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MEETING

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ABSTRACTS

A good start to CIC with LoFric Sense and LoFric Origo

Welcome to visit our stand no. 23



10:30 - 12:00

Oral Session 1 Aging Tuesday AM
Auditorium

Experiences of participation in everyday occupations among persons aging with a traumatic SCI

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Introduction and Aims

Today, an increasing number of persons are aging with a SCI and earlier research has explored both favorable and unfavorable changes over time. Negative aspects of aging with a SCI have been identified such as loss of physical functions and risk for secondary health complications which can change participation in everyday life. Nevertheless, there is a lack of knowledge regarding persons' own experiences of participation in everyday life while aging with SCI. A knowledge that can complement earlier research, and is essential in order to promote lifelong rehabilitation that can enhance participation across the lifespan of individuals' aging with an SCI. The aim of this study was to describe experiences of participation in everyday life among persons aging with a traumatic SCI.

Material and Methods

Data were collected through narrative interviews with 8 participants, four women and four men aged 48 to 74 years (mean age: 57.3 ±9.0) with tetraplegia caused by a traumatic SCI (mean years post injury: 37.25 ±10.5); two had incomplete injuries (at levels C3-4 and C5-6) and six had complete injuries (at levels C3-5, C4-5, C5, C6, C7, and C6-7). A narrative analyze was used to provide a picture of the process of participation in everyday occupations while aging with an SCI among the stories that have been collected.

Results

The participants described how participation suddenly changes after an SCI and how they soon after their injury acted in order to become agents of their own lives and to manage the complexity of participation in everyday occupations. After some years, the participants described how they realized that they had to prioritize participation in meaningful occupations due to both personal and environmental factors. As years went by, they described how they had to try new strategies to continue participation in occupations due to secondary health complications as a result of aging. Their ability to act to facilitate participation in everyday occupations decreased, and feelings of uncertainty aroused concerning the future while aging with a SCI.

Conclusion

our findings capture how aging with a SCI is a complex daily struggle in order to maintain agency and participation in everyday occupation. Thereby our findings give implications for a well-functioning lifelong rehabilitation and appropriate support from society, in order to enable agency and participation in everyday occupation throughout the whole lifespan for individuals with SCI.

Clarification of the molecular bases of the vulnerability in aged spinal cord

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Introduction and Aims

The incidence of spinal cord injury (SCI) without bone injury in aged patients is increasing in Japan. SCI in aged patients is often caused by relatively low-energy traumas, including stumbles. We have been researching a possibility that aged spinal cord itself is vulnerable to the external force. The purpose of the present study was to clarify the molecular basis of aging-related vulnerability of spinal cord. In last year's meeting, we have reported the peripherin and alpha-crystallin B subunit (CRYAB) were detected as differentially up-regulated proteins in aged spinal cord of female SD rat by 2D PAGE and following mass spectrometry. And these proteins were confirmed with western blot analyses of the spinal cord protein and immunohistochemistry of spinal cord histological slides. To compare in the SCI model, we performed experiments using Senescence-Accelerated Mouse (SAM). SAM are a collection of inbred mouse strains developed as models of accelerated aging, and include short-lived, senescence-accelerated mouse prone strains (SAMP) and longer lived control strains designated senescence-accelerated mouse resistant (SAMR).

Material and Methods

1. Two proteins were confirmed with western blot analyses of the protein samples and immunohistochemistry of histological slides from spinal cord of SAMP and SAMR (7-months-old male, n=5 respectively).
2. 8-months-old male SAMP (n=16) and SAMR (n=14) were anesthetized with Sevoflurane. After performing a laminectomy at the 9th thoracic vertebrae, the exposed spinal cord was contused using the Infinite Horizon Impactor device. Injuries were made using a force of 60 kdynes. Locomotor recovery was evaluated in an openfield test using the nine-point Basso Mouse Scale (BMS) for 6 weeks. 7 weeks after SCI, immunohistochemistry of histological slides from injured spinal cord was performed.

Results

1. Peripherin expression was observed mainly in neurofilament of ventral horn, dorsal horn and dorsal funiculus. CRYAB expression was detected in oligodendrocytes, and significantly higher in the SAMP group compared to the SAMR group.
2. BMS was significantly lower in the SAMP group than in the SAMR group. No significant difference was observed between two groups, about the degree of reduction in the number of neuron around the injury site.

Conclusions

Inflammation is known as one of age-related factors, it was reported that inflammatory cytokines and their receptors are increased in the aged spinal cord, and that might be related to maintaining a balance of inflammatory reaction in the spinal cord during normal aging. It was also reported the overexpression of peripherin induces degeneration of spinal motor neurons during aging in transgenic mice, and CRYAB is induced in oligodendrocytes and astrocytes in areas of active demyelination in multiple sclerosis, and astrocytic dopamine D2 receptor activation normally suppresses neuroinflammation in the central nervous system through a CRYAB-dependent mechanism. Up-regulation of those proteins might be related to molecular changes in aged spinal cord.

Prediction of pressure ulcer healing in spinal cord injury patients during conservative treatment with the "Decu-stick"

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Introduction and Aims

Pressure ulcers (PU's) are a common and serious complication in SCI patients. Conservative treatment takes usually many weeks or months. The aim of this study is to predict early if the PU will close under one conservative treatment or that an operation or change to an alternative conservative treatment is needed.

Material and Methods

We developed and validated a cheap, reliable and practical tool (working name "Decu-stick") to measure length, width, depth and undermining of PU's with one instrument. We measured 75 PU's under sacrum or ischial tuberosity in 63 SCI patients (age 52.5 [18-70] y), (tsi 11.7 [0-54] y) once a week under standardized conservative treatment until closure. In case of non-closure we measured during 12 weeks or until operation.

Results

Forty of the 75 studied PU's closed. During the granulation/epithelialisation (G/E) phase the speed of reduction of the greatest surface or undermining dimension of the PU predicted closure of the PU. A reduction with > 0.5 cm/week had a positive predictive value (PPV) for closure of 76% after 2 weeks, 91% after 4 weeks and 96% after 6 weeks. Reduction of this dimension with < 0.5 cm/week predicted non-closure of the PU with a negative predictive value (NPV) of 88% after 2 weeks, 82% after 4 weeks and 92% after 6 weeks.

Conclusion

This study describes a cheap, reliable and practical bedside method, applicable during clinical admission, in an outpatient clinic or at home, to predict after 2-6 weeks of conservative treatment the chance of closure of a PU. This can be a scientific basis for the decision on operative or an alternative conservative treatment. It can also be used to compare different conservative treatment modalities in one patient.

The relationship of age and labour market participation in individuals with spinal cord injury in Switzerland

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Introduction and Aims

Age-related variables (i.e. chronological age, age at injury, time since injury) and secondary health conditions (SHC) are factors known to influence labour market participation (LMP) of persons with spinal cord injury (SCI). However, we have only limited knowledge of how these factors interrelate with each other. The purpose of this study is to examine the association between age-related variables, SHC and LMP.

Material and Methods

A cross-sectional observational study was conducted using data from the 2012 community-based survey done by the Swiss Spinal Cord Injury Cohort Study (SwiSCI). Eligibility criteria included having a traumatic or non-traumatic SCI, being of working age (18 - 64 years old) and living for at least 1 year in the community. We interviewed five medical and vocational experts to identify and rank the most relevant SHC in relation to LMP. Outcome variables were work status and work hours. Descriptive statistics and group differences (t-tests and X²-tests) were calculated. Direct and indirect effects (decomposition) were tested using imputed and non-responder corrected data. Decomposition and mediation was examined with the KHB-method (Karlson & Holm 2011) as implemented in Stata and in combination with logistic and linear regression models. Finally, to account for potential non-linearity, we introduced fractional polynomials in the analysis.

Results

A total of 1559 persons were included in the study. Fifty-six percent were employed. Bivariate analysis showed a curvilinear relationship between work status and chronological age, peaking around 30 years of age. Longer time since injury and younger age at SCI increased employment. Of the six SHC analyzed, only pain, urinary tract infection and pressure ulcer were associated with the age-related variables. Decomposition showed a direct effect of chronological age on work status and work hours. Longer time since injury slightly increased the likelihood to work when chronological age was controlled for. Pain mediated the relation between age at injury and work status. Furthermore, partial mediation was found in the model including chronological age and time since injury. Regarding part-time work, we found that older individuals were more likely to reduce their work hours than younger individuals. However, no associations regarding part-time work was mediated by SHC.

Conclusions

According to our results, how old an individual is impacts whether and how much the individual is working. The effect of age at injury on work status is partly mediated by pain. Therefore, pain should be carefully considered in rehabilitation of individuals with age at injury onset later in life. However, SHC other than pain seem to play less of a mediating role in the association between age-related variables and the two work outcomes than a priori hypothesized.

Functional upper extremity surgery in elderly tetraplegic patients - never too late to improve

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Introduction and Aims

The effectiveness of functional surgery in the increasing number of elderly tetraplegic individuals is largely unknown and only few seem to be offered upper extremity surgery.

Material and Methods

A total of 25 individuals (7 women and 18 men) aged over 60 (mean age: 66, max. 75 years) were reviewed following functional restoration of 30 upper extremities (4 bilateral) at an average interval of 6.5 (range, 1.3-23.7) years after spinal cord injury. Follow-up was possible in 22 patients after a mean interval of 6.8 (range, 6 months-20.8) years including standardised measurements of range of motion, key pinch, grasp and opening of the first web space.

Results

A mean of 1.7 (maximum, 6) operative procedures were performed per patient to restore elbow extension (n=5), key pinch (n= 23, 2 passive, 21 active), active finger grasp (n=8), active finger extension (n=5), passive thumb extension or abduction (n=13), finger extension tenodesis (n=3) and thumb stabilization (n=14, 9 tenodeses, 5 arthrodeses). Postoperatively, antigravity extension of the elbow was possible in 4 of 5 cases. Key grip strength averaged 1.7 ± 1.8 kg (mean \pm SD) and active opening of the first web space increased by an average of 8 ± 4.1 cm.

Conclusions

In summary, patients of advanced chronological age markedly benefit from upper extremity surgery, as do their younger counterparts. Even decades after the spinal cord injury, most rewarding results can be achieved in this cohort which is certain to grow in the future.

Pro-inflammatory genetic and physiological alterations in peripheral tissues associated with cardiometabolic dysfunction in chronic SCI

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Introduction and Aims

Chronic spinal cord injury (SCI) incites early cardiometabolic disease (CMD) risks and cardiovascular disease (CVD). Current clinical management targets pro-atherogenic inflammatory cytokines (PAIC) as disease instigators. However, mechanisms underlying their activation, and impact on CVD after SCI are unknown. This study tested whether SCI promotes over-expression of genes regulating PAICs associated with CVD, and hastens onset of CMD.

Materials and Methods

C57Bl/6 or ApoE^{-/-} (C57BL/6 background [B6.129P2-ApoE^{tm1}UNC/J]) female mice were used in all experiments. Contusion injury was induced with the Infinite Horizon device adapted to the mouse. Mice were anesthetized with IP injection of ketamine (80--100 mg/kg) and xylazine (10 mg/kg), subjected to a T9 laminectomy and the exposed spinal cord was injured at a force of 70 k-dynes (severe). Heart and visceral adipose tissue (VAT) were harvested 1-month post-SCI. Evaluations of mRNA levels of Fatty Acid Synthase (FASN), Carnitine palmitoyltransferase-1 (CPT1, heart) and Fatty Acid Binding Protein-4 (FABP4), peroxisome proliferator-activated receptor- γ (PPAR γ) in visceral adipose tissue (VAT) were performed by Quantitative polymerase chain reaction (qPCR). Plasma glucose obtained by tail prick was monitored following IP glucose administration (1.5 g/kg). Whole blood obtained at sacrifice was assayed for PAICs Interleukin 1-beta (IL-1 β) and Interleukin-6 (IL-6). Aortas (ApoE^{-/-}) (n=5) were harvested and formalin-fixed at sacrifice. Atherosclerotic disease was evaluated by en face Oil Red O staining followed by blinded (SCI vs. control) digital quantitation of visualized lipophilic regions.

Results

In C57Bl/6 mice 1-month post SCI, we observed a significant increase in FASN mRNA and a trend toward increase in CPT1b mRNA in heart tissue compared to control, reflecting compromise of cardiac function and mechanical efficiency. We also found a significant increase in VAT FABP4 after SCI compared to control, and a trend toward increase in VAT PPAR γ , which reflect markers associated with obesity-related CMD risk. Plasma glucose clearance was impaired following glucose challenge after SCI, a clinical indicator of dysglycemia and diabetes risk. We observed a significant increase in serum IL-1 β , as well as a trend for increased IL-6 at 1-month post SCI, which are clinically linked to chronic inflammation and the development of cardiometabolic pathologies. Aortic lesion histomorphometry was performed to quantify atherosclerotic disease burden in ApoE^{-/-} mice. We found a two-fold higher mean level of disease in the thoracic aorta in SCI animals versus control.

Conclusions

Genes that mediate cardiac and VAT inflammation related to CMD are upregulated after SCI. SCI also impairs glucose metabolism, and increases circulating PAICs that are surrogates for metabolic pathologies. In ApoE^{-/-} mice, SCI accelerates aortic atherosclerotic lesions. SCI is thus an inciting event for chronically acquired CMD. These findings can help identify needed therapeutic interventions and direct appropriate rehabilitation countermeasures.

10:30 - 12:00

Oral Session 2: Orthotics Tuesday AM
Brussels Room

A literature review of the advantages and disadvantages of functional electrical stimulation for spinal cord injury patients

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Introduction and Aims

Spinal cord injury (SCI) leads to degenerative changes and complications such as muscle atrophy, spasticity, osteoporosis, reduced cardio respiratory fitness, metabolic changes, pressure ulcers and poor circulation in the affected limbs. These changes are often a consequence of the reduced physical activity of persons with SCI. Functional electrical stimulation (FES) gives SCI patients the opportunity to exercise the paralysed muscles. Nevertheless its use in spinal cord injury is only supported by studies of small sample size, leading to insufficient evidence to determine its use. A literature overview is warranted.

Material and Methods

A literature search was performed in pubmed with mesh terms: SCI, FES and cycling. Inclusion criteria were studies investigating SCI human patients ages 18 years or older having received FES by cycling and exclusion criteria were concomitant diseases.

Results

46 hits were found and 22 studies were included in our review. Several studies concluded an increase in muscle mass (7% to 22%) after FES exercise. Furthermore some studies demonstrated a change from muscle fibre type IIb to IIa resulting in an increased fatigue resistance. Conceding spasticity various theories with contradictory outcomes are found. A possible explanation of the diversity in outcome is that FES may decrease tonic spasticity but increase phasic spasticity in SCI subjects. Regarding bone mass also various theories and many contradictory outcomes exist. FES cycling may cause an increase in the trabecular bone compartment either by an increased blood flow to the lower limbs or by loading the power on the limbs. In most studies the difference is not significant. Cardiovascular benefits are mainly caused by an increase in venous return from the dependent limbs causing an increased stroke volume and therefore an increased cardiac output. Besides, a significant local reversal of negative vascular changes were seen in some studies. Furthermore during FES cycling there is a metabolic benefit but the efficiency values are low (10%). As a consequence of the increased thigh muscle mass and the enhanced blood flow in the lower limbs there is a reduced risk of pressure ulcers. Finally the psychological benefits mainly depend on the expectations. More specifically SCI subjects with unrealistic expectations experience significantly increased depression compared to subjects with realistic expectations who had reduced depression compared to the control group.

Conclusion

We can conclude that positive outcomes after FES-evoked exercise have been identified for individuals with SCI across multiple domains of health and fitness, such as muscle mass, cardiovascular effects, metabolic effects, pressure ulcers and psychological outcomes. However changes in spasticity and bone mass are not significant in therapeutic use. It has to be mentioned that studies are of limited sample and poor quality and therefore more research is needed to determine the effect of FES.

Feasibility and effects of 2 weeks overnight electrical stimulation-induced muscle activation using electrical stimulation shorts in people with a SCI

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Objective

To study the

1. feasibility of electrical stimulation (ES-) shorts during overnight use,
2. the effects of prolonged surface ES-induced muscle activation on muscle fatigue and
3. muscle oxygenation in upper leg muscles persons with spinal cord injury (SCI). Design: Pre- post-test intervention design. Setting: Research laboratory of a Rehabilitation Center. Participants: Eight participants with SCI, Asia A or B. Intervention: ES-induced activation of the gluteal, hamstrings and quadriceps muscles in a 2 weeks overnight stimulation protocol, 8 hours per night. Custom-made ES-shorts were developed for this study. A questionnaire was used to determine usability of the ES-shorts. Main Outcome Measures: Feasibility, Muscle fatigue, oxygenation after arterial and venous occlusion.

Results

Usability of the ES-shorts in general was good, and ES did not disturb sleep. After 8 hours of activation muscles still contracted, although mean contraction size was significantly lower at the end of the night compared to the start. After 2 weeks of ES induced muscle activation, gluteal oxygenation while sitting, was not significantly higher compared to prior ($p=.77$). No significant differences were found in mean oxygen uptake ($p=.31$) after arterial occlusion, or blood flow after venous occlusion.

Discussion

Clinical implications of this study concern the challenge to lower the incidence of PU's in SCI due to sitting. We believe that the nightly use of the ES-shorts could be an important part of the daily routine of people with SCI. The ES-shorts do not reduce IT pressure when used lying (in bed, overnight), but several proven effects in literature suggest positive effects of prolonged muscle activation, like increase of tissue oxygenation and reduction of muscle atrophy. Likely due to the study limitations (too short period in time in combination with too little participants), no significant changes, i.e. increase of oxygenation, decrease of recovery rate after occlusion, and an increase of blood flow were found. Using the ES-shorts, muscle contractions decreased during the stimulation cycles, which is most likely due to fatigue of fast fatigue type 2 muscle fibers. After SCI, composition of muscle fibers in muscle below the level of lesion shift towards fast fatigue muscle fibers. Although contractions decreased during stimulation, contractions were still detected at the end of stimulation cycles, indicating (type 1 and type 2a) muscle fibers were active throughout stimulation.

Conclusions

Overnight ES-induced muscle activation in SCI is a feasible method that does not interfere with sleep. Muscles still contracted after 8-hours of ES-induced activation, although contraction size was significantly lower. No statistical significant effects were found on muscle oxygenation or blood flow after 2 weeks of muscles activation.

Araz medial linkage orthosis to assist for walking in spinal cord injury patients: concept and design

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Introduction

Medial linkage orthosis (MLO) is new generation of assistive device to assist walking in spinal cord injury patients. This type of orthosis use as link to joint knee ankle foot orthoses (KAFOs). Walkabout orthosis, Moorong MLO and Primewalk are samples of common MLOs. The positive effects of MLOs reported in previous studies in this field, but the reciprocation movement is not available in mechanical structure of them, therefore the Araz MLO attempt to provide MLO with reciprocating concept. This paper explains the concept and design of this new orthosis.

Orthosis description

The Araz MLO is a new generation of medial linkage orthoses to assist of ambulation in spinal cord injury patients with the separate KAFOs or hip knee ankle foot orthosis (HKAFOs). MLO joints the medial uprights of a pair of KAFOs to control adduction and abduction of the lower extremity during walking. The Araz MLO has a simple reciprocating mechanism. This new mechanism was placed below the perineum. It was decided to extend the MLO concept by providing the reciprocating motion between two KAFOs. This was achieved by using three rolling element to provide reciprocal function.

A collaborative approach to the development of a robotic exoskeleton that has an option for functional electrical stimulation

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Introduction and Aims

Indego® is being developed from a collaborative research effort between Vanderbilt University Engineering, Nashville TN, Shepherd Center Clinical Staff, Atlanta GA and Parker Hannifin Engineering, Cleveland OH. It is the only robotic lower extremity exoskeleton to incorporate functional electrical stimulation (FES), a known modality to enhance neuromuscular re-education, strength and gait training in persons with spinal cord injury (SCI). At 27 pounds and modular, it is nearly half the weight of other exoskeleton devices and easily transported and stored by the user, caregiver or clinician. Indego® is also the only exoskeleton that can be don/doffed and worn in the users wheelchair, thus bypassing the need to transfer. Clinicians find the efficiency for set up between subjects to be unprecedented, thus increasing walking time for the user during a course of therapy. Indego® is intended to provide options for mobility for persons who are non-ambulatory and to be used as a progressive rehabilitation intervention for persons who may be poorly ambulatory. The unique design, functionality and clinical research outcomes discovered during trials indicate substantial benefits for both the user and the clinician.

Material and Methods

At the time this presentation will be given, Shepherd Center and 4 additional centers in the USA would have enrolled nearly 40 subjects in clinical research trials. Subjects have injury levels of cervical 4 (C4) and below with International Standards for Neurological Classification for Spinal Cord Injury (ISNCSCI) A, B or C. Acute and chronic SCI subjects have been enrolled. Individual subject session numbers range from five to 60. Subjects walk over even and uneven terrain using Indego® with a stability aid; platform walker for cervical injuries and a walker or forearm crutches for thoracic and lumbar injury levels. Mobility outcome measures include Ten Meter Walk Test, Timed Up and Go and 6 Minute Walk Test. Other areas of outcome measures include functional independence measure (FIM), ISNCSCI, balance, bodily systems and quality of life.

Results

Preliminary mobility studies with SCI show subjects had similar speeds when tested for all walking measures. Average walking speed for complete paraplegics using Indego® was 0.35 m/s (0.4 m/s is considered a functional speed for gait outside the home). Indego® mobility with FES option for persons with motor complete SCI shows that muscle contribution from otherwise paralyzed muscles ranges from 27% to 95%. The motors and FES work co-operatively without sacrificing stepping trajectory. Subjects have also shown significant changes in FIM, health and other measures.

Conclusion

A unique approach between clinicians and engineers since the year 2009 offers advances in exoskeleton technology for persons with SCI. Based on preliminary results, the potential for Indego® to provide personal mobility and functional recovery for persons with neurological diagnoses is promising. Secondary health benefits for persons with SCI being upright and walking is an ongoing aspect of our investigation.

A systematic review of neuromuscular electrical stimulation for pressure ulcer care in spinal cord injuries

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Introduction and Aim

Pressure ulcer (PU) is one of the most common secondary complications following a spinal cord injury (SCI). Electrical stimulation (ES) can confer the benefit to pressure ulcer care in SCI. However, to date, the clinical guidelines regarding the use of ES for PU management in SCI remain limited. This systematic review was therefore conducted to identify the updated evidence, and to pinpoint the scope of the feasibility of future studies implementing electrical stimulation for PU management in SCI. The overall aim of this review was to critically appraise and synthesize the research evidence on neuromuscular ES for the prevention and treatment of PU in spinal cord injuries.

Material and Method

Review was limited to peer-reviewed studies published in English from 1970 to 2013. A Free-text and keyword/MESH terms search of five databases (Medline, CINAHL, EMBASE, PsycINFO and the Cochrane Central Register of Controlled Trials.), in addition to manual searches of other resources and retrieved articles was undertaken on 18th July 2013. Studies included randomized controlled trials (RCTs), non-randomized controlled trials, prospective cohort studies, case series, case control studies and case report studies. Target population included adults with SCI. Interventions of any type of neuromuscular ES were accepted. Any outcome measuring the effectiveness of PU prevention and treatment was included. Methodological quality was evaluated using established instruments by two independent reviewers.

Results

Twenty-seven studies were included in this review, 9/27 studies were RCTs. Six of RCTs were therapeutic trials. ES enhanced PU healing in all therapeutic studies. The evidence of long-term benefit of ES for pressure ulcer prevention is uncertain. Five types of ES modalities (surface electrodes, ES shorts, sacral anterior nerve root implant, neuromuscular electrical stimulation implant and anal probe) were identified in this review.

Conclusion

The great variability in the parameters and locations of ES application and outcome measure leads to an inability to advocate any one standard therapeutic approach for PU therapy or prevention. The methodological quality of the studies was generally poor, in particular for those prevention studies. Future research is suggested to improve the design of ES devices, standardize ES parameters and conduct more rigorous trials.

10:30 - 12:00

Oral Sessions 3 (Free Communication: Urology) Tuesday AM
Paris Room

Nocturnal polyuria in patients with a spinal cord injury: circadian rhythms of renal functions

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Introduction

It is commonly observed that patients with a spinal cord injury (SCI) have nocturnal polyuria (NP), which gives rise to important complications (autonomic hyperreflexia, urinary tract infections, hydronephrosis, ...) and affects quality of life. First, it is considered that the circadian rhythmicity in the secretion of the anti-diuretic hormone, vasopressin, is disturbed, which leads to an increased water diuresis. Second, it is known that these patients experience more fluid retention, which returns in the intravascular space when they lie down. This influences the secretion of natriuretic hormones, which contributes to an increased solute diuresis. The objective of this study was to evaluate circadian rhythms of renal functions in an adult population with a SCI compared to a control population, both with and without NP.

Material and Methods

A total of 97 adults <60 years were included: 26 cases with a SCI and NP, 30 able bodied controls with NP and 41 without NP. NP was defined as a nocturnal urine production >33% of the total 24h-urine production. All participants performed a 24h-urinecollection (1sample/3h) to determine the voided volumes and the levels of creatinine, osmolality, urea and sodium for each sample. The last 3 samples (12-2am, 3-5am, 6-8am) were considered as nighttime samples in the controls, while the last 4 samples were considered as nighttime samples in the cases. A blood sample was taken during the 24h-urinecollection.

Results

The median age in the 26 cases, 30 controls with NP and 41 controls without NP was 46 [21-59], 51 [21-59] and 42 [18-59] years, respectively. Controls without NP (n=41) showed a significant circadian rhythm with a lower diuresis rate (1.8 [0.7-3.3] vs. 0.8 [0.4-1.9], $p<0.001$), creatinine clearance (147 [70-275] vs. 118 [51-235], $p<0.05$) and osmotic clearance (2.5 [1.2-4.4], 1.7 [0.9-4.0], $p<0.001$) during the night. They showed no diurnal variation in free water clearance (-0.7 [-3.0-0.9] vs. -0.8 [-2.6-0.1]). In contrast, controls with NP (n=30) showed a significant increase in nocturnal free water clearance (-1.2 [-2.3-0.2] vs. -0.7 [-2.4-1.2], $p<0.001$), pleading for a disturbance in vasopressin secretion. We observed no circadian rhythms in renal functions (diuresis rate, creatinine clearance, free water clearance and osmotic clearance) in the 26 cases. An episode of higher diuresis rate, creatinine clearance and osmotic clearance was observed early in the night. The first hypothesis to explain these peaks is an episode of glomerular hyperfiltration due to the increased intravascular volume when lying down at night. A second hypothesis is the activation of the renal functional reserve capacity.

Conclusion

Different pathophysiological mechanisms can contribute to the development of nocturnal polyuria: disturbances in water diuresis, osmotic diuresis, and glomerular filtration. Consequently, specific treatment is necessary in order to avoid the symptoms and complications of NP.

50 years follow-up on plasma creatinine after spinal cord injury

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Introduction and Aims

Individuals who have sustained a spinal cord injury (SCI) are in increased risk of developing renal insufficiency, due to neurogenic bladder dysfunction, and patients are recommended to participate in a lifelong follow-up program of the renal function. Despite the fact that plasma creatinine (p-creatinine) is affected by the level of muscle mass, the repeated measurement of p-creatinine remains a commonly accepted method in monitoring renal function. We wanted to investigate if there was a trend in the level of p-creatinine over a 50-year follow-up period and how well p-creatinine correlates to renal deterioration in patients with SCI.

Material and Methods

119 patients with a traumatic SCI during the years 1944-1975 followed at our clinic were included in this retrospective study. P-creatinine measurements, results from renography and glomerular filtration rate (GFR) measured with ⁵¹Cr-EDTA clearance were obtained from medical records and analyzed using linear mixed model and linear regression analyses.

Results

When compared to median p-creatinine level in the first 5-year period after injury, the level of p-creatinine was stable throughout the first 30 years and decreased significantly after the 30th until 45th year post injury. Only patients with a functional distribution outside the limits 30-70% on renography or a relative GFR ≤ 51 % of expected had a significantly elevated level of p-creatinine. Significance was not found for patients with a distribution outside 40-60% on renography or relative GFR ≤ 75 %. By comparing Cr-EDTA clearance and p-creatinine in terms of exceeding the upper reference level, p-creatinine revealed 17 % sensitivity, 100 % specificity, 100 % positive predictive value and 73 % negative predictive value as a diagnostic test for renal deterioration defined as GFR ≤ 75 %.

Conclusion

P-creatinine decreases over time in patients with SCI with a level below the upper reference limit and is a poor detector of early renal deterioration in patients with SCI.

A comparative study between oxybutynin chloride and onabotulinumtoxinA in spinal cord injured patients: urodynamic evaluation and quality of life

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Introduction and Aims

The treatment of the neurogenic detrusor overactivity (NDO) is an important issue in the rehabilitation of patients with spinal cord injury (SCI). The goals of this study were to evaluate the impact on Quality of Life (QoL) and urodynamic parameters on patients with SCI who were treated with intradetrusor injections of onabotulinumtoxinA or oral oxybutynin.

Material and Methods

Sixty-eight patients with SCI and NDO were randomized into two groups. Patients in Group I (n=34) received 15 mg/day oxybutynin orally, and patients in Group II (n=34) were treated with intradetrusor injections of 300U onabotulinumtoxinA into 30 different segments of the urinary bladder wall, sparing of the trigone. Urodynamic parameters such as maximum cystometric capacity (MCC), maximum detrusor pressure (Pdetmax) and bladder compliance were evaluated, and QoL scores were obtained by applying the Qualiveen questionnaire. Evaluations were performed prior to randomisation, at 4 and 24 weeks of treatment. The significance level was set at 5%.

Results

Seven patients did not complete the study. Of the 61 patients, 49 (80.3%) were male. The mean age of patients was 31.84 (\pm 8.73) years old in group I and 33.54 (\pm 11.86) years old in group II ($p=0.839$). After 24 weeks, the mean increase in MCC in group I was 126.24 (\pm 62.22) mL compared to 289.25 (\pm 134.52) mL in group II ($p<0.001$). We determined a mean decrease of 21.09 (\pm 19.95) cm H₂O in Pdetmax in group I compared to 48.75 (\pm 29.34) cm H₂O in group II ($p<0.001$). Furthermore, the mean increase in bladder compliance was 6.85 (\pm 5.13) mL/cm H₂O in group I compared to 25.82 (\pm 24.00) mL/cm H₂O in group II ($p=0.006$). A mean decrease in 24-hour urine leakage of 2.34 (\pm 1.89) episodes occurred in group I, with a mean decrease of 7.55 (\pm 3.52) episodes in group II ($p<0.001$). Scores in the Qualiveen questionnaire that focused on the specific impact of urinary dysfunction were decreased by a mean of -0.26 (\pm 0.33) in group I and -1.48 (\pm 0.70) in group II ($p<0.001$). Importantly, the Qualiveen scores related to the QoL index increased by a mean of 0.12 (\pm 0.26) in group I and 0.63 (\pm 0.45) in group II ($p<0.001$).

Conclusions

Both intradetrusor injections of onabotulinumtoxinA and oral administration of oxybutynin resulted in a significant improvement in urodynamic parameters and QoL in patients with detrusor overactivity due to SCI. However, a comparison of the two treatments showed a significantly improved response with onabotulinumtoxinA compared to oxybutynin.

Failure of urological improvement following the artificial somato-sensory reflex arch (Xiao procedure)

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Introduction and Aims

A new controversial concept in the treatment of neurogenic bladder dysfunction is the artificial somato-sensory reflex arch (Xiao procedure). The aim of the study was to investigate the urological efficacy of the procedure.

Material and Methods

All patients underwent the Xiao procedure: the ventral (motorical) part of L5 is anastomosed to the ventral part of S2 or S3. Thereby, in theory, a new reflex arch can be created to stimulate the bladder via the L5 dermatome. Urodynamic evaluation and the International spinal cord injury lower urinary tract function basic data set were filled in preoperatively and at 18 months follow-up. Results are given as median and quartile range (25 % and 75 %).

Results

Ten patients were included (age = 46 years (19-64 years); ASIA impairment scale = A (7) and B (3); injury levels = C5 -- Th10; time(injury to surgery) = 4 years (1-18 years); time(surgery to follow-up) = 19 month (17-24 month). Urodynamics: none of the included patients displayed volitional voiding at baseline or at follow-up. Neither maximum cystometric bladder capacity (at baseline median = 427.5 mL (168-581 mL) and at follow-up = 498.5 mL (271-580 mL), $p = 0.09$), compliance (16.9 (15.0-65.0) respectively 25.1 (17.5-50.0), $p = 0.95$), nor autonomic dysreflexia (two patients at baseline, four patients at follow-up, $p = 0.32$) changed significantly. The sole significant change was leakage in the urodynamic evaluation which was lower at follow-up (seven at baseline, two at follow-up), $p = 0.03$. Upon stimulating the artificial reflex arch with a cloth, digitally or by means of a vibrator, bladder emptying could not be initiated and no significant changes were seen in bladder pressure (cloth: at baseline, median = 12.5 cm H₂O (5-24 cm H₂O) and at follow-up = 9.5 cm H₂O (1-22 cm H₂O), $p = 0.22$); digitally: 9.5 cm H₂O (2-16 cm H₂O) respectively 9 cm H₂O (3-20 cm H₂O), $p = 0.84$; vibrator: 8.5 cm H₂O (2-15 cm H₂O) respectively 9.5 cm H₂O (2-20 cm H₂O), $p = 0.08$). No difference was found with regard to awareness of bladder filling ($p = 0.16$), average number of clean intermittent catheterizations per day ($p = 0.58$), incontinence episodes ($p = 0.32$) or collecting appliances for urinary incontinence ($p = 0.56$). Use of pharmacological agents or means of bladder emptying showed no specific trend.

Conclusion

In contrast to earlier findings, creation of an artificial reflex arch, in spinal cord injury patients, had no significant effect on the lower urinary tract: no urodynamic changes attributable to the procedure could be measured, the patients did not experience any significant changes in symptoms or bother and no micturition induction was achieved. The significant lesser leakage is perhaps due to lesser spasticity caused by the dissection of a sacral nerve. We therefore cannot recommend this procedure as a management option for neurogenic bladder dysfunction.

Which sacral roots for detrusor innervation ? Per-operative electrophysiological findings during Brindley procedure

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The Brindley procedure consists of a stimulator for sacral anterior-root (SARS) and sacral deafferentation (SDAF) to abolish neurogenic detrusor overactivity (NDO). During the surgical procedure, the anterior and dorsal components of the roots, especially relevant anterior roots for micturition, can be identified intradurally by electrical stimulation of these components while monitoring the effects on detrusor activity and somatomotor responses. We report the results of the per-operative electrophysiological evaluation of a prospective cohort of patients who underwent SARS/SDAF in our institution.

Method

During surgical procedure the bladder responses were recorded via an indwelling balloon catheter connected to a cystometer. The identification of each roots and of the anterior and posterior components was confirmed by electrical stimulation of each component with a tripolar hook electrode. For somatic responses 3 pulses/s and thresholds between 0.3 and 1.0 V and for bladder responses 30 pulses/s and thresholds between 1.5 and 4V were used. The amplitude of detrusor contraction during stimulation was recorded for each of the six ventral sacral roots S2 to S4.

Results

Population : 32 patients (26 males, 6 females) underwent SARS/SDAF at our institution between 1998 and 2013. 11 were tetraplegics, 21 paraplegics. The mean age at the time of the surgery was 35.07 years, the mean post-traumatic delay was 5.4 years. 30 patients were AIS A, 2 AIS B, all the patients but one had intractable NDO with incontinence and/ or high intra-vesical pressures.

Electrophysiological Findings (31 patients)

The six sacral roots (S2 to S4) have been tested in 28 cases, one case had only an evaluation of S3 and S4 (right and left), and in two patients we recorded the response after implantation of the electrodes without differentiation of the side.

The stimulation of S2 gave a bladder contraction in 10/29 cases :

- mean bladder contraction amplitude: S2 (right and left) = 5.4 cm H₂O ; Right S2 = 5.34 cm H₂O ; left S2 = 5.45 cm H₂O. The stimulation of S3 gave a bladder contraction in 28/31 cases :
- Mean bladder contraction amplitude : S3 (right and left) = 56 cm H₂O ; right S3= 58 cm H₂O ; left S3 = 52.31 cm H₂O.
- The right S3 root was predominant in 13 cases and the left one in 12. The stimulation of S4 gave a bladder contraction in 28 / 29 cases,
- Mean bladder contraction amplitude : S4 (right and left) = 47.34 cm H₂O ; right S4 = 44.17 cm H₂O ; left S4 = 49.35
- S4 right was predominant in 9 /28 cases and S4 left in 16. Conclusion : the contribution of the S3 roots and S4 roots to the bladder contraction seems to be the same in term of frequency. However, S3 roots are the most efficacious contributor and the right S3 root seems to be predominant in term of efficacy in the innervation of the detrusor. Clinical implications for sacral neuromodulation and for sacral tumor surgery will be discussed.

A scoring system for urethral strictures in men with neurogenic lower urinary tract dysfunction

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Introduction and Aims

Intermittent catheterization (IC) is the gold standard for bladder evacuation in men with neurogenic lower urinary tract dysfunction (NLUTD). However, IC has been associated with an increased risk of urethral strictures, which may impede bladder evacuation by IC. The assessment of urethral strictures takes into account clinical symptoms and the presentation in retrograde urethrography. However, there is no standardized urethral stricture grading in radiologic imaging. Wiegand et al. (2012) have proposed a urethral stricture scoring system to facilitate surgical decision-making and objective analysis of surgical outcomes. We have investigated a modified Wiegand urethral stricture scoring system in men with NLUTD suffering from urethral strictures.

Materials and Methods

The patient database of a single spinal cord injury (SCI) rehabilitation centre was searched for men evacuating their bladders by IC and suffering from urethral strictures. The urethral strictures were classified using the Wiegand scoring system modified for men with NLUTD:

- a) total number of strictures;
- b) anatomic location: 1=bulbar, 2=penile urethra, 3=panurethral;
- c) length: 1 point per cm.

The sum of these values represented the stricture score. The dates of first diagnosis and urethrotomy procedures were noted. Furthermore, personal characteristics and bladder diary details were collected. Data were presented as the median and the lower (LQ) and upper (UQ) quartiles. Non-parametric tests were used to investigate differences between groups.

Results

The database contained 415 men using IC for bladder evacuation. Among these, 105 men were suffering from a urethral stricture for a median 12 years (LQ 5 UQ 18 years). Their median age was 52 years (LQ 41 UQ 63 years) with a median NLUTD duration of 22 years (LQ 14 UQ 29 years). The majority suffered from paraplegia (90%, 95/105) and traumatic SCI (92%, 97/105). They had been using IC for bladder evacuation for a median 14 years (LQ 7 UQ 15 years). Only 11 men had more than one stricture (two or three strictures). The anatomic location was mainly bulbar (50%, 53/105), followed by penile (37%, 39/105), but rarely panurethral (12%, 13/105). Most strictures (73%, 77/105) were short. Four strictures resulted in a non-patent urethra. In 36/105 (34%) men, urethrotomy had been performed. More than one (2-5) urethrotomy was performed in 12/36 (33%) men. The stricture score of men undergoing urethrotomy was significantly ($p=0.001$) greater (5.5 LQ 4 UQ 7) compared to men who did not (4 LQ 4 UQ 5).

Conclusions

The modified Wiegand stricture score successfully discriminated between strictures resulting in a urethrotomy and those that did not. The herein investigated stricture score could facilitate surgical decision-making and objective analysis of surgical outcomes.

Nocturnal polyuria in patients with spinal cord injury

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Introduction

Patients with spinal cord lesions have an increased urine production during the night, which is called nocturnal polyuria. Patients have a typical edema of the lower limbs with swelling of the ankles in the evening, this is more pronounced when sitting up in a wheelchair during the day. In the morning, the edema disappeared. It seems that the circadian rhythm is inadequate which is the cause of the increased diuresis during the night. Sleep interruptions because of the required catheterizations, affect the quality of life of both patient and his environment and lead to physical and mental disorders.

Materials and Methods

We included 24 adult patients, mean age 44.04y (SD 13.23), 20 with a spinal cord injury, 2 with multiple sclerosis and 2 with Guillain Barré syndrome. The patients, hospitalized in the Rehabilitation Centre during the rehabilitation period, are asked to participate in the measurement of the ankles and measuring the weight when they go to bed in the evening and before coming up in the morning with registration of the voiding volumes (time and volume) during 3 days. Sitting in the wheelchair and changing position to the recumbent position is registered on the urinary diary cards.

Results

The average ankle circumference in the evening (21.26 cm) is higher than in the morning (20.40 cm) with a difference of 0.86 cm ($p < 0.01$). The average weight in the evening (72.03 kg) is higher than in the morning (71.22 kg) with a difference of 0.81 kg ($p < 0.01$). The average diuresis during the night (1.44 ml/min) is higher than during the day (1.03 ml/min) with a difference of 0.41 ml/min ($p = 0.05$). There is a positive correlation between the difference in ankle circumference (evening-morning) and the number of hours sitting up in the wheelchair. The nocturnal polyuria index (ratio of nocturnal urine volume on total 24h urine volume) is higher than 0.33 in 19 patients.

Conclusion

There is a fluid retention in the lower limbs during the hours sitting up in the wheelchair. The higher weight in the evening is according to the fluid retention during the day. During night the surplus of fluid is presented to the kidneys and leads to a higher nocturnal diuresis. The higher nocturnal diuresis is often associated with nocturnal polyuria. Healthy individuals produce smaller volumes of concentrated urine during the night due to the increased nocturnal vasopressin secretion. In spinal cord injury this circadian rhythm is inadequate or even absent. It is an important starting point for future research.

The use of neurologic examination to predict awareness and control of lower urinary tract function post spinal cord injury

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Introduction and Aims

Whereas significant information is available to predict the impact of specific levels and types of SCI on recovery of motor and sexual function, little information is available that will allow one to use the clinical neurologic examination to predict the potential for control of the neurogenic bladder. This cross-sectional study was conducted to assess whether T11-L2 sensory function is correlated with perception of bladder filling and whether S3-S5 sensory function is correlated with potential for voluntary voiding after spinal cord injury (SCI).

Material and Methods

Eighty men and women with SCI and 40 able-bodied (AB) subjects, ages 19 to 60, underwent urodynamic testing to assess lower urinary tract function. Persons with SCI, 6 months to 3 years post injury, also underwent International Standards for Neurological Classification of SCI (ISNCSCI) assessment. Chi-square test was performed to compare: 1) bladder sensation across T11-L2 groups classified by total sensory scores and 2) ability to voluntarily void across S3-S5 scores.

Results

Those with a greater ability to perceive pinprick and light touch sensation in the T11-L2 dermatomes were more likely to perceive sensation during bladder filling. The percentage of individuals with normal bladder sensation was 5%, 29%, 40%, and 100% for T11-L2 total sensory scores 0-8, 9-23, 24-32, and AB groups, respectively ($P<0.001$). A similar trend was observed for the first sensation, normal desire, and strong desire to void. Bladder control was associated with S3-S5 sensory function; normal detrusor function was observed in 0%, 11%, 38%, and 100% of individuals with S3-S5 total sensory scores 0, 1-12, and 13-16 and AB controls, respectively ($P<0.001$), a similar trend observed for voluntary voiding initiation reported by study participants.

Conclusion

Findings suggest that ISNCSCI results can be used to predict potential for bladder control. This information would be useful to allow better planning for neurogenic bladder management after SCI.

10:30 - 12:00

Workshop 1 ESCIF

Berlin/Cop Room

ESCIF SCI consumer workshop: consumer initiatives: pushing the spinal cord injury (SCI) agenda forward

J Horsewell¹; J Dekkers²; A Täckman³; K Anderson⁴; C Jeanmaire²

¹European Spinal Cord Injury Federation, Denmark; ²Netherlands; ³Finland; ⁴USA

Workshop Introduction

J Horsewell, Denmark

Back on Track: a unique co-operation between Dutch SCIA and specialized Rehab Centres

J Dekkers, The Netherlands

Parenthood: an SCI perspective

A Täckman, Finland

The role of consumers and consumer organizations

Kim Anderson, United States of America

Ending paralysis: a consumer initiative

C Jeanmaire, The Netherlands

13:00 - 13:35
Keynote 1 - Charlifue
Auditorium

Aging and SCI: Focus on the Positives

Susan Charlifue, PhD, FACRM

Decades of clinical experience, research, and personal reports from individuals with SCI provide a detailed picture of the likely health and psychosocial complications that occur in the years following injury. With improved post-SCI survival and life expectancy, clinicians are facing not only the anticipated conditions that accompany aging with SCI, but also must address the more common conditions associated with normal human aging. Even in the presence of excellent resources and technology, we continue to face challenges in managing the long term consequences of aging with SCI. Not only does this constellation of factors have an impact on those aging with SCI acquired at younger ages, those injured in later life face these same issues, and in fact, may experience even more difficulties. Elderly individuals often incur SCI due to relatively minor trauma, when they may already have other chronic health conditions or other functional and cognitive limitations. The combination of age and SCI equates to individuals having a thinner margin of health, the potential earlier onset of additional chronic conditions, and even the risk of experiencing more severe consequences of those conditions before appropriate medical intervention is sought.

The majority of research on aging with SCI identifies declines not only in physical health as individuals age with SCI, but in many aspects of social participation and perceived quality of life. Nonetheless, there are numerous accounts of individuals who, in spite of age-related health concerns, maintain a positive outlook and even report better life satisfaction as they grow older. The data from qualitative studies illustrates pathways of change experienced by people with SCI. Using information from these "lived experiences" can enhance our understanding of the interplay between aging and SCI, the complexities of that interplay, and can identify useful strategies to enhance positive aging.

Further, incorporating a multi-disciplinary approach to facilitate successful aging with SCI, involves not only the team of clinicians but also the individual with SCI, family and community members. Together, we can best serve our clients to age with optimal health and life satisfaction, while helping them avoid unexpected and unwanted long-term complications.

13:35 - 15:05

Oral Session 4 (Free Communications: Basic Science/Clinical Trials) Tuesday PM
Auditorium

Loss of cortical representation of the foot in long-term SCI patients

N Keijsers¹; K Koenraadt²; N van den Hurk-Kitselaar²; I van Nes²; H Rijken²; J Duysens²

¹Sint Maartenskliniek, Ubbergen (Nijmegen), Netherlands; ²Sint Maartenskliniek, Nijmegen, Netherlands

Introduction

Since the brain is intact, persons with a spinal cord injury (SCI) might benefit from a brain-computer interface (BCI) to improve mobility. Functional Near-Infrared Spectroscopy (fNIRS) is an alternative for EEG to use in BCIs, being less sensitive to movement artifacts. A prerequisite for using a NIRS-based-BCI in chronic SCI patients for mobility purposes is that the foot motor cortex can still be voluntarily activated. The presence of this motor cortex activity is questionable, because reorganization of the motor cortex occurs due to neural plasticity in SCI patients. Therefore, it can be expected that the motor cortex of the foot cannot be voluntarily activated in long-term SCI patients in contrast to short-term SCI patients.

Aim

What are the differences in motor cortex activity of the foot during attempted foot movements between short- and long-term SCI patients?

Methods

A six-channel fNIRS, including two reference channels, measured relative concentration changes of oxy- (HbO) and deoxy-hemoglobin (HbR) in the motor cortex of the right foot. Seven subjects, studied within 18 months after injury (short-term group), and eleven subjects, studied more than 5 years after injury participated (long-term group). All subjects were complete paraplegic SCI patients. Subjects performed 12 trials of attempted foot movements and real hand movements (used as reference). Mean hemodynamic responses were used as primary outcome measure. T-tests were used to indicate significant hemodynamic responses within the subjects and within the groups. In addition, the difference in hemodynamic response between foot and hand tapping was compared between the two groups using a T-test. Significance level was set at $p < 0.05$.

Results

The short-term group showed significant hemodynamic responses on the left motor cortex for attempted foot movements but not for real right hand movements. In addition, a larger decrease in HbR for attempted foot movements compared to real hand movements was found. For the chronic group, the attempted foot movement and the real hand movements revealed significant hemodynamic responses and no difference in hemodynamic responses between the two conditions was found.

Conclusion

Activity in the motor cortex of the foot can be measured with fNIRS in complete SCI patients during attempted foot movements, even several years after date of injury. This implies that the activation detected by NIRS during attempted foot movements can be used in future BCI studies and development. The long-term SCI group showed a smaller difference in activity between hand and foot movements, suggesting loss of cortical representation of the foot. Therefore, cortical reorganization in long-term SCI patients has to be taken into account in future BCI use.

Structural biomarkers in the cerebrospinal fluid within 24 hours after a traumatic spinal cord injury: a descriptive analysis of 16 subjects

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Introduction and Aims

To characterize the cerebrospinal fluid(CSF) concentrations of glial fibrillary acidic protein(GFAP), neuron specific enolase(NSE), S-100 β , tau, and neurofilament heavy chain(NFH) within 24 hours of an acute traumatic spinal cord injury(SCI), and to correlate these concentrations with the baseline severity of neurologic impairment as graded by the American Spinal Injury Association impairment scale(AIS).

Material and Methods

A lumbar puncture was performed to obtain CSF from sixteen acute traumatic SCI patients within 24 hours post-injury. Neurological examinations were performed within 24 hours of injury and again at 6 or 12 months post-injury. The correlations between the CSF concentrations and initial AIS were calculated by using Pearson correlation coefficients. In addition, an independent student t-test was used to test for differences in CSF concentrations between patients of different AIS grades.

Results

The CSF NSE concentrations were significantly correlated with the baseline neurologic impairment being either "motor complete"(AIS A,B) or "motor incomplete"(AIS C,D) ($r=0.520$, $p<0.05$). The mean S-100 β concentration in motor complete patients was significantly higher compared with motor incomplete patients; 377.2 ng/l ($SD \pm 523 \text{ ng/l}$) vs 57.1 ng/l ($SD \pm 56 \text{ ng/l}$) ($p<0.05$) respectively. Lastly, the mean NFH concentration in motor complete patients was significantly higher compared with motor incomplete patient, 11813 ng/l ($SD \pm 16195 \text{ ng/l}$) vs 1446.8 ng/l ($SD \pm 1533 \text{ ng/l}$), ($p<0.05$), respectively.

Conclusion

In this study we identified differences in the structural CSF biomarkers NSE, S-100 β and NFH between motor complete and motor incomplete SCI patients. Our data showed no clear differences in any of the protein concentrations between the different AIS grades.

Mental health and spinal cord injury: a heavy load to bear?

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Introduction and Aims

It is not surprising that an adverse life-event like spinal cord injury (SCI) has been studied for associations with mental health disorders. However, few studies have investigated mental health and SCI using a longitudinal design while employing gold standard mental health disorder diagnostic assessments. Occurrence of mental disorders arising in adults with SCI was investigated during inpatient rehabilitation. A major aim of the study was to determine the efficacy of group cognitive behavioral therapy (CBT) in reducing mental health disorders.

Materials and Methods

The intervention SCI group (SCI-I; n=49) participated in group CBT program, while the SCI Control (SCI-C; n=39) only received individual psychological therapy on a needs basis. All participants were assessed comprehensively on three occasions for mental disorders, soon after admission to rehabilitation, within two weeks of discharge, and after 6 months in the community. A convenience able-bodied control group (AB; n=30) was also assessed on one occasion. The Mini International Neuropsychiatric Interview (MINI) based on the Diagnostic and Statistical Manual of Mental Disorders (DSM IV) was employed to determine presence of mental health disorders.

Results

Initially, the SCI groups had total DSM diagnoses around 33% (SCI-I) and 48% (SCI-C), with spot prevalence rates of 19% and 21% respectively. The AB group had a total diagnoses rate of 33% with a prevalence of 23%. Depression and alcohol dependence were most common disorders in all groups. At discharge, total diagnoses and prevalence was significantly reduced in the SCI-I group (11% and 9% respectively), while the SCI-C group rates increased. After 6 months, the SCI-I had relapsed back to pre-intervention DSM disorder rates.

Conclusions

Clearly, CBT can be effective in improving mental health in the short-term, but additional resources should be provided to maintain gains when living in the community, such as the provision of anti-relapse strategies. In addition, further consideration needs to be given to the influence of an aging population on psychosocial wellbeing after SCI.

Molecular background of the KCC2 up-regulation secondary to treadmill training after spinal cord injury in adult rats

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Background

Spasticity and allodynia are major sequelae after spinal cord injury (SCI). We reported that spasticity and allodynia are attenuated by training induced endogenous BDNF through the up-regulation of KCC2. However, the role of BDNF in the regulation of KCC2 is context-dependent; the activation of Shc pathway in the absence of PLC γ activation is needed in the up-regulation of KCC2, and still unclear in the injured spinal cord. Here, we investigated how training affects post SCI spasticity and allodynia, focusing on KCC2 regulation by BDNF.

Material and Method

In 50 adult rats, moderate contusive SCI was induced at Th10 level using an IH impactor (200 Kdynes). In the trained group, treadmill training was conducted using robotic device from 7 to 21 days post-injury (DPI). No treadmill training was performed in the untrained group. In the sham group, only Th10 laminectomy was performed without any injury. Spasticity and allodynia were assessed up to 49 DPI. Changes in BDNF, KCC2, shc and PLC γ protein expressions of lumbar enlargement were assayed by western-blotting at 14, 28 and 49 DPI.

Result

Spasticity and allodynia, as well as the locomotor function, significantly improved in the training group compared to the control group. There was a significant difference in BDNF expression between the trained and untrained groups at 14 DPI, but not at 49 DPI. Phospho-KCC2 expression was significantly up-regulated at 49 DPI and had significant correlation with the values of spasticity and allodynia testing. Shc expression was not affected neither SCI nor the training, besides phospho-PLC γ expression was significantly down-regulated only in SCI operated animals regardless of training at the 14 DPI than the sham group.

Conclusion

Down-regulation of phospho-PLC γ possibly contributes in the KCC2 regulation by BDNF in the early phase after SCI; training induced BDNF did not induce KCC2 down-regulation. There would be other mechanisms in which BDNF longitudinally up-regulates KCC2 that result in attenuation of spasticity and allodynia.

The impact of folic acid food fortification on global incidence of neural tube defects: a systematic review and meta-analysis

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Introduction and Aims

Folic acid intake has been proven to reduce the risk of neural tube defects (NTDs). Despite this evidence, folic acid food fortification (FAFF) as public health intervention has not been universally adopted primarily due to concerns regarding adverse health effects; concerns which have been largely disproven in recent research. This study aims to assess the global impact of FAFF on the incidence of NTDs and to estimate the number of potentially preventable NTD cases through implementation of FAFF worldwide.

Material and Methods

A systematic literature search identified studies reporting NTD incidence rates (IRs) (N=163). Included studies were assessed for quality according to the Centers for Review and Dissemination (CRD) guidelines. A random-effects meta-analysis was conducted to estimate the global IR of neural tube defects without FAFF, and the effect size of FAFF. A multivariate meta-regression analysis was used to determine the relationship between pre-FAFF incidence rates and the effect size of FAFF in the corresponding populations. The number of NTD cases that could be prevented globally through worldwide mandatory FAFF was calculated using global birth data obtained from the United Nations population division.

Results

Pre-FAFF incidence of NTDs among studies including only live births ranged between 3.8/10,000 (United States) and 82.1/10,000 (India) with an overall IR of 14.1/10,000 (95% CI:12.3-16.1; I²=99.6%). In study populations that included live births, stillbirths, and terminations of pregnancy, FAFF reduced the incidence of NTDs by 46% (IR Ratio: 0.54; 95% CI: 0.42-0.71; I²=91.6%); among live births by 37% (IR Ratio: 0.63; 95% CI: 0.57-0.69; I²=89.3%). The IR before FAFF was significantly associated with the effect size of FAFF (p=0.03). We estimate, using recent world population data and information on countries legislation to mandate FAFF, roughly 70,000 preventable births with NTDs.

Conclusion

Recent research has shown that the benefits of FAFF outweigh the possible risks. Our results suggest that FAFF would prevent a large number of babies born with NTDs, especially in low income countries, as well as affected pregnancies that are terminated. Consequently, strategies and campaigns that advance worldwide adoption of mandatory FAFF as a public health intervention should be encouraged to reduce the risk of NTDs.

Optimizing management of ventilator dependent spinal cord injured patients

R Onders; MJ Elmo; C Kaplan

Surgery, University Hospitals Case Medical Center, Cleveland, USA

Introduction and Aims

High cervical tetraplegics dependent on tracheostomy mechanical ventilation (MV) have a significant higher morbidity, mortality, hospital length of stay and cost. Inappropriate management can lead to ventilator induced diaphragm dysfunction (VIDD), increased secretions, pneumonias, speech problems and tracheal complications such as tracheomalacia or bleeding from erosions. This report outlines current management with diaphragm pacing (DP) to decrease morbidity.

Material and Methods

Analysis of available literature and prospective trial data bases under FDA and/or IRB approval of SCI patients evaluated. Patients with stimlatable diaphragms were implanted with intramuscular electrodes with subsequent diaphragm conditioning and ventilator weaning.

Results

At the primary site, 111 patients were evaluated with patients implanted between the age of 2 and 74 years (average of 28). Time spent on MV ranged from 11 days to 28 years (average of 3.8 years). The initial FDA trial, ending in 2008, has shown continuous DP use for up to 13 years with over 250 years and no deaths from pneumonia. Cuffed tracheostomy use decreased from 46% to 8% after DP with complete decanulation or replacement with stoma stents in some. Unfortunately, prior to DP, 4 patients already developed tracheomalacia and one with tracheal bleed. Early knowledge of patients with non-stimlatable diaphragms from phrenic nerve injury or phrenic motor neuron loss, allows stopping of unsuccessful weaning trials and switching to high tidal volumes to decrease pneumonias. Also, changing to cuffless tracheostomy tubes and early use of Passy-Muir valves improves speech. DP leads to a 68% decrease in patient secretions. DP causes a 20% improvement in respiratory compliance which is a marker for decreasing posterior lobe atelectasis. In a multicenter analysis of early DP, the average wean from MV was 10 days. Thirty-six percent of DP patients recovered natural volitional breathing after overcoming VIDD or from neuroplastic effects of electrical stimulation.

Conclusions

The present paradigm of prolonged cuffed tracheostomy MV of SCI patients should change with early DP implantation. DP decreases morbidity and helps in recovery.

Does regular standing improve bowel function in people with spinal cord injury? A randomised controlled cross-over trial

S Kwok¹; [LA Harvey](#)²; J Glinsky²; JL Bowden²; M Coggrave³; D Tussler³

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Introduction and Aims

Regular standing has been advocated for a long time as an effective way to improve bowel function in people who are wheelchair dependent following spinal cord injury (SCI). There is a sound rationale to believe that regular standing is therapeutic but little empirical evidence. The aim of this study was to determine if a 6-week standing programme improved bowel function in people with SCI.

Material and Methods

Seventeen community-dwelling people with motor complete SCI above T8 participated in the 16-week trial. The trial consisted of a 6-week stand phase and a 6-week no-stand phase separated by a 4-week washout period. Participants were randomised to one of two treatment sequences. Participants allocated to the Treatment First group stood on a tilt table for 30 minutes, five times per week for 6 weeks and then did not stand for the next 10 weeks. Participants allocated to the Control First group did the opposite: they did not stand for 10 weeks and then stood for 6 weeks. Participants in both groups received routine bowel care throughout the 16-week trial. Assessments occurred at weeks 0, 7, 10 and 17 corresponding with pre and post stand and no-stand phases. The primary outcome was time to first stool. The secondary outcomes were time to complete bowel care and six self-reported outcomes reflecting bowel function and spasticity.

Results

The mean (95% CI) between-intervention difference for time to first stool was 4 minutes (-4 to 11) indicating that standing increased the time to first stool by 4 minutes. However, this treatment estimate was associated with uncertainty as reflected by the 95% CI. The 95% CI encompassed a 4 minute beneficial effect and a 11 minute detrimental effect. However, few would consider a 4 minute beneficial effect (as indicated by the lower end of the 95% CI) to be clinically important. Interestingly, some participants believed that standing did improve their bowel function although this was not reflected in any of the objective outcome measures.

Conclusions

The results indicate that standing for 30 minutes, five times per week, for 6 weeks does not have a clinically important effect on time to first stool. Future trials could quantify if standing for longer is therapeutic or if standing has therapeutic effects on other aspects of bowel function or general health. This trial highlights the pressing need to systematically go back and test the effectiveness of interventions which have been routinely administered and advocated for the last 40 years. It is not sufficient to base interventions on a sound rationale because often interventions are not administered in sufficient dosages to be therapeutic. Trial registration: ACTRN12612000003875.

Obstructive sleep apnoea (OSA) diagnostic experience in the Midlands Centre for Spinal Injuries (MCSI)

I Zobina¹; C Whittall¹; R Dytor¹; J Kennedy¹; J Williams¹; D Short¹; RM Schembri²; DJ Berlowitz²; study team COSAQ³

¹Midlands Centre for Spinal Injuries, Robert Jones & Agnes Hunt Orthopaedic Hospital, Oswestry, United Kingdom; ²Institute for Breathing and Sleep, Austin Health, Melbourne, Australia; ³The COSAQ collaborative group, International and, Australia

Introduction and Aims

MCSI is one of 4 UK centres involved (since December, 2011) in a multi-centre research trial which is run by Sleep Health in Quadriplegia (SHiQ), based in Austin Health, in Australia. This trial is called COSAQ: A prospective, randomised controlled trial of auto-titrating Continuous Positive Airway Pressure (CPAP) treatment for Obstructive Sleep Apnoea (OSA) after acute Quadriplegia (tetraplegia) which was started in 2009.

There is a known higher incidence of OSA in tetraplegia, specifically in the acute stages. The purpose of this study is to examine the incidence rate of OSA at the MCSI in acute admissions in a sample population and compare with other centres involved in the trial (both nationally and internationally).

Materials and Methods

We retrospectively evaluated data concerning acute, traumatic quadriplegic admissions in the MCSI, Oswestry and screened within the time period of 09/12/2011 - 05/12/2013. Demographic and clinical data were extracted from the electronic patient record database. The main criteria of inclusion in the study was acute, traumatic tetraplegia T1 or above, and participation in the study was based on having an apnoea-hypopnea index (AHI) >10.0 events per hour.

Results

Within the 24 month study period the total number of tetraplegic patients screened for eligibility were 111 in the MCSI (8.96% of total screened in all sites (1239)), of those screened 18 went on to have a baseline sleep study performed. OSA was diagnosed in 16 cases, in whom sleep studies were performed (14% of cases screened, 89% of tested tetraplegic patients). Sixteen patients with tetraplegia and OSA were thus randomised to either control (no CPAP) or CPAP treatment. All patients received CPAP therapy at the end of the 3 month study period. The mean age of tetraplegic patients with OSA was 59.8 (SD 16.4) years, 75% of them were male (12) and 25% female (4).

Conclusions

The incidence rate of OSA at the MCSI, in acute admissions of tetraplegic patients, in the sample population over a period of 24 months was higher than expected, with 89% of those tested being diagnosed with OSA and were therefore eligible for the study and treatment with CPAP following study conclusion. The COSAQ trial opened our eyes to the actual incidence of OSA in our sample population. We feel that all acute traumatic patients with tetraplegia and high paraplegia should be tested for OSA and that there are open questions regarding diagnostic sleep studies and OSA diagnosis as part of a service improvement. There is space for change in our practice in the assessment of respiratory function in a wider client group, initially with acute injuries and later with chronic SCI. Such changes are likely to prevent later respiratory complications of OSA with aging and improvement of patient activities of daily living.

13:35 - 15:05

Workshop 3 - Comprehensive interprofessional approach to management of pediatric spinal cord injury)

Tuesday PM

Brussels Room

Comprehensive interprofessional approach to management of pediatric spinal cord injury

L Vogel¹; R Betz¹; MJ Mulcahey¹; K Zebrachi^{1,7575}

¹USA; ²

Workshop Introduction/Overview of pediatric SCI

L Vogel, United States of America

Orthopaedic considerations and complications

R Betz, United States of America

Rehabilitation/Habilitation

MJ Mulcahey, United States of America

Psychosocial Issues

K Zebrachi, "country" **Case presentations and discussion**

13:35 - 15:05

**Workshop 4 - Surgical Management of upper extremity in tetraplegia - state of the art) Tuesday PM
Paris Room**

(Surgical) Management of upper extremity in tetraplegia - state of the art

A Nene¹; G Snoek¹; C Reinholdt²; J Wangdell²; J Fridén²

¹Netherlands; ²Sweden

Initial therapy for upper extremities in tetraplegia: no standard recipe and crucial for the reconstructive phase

Govert Snoek, The Netherlands

Surgical procedures for reconstruction of grips -- Current practice

Anand Nene, The Netherlands

Spasticity surgery

Carina Reinholdt, Sweden

Post-operative management

Johanna Wangdell, Sweden

Reconstructive Upper Extremity treatment in tetraplegia - Future perspectives

Jan Fridén, Sweden

13:35 - 15:05

Oral Session 5: Consumer Rights Tuesday PM
Berlin/Cop Room

An exploration of constituents of, barriers to, and enablers of quality of life in individuals with SCI: an indian perspective

D Parashar

Rehabilitation, Indian Spinal Injuries Centre, New Delhi, India

Introduction

Quality of life (QoL) has gained significance as a key rehabilitation goal after an SCI. However, it is an underexplored concept in developing countries like India. The objective of this study was to do a comparative analysis of QoL between inpatients and consumers with SCI living in the community. The pathway of QoL was of interest, to ascertain the following (i) What contributes towards attaining optimum QoL for the participants? (ii) Does the definition of QoL change as time elapses after an SCI? (iii) What did QoL mean to the participants before the injury? (iv) The participants' self-rating on the International SCI Data Set for QoL.

Methods

In-depth, semi-structured personal interviews were conducted with 25 inpatients and 25 consumers with SCI (onset of injury > 1 year) with the aim of gaining extensive knowledge into their perceptions of the injury, and their perceived QoL. The SCI Data Set for QoL was administered to the participants.

Results and Conclusions

For the inpatients, QoL was focused primarily on health status, physical dependence, financial and vocational concerns, guilt about disruptions in family functioning, & worry about implications of the injury. The inpatients scored low on the SCI QoL data set compared to the consumers. The consumers focused on optimum health, adequate income, recreational opportunities, social support, sexual functioning, family satisfaction, vocational success, accessibility, societal attitudes, and perceived control over one's life towards a satisfying QoL. A shift in the definition of QoL pre-and post-injury was noted with QoL assuming a multi-dimensional nature.

Customizing rehabilitation interventions to enhance individuals' QoL is of significance in a country like India. Empowering the individual with SCI, to enlarge their scope of values beyond the injury goes a long way in determining a satisfying QoL, in addition to engaging in problem solving coping when maneuvering environmental and attitudinal barriers in the community.

End of life decisions in chronic spinal cord injury: a study on the effect of a legal framework in Belgium and the Netherlands

EMS Waals¹; MWM Post²; C Kiekens¹

¹Physical & Rehabilitation Medicine, University Hospitals Leuven, Pellenberg, Belgium; ²University Medical Center Utrecht, De Hoogstraat, Utrecht, Netherlands

Introduction and Aims

Worldwide euthanasia is a delicate issue. So far only the Netherlands, Belgium, Luxemburg and Switzerland implemented a legal framework for medically assisted termination of life. The demand for euthanasia also occurs in the care for persons with a spinal cord injury (SCI). This study examined the effect of the legislation on SCI care as perceived by SCI specialists united in the Dutch Flemish Spinal Cord Society (DuFSCoS).

Material and Methods

From an extensive literature review in the MEDLINE database, the pro-and contra-arguments for euthanasia of mentally competent non terminally ill adult patients, were extracted. The Dutch and Belgian legislation were assessed with regard to these considerations. In addition, the relevance of these arguments to SCI care was checked by means of a questionnaire, sent to all 23 Dutch and Flemish physical and rehabilitation medicine specialists, members of the DuFSCoS. After filling out the questionnaire, the opportunity was given to clarify or expand their answers via a short telephone interview.

Results

Seventeen physiatrists returned a completed questionnaire. They shared the opinion that the legal framework for medically assisted termination of life adds value to the care they can offer for persons with SCI. All agreed that such legislation has a positive influence on the quality of life of SCI patients in the chronic phase because it makes it easier to discuss end of life issues and to assure patients that a future demand for medically assisted termination of life will not be ignored. According to 66.7% of the respondents, there also is a positive influence on the rehabilitation process in the acute phase, although all feel it should not be performed in the acute phase of SCI. Although 66.7% of the respondents believe the criteria of the current legislation are appropriate, there is more discordance on the required criteria for its application and the timing of assistance to termination of life. The estimated prevalence of euthanasia requests from persons with a spinal cord injury seems to remain low and it very rarely happens in the acute care or rehabilitation hospital. The majority of the responders don't expect an increase of the incidence of euthanasia requests nor of its implementation.

Conclusion

All participating physicians, specialised and active in SCI rehabilitation, positively valued to work in a country with a legal framework for medically assisted termination of life. They all considered such legislation to have a positive impact on the quality of life of the SCI patient during the chronic phase. The Belgian and Dutch experiences may be useful input for the debate in countries where the design and implementation of laws considering medically assisted termination of life are still under discussion.

End of life decision in spinal cord injury: working within a legal framework

C Kiekens¹; EMF Waals¹; EH Roels¹; MWM Post²

¹Physical & Rehabilitation Medicine, University Hospitals Leuven, Pellenberg, Belgium; ²University Medical Center Utrecht, De Hoogstraat, Utrecht, Netherlands

Introduction and Aims

Many persons with a spinal cord injury (SCI) are dissatisfied with life in the early post-injury period. Some of them even ask for a termination of their life. This is usually rather a cry for help and disappears quite rapidly but in some people a lucid rational choice persists.

Material and Methods

Two case reports of tetraplegic patients with a request for a termination of life shortly after their injury, admitted at the Leuven University Hospitals in Belgium, are described.

Results

The first case concerns an 88 year old man in good general health who presented with a tetraplegia C4 AIS D (central cord lesion syndrome) after a fall in his garden. Soon after the accident he expressed the desire not to live in case he would not recover and more specifically be dependent on others for activities of daily living; also he did not want to leave home and be institutionalised. As there initially seemed to occur some discrete recovery he was motivated for a transfer to the rehab centre. After a month however he expressed the explicit desire for euthanasia. The rehabilitation physician and his team again motivated him to go through a phase of rehabilitation before making such an irreversible decision. Unfortunately his general condition deteriorated with increasing therapy-resistant spasticity and pain. The palliative support team further focussed on maximal comfort but he persisted on the wish for termination of his life and filled out a written request file as he satisfied the Belgian criteria for euthanasia. The family was intensely involved in the process. A date for euthanasia was fixed four months post-injury. Once this date was fixed, he extensively and consciously said goodbye to his wife, children and grandchildren and peacefully died amongst them. The second case is a 61 year old patient who also sustained a C4 AIS B tetraplegia due to a fall. Early after the injury he declared no to want to live if not being able to live independently. An agreement was made that he would complete a comprehensive rehabilitation programme first, and once he would be in a stable medical and social situation he would be able to decide on his life. After this he did not even feel the need for an advanced directive. Ten months later he was able to move to an ADL-assisted apartment. He is now very satisfied with his life, knowing that he is in control of his life, but also has an escape if he would deteriorate and be in unresolvable suffering.

Conclusion

The idea of having a right to decide, of course within the conditions of the law on termination of life permits an open discussion with SCI patients who are in distress. In countries with a legal framework for euthanasia or medically assisted suicide, the patient's perception of autonomy may influence positively the rehabilitation process.

Causes of in-hospital death after traumatic spinal cord injury in the Netherlands

R Osterthun; JHB Nijendijk; FWA Van Asbeck; MWM Post
De Hoogstraat Rehabilitation, Utrecht, Netherlands

Study design

Retrospective files study

Objective

To describe causes and determinants of in-hospital death of persons with traumatic spinal cord injury (TSCI) in the Netherlands and to identify the group of patients in which end-of-life decisions had played a role in death.

Setting

The Netherlands

Methods

Discharge letters of patients with TSCI discharged from a Dutch hospital in 2010 were analyzed. Data were extracted on survival, personal and lesion characteristics, and cues for end of life decisions. Deceased persons and survivors were compared using Chi-square and t-tests.

Results

A total of 185 persons with TSCI were identified. Thirty persons died during their initial acute care hospital stay (16.2%). Mean age in this group was 73.2 years and 70% was aged above 70, 63.3% had a lesion level of C4 or higher, and 46.7% had a motor complete lesion. The main cause of death was respiratory failure (53.3%). Significant determinants of death were age, a lesion at C4 or above and a motor complete lesion. In 16 cases (53.3%), information in the discharge letter suggested end-of-life decisions had played a role in death. The large majority of these cases were decisions to abstain from further treatment.

Conclusion

The in-hospital mortality rate of persons with TSCI was 16.2% in the Netherlands in 2010. In more than half of these cases end-of-life decisions had played a role in death.

Influence of socio-economic status on management of spinal cord injury

A Bhalla; HS Chhabra

Indian Spinal Injury Centre, New Delhi, India

Study Design

Retrospective study.

Objective

To assess if any aspect of spinal cord injury management gets adversely affected due to economic constraints in various strata of Indian population and if it does, to assess the degree of impediment.

Setting

Indian Spinal Injury Centre, India.

Methods

The patients were classified into different socioeconomic classes according to Kuppuswamy scale which is a standard scale designed for the Indian population. A self designed questionnaire was administered to reveal the degree of financial constraints faced by the patient, immediate family and stakeholders.

Results

No sample was available for the lower class. Economic constraints variably affect different aspects of spinal injury management in various strata of the Indian population. There was especially a significant difficulty in availing most aspects of treatment among the middle income class where as the upper lower class could avail the treatment only through the welfare schemes.

Conclusion

Financial constraints affected all aspects of treatment in all groups except the upper group. Thus it is expected that a very large percentage of the Indian population would find it difficult to afford the expenses of SCI management. Significant difficulties in availing treatment and management were faced by all groups in various aspects of spinal cord injury management. However the self financed upper lower and lower middle group faced the most significant financial hurdles in availing treatment. The upper lower group could not avail most of the aspects of management which were not funded by the hospital welfare scheme. The results of the survey advocate extension of essential medical cover to the unaided upper lower, lower middle and upper middle Indian groups since these strata face maximum financial challenges in all the stages of treatment.

Spinal cord injury in children and adolescents: identifying research priorities through an international service user survey

M Augutis¹; H Burkhart²; E Castelli³; A Graham⁴; T Glotts⁵; EM Hagen⁶; R Háková⁷; H van Hedel⁸; N Henderson⁴; E Kelly⁹; E Lopez Dolado¹⁰; JJ van Middendorp¹¹; MJ Mulchahey¹²; A Scheel¹³; E Smith¹⁴; L Vogel⁹; K Zebracki⁹

¹Karolinska Institutet, Stockholm, Sweden; ²Rehabilitationszentrum Häring, Bad Häring, Austria; ³Pediatric Neurorehabilitation Units, Bambino Gesù Children's Hospital, Rome, Italy; ⁴National Spinal Injuries Centre, Aylesbury, United Kingdom; ⁵Sunnaas Rehabilitation Hospital, Nesodden, Norway; ⁶Spinal Cord Injury Center of Western Denmark, Regional Hospital of Viborg, Viborg, Denmark; ⁷University Hospital Motol, Prague, Czech Republic; ⁸Rehabilitation Centre for Children and Juveniles, University Children's Hospital Zurich, Affoltern am Albis, Switzerland; ⁹Shriners Hospitals for Children, Chicago, USA; ¹⁰National Paraplegic Hospital, Toledo, Spain; ¹¹Stoke Mandeville Spinal Foundation, National Spinal Injuries Centre, Aylesbury, United Kingdom; ¹²Thomas Jefferson University, Philadelphia, USA; ¹³Swiss Paraplegic Centre, Nottwil, Switzerland; ¹⁴National Rehabilitation Hospital, Dublin, Ireland

Introduction and Aims

Spinal Cord Injury (SCI) in children and adolescents is considered as a "very rare disease", affecting less than 1 in every 100,000 children. In contrast to adult SCI, there is a lack of internationally endorsed management guidelines for this group of young patients. In 2011, a European group of rehabilitation specialists - supported by colleagues from the Shriners Hospitals for Children, USA - formed a collaboration aiming to improve the overall management of SCI in paediatric patients. In order to scope their research activities, the first step was to identify the needs of children, adolescents and their caregivers. Hence a survey was designed with the primary aim to identify the most important research topics for SCI in children and adolescents, from the perspectives of youth and caregivers themselves.

Material and Methods

An international cross-sectional, quantitative survey was designed in order to measure the following key aspects: 1) quality of life -- using the Paediatric Quality of Life Inventory 4.0 Generic Core Scale --, 2) satisfaction and importance of "life & health domains" -- using an adapted check-list published by *Simpson et al. 2012, J Neurotrauma* and 3) the importance of researching each of these "life & health domains". Children and adolescents with either an acquired or a congenital lesion of the spinal cord will be identified from clinical databases in each participating investigative site. Children up to 18 years will be asked to fill in the questionnaires, along with their parents for proxy reports. Young adults (up to 25 years old) with childhood-onset SCI will also be invited to participate. Duration of recruitment will be limited to 12 months.

Results

At the time of abstract submission, ten European and two North American centers were part of the project. The investigational plan has been agreed upon and applications for supporting funds for employing a study coordinator have been submitted to appropriate funding bodies. Ethics and IRB applications will be prepared and will be followed by a pilot phase to test the questionnaires. Afterwards the questionnaire will be translated into different European languages and distributed among participants who consented to take part.

Conclusion

Whilst preparations are under way, this initiative highlights the need for a close international collaboration. This will enable the delivery of meaningful research for children and adolescents with SCI. The collaborators welcome any interest from healthcare professionals and service user organizations across the world and are keen to establish a service user-led research agenda.

13:35 - 15:05

**Workshop 2A - Analyzing factors influencing decision making in management of sub axial cervical and thoraco lumbar spinal injuries and proposing suitable treatment) Tuesday PM
Colorado Room**

There is still no clear consensus on the optimal management of traumatic injuries of vertebral column which leads to spinal cord injury. There has been no prospective randomized control study so far in this field. The low level of evidence available is compounded by shortcomings in study design.

Management strategy differs from surgeon to surgeon with varying results. Decisions of conservative /surgical management, surgical approach, levels of fixations, need for decompression etc lacks uniformity.

Hence there is an urgent need for a universally accepted algorithm for management of thoraco-lumbar fractures.

In the proposed workshop, various factors to be considered for effective management of Thoraco-lumbar Spine injuries like fracture morphology, neurology etc will be discussed.

The current evidence for management of Thoraco-Lumbar spinal injuries will be presented and prevailing controversies in this regard will be discussed in an effort to come to a consensus.

The findings of the study presently being done (protocol enclosed) to develop Spine Trauma Study Group's Treatment Algorithm for Management of Thoraco lumbar Spinal Injuries will be presented.

We hope that the deliberations will help the participants and the Spine Trauma Study Group to get a better understanding in the field. The deliberations will also be useful for improving the patients overall functional outcome and more importantly simplify and standardize the treatment protocols in management of Thoraco-Lumbar injuries patients.

15:05 - 16:00

Tea and Coffee break with poster viewing. Poster Session 1
Exhibition/Poster Area

High incidence of acute traumatic spinal cord injury in a rural population in Japan in 2011 and 2012: an epidemiological study

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Study Design

Retrospective questionnaire-based epidemiological study. Background: Physicians treating acute traumatic spinal cord injury (SCI) in Japan noticed an increased occurrence of cervical SCI without skeletal injury. Objective: To elucidate the precise epidemiology of acute cervical SCI with the aim of planning a prevention program.

Methods

Questionnaires were posted to all hospitals in Tokushima prefecture (around 780,000 residents) to investigate the annual incidence of SCI in 2011 and 2012.

Results

The response rate was 79% in 2011 and 64% in 2012, but returns were made by all targeted departments in major hospitals. The returned questionnaires reported on 95 patients in 2011 and 91 patients in 2012, with a mean age of 67.6 and 64.3 years and an annual injury number of 121.4 and 117.1, respectively. More than two-thirds of the cases suffered cervical injury without skeletal injury, and 61% of these were categorized as Frankel D neurological deficits due to low-energy impact as the main cause.

Conclusion

The incidence of incomplete cervical injury does appear to be increasing, and significant regional differences in incidence of cervical SCI exist across Japan. We speculate that factors other than age are contributing to this increase.

The experience of learning to eat again after a high spinal cord injury

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Introduction

To be dependent after a high spinal cord injury means a loss of control to perform everyday activities. Previous studies have shown that assisted feeding needs to be individually adapted but there is a lack of knowledge about the experience of learning to eat again after a high spinal cord injury. Objectives: To explore and describe how persons with high spinal cord injury experience the process of learning to eat again.

Method

Seven persons with high spinal cord injury were included and interviewed at two separate occasions; during the process of starting to learn to eat by themselves and after finishing rehabilitation. The interviews were transcribed verbatim and analyzed with constant comparative method.

Results

One core category, "the meaning of assisted feeding and independent eating as a part of adapting to a new life" imbued the findings and all the interviews. Three categories, "to wake up and to realize that everything has changed", "to need assistance and aids, a necessity or an experience of frustration" and "finding a sense of freedom" all emerged during the analysis.

Conclusion

Both assisted feeding and learning to eat again need to be developed to fit every individual based on his or her resources and limitations. There are room for improvement in several areas as the staff's treatment, design of the environment, access to aids and food quality. Conclusion to the practice/evidence base of occupational therapy: Every meal need to be structured according to individual needs and resources. A schedule should be created for the mealtime situation so that every staff member easily can grasp how the specific individual in front of them wants the situation to be handled.

Neurological and functional recovery in elderly patients with traumatic and non-traumatic spinal cord injury

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Introduction and Aims

Due to demographic changes the population of elderly patients with spinal cord injuries (SCI) is increasing in the last few decades. Aim of this investigation was to evaluate differences between neurological and functional outcome in patients with traumatic SCI compared to non-traumatic after onset of SCI.

Materials and Methods

Prospective analysis of a retrospective database of a German university hospital. Inclusion criteria consisted of patients aged over 50 years, suffering from acute traumatic and non-traumatic spinal cord injury with neurological impairment (AIS A-D). Patients underwent follow up re-evaluation at all 4 examination dates (at the first ten days after trauma or appearance of neurological symptoms in non-traumatic cases [E1] and in follow-up after four weeks [E2], three months [E3] and six months [E4]). Overall function according to the International Standards for Neurological Classification of SCI (ISNCSCI), including neurological level, ASIA Impairment Scale (AIS), ASIA Motor Score (AMS) and Spinal Cord Independence Measure (SCIM III). Statistical analysis was performed with SPSS software version 17. Data were considered statistical significant with p-value <0.05 using Mann-Whitney-U-Test.

Results

73 patients were included (42 men and 31 women, 42 traumatic and 31 non-traumatic cases). Mean age of traumatic patients was 66,5 years [range 50-89] and 70,5 years [range 50-88] of non-traumatic. All patients received surgical procedure at least 2 days after trauma event or during the first 10 days after appearance of neurological symptoms in non-traumatic cases. All underwent early SCI rehabilitation in a specialized spinal cord injury center. Between examination E1 and E4 trauma SCI patients showed highly significant improvement in SCIM Score from 15.77 to 43.13 points ($p < 0.001$), compared to non-trauma SCI 27.81 to 41.39 ($p = 0.011$). ASIA Motor-Score of trauma SCI population was also highly significant improved 42.61 to 55.32 ($p = 0.042$) compared to non-trauma SCI group (56.26 to 62.61 points [$p = 0.226$]).

Conclusion

The trauma SCI group presented lower values in functional outcome parameters and overall strength at admission but a significant improvement compared to the non-trauma SCI group after six months. Although patients with trauma SCI reached lower AMS after sixth months follow up, the functional results assessed with the SCIM score were better than those of the non-trauma SCI group. This might be a consequence of a higher incidence of pre-SCI co-morbidities and increased complications during rehabilitation. Regarding this, further investigations are needed.

The relationship between the MRI features and the neurological prognosis in patients with cervical spinal cord injury without major bone injury

A Matsushita¹; K Shiba²; T Ueta²; T Maeda²; E Mori²; I Yuge²; O Kawano²; T Takao²; H Sakai²

¹Spinal Injury Center, Iizuka, Japan; ²Spinal Injury Center, Fukuoka, Japan

Introduction and Aims

Some papers reported about the early relationship between the MRI features and the clinical outcomes in patients with cervical spinal cord injury (CSCI) at the acute stage following trauma. However, to the best of our knowledge, there are few papers reporting about this relationship at subacute or at chronic stages following trauma. In this study, we evaluated the MRI findings of CSCI at subacute stage, especially T1 low intensity changed area, and investigated the relationship between the MRI features and the neurological prognosis in patients with CSCI without major bone injury at chronic stages.

Material and Methods

From January 2005 to May 2010, 72 patients with CSCI without major bone injury were treated in our hospital. The mean patient age was 62.4 years (31-80 years). Paralysis at the time of admission was graded as A in 4 patients, B in 16, and C in 43, and D in 9 on the basis of the ASIA impairment scale. All patients were treated conservatively, and were followed up for average 240.9 days (35-1423 days). MRI was performed for all patients at admission (acute stage) and 1 month following injury (subacute stage). Using the MRI sagittal images, we measured the transverse diameter ratio of intramedullary intensity changed area with T1-weighted images at the injured segment. Neurological evaluation was performed using ASIA motor score and the modified Frankel grade at the time of admission and discharge. We evaluated the relationship between the size of intensity changed area in MR images and the ASIA motor score at discharge, the improvement ratio of ASIA motor score and the modified Frankel grade.

Results

In the MR images at the subacute stage, T1-weighted image for 52 out of 72 patients demonstrated clear low-intensity changed area. There was significant relationship between the transverse diameter ratio of T1 low-intensity area in MR image at subacute stage and the ASIA motor score, the improvement ratio of ASIA motor score at discharge. The optimal threshold of T1 low-intensity diameter ratio for prediction that the patient able to walk with or without T-cane at discharge was determined to be 46%. Moreover, 96.8 % (61 out of 63) of the patients with no or less than half of the cord transverse diameter ratio of T1 low-intensity area recovered to walk with or without a cane at discharge.

Conclusion(s)

From our study, a significant relationship was observed between T1 low-intensity area in T1-weighted MR image at 1 month following injury and the prognoses of neurological recovery at discharge. If the T1 low-intensity changed area ratio was less than 50%, the patients recovered their neurological states higher scale than ASIA D or modified Frankel D. The patients can walk with or without cane at discharge. T1 low-intensity changed area in T1-weighted MR image may be an important predict factor in the natural course of neurological recovery for CSCI without major bone injury.

Participatory action research and the role of consumer networks to improve primary care for persons with spinal cord injury

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Introduction and Aims

A Consumer Network (CN) was developed in Ontario, Canada using a participatory action research (PAR) model to provide consumer input into health care planning with the aim of improving primary care for persons with spinal cord injury (SCI). The Ontario Neurotrauma Foundation, a research funder, and the Centre for Family Medicine (CFFM), a primary care team, have partnered and developed several initiatives including an interprofessional clinic and a learning and research collaborative to integrate primary care, rehabilitation, and self-management in SCI healthcare delivery. The aim of this presentation is to discuss the role of this CN and the PAR model in the ongoing implementation of an interprofessional SCI clinic, SCI collaborative, as well to identify needs, gaps, and opportunities for improving primary care.

Methods

The creation of the CN is guided by a PAR model, which is well suited for SCI population/consumer as it is based upon the premise that health services informed by participants' lived experience may result in multiple positive outcomes, collaborative relationships between providers and users, greater efficiency of health services, an emphasis on preventative health care, and fosters self-management. Twenty-two SCI participants included are receiving care at the CFFM.

Results

The development of this CN has resulted in a multi-dimensional, community-based and consumer driven model tailored to SCI consumer needs. As a result of this initiative, an interprofessional primary care clinic was developed aimed at improving access to quality care for persons with SCI, education sessions have been delivered to the broader SCI community as well as primary care health professionals and students, and two network participants have taken on the formal role of SCI Patient Advisors. These Advisors have contributed consumer perspectives on the provision of the primary health care, the development of research projects aimed at improving SCI care as related to e-consultation opportunities with rehabilitation specialists and SCI self-management strategies, and the development of education sessions.

Conclusions

This initiative has demonstrated the beneficial role of a CN model based on a PAR approach to positively impact practice improvements through both program enhancements and the development of research projects aimed at improving care and quality of life for persons with SCI. Challenges of this approach are the time required to build community and consumer partnerships, the unpredictability of the process, and the difficulty in procuring funding. Success has been facilitated by the clear support and understanding between funders, clinicians, researchers, and consumers for the PAR model with strong beliefs that it can result in real change for those consumers who have been traditionally marginalized by health services. This exemplifies the possibilities of collaborative health care for SCI consumers.

Improvement of dysphagia after anterior cervical instrumentation removal

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Introduction

Swallowing difficulty is common complication after anterior cervical spine surgery in patients with cervical spinal cord injury. The incidence of dysphagia after anterior cervical fixation is 11~67%. However cervical instrumentation removal leading to dysphagia has not been reported. We show a case of dysphagia after cervical spine surgery and improvement of dysphagia after anterior cervical screw extrusion.

Case report

A 64 years old man developed left side weakness after falling out of bed. He was evacuated to hospital and diagnosed myelopathy from C2 to C6. He underwent C3-C6 total laminectomy, C2 and C7 partial laminectomy, and C2-C7 posterior fusion with instrumentation. 1 week later, he underwent C5-C7 corpectomy and C4-C7 anterior fusion with instrumentation. After surgical procedure, his muscle power improved gradually but he complained swallowing difficulty. He received food and drugs through lavage tube. The patient underwent a videofluoroscopic swallow study(VFSS) and showed delayed swallowing reflex, incomplete pharyngeal peristalsis, incomplete larynx elevation, cricopharyngeal dysphagia and aspiration. He was treated swallowing difficulty such as oromotor facilitation and VitalStim therapy. However he complained dysphagia continuously and underwent percutaneous endoscopic gastrostomy tube insertion. Since then, he was treated swallowing difficulty but dysphagia symptoms persisted. 8 months after spinal cord injury anterior cervical instrumentation was removed. After procedure dysphagia improved and there were improvement of delayed swallowing reflex, incomplete pharyngeal peristalsis, incomplete larynx elevation and cricopharyngeal dysphagia and in a follow up VFSS. Also no aspiration was reported. 6 months after anterior cervical screw removal, he underwent procedure for percutaneous endoscopic gastrostomy tube removal.

Conclusion

We reported the case for improvement of dysphagia after anterior cervical instrumentation removal in patient with cervical spinal cord injury. We suggested that considering patient's condition, anterior cervical screw removal can assist an improvement of swallowing difficulty in patient with spinal cord injury.

Audit of botulinum toxin therapy to manage focal spasticity in spinal cord injury

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Introduction

Local intramuscular injection of botulinum toxin type A (BTA) is an established, well-tolerated treatment in the management of focal spasticity following Spinal Cord Injury. The Royal College of Physicians (RCP) UK has developed National Guidelines for management of spasticity in adults using Botulinum toxin in January 2009.

Aims and Objectives

To compare our current practice of using BTA to manage focal spasticity against the RCP Guidelines. To test compliance with quality of documentation, evidence of consent obtained, therapy intervention, follow up, outcomes from treatment, in particular achievement of treatment goals & adverse events.

Sample and Methodology

Consecutive in-patients selected for a period of 18 months (Jan 2010 -- Jun 2011). 16 patient episodes where BTA was used. The list of patients was obtained from the Pharmacy department as the Botulinum toxin was supplied on a named patient basis. Data was collected on a purpose designed data collection form; this included 21 questions based on the recommendations by the RCP guidelines. Information on services and training were collected by information provided by clinicians.

Results

compliance with; Principles of coordinated spasticity management was 62 to 100%, Botulinum Toxin Injection was 50 to 100%, Follow up, documentation and outcome evaluation was 18 to 100% and Services was 100 %.

Conclusion

The principles of coordinated multidisciplinary assessment and management was followed in most of the cases. Appropriate documentation of the information provided to patients and carers and written consent was lacking in most of the cases. The documentation of follow up and outcome assessments was poor. Dose more than that recommended by the RCP guidelines has been used in five cases.

Recommendations

Developing a patient information leaflet to provide patient and carers information on the use of BTA. Developing a BTA management form to include all records of assessment, consent, injection procedure, follow up and outcome assessment, to ensure appropriate documentation. To carry out a re-audit once the above recommendations are in place to ensure.

Sustainability

Re-audit in 24 months time.

Changes of decision making and capacity of autonomy with a spinal cord injury -- acute and long-term phases: a qualitative interview based study

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Introduction

A patient with a newly acquired Spinal Cord Injury (SCI) remains in a complex health situation. During this time dependency, autonomy and decision making are important concepts. The aim of the rehabilitation is to achieve as much independency as possible. Since January 2012 a new protective law for adults and children in Switzerland is introduced which strengthen and regulates self-determination by law. Until now we don't know how the patient feels in this stress field between dependency and capacity of autonomy and how we can support his capacity for decision making.

Study design

Qualitative interview based study. Objectives: To examine the capacity for decision making and autonomy after a SCI and a consecutive Paraplegia. Setting: People living with a complete or incomplete Paraplegia in the acute or chronic phase since 1 up to 40 years treated and followed up in a rehabilitation clinic specialized in SCIs in Switzerland.

Methods

An semi-structured interview guideline was created with an interdisciplinary group of specialists for SCI about the process of decision making, autonomy and dependencies. 22 people with a SCI in different phases after the onset of a SCI stratified for age, gender, level and completeness of lesion were selected and agreed for the interview conducted between 1/09 and 6/09. The interviews were transcribed and analyzed with the Mayring qualitative content analyses by two independent persons. Grouped codes were created.

Results

Patients reported that their own capacity for decision making is changed after a new SCI and the own well-being, the personal engagement and personality, time and the manner of conversations were mentioned as influencing factors. The capacity for decision making was significantly reduced during the first phase, in minimum for the first three months after a new SCI but necessary to begin an individual self-determined life with SCI. To receive information in an adequate way was an important help. Slightly gender differences were detected. The capacity for decision making was mentioned as a main part for acceptance and quality of life.

Conclusion

Decision making and the capacity of autonomy were hardly influenced after a new SCI because of the physical and psychological changes. A concept to handle the discrepancy between the right for autonomy and the missing capacity for autonomy in the early phase after a SCI has to be developed with a respect for the individual situation and the political context. Skills to recognize the patients capacity for decision making and self-determination with a view to his actual physical and psychological situation are recommended.

Effect of and satisfaction with www.elearnSCI.org for training of nurse students: a sub-module pilot study

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Introduction and Aims

The website www.elearnSCI.org was launched during the 51st Annual Scientific Meeting of International Spinal Cord Society (ISCoS) in London on 4th September 2012. As an up-to-date educational resource in spinal cord medicine, limited knowledge exists on its training effect and satisfaction in using it by trainees. The aim of this study is to investigate the effect of and satisfaction with training using a sub-module of www.elearnSCI.org for nurse students through interventional training session at a teaching hospital affiliated to Peking University, China.

Material and Methods

28 nurse students in 2 groups (14 in each) were involved. Group A received a translated print-out of the slides from the "Nursing management" sub-module in www.elearnSCI.org for self-study one hour before the class. At the beginning of class, both groups were tested using the nine self assessment questions from the same sub-module. Then, a lecture according to the content of the "Nursing management" sub-module was carried out and afterwards both groups answered the self assessment questions again. Finally, both groups filled in a training course satisfaction questionnaire (including ten questions).

Results

At the beginning of the class, the mean score (max. 9) of the self assessment in group A was 7.1 ± 1.1 , which was significant higher than that in group B (4.9 ± 1.7 , $p = 0.001$). After the lecture, the mean score of the self assessment in group A had insignificantly increased to 7.4 ± 1.3 , while in group B it increased significantly to 6.9 ± 0.8 ($p < 0.001$). The mean score (max. 50) of the training course satisfaction questionnaire was 42.8 ± 5.2 . 64% of the students indicated they were very satisfied (overall score ≥ 42) with the training and no students were unsatisfied (overall score < 30).

Conclusion

Both self-study and lecture presentation are effective methods for training the content of www.elearnSCI.org to nurse students. The training satisfaction of this sub-module within the www.elearnSCI.org is favorable.

Clinical course and prognosis of patients 75 years old and older with cervical spinal cord injury

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Introduction

Recently the number of elderly patients with cervical spinal cord injury (CSCI) has been increased. However, there are few reports concerning the prognosis of those patients. Aims: The clinical course and prognosis at 2 years later in patients 75 years old and older with CSCI were investigated and discussed the problems involved.

Methods

Among 45 patients transported to the two hospitals between 2009 and 2011, 30 patients could be chased (22 males, 8 females, 75-87 years, average of 79.8 years). At admission, ASIA (American Spinal Injury Association) Impairment Scale (AIS) was A in 6 patients, B in 2, C in 16, and D in 6. From the clinical documents and direct questionnaires obtained using telephones, the items below were investigated: AIS at admission and discharge, cause of injury, level of injury, combined bony injury, treatment method, walking ability, and prognosis. The statistical analysis was performed by JMP 10(SAS Institute Inc., Cary, NC, USA) software system. Data were compared using a Fisher's exact test. $P < 0.05$ was considered statistically significant.

Results

During hospital stay, 6 patients (4 of A and 2 of C) died of pulmonary infection, 6 improved (2 from B to C, and 4 from C to D), and resting 18 unchanged. Among 24 patients of discharge, 5 came back home directly, 18 to other general hospitals, and 1 to care house. Concerning walking ability at discharge of these 24 patients, 1 walked freely, 2 walked using a T-cane, 3 walked with catching a wall, 4 wheelchair independently, 7 wheelchair assisted, and 7 bedridden. Two patients of A discharged to other general hospitals died of pulmonary infection within a year. Among 12 patients of C who discharged to other general hospitals, 3 died there, and 2 of 7 who came back home later died of pulmonary infection within a year. After all, 16 patients were alive at 2 years later, and the vitality rate was 53.3 %. Concerning walking ability of these alive 16 patients, 3 walked freely, 2 walked using a T-cane, 5 walked with catching a wall, 2 wheelchair independently, 2 wheelchair assisted, and 2 bedridden. The vitality rate at 2 years later was 4 times better in the patients who could at least move around using a wheelchair assisted than in patients bedridden ($P = 0.01$). There were no significant differences concerning age, gender, cause of injury, level of injury, combined bony injury, and treatment method.

Conclusion

The vitality rate of 2 years later was 53.3% and it depended on walking ability. Therefore, adequate rehabilitation is necessary to allow obtaining moving or walking abilities as much as possible both during hospital stay and after discharge.

A suitable surgical method for old distractive-flexion injuries of the subaxial cervical spine

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Introduction

The vast majority of subaxial cervical spine injuries are recognized early and managed appropriately using CT or MRI. However, subaxial cervical spine injuries are sometimes missed on primary trauma surveys. Such cases are revealed to be cervical spine injuries by the appearance of neck pain, arm pain and neurologic deterioration. Although surgical intervention is usually considered if either a new onset or a progression of neurologic deficits is observed or if the kyphotic deformity progresses over time, the treatment of old subaxial cervical spine injuries can be extremely challenging. We herein describe a safe surgical treatment for old subaxial cervical spine injuries, especially distractive flexion injuries, and discuss the importance of lateral flexion-extension radiography in primary assessments.

Materials and Methods

Eleven patients with old distractive flexion injuries of the subaxial cervical spine were treated surgically between 1988 and 2013. For each patient, we investigated the level of the injured segment, the results of the initial radiographic assessment, the time from injury to presentation, the surgical procedure and the complications of the surgery.

Results

The injured segments were at the level of C4/5 in two cases, C5/6 in four cases and C6/7 in five cases. A radiographical assessment at the acute phase was not performed in three cases. Radiographical abnormalities were not noted in seven cases, even though radiographical assessment was performed at the initial examinations. The time from injury to presentation averaged 2.7 months (range 1-3.5). A re-examination of the radiograph images was performed because new symptoms occurred in seven cases and neck or arm pain persisted in three cases. A classic anterior-posterior-anterior approach (anterior discectomy and release, posterior release and instrumentation, anterior bone grafting) was applied in seven cases and a posterior approach alone was carried out in two cases in which preoperative reduction was obtained without neurological deficits. In two cases, we attempted a posterior approach; however, neurological deterioration occurred due to disc herniation. Additional surgery with anterior discectomy and bone grafting was performed immediately and the patients showed neurological improvements.

Conclusions

The initial assessment of cervical spine injuries is sometimes difficult because the shoulder conceals the lower cervical spine. In addition, recoil cases of dislocation without fracture cannot be detected, even if CT or MRI are applied. Careful lateral flexion-extension radiography using X-ray images assisted by spine surgeons is therefore important for assessing cervical spine injuries. The classic anterior-posterior-anterior approach is thus considered to be a safe and effective surgical approach for old distractive flexion injuries of the subaxial cervical spine.

Current treatment of individuals with traumatic spinal cord injury: do we need age-specific guidelines?

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Objectives

The elderly are increasingly at risk for tSCI from falls compared to younger patients.. However, it is unknown if this translates into different management and outcomes. Our objective was to determine if age affected management decisions and outcomes.

Methods

tSCI patients with complete records prospectively recruited from 2004-2013 for the Rick Hansen Spinal Cord Injury Registry (RHSCIR) were included. Demographic/injury differences between age groups (<70/≥70y) were assessed. Age (<70/≥70y), gender, injury etiology (falls vs other), energy of injury (high/low), injury level (cervical vs thoracolumbar), admission AIS (A&B vs C&D), and Injury Severity Score (ISS; ≥ 25) were examined with chi-square bivariate analysis and multivariate analysis for associations with operative treatment.

Results

Of 1440 participants with operative data, 167(11.6%) were >70y at time of injury. Older patients were more likely to have been injured by falling compared to higher-energy mechanisms (83.1% v 37.4%, p<0.0001), to have cervical (75.9% vs 60.1%, p<0.0001), to have admission AIS of C/D (67.9% vs 45.4%, p<0.0001), and a higher number of medical co-morbidities (mean 1.1 vs 0.31, p<0.0001). Older patients were less likely to have received operative treatment (80.2% vs 87.7%, p=0.0077) and to have a high ISS (41.8% vs 60.9%, p=0.0011). Age >70 did not affect odds of having operative treatment with multivariate analysis; high energy of injury and AIS of A/B increased the odds of having surgery (2.3 and 5.0 respectively). Older patients had longer time from injury to surgery, and longer acute (but not rehabilitation) length of stay. Age over 70 was associated with higher in-hospital mortality (25.5% v 5.6%).

Conclusions

Practice patterns in Canada demonstrate that age in of itself, does not impact the odds of having surgery. However, older patients wait longer for surgery and have substantially higher in-hospital mortality rates despite less severe injuries. Surgical guidelines for older patients could reverse these trends!

Benefits of early transport to specialized centres of care for SCI

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Objectives

The concept of a critical time period between a traumatic spinal cord injury (SCI) and treatment has been widely discussed in the literature. Studies have also shown the benefit of specialized SCI trauma hospitals (SSTH). Does earlier time from injury to arrival at a SSTH impact on patient outcomes?

Method

Prospective tSCI patients from 18 acute SSTH from the Rick Hansen Spinal Cord Injury Registry (RHSCIR) were included. Times from injury to admission to a SSTH were analysed for effects on acute length of stay (LOS) and most prevalent complications (pressure sores, urinary tract infections (UTIs), and pneumonia) using multivariate regression.

Results

Of the 1506 patients receiving acute care at a RHSCIR site, 52.6% were admitted to a community hospital prior to being transferred to a SSTH. Although on bivariate analysis time to SSTH admission was impacted by age, gender, admission AIS, neurological level, type of injury, on multivariate analysis only AIS (A/B vs C/D) impacted time to SSTH admission, with those with AIS A/B arriving at a SSTH sooner. Earlier time to admission to SSTH was related to shorter acute LOS ($p=0.0075$). Those admitted to a SSTH via a community hospital had a significantly longer acute LOS than those admitted directly to a SSTH (42 vs 36 days, $p<0.001$). There was no difference between the time from injury to discharge or rates of complications between groups. There is a small but significant positive relationship between time to admission to SSTH and acute LOS and time to discharge; time to admission to first acute site had no effect on complications.

Conclusions

Patients with tSCI admitted to a SSTH via a community hospital have a significantly longer LOS than those patients admitted directly to a SSTH. There appears to be no association between common complications and time to SSTH.

Fear of falling in wheelchair using individuals with spinal cord injury

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Introduction and Aims

The spinal cord injury (SCI) population is getting older and falls, fall-related injuries and negative consequences of falls are a growing health concern. Fear of falling (FoF) is known to limit activity and participation in ambulating individuals and is often assessed with the Falls Efficacy Scale International (FES-I). Recently, the Spinal Cord Injury Falls Concern Scale (SCI-FCS) for wheelchair users was developed by Boswell Ruys et al (Spinal Cord 2010), based on the FES-I. The scale has now been translated and culturally adapted to Swedish.

The aims of the study were to investigate FoF in wheelchair using individuals with SCI and to investigate the relationship between FoF and age, gender, duration of SCI, ability to transfer from the ground, falls and fall-related injuries.

Material and Methods

A total of 48 wheelchair users with traumatic SCI (78% men), median age 47 (22-79) years, attending their regular follow-up at Rehab Station Stockholm / Spinalis SCI unit and participating in a prospective multi-center study on falls reported FoF using the SCI-FCS. Level of injury was C3-L3, AIS A-D. Excluded were individuals with motor complete injuries above C5 as well persons able to walk. Median time since injury was 14.5 (3-52) years. Falls and fall-related injuries in the previous year as well as the ability to get up from the ground were assessed. The variables were dichotomized and analyzed for group differences by Mann Whitney U-test.

Results

Median FoF was 21 (16-64) out of 64 points indicating low falls concern on group level. Activities with highest reported FoF was driving wheelchair on uneven surface or up/down gutters and curbs, although the median 2 corresponds to "a little concerned". Higher FoF was reported in individuals unable to get up from the ground ($p=0.047$), those who had fallen the previous year ($p=0.030$) and those who had their SCI for less than 14.5 years ($p=0.025$).

No group differences in total SCI-FCS score were found due to different ages, genders or injurious falls. The previous year 88 % reported falls and 48% reported fall-related injuries (including both minor injuries such as scratches, bruises, strains and severe injuries such as fractures).

Conclusions

Wheelchair users with SCI reported relatively low level of FoF in spite of a relatively high reported frequency of falls and fall-related injuries. The reported FoF showed a relationship with previous falls, shorter duration of SCI and ability to transfer from the ground independently.

Key words

Fear of falling, spinal cord injury-falls concern scale, falls efficacy scale- international.

Modification and validation of a motor-response dependent measure of sleepiness (OSLER-2) for use in spinal cord injury

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Introduction and Aims

Daytime sleepiness is a debilitating symptom commonly experienced by people with tetraplegia. A simple, inexpensive, portable measure of daytime sleepiness is the OSLER-2 test which can aid in the diagnosis of underlying sleep disorders. The test asks participants to respond when they see a red light displayed. If they fail to respond repeatedly then they are considered asleep. The test requires rapid, accurate finger responses and thus would be expected to give falsely low scores in people with impaired hand function. The aim of this study was to modify the OSLER-2 test and assess the measurement of daytime sleepiness using two alternative, non-hand held response switches.

Materials and Methods

In collaboration with the manufacturers, the unit was modified to accept the standard hand-held switch, a head-tap switch ("jelly-bean") and a chin-tap switch ("wand"). The OSLER-2 test presented an LED light centrally for one second every three seconds. The test terminated following either seven consecutive missed responses (errors) or following forty minutes (maximum test length). Able-bodied, sleep restricted participants attended three testing days. The test was performed in a darkened room four times over each day. A different response switch was used on each testing day with switch order randomised. Time taken from test start to errors if they occurred (sleep latency), performance times and errors were recorded for each switch type. Video of the participants' test was recorded to monitor use and qualitatively describe the performance of each switch.

Results

22 participants (median age=21 yrs(IQR=6.3)) with no diagnosed sleep disorders were recruited. Analyses were conducted on those who fell asleep only (sleep latency) and again including those who completed the OSLER-2 test without falling asleep (performance times). Participants took longer to fall asleep when using the wand (M=1265sec(546)) than both the jelly-bean (M=1102(544)) and hand-held switch (M=1037sec(557), $p<0.05$; CI:-60,-543). Performance times were slower with the wand (M=1788sec(695)) than the jelly-bean (M=1530sec(758); $p<0.05$; CI:72,589) and hand-held switch (M=1459sec(784); $p<0.01$; CI:101,619). There were no significant differences in sleep latency, performance times or errors between the jelly-bean and hand-held switches. Video monitoring suggested the wand was not always purposely activated for the test. Participants often activated the wand when their heads dropped forward as they fell asleep.

Conclusions

The placement and design of the wand appeared to result in false responses, making it an unreliable alternative switch for the OSLER-2 test. The jelly-bean provided an effective alternative for use by people with limited hand function. Replication of this study with participants with tetraplegia would provide a new method for objective quantification of daytime sleepiness in this population; a group known to have an extremely high incidence of sleep disorders.

Current surgical practice for traumatic spinal cord injury in Canada

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Introduction

Traumatic spinal cord injury (tSCI) is often treated surgically, however there is no consensus on indications and timing. Published data on rates of surgery for SCI patients vary widely internationally. The objective of this study was to determine surgery rates for tSCI in Canada and describe the demographic and clinical characteristics of operative and nonoperative patients.

Methods

tSCI patients with complete records from the Rick Hansen Spinal Cord Injury Registry (RHSCIR), prospectively recruited from 2004-2013 from 18 acute care centres across Canada were studied. Data on patient characteristics (e.g. age, ethnicity, neurology) were analyzed using chi-squared tests.

Results

1440 participants had complete data; 1250 (86.8%) had surgery. Those with thoracic (T2-T10) injuries were most likely to undergo surgery (94.1%), followed by thoracolumbar (T11-L2; 91.6%), low cervical (C5-T1; 86.8%), and high cervical (C1-C4; 81.1%) injuries ($p < 0.0001$). There was no difference between surgical and non-surgically treated groups with regards to gender, ethnicity, injury year, time from injury to first neurologic examination, admission Glasgow Coma Scale, or admission Charlson Comorbidity Index. Patients with AIS A/B at admission were more likely to have surgery than patients with AIS C/D (95.1% vs 80.7%, $p < 0.0001$). Those having surgery were younger (44.6 vs 52.1y, $p < 0.0001$), were more likely to have been injured by a high energy mechanism (88.9% v 84.3%, $p = 0.0115$). Participants with one or more comorbidities were less likely to receive surgery (88.8% v 82.2%, $p = 0.0033$). Participants with Central Cord Syndrome (CCS) were less likely to receive surgery (75.2% v 92.7%, $p < 0.0001$). Acute LOS was significantly affected by AIS (A/B 51.5d vs C/D 26.5d, $p < 0.0001$) and neurologic level ($p < 0.0001$).

Conclusions

The surgical rates for both cervical and thoracolumbar injuries are higher than published data. Ongoing analyses will determine if surgical intervention produces superior outcomes and provide evidence to promote the standardization of care.

Current surgical practice for traumatic spinal cord injury in central cord syndrome patients in Canada

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Introduction

Traumatic spinal cord injury (tSCI) is often treated surgically, however there is no consensus on indications and timing. Central cord syndrome (CCS) is a clinical diagnosis based on the ASIA Injury Scale (AIS) being C or D, and an upper extremity motor score (UEMS) being ≥ 5 points lower than the lower extremity motor score (LEMS). There is little consensus among clinicians on how best to treat patients with CCS. We aimed to determine any surgical practice or outcome differences in treatment of CCS patients with AIS C vs D.

Methods

tSCI patients with complete records from the Rick Hansen Spinal Cord Injury Registry (RHSCIR), prospectively recruited from 2004-2013 from 18 acute care participating centres across Canada were studied. Those with AIS C/D and UEMS < LEMS of 5 or more points were classified as CCS. Data on the patient (e.g. age, ethnicity, neurology), treatment (surgery yes/no, time to surgery), and outcome (change in motor score and Functional Independence Measure (FIM)) were compared using chi-squared tests.

Results

525 participants had complete data and CCS; in those with surgery data available (n=471), 75.9% had surgery (entire sample surgery rate was 86.8%). In participants with CCS, there was no difference between rates of surgery between those with AIS C vs D, but AIS C patients had a shorter mean time from injury to surgery (81.4h vs 109.0h, $p=0.0051$), a significantly larger change in motor score (38.3 vs 9.6 points, $p<0.0001$), and a significantly larger change in FIM (30.1 vs 14.9 points, $p<0.0001$) than AIS D patients.

Conclusions

There is no difference in surgical rates for CCS patients with AIS C/D at admission, however there is an association that favours a role for early surgical intervention. Surgeons should consider surgical intervention for AIS C patients presenting with CCS.

Differences in surgical treatment for tSCI across Canada: are surgeons doing what they say they are doing?

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Objectives

Traumatic spinal cord injury (tSCI) is often treated surgically and more recently, it has been suggested that early surgical treatment is optional. Published data on rates of surgery for SCI patients vary widely internationally. We aimed to determine surgery rates and timing for tSCI in Canada and compare this to reported current/ideal treatment from a survey of spine surgeons country wide.

Methods

tSCI patients with complete records from the Rick Hansen Spinal Cord Injury Registry (RHSCIR), prospectively recruited from 2004-2013 from 18 acute care participating centres across Canada. Admission patient neurology was linked with surgical treatment. Surveys asking spine surgeons about current and ideal surgery timing/decisions for certain SCI patient types were completed at the Canadian Spine Society (CSS) 2013 conference or online.

Design/Results

1151 participants had complete data with 1008 (87.6%) of these patients having surgery. Actual/current survey/ideal survey are: those with AIS A/B thoracolumbar (T2-L2) injuries were most likely to undergo surgery (95.4%, 89.2%, 90.9%), followed by AIS A/B cervical (C1-T1: 94.6%, 91.9%, 95.0%); AIS C/D thoracolumbar (89.1%, 100%, 96.7%), and AIS C/D cervical (76.7%, 89.2%, 90.9%) ($p < 0.0001$). 31 surgeons (15 (48.4%) neurosurgeons, 16 orthopedic surgeons) with a mean of 13.5 years in practice responded. Surgeons appear to overestimate surgery rates in AIS C/D patients. Surgeons would in general prefer to operate on most patients earlier (<12 h post-injury; current 21.8%, ideal 46.2%) vs later (24-72 h post-injury; current 25.4%, ideal 10.1%). Actual data suggests surgeons currently underestimate those being operated on < 12 h post-injury, and overestimate the number of those being operated on between 24-72 h post-injury. Surgeons rated delay in operating room availability and transport of patients to specialized centres as major obstacles to operating within ideal timelines.

Conclusions

Overall data suggest surgeons believe they are achieving decompression and stabilization earlier than the actual data would suggest. Major obstacles to operating at ideal times included the transport of patients to specialized centres and operating room availability.

The importance of "time to surgery" for traumatic spinal cord injured patients: results from an ambispective Canadian cohort of 949 patients

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Introduction

The timing of surgery for Traumatic spinal cord injury (tSCI) is controversial. Although some recent studies highlight the benefit of surgery within 24h of injury, this is not definitive. The objective of this study was to determine current surgical timing for tSCI in Canada and to ascertain whether the timing of surgery influences neurological outcome in tSCI patients.

Methods

Ambispective cohort design of tSCI patients who underwent spine surgery within 30d of injury, recruited to the Rick Hansen National Spinal Cord Injury Registry (RHSCIR). between 2004-2013, Patient demographics, admitting and post-operative neurology, timing of surgery were collected. Multiple linear and gamma regression were used to determine correlations between times of arrival at the first acute hospital, initial neurologic examination, and surgery, as well as to determine if there were differential patterns of recovery dependent on time to surgery and admission neurology (ASIA Injury Scale (AIS) A, B, C, or D). Possible reasons for neurologic deterioration over time were also examined.

Results

949 patients were included in this analysis. The mean/median/range time to surgery for all participants were 60h / 32h / 2-705 h. Participants with AIS A at admission did not demonstrate an effect of time of surgery on change in motor score; however, surgery within 24 hours on AIS B, C, or D increased motor score by almost 7 points.

Conclusions

In tSCI participants who present with AIS A injuries; the timing of surgery does not appear to influence motor recovery. When the AIS is B, C, and D at admission, surgery within 24 hour from injury is correlated with improved motor score recovery.

Bone health opinions and practice patterns after spinal cord injury

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Introduction and Aims

Spinal cord injury (SCI) patient population is at a high risk of accelerated bone loss often at an early age, and a better understanding of effective interventions in the acute setting before bone hyper-resorption would be beneficial both to reduce the low-energy fracture incidents in chronic SCI and to prevent fracture associated with weight-bearing activities during physical rehabilitation to optimize recovery after injury. Bone health after a SCI is an important issue that needs to be addressed because of an increased risk for fragility fractures. Because bone loss after spinal cord injury is multifactorial, it can be difficult to assess and treat. This process becomes even more complex as secondary conditions associated with aging are introduced.

To promote healthy and independent aging in SCI patients, Midlands Centre for Spinal injuries (MCSI) has started a project to improve bone health in patients with SCI. First step in this project is to find out what other Spinal Injury Centres are doing and establish current practice patterns in the UK.

Materials and Methods

A 4-page 17-question survey was sent to working spinal consultants in all UK SCI rehabilitation centres. It was self-report survey.

Results

We had 65% response rate (21 responses). Spinal Consultants reported that they should be managing bone health issues after SCI in conjunction with family physicians (GP), metabolic specialists and most respondents (15 (71%)) assess and treat bone health issues after SCI. However, most of the consultants (13 (62%) over half of the responded spinal consultants) reported that they did not think the current treatment was effective. However, there was more prescribed pharmacological treatment than rehabilitation modalities despite equal belief in both. Spinal Consultant responses showed belief in a combination of treatment options instead of a single type of treatment.

Conclusion

Bone health after SCI is an important health concern. Current practice in UK is that somebody else (metabolic specialist, GP) should manage bone health for patients with spinal injury. This survey is an important starting point for discussion with other spinal injuries centres about these important issues and improvement of current practice. There is a need for the development of standards for bone health management based on the outcomes of well-designed studies.

Health and quality of life outcomes of spinal cord injury patients comparing rural and urban residents

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Introduction

Spinal cord injury (SCI) requires the collaborative effort of a number of health care professionals in the acute and rehabilitation phases of care. Much is known about the basic needs needed for transition into community living, however, very little is known about the outcomes of patients with SCI who reside in rural areas with less access to specialized care compared to those who reside in urban centers. Objectives:

- 1) Compare health and quality of life outcomes at 1 year and 5 years between SCI patients residing in a rural area versus those residing in an urban area
- 2) Determine whether SCI patients continue living in a rural area after their injury.

Methods

Patients admitted to Vancouver General Hospital or GF Strong Rehabilitation Centre with a traumatic SCI from 2004-2012 were identified using the Vancouver Rick Hansen SCI registry (RHSCIR). Patients were stratified into high cervical, low cervical or thoracic and then further divided based on their ASIA impairment score (AIS). Health Related Quality of Life (HRQOL) was determined with SF-36 physical and mental scores, and functional and health outcomes were determined using the Functional Independence Measures (FIM), Craig Hospital Inventory of Environmental Factors short form (CHIEF-SF) and the Spinal cord injury health questionnaire (SCI-HQ).

Results

867 RHSCIR participants were identified. Prior to injury, 41.7% of participants lived in a rural setting. Five year follow-up data available demonstrated that 33.3% of patients maintained their residence in rural communities. The majority of patients moving from a rural to an urban setting after SCI were in the high cervical ASIA A/B group. Overall, rural participants scored higher on SF-36, CHIEF-SF scores ($p=0.01$) but SCI-HQ were superior in the urban group ($p=0.01$).

Discussion

Rural patients with lower cervical or thoracic SCI and better AIS scores are able to maintain their rural place of residence. Rural patients have higher HRQOL scores whereas urban patients tend to experience greater isolation despite living in a large center.

Case report: chronic autonomic dysreflexia and Charcot arthropathy of the spine after scoliosis surgery

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Introduction

Autonomic dysreflexia (AD) is an acute syndrome that usually appears in patients with cervical and thoracic injuries over T6. Frequently it is triggered by a noxious stimulus that in some cases can be difficult to diagnose, turning into a chronic and distressing process. Charcot's arthropathy of spine is a degenerative disorder that we found in SCI patients, caudally to the level of injury, and can be an AD's stimulus. We submit the case of a patient that after being under surgery for scoliosis, he generated repetitive symptoms of chronic AD and that, after multiple explorations, was diagnosed of Charcot spine.

Case report

Male, 23 years old, with a complete spinal cord injury (level T1), due to a traffic accident at the age of 3. After surgery for thoracolumbar scoliosis T5-sacral), he developed a pressure scar in left ischiatic that solved with conservative treatment. After 6 months, he presented crisis of AD daily on the sitting posture complaining of headache, facial and thoracic flushing and hypertensive crisis. He was presenting left coxofemoral luxation, but in several image studies of spine, it was not observed any pathology that could justify AD's features. To try of diagnose the etiology of the clinical signs, multiple studies were realized: Imaging, urologic, digestive, etc. Several treatments: Orthopaedic (femoral head exeresis for luxation and removing the arthrodesis material of the spine), and also placement of an intrathecal catheter (analgesic), without identifying the reason or reducing the number of crisis. Finally, a CT study proved to be a Charcot's neuropathic articulation (L2-L3). After new vertebral arthrodesis (T12-S1) the clinical disturbances were solved, being the patient finally able to sit and resume his normal life.

Conclusion

We expose an inusual case of Charcot spine that was the stimulous of autonomic dysreflexia. Spinal arthrodesis doesn't prevent degenerative disc disease in some SCI subjects, leading to a neuropathic arthropathy.

Restless leg syndrome in patients with spinal cord injury and neuropathic pain

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Introduction

Restless leg syndrome (RLS) is a common condition in the general population. However the presence of RLS in patients with spinal cord injury (SCI) has not been well defined. Methods: Here we diagnosed RLS in 7 patients with SCI and with previous diagnosis of neuropathic pain. These subjects had a follow up visit at that time and were interviewed about the response to the treatment with dopamine agonist.

Results

All 7 were male, with a mean of 52.4 years of age. Three had a thoracic SCI level, and 4 a lumbar level (complete/incomplete SCI: 2/5). All patients had an initial diagnosis of neuropathic pain (NP), but after the interview we concluded that 6 patients had RLS with NP and 1 patient presented RLS without NP. All the subjects reported an improvement of >50% of their symptoms of RLS with treatment.

Conclusion

In SCI subjects with neuropathic pain, the diagnosis of RLS should be considered and a dopamine agonist should be tried.

Invasive dumbbell spinal meningiomas: report of four cases and review of the literature

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Introduction and Aims

Most meningiomas are entirely benign, however, some tumors are locally aggressive and may recur after surgery. We experienced four rare cases of dumbbell-typed spinal meningiomas eroding the vertebrae, three of which recurred after surgery. The salient features are described.

Material and Methods

Eighty-six consecutive patients with neuroradiologically and histologically confirmed spinal meningiomas were treated surgically from 1983 to 2008. Among them, four cases with dumbbell-typed localization were included in this study. They were all male with their mean age of 54.5 years old. Clinical features, tumor localization, extent of tumor resection, pathological features (histological classification and MIB-1 staining index), neurological and clinical outcomes were reviewed.

Results

Two patients had lumbar pain as an initial symptom whereas the other two patients started from lower extremity sciatic pain. Regarding disease duration, the former two patients who complained of lumbar pain had longer time (10 years) than those who complained of sciatic pain (2.1 years). All tumors were located at lumbar or lower thoraco-lumbar levels, eroding adjacent vertebrae. Two cases were extradural localization and the other two were intra-extradural localization. Gross total resection including dura mater was performed in three cases and subtotal resection was performed in one case. Three of four patients experienced recurrence. All these three patients died of tumor finally. Histological classification was WHO Grade I meningioma in all cases although the N/C ratio was higher than usual. Interestingly, the recurrent tumors exhibited higher proliferation rates than the primary tumors in all three cases. Furthermore, one case appeared neoplastic transformation as an anaplastic meningioma (WHO Grade II).

Conclusion(s)

Invasive dumbbell-typed meningioma is histologically benign but shows aggressive behavior with a higher proliferation rate. Massive tumor resection including originated dura mater as well as invaded vertebrae should be performed to avoid recurrence.

Using penile vibratory stimulation for controlling spasticity and spasm in spinal cord injury

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Introduction and Aims

Spasticity and spasm are common problems following spinal cord injury (SCI) above T12, and are troublesome in 40%-60% patients. They can cause pain, sleeplessness, difficulties with activities of daily living and transfers, can eventually cause contractures and may predispose to pressure sores. Conservative treatments include physiotherapy and standing programmes. Medications include baclofen and clonazepam, which can be administered orally or by patch. Baclofen can also be given intrathecally via an implanted pump in intractable cases. Severe cases may also be helped by botox injections, tendon transfers, rhizotomy or phenol injections. All medications have side effects, chiefly sedation. The baclofen pump is highly effective, but involves surgery and compliance from the patient. Whole body vibration and rectal probe stimulation have been demonstrated to give relief, but are expensive or invasive to apply, and need to be given in the clinical setting. Our aim was to investigate the acute effects of penile vibratory stimulation (PVS) on spasm and spasticity in order to evaluate whether this may be a useful adjunct for relief, which can be used in the home setting.

Materials and Methods

39 SCI patients were evaluated. Two commercially available penile vibrators were used, the Ferticare (Multicept, Denmark) and the Viberekt, (iMEDicare, US-UK). PVS was delivered by the same nurse for 3 x 1 minute periods, using a frequency 110 Hz and optimal amplitude for each stimulator. Spasticity and spasm were evaluated by the same physiotherapist, pre and post PVS using Visual Analogue Scale (VAS), Ashworth Scale (AS) measured at the hip and knee, Modified Penn Spasm Frequency Scale (MPSFS) and Clonus. A student two-tailed paired t-test was used for statistical comparison before and after PVS. The patients were contacted the following day to determine the persistence of effect.

Results

There was a statistically significant reduction in VAS following PVS from 6.2 ± 1.9 to 2.2 ± 1.0 ($p < 0.0001$) in the complete patients and 6.6 ± 1.4 to 4.3 ± 2.8 ($p < 0.003$) in the incomplete patients. There was also a statistically significant reduction in AS following PVS at hip and knee in all patients. In the complete patients AS measured at the hip and knee reduced from 1.34 ± 0.84 to 0.28 ± 0.56 and 1.56 ± 0.74 to 0.56 ± 0.64 respectively (all at $P < 0.0001$). In the incomplete patients the AS at the hip and knee reduced from 2.25 ± 0.99 to 1.45 ± 1.09 and 2.5 ± 1.0 to 1.79 ± 1.27 respectively (all at $P < 0.0001$). The mean duration of effect was 6 hours in both complete and incomplete subjects.

Conclusions

PVS can effectively reduce spasm and spasticity immediately for up to 6 hours. PVS is a relatively inexpensive, non-pharmaceutical and easy to apply therapy, which can be used by patients in the home setting.

Isolated bilateral phrenic nerve palsy in a paraplegic patient complicating weaning from ventilation

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Introduction

We present an unusual case of prolonged ventilator weaning due to bilateral diaphragmatic paralysis in a paraplegic patient. This has not been reported in literature previously.

Materials and Methods

A 40 year old obese woman was operated with a C6-T2 laminectomy for resection of intramedullary ependymoma. 6 days after the operation she was rushed to intensive care for respiratory failure. She needed intubation and ventilation. Several attempts to wean the patient from the ventilator in the following 4 months failed. Episodes of bradycardia and cardiac asystole further complicated her management and prolonged her stay in Intensive care unit.

Results

Transfer to the regional specialist spinal cord injury respiratory unit resulted in care in appropriate setting. Further investigation of diaphragm confirmed bilateral diaphragm paralysis. Bilateral phrenic nerve stimulation failed to produce any movements of the diaphragm. Long term domiciliary ventilation was planned. Rehabilitation goals included accessory muscle training for ventilator free breathing periods.

Conclusions

Several learning points are highlighted in this case. Isolated bilateral diaphragm paralysis is rare but must be suspected in all cases of spinal cord injury where weaning attempts from ventilator are difficult. Weaning attempts are distressing for the patient and can make rehabilitation challenging. Specialist spinal centres for respiratory management of such patients result in better outcomes. Ventilator free breathing for short period is achievable with accessory muscle training and allows for transfers, personal hygiene, shower etc,ensures safety and gives a sense of autonomy to the patient. We advise follow up for screening the diaphragm to see for recovery.

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Global meaning in people with spinal cord injury: content and changes

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Introduction and Aims

Global meaning refers to basic ideas that guide people in giving meaning to their lives. Spinal cord injury (SCI) is a traumatic experience that results in life changes. Little is known about global meaning relating to SCI and whether global meaning changes after SCI. The purpose of this study is twofold:

- (i) to describe the content of global meaning of people with SCI, and
- (ii) to determine whether or not global meaning changes after SCI.

Methods

In depth semi structured interviews were conducted with 16 people with SCI. Interviews were analyzed according to the method of grounded theory.

Results

- (i) Five aspects of global meaning were found: core values, relationships, world-view, identity and inner posture.
- (ii) Little change in the content of global meaning was found. After SCI, specific aspects of global meaning are fore grounded.

Conclusion

Five aspects of global meaning were found in people with SCI. Four have been previously reported in research on global meaning, whereas inner posture has been described in other disciplines, like philosophy and spiritual counselling. Inner posture refers to thoughts and inner exercises that help people bear what cannot be changed. Global meaning seems hardly subject to change.

Epidemiology and outcome of ankylosing spondylitis with spinal cord injury: five year followup of a single centre study, Indian perspective

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Study design

Retrospective study. Summary of Background Data: Ankylosing spondylitis is an inflammatory arthropathy affecting axial joints of body. Spine fractures in ankylosing spondylitis are usually three column fractures and are associated with mild trauma. These injuries can be disabling and can have serious consequences. Spinal fractures are up to four times more common in patients with ankylosing spondylitis than the general population. Fractures in this population have a high incidence of neurologic complications, with spinal cord injury at initial presentation in two-thirds of patients sustaining a traumatic fracture in one large review. Most of data on spinal cord injuries is available from developed nations. There is no data on spinal cord injured from developing nations. This is first and largest study to the best of our knowledge from developing nation which addresses this issue and its complications.

Methods

We analysed the data of patients admitted at our centre over the last 5 years with the diagnosis of ankylosing spondylitis with spinal cord injury. Only patients who were operated were taken into consideration. Their records were analysed retrospectively to know sex predilection of patients, neurological status, mode of trauma, duration of hospital stay, common level of fracture in vertebral column, comorbid factors, minor complications and if any major complications during the stay. Expenditure occurred to patients during their hospital stay was also analysed and correlated with their neurological status.

Results

There were 46 patients admitted at our centre over the last five years. All patients were male patients. Mean age of patients was 58.71 years. 31 patients (67 %) had history of trivial trauma. 25 patients (54.3%) had history of fall at home. While 14 patients (30%) had history of high velocity trauma. In one patient mode of trauma was hit by a bull. 12 patients had complete injury (AIS A), 5 patients had AIS B neurology, 9 had AIS C , 10 AIS D and 10 patients had intact neurology. 74% of patients had incomplete or normal neurology. Average expenditure of a patient admitted with SCI with AS is more than 7000 USD which is around than six times the per capita income in India. C5 C6, C6C7 ,C7 D1 and D12 were the most common injured level. Out of 25 fractures in cervical spine 18 occurred through disc in cervical spine while it was not significant for dorsal and lumbar spine. Total five patients had expired till last follow up.

Conclusion

Males with AS are much more prone to injury than females. Not even a single female with AS with SCI was operated by us during the last 5 years. Most of them result in incomplete neurological deficit. Most common level of fracture is cervical followed by thoracolumbar junction. Length of hospital stay correlates with neurology of patient with complete injuries requiring prolonged stay. Fall at home is the most common mechanism of injury in these patients. Hypertension and diabetes are most common comorbid factors.

Usefulness of laser-evoked potentials and quantitative sensory testing in patients with spinal cord injury pain: a multiple case study

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Introduction and Aims

Laser-evoked potentials (LEP) and quantitative sensory testing (QST) are recommended to assess the function of spinal thalamic tract (STT) and dorsal column system (DCS). In this study, their usefulness was tested in patients with spinal cord injury pain (SCIP).

Materials and Methods

Eleven consecutive patients (3 females and 8 males) with a mean age of 49 years (SD 15) having SCIP were assessed with the German pain questionnaire for pain, disability, psychic distress and health-related quality of life. All patients had MRI of the spinal cord and a careful neurological examination was performed. Nine patients had an injury level above L1 vertebra consistent with a spinal cord lesion, while 2 patients were diagnosed with cauda equina syndrome. LEP following Tm-YAG laser stimulation of the skin and QST performed according to the protocol of the German Research Network on Neuropathic Pain (DFNS) were obtained within clinical affected dermatomes, corresponding to the pain site in 9 patients. The following QST parameters were studied: Cold detection threshold (CDT), warm detection threshold (WDT), thermal sensory limen (TSL), paradoxical heat sensation (PHS), cold pain threshold (CPT), heat pain threshold (HPT), mechanical pain threshold (MPT), mechanical pain sensitivity (MPS), allodynia (ALL), wind up ratio (WUR) and pressure pain threshold (PPT) for STT function. DCS function was assessed by mechanical detection threshold (MDT) and vibration detection threshold (VDT).

Results

Patients had a mean history of spinal cord lesion of 7.0 years (SD 5.8) and a mean pain history of 5.2 years (SD 4.5). ASIA impairments were: A in 2; B in 1; C in 1 and D in 7 patients. The mean pain intensity was 76.8 (sd 10.4). Six patients had at-level SCIP and 5 had below-level SCIP. Pain sites were: hand (3); trunk (3), thigh (2) and foot (3). LEPs were abnormal in 9 patients with reduced amplitude in 1 and no LEPs in 6 cases. Sensory detection and pain thresholds to laser stimuli were respectively abnormal in 6 and 4 patients. QST was abnormal for STT in all patients. Thresholds were increased for TSL (7 patients), WDT (6), CDT (5), MPS (3), MPT (2), HPT (1). PHS was present in 3 cases. Decreased thresholds were found for MPT (4), MPS (3), CPT (2), HPT (2), PPT (3) and CDT (1). Allodynia was present in 4 and WUR in 2 patients. DCS function in QST was abnormal in 11 patients showing increased VDT (10) and MDT (6). MRI's were normal in one patient, abnormal in 6 for both STT and DCS lesions, while 4 MRI scans were not assessable due to artifacts or patients had cauda equina syndrome with no obvious lesion. STT abnormalities were consistent between LEP, QST and MRI in 5 cases. DCS abnormalities were consistent between QST and MRI in 6 cases.

Conclusion

Based on our results in patients with SCIP, a high rate of STT and DCS abnormalities measured by LEP and QST is found. A comparison to patients without SCIP should further support their usefulness.

Development of an international spinal cord injury (SCI) spinal interventions and surgical procedures basic data set

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Introduction and Aims

The use of common data elements is now required by funding agencies to improve data quality and ensure data from multiple studies can be compared. The aim of this study was to develop a minimal data set to describe spinal interventions and surgical procedures, referred to as the International SCI Spinal Interventions and Surgical Procedures (ISCISISP) Basic Data Set. This data set will accompany the International SCI Spinal Column Injury Basic Data Set, as well as other International SCI Data Sets.

Materials and Methods

The process used to develop the data set included obtaining expert opinion, feedback and then reaching final consensus. An expert committee defined the data elements included in the ISCISISP Basic Data Set. The data set was then disseminated to the appropriate committees and organizations for comment. All feedback was considered and the final version was endorsed by both the International Spinal Cord Society and the American Spinal Injury Association.

Results

The data set consists of 6 variables: #1) Non-surgical bed rest and external immobilization, #2) Spinal intervention-closed manipulation and/or reduction of spinal elements, #3) Surgical procedure-approach, #4) Surgical procedure-open reduction, #5) Surgical procedure-direct decompression of neural elements, and #6) Surgical procedure-stabilization and fusion (spinal segment number and level). All variables are coded using numbers or characters. Each spinal intervention and procedure is coded (variables #1 through #5) and the spinal segment level is described (variable #6). Sample clinical cases have been developed to illustrate how to complete the ISCISISP Basic Data Set.

Conclusions

The ISCISISP Basic Data Set will facilitate comparisons of spinal interventions and procedures data among studies and countries. It is part of the National Institute of Neurological Disorders and Stroke (NINDS) Common Data Element project and now is recommended for use in new SCI clinical studies.

Retrospective review of time to surgical decompression in traumatic spinal cord injured patients in Ireland

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Introduction and Aims

Timing of surgical decompression, in relation to neurological and functional outcomes in traumatic spinal cord injury (TSCI), evokes much interest at present. In Ireland, there is one specialist acute spinal cord injury centre, the National Spinal Injuries Unit (NSIU), Mater Misericordiae University Hospital, Dublin, where the vast majority of patients with TSCI are managed. Many factors can influence the time taken for patients to arrive at the NSIU from their local hospitals including ease of contact with the spinal surgical service, distance from some remote parts of the country, availability of ambulance transport. A review of all spinal surgical services is currently being undertaken by the Health Services Executive (HSE) in Ireland, the body responsible for the implementation of change in delivery of healthcare, with the emphasis on improving quality of care. The aim of this study was to examine the process of referral from local hospitals to the NSIU and, in particular, the timeframes involved in each phase of patient management.

Materials and Methods

A retrospective review of healthcare records of all patients with TSCI, who had surgical management, in the NSIU in 2010, 2011, 2012, was carried out. The NSIU referral form from the local acute hospital, ambulance documentation, written entries in the health-care record, ASIA worksheets, theatre logs were searched for necessary information. From this, the duration of each stage of the patient pathway was calculated. A relationship with severity of injury and distance from NSIU was also explored.

Results

Records of 110 patients were reviewed. At presentation, there were 17 patients with complete tetraplegia, 44 with incomplete tetraplegia, 19 with complete paraplegia, 30 with incomplete paraplegia. Median duration between onset of injury and time of arrival at local hospital was 1 hour 25 minutes, between arrival at local hospital and referral to NSIU was 3 hours 8 minutes, between referral to and arrival at NSIU was 28 hours 54 minutes, between onset of injury and arrival at NSIU was 33 hours 27 minutes, between onset of injury and surgical decompression 72 hours 30 minutes. Preliminary results suggest that the distance from NSIU was not a significant factor in determining time to arrival at NSIU and that severity of injury was not related to time to decompression.

Conclusions

Overall times to arrival at NSIU and surgical decompression seem prolonged. It is likely that there are a range of contributing factors at different stages of the referral and transfer process. These now need to be analysed and where possible, improved upon.

Establishing disease severity of cervical spondylotic myelopathy (nontraumatic SCI) through novel sensitive gait assessments

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Introduction and Aims

Disrupted locomotion plays a significant role in the disability of individuals with cervical spondylotic myelopathy (CSM), more so as the disease progresses. However the current assessment tools fail to demonstrate sensitivity in early detection of subtle gait changes in CSM. Detailed gait analysis can show utility when measuring individuals with early signs of CSM or when measuring efficacy of new therapeutics. The objective of this study is to define the significance of using spatio-temporal gait parameters in the assessment of the CSM population, both to define severity of disease and to measure change in the natural history of the disease and most importantly assess change secondary to intervention.

Methods

An observational cross sectional study (n=30) was conducted; including patients with a diagnosis of CSM (positive MRI imaging, 1 clinical symptom and 1 neurological sign of cord compression). GAITRite walkway analysis, Modified Japanese Orthopaedic Association Assessment (mJOA) and the Berg Balance Scale were administered. Analysis: Paired T-tests were used to compare the study sub groups to normative values.

Results

Stride velocity variability and asymmetry in step length, stride length and base of support are spatio-temporal parameters that detect very early changes in disruption of the gait pattern ($p<0.05$), prior to any other detectable gait impairment. As severity increases velocity, cadence, single and double stance time, and variability in stepping show significant ($p<0.05$) differences from normative values.

Conclusions

Current clinical tests do not detect or quantify early signs of CSM. The results of this study strongly suggest for the first time that detailed gait analysis enables the clinician to identify CSM during the early stages. This work identifies the spatio-temporal parameters that are meaningful to the gait impairment specific to CSM. Finally characterizing the spatio-temporal gait parameters that are sensitive and specific to CSM provide the opportunity to determine the natural history and assess treatment effects.

Loss of manual dexterity and related upper limb disability in cervical spondylotic myelopathy (nontraumatic SCI): The role of upper limb assessment

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Introduction and Aims

Loss of manual dexterity (impaired upper limb function) is one of the consequences of cervical spondylotic myelopathy (CSM). The deficits related to upper limb dysfunction are typically defined subjectively by the patient. There is limited use of quantitative methods for upper limb assessment in CSM. The purpose of this study is to characterize the upper limb deficits specific to CSM and define an optimal method for sensitive quantitative assessment of the loss of manual dexterity and upper limb dysfunction. Scientific Aims: 1) To characterize the specific hand and upper limb deficits related to CSM and 2) to define the optimal method for sensitive measurement of upper limb impairment which can be used to quantify neurological deficits related to weakness and loss of manual dexterity.

Methods

Thirty individuals diagnosed with CSM were assessed at baseline presentation with hand function testing, modified Japanese Orthopaedic Assessment (mJOA), Grip Dynamometer (D), and QuickDASH. Hand assessment consisted of strength, sensory and dexterity testing which is scored and timed. Analysis: Paired t tests were conducted between scores of severity groups to determine differences between groups. Known group validity was used to establish sensitivity of the surrogate outcomes and associations between impairment and function.

Results

Mean differences between mild and severe groups with mJOA for hand function and sensation were 1.8 and 0.9 respectively. Similar comparisons with hand function testing sensation, strength and manual dexterity scores were 4.2, 9.3, 6.7 (55seconds) ($p < 0.05$) respectively. Pearson correlation coefficients were used to calculate the association between impairment and disability (QuickDASH) scores; further defining, the role of upper limb impairment to disability (0.731-0.491), and in turn defining partial cause of global impairment in CSM.

Conclusions

Hand function testing defines discrete groupings of severity dissimilar to the mJOA, indicating greater sensitivity than the gold standard. The degree of global dysfunction related to the upper limb can be quantified with surrogate upper limb measures that are sensitive and quantify manual dexterity and sensation of the hand. Hand weakness and disability measures determined that upper limb impairment contributes to the global disability of individuals even with a mild presentation of CSM.

Bladder and bowel related quality of life: differences based on age, time since injury and neurological classification

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Introduction and Aims

Very few studies have focused on the impact of neurogenic bladder and bowel on quality of life (QOL) or psychosocial and behavioral factors associated with bladder and bowel dysfunction. With aging and time since injury changes in bowel motility, sphincter control, coupled with impaired mobility and hand dexterity make bowel management a major life-limiting problem. Similar difficulties may be attributed to bladder changes. Thus, it is not surprising that improving bowel and bladder function is rated as one of the highest priorities among individuals with SCI. This study investigated patterns of bladder and bowel management and complications and their relation to QOL outcomes. The aims included to determine differences associated with age, time since injury (TSI) and neurological classification.

Materials and Methods

Data from 127 individuals with traumatic spinal cord injury (SCI) of ages 21 to 94 and time since injury from 5 to 48 years post were examined in terms of quality of life related to bladder, bowel and overall life satisfaction. The International Data Sets for Neurogenic Bladder and Bowel were adapted into an easy to use instrument to interview chronic patients with SCI. Quality of life was measured using the Qualiveen, the LSI-Z and selected SCI-QOL item banks, a new multidimensional measure of health related QOL based on patient reported outcomes (PROs). Interviews were conducted by trained research assistant and a nurse using the BBTI (Bowel and Bladder Treatment Index) followed by other QOL measures. All participants received their rehabilitation at a large university hospital and are part of the SCI Model Systems network of centers.

Results

Results suggest that bladder related QOL is most impacted by TSI with those with shorter time reporting lowest QOL ($p<.031$). They also reported lowest overall life satisfaction. There were no differences in bladder or bowel QOL across age cohorts. However, the number of bowel surgeries differed as a function of age with older people having more surgeries ($p<.025$). Persons with incomplete injuries (AIS D) had the lowest bladder QOL ($p<.009$). Life satisfaction was highest for those classified as Para ABC ($p<.030$). Those who were treated for UTIs during the past year also rated their QOL the highest ($p<.0005$) as did those who reported surgeries during the past year. Changes in sexual function was rated one of highest issue of negative impact on QOL based on bladder dysfunction by the overall sample. Most frequent method of bowel management was a combination of digital stimulation, rectal suppositories, digital evacuation, and oral laxatives. Intermittent self-catheterization was the most common method of bladder management. Hemorrhoids and urinary tract infections (UTIs) were the most frequent complications observed.

Conclusions

Time since injury seems to play a major role in the adjustment to loss of bladder and bowel after injury, as reflected by reported QOL outcomes. Differences in QOL are less clear when taking age into consideration. Although our data did not show differences associated with age, its relationship to QOL is more complex as better adjustment is often associated with older age in spite of possible health changes. Poor QOL was clearly observed among those with incomplete injuries suggesting that personal expectations can be a factor for those with greater hope of full recovery. Expectations also may play a role in increasing QOL after surgeries and treatment for complications as observed in our data. It is unclear if these positive effects on QOL will be maintained with passage of time. Longitudinal follow studies investigating the interaction of age and time since injury are needed to address these differences in QOL related to bowel and bladder management after SCI.

Rehabilitation outcomes of patients with cervical cord injury complicated by CVA: a report of 2 cases

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Introduction

Cervical Spinal cord injury (SCI) with complete AIS A or B leads to long term disability and initial rehabilitation is a difficult process for both patients as well all those who care for the patient. However if this is complicated by a CVA then it becomes even more difficult to rehabilitate such a patient. Aim of our study was to report two of such cases and the problems we faced in rehabilitating such patients so that it could be a learning experience to other spinal centres.

Materials and Results

We report two males (One aged 55 and One 64) who sustained cervical SCI as a result of road traffic accident. Both patients went on to have CVA during their stay under spinal orthopaedic team. One of them needed to have a Tracheostomy due to ventilatory issues and has since been unable to be weaned of tracheostomy. Both the patients had cord injury at C5-6 and CVA during early ICU stay.

Discussion

Traumatic SCI as such could lead to life long disability and if this is complicated by a CVA then it would lead to prolonged rehabilitation time. There are only a few reported similar cases in literature . Focus should be to see how this could be prevented, if however this cannot be prevented then depending on the area of CVA then early adequate stroke work up and preventative steps needed to be initiated. In addition to the SCI one need to be aware of stroke rehabilitation issues in these patients. Further studies in these area is strongly recommended.

Retrospective study of the effectiveness of spinal cord injury rehabilitation by Spinal Cord Injury Ability Realization Measurement Index (SCIARMI)

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Introduction

The SCIARMI is a tool based on the Spinal Cord Independence Measure (SCIM) that allows to evaluate the success of rehabilitation and the rehabilitation potential of Spinal Cord Injury (SCI) patients, net of clinical (motor scores) and demographic (gender and age) factors of patients. The aim of this study is to evaluate the patients discharged to understand if they had developed all the rehabilitation potential.

Patients and Methods

We studied 319 patients (M 237, age 48 years; distance from the lesion 6.2 months, level : C 118, T 136, L65; AIS impairment : A 108 , B 37, C 68, D 106) to the first rehabilitation hospitalization after SCI. At discharge, patients were evaluated with the SCIM. Based on this assessment and the motor assessment we calculated the SCIARMI, that expresses the percentage of rehabilitation potential developed by the patients.

Results

17 patients were discharged having developed between 0 and 30% of the potential, 61 between 30 and 60%, 167 between 60 and 90%, 62 between 90 and 100% and 12 more than 100%.

Conclusions

The SCIARMI is a useful measure to assess the level of potential rehabilitation expressed by patients with SCI. This data can be useful to highlight groups of patients who are at greater risk of not developing their rehabilitative potential and to establish for these patients different and more appropriate rehabilitative paths. Our study has shown that a large percentage of patients with SCI is discharged not having reached the full potential of rehabilitation. This can be due to both clinical factors (such as associated injuries and complications of spinal cord injury that can slow the rehabilitation process) or to choices of organizational nature (for example the patients, once they reach a certain level of independence could be discharged and routed to different levels of care).

Mid- to long-term outcomes of posterior decompression with instrumented fusion for thoracic ossification of the posterior longitudinal ligament

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Introduction and Aims

The aim of the present study was to elucidate the mid- to long-term clinical outcome of posterior decompression with instrumented fusion (PDF) for thoracic ossification of the posterior longitudinal ligament (T-OPLL).

Patients and Methods

This study included 20 cases (11 male and 9 female patients) who had undergone PDF for T-OPLL and were followed for at least 4 years. The average age of patients was 53.8 years at the time of surgery and the mean follow-up period was 112.4 months. Clinical measures included the Japanese Orthopaedic Association (JOA) score (excluding upper extremity scores) calculated out of a possible 11 point total, and recovery rate assessed by Hirabayashi's method. Kyphotic angles in fused thoracic spine segments were measured on a lateral radiograph by the Cobb method. Revision surgery during the follow-up period was also assessed.

Results

Average () standard deviation) JOA scores (points) were 3.5 () 1.65 preoperatively, 7.1 () 2.3 postoperatively, and 48.8 () 23.6% for the recovery rate. The JOA score took 9 months to reach its peak showing gradual postsurgical recovery. Complete paralysis occurred postoperatively in one patient who recovered naturally becoming ambulatory several months later. The average kyphotic angle in fused segments was 25° before surgery, 27° immediately after surgery, and 32° at the 2-year follow-up visit. Six revision surgeries were performed in 4 (20%) patients. Additional anterior decompression was only performed in 1 patient (5%) showing deterioration, or bilateral lower leg numbness, 2 years after PDF surgery. Decompression surgery for pre-existing cervical OPLL was performed in 3 (15%) patients on average 55 months after initial PDF surgery. One patient had undergone lumbar decompression surgery for de novo ossification of the ligamentum flavum 24 years after PDF.

Discussion

PDF surgery for T-OPLL is considered to be relatively safe because neurological deterioration immediately after PDF surgery was only observed in 1 patient. The average JOA score recovery rate was satisfactory (48.8%) compared with other surgical procedures. Patients in this study showed slow neurological recovery that peaked 9 months postsurgery, suggesting that stabilization for neurological recovery of T-OPLL is important. The postoperative anterior decompression required by a single patient indicates PDF can achieve sufficient neurological recovery. Additional surgeries were mostly performed for pre-existing cervical OPLL. Evidence provided by this study revealed that PDF for T-OPLL is a relatively safe procedure and showed satisfactory clinical outcomes in the mid- to long-term.

Spinal cord infarction in a patient receiving hormone replacement therapy

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Introduction

The influence of hormone replacement therapy (HRT) on ischemic brain damage remains controversial, with some papers reporting an increased incidence of ischemic brain infarction and some reporting no increase. We report a rare case of spinal cord infarction in a patient receiving HRT.

Case report

A 38-year-old woman came to our hospital by ambulance in the early morning after awakening with sudden severe back pain and numbness and weakness in both hands. The radiograms and magnetic resonance imaging (MRI) showed no abnormalities. Five hours later, she was referred to the orthopaedic surgery department and complained of numbness and weakness in her whole body. Manual muscle tests (MMTs) showed upper extremity weakness ranging from zero to four but normal lower extremities. She had hypoalgesia on the inner aspect of the upper arms, the ulnar aspect of the forearms, and the upper trunk. A psychiatric etiology was considered unlikely based on her reaction to the examinations. Another MRI two days later showed a C6-T1 spinal cord lesion with low intensity on a T1-weighted image and high intensity on a T2-weighted image, confirming the diagnosis of spinal cord infarction. MMTs in both upper extremities were almost normal after the second MRI; therefore, we continued observing the patient. She had no history of smoking, diabetes mellitus, hypertension, or collagen diseases that may induce ischemic events, but she had a 10-year history of HRT (conjugated oestrogen, norgestrel and ethinylestradiol) for infertility. After consulting her gynecologist, we stopped the HRT due to its possible causal relationship with spinal cord infarction.

Conclusion

Spinal cord infarction occurred in a patient receiving HRT. To our knowledge, there have been no reports of HRT-associated spinal cord infarction. It is difficult to determine that HRT caused the spinal cord infarction; however, HRT should be considered as one possible cause.

Surgical revision of Intrathecal Drug Delivery System (ITDDS) due to complications

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Introduction

Spasticity and pain are among the most common symptoms in patients with neurological diseases. They effect participation in rehabilitation and have a significant impact on the quality of life of patients. Intrathecal drug delivery system (ITDDS) have been used in rehabilitation in the management spasticity and pain for almost 30 years. Complications associated with ITDDS are usually either system-related (pump or catheter) or surgical procedure-related (e.g. tissue necrosis, pump flipping). Complications related to the programming (e.g. erroneous over dosage or refilling) have been described. The Duke of Cornwall Spinal Treatment Centre (DoCSTC) is one of the 11 spinal units in the United Kingdom. It was established in 1984 and has a catchment area serving a population of 8 million. The first Intrathecal drug delivery system was implanted in 1992. The aim of this study is to review the complications leading to a surgical revision of ITDDS during the period from 1993 to 2013. We evaluated the incidence and types of complications which required surgical revision of ITDDS. In a recent review by Stetkarova et al.complication rate per implant was found to be 0.41 (0-2.24) with most complications being catheter related (66%) then surgical procedure related (27%) and pump related (7%).

Methods

Patients with ITDDS, who were followed up in our centre were included in the study. We reviewed the case notes and collected data including the demographics, the nature and type of the lesion, the reason for the implant, the complications leading to a surgical revision and the investigations performed.

Results

88 patients met the inclusion criteria. 80 patients' records were available out of 88. 4 notes were destroyed and 4 notes were not found in the archives. Indication for implantation was spasticity in 66 (82.2%), Pain in 9 (11.2%) and both in 5 (6.2%) patients. Aetiology was Spinal Cord Lesion (SCL) in 72 (90%), Brain injury in 1 (1.2%), Multiple sclerosis in 2(2.5%), cerebral palsy in 2(2.5%), amputation in 1(1.2%) and progressive spastic paraplegia in 2(2.5%) patients. The average follow-up per patient was of 112 months and the average follow-up per pump was of 60 months. Primary implantation has been the predominant activity during the first 15 years. The latter years, revision implantation has been the predominant activity. The average life of a pump before replacement for end of service was 107 months. Total implants were 119. 28 systems were revised due to complications. Complication rate was 0.23.

Conclusions

Complication rate requiring a surgical revision in our centre is approximately 30% less than the rate reported in the literature. After 2003 the incidence of complications has significantly declined (0.16). In our retrospective cohort the percentage of catheter related complications have been stable over the 2 decades, the percentage of pump related complications have reduced, the percentage of surgical procedure related complications have relatively increased. Overall all the 3 types of complications have decreased.

5-year epidemiology of spinal cord injury in Indonesia: an example from Yogyakarta Province

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Introduction and Aims

There is a dearth of epidemiological data on spinal cord injury (SCI) in developing countries, especially from the South-East Asian region. In Indonesia, rehabilitation care is not easily accessible and injury risks from traffic accidents and high-risk occupations are high. Therefore, to reduce the enormous impact of SCI to individuals and society, prevention is of paramount importance. To develop effective prevention strategies, sound evidence on the epidemiological pattern of SCI is needed. This study aims to assess the epidemiological pattern of SCI in Yogyakarta Province, Indonesia.

Material and Methods

Retrospective review of the hospital records of all patients aged >15 years diagnosed with SCI and discharged between January 1st 2008 and 31st December 2012 from two referral hospitals in Yogyakarta Province, Indonesia. Records were identified from the hospital's electronic medical registry using International Classification of Disease 10th revision (ICD-10) codes for para/tetraplegia (G82), spinal cord injuries (S14, S24, S34, T06, T09.3, T91.3) and spinal fractures (S12, S22, S32, S13, T08). Information from the patient charts were abstracted and reviewed by two independent reviewers. SCI was defined as the occurrence of spinal cord lesion resulting in neurological deficit at discharge from the hospital.

Results

A total of 355 SCI cases was identified, of which 63.7% was male. Mean age at onset was 48.13 ± 15.0 years. Median length of stay at the hospital was 13 days. Paraplegia accounted for 72.6% of cases. Almost 70% of cases was motor incomplete. Causes of SCI were non-traumatic in 55.8% of cases, the majority of which was due to primary or secondary malignancies (54.1%), followed by infection and inflammation (22.5%) and degeneration (12.2%). The main cause of traumatic SCI was falls from height, especially from trees (52.6%), followed by low falls (14.3%) and two-wheeled traffic accidents (16.9%). About one-third of patients had bladder and bowel dysfunction. Radiological abnormalities of the spine were found in 88.1% of all patients who underwent X-ray examination. Spinal surgery was performed in 27.5% of patients, of which 60% was traumatic SCI. The accurate estimation of incidence was hampered by a number of missing records, incomplete documentation and non-standardized reporting of cases, resulting in, for example, variation in the diagnostic terms.

Conclusion

The epidemiology of SCI showed a unique pattern in Yogyakarta Province, Indonesia. Prevention strategies should be targeted to people with high-risk occupations and motor-bikers. The high number of non-traumatic cases warrants early detection and treatment of primary causes i.e. tumors and infection. There is an urgent need to improve the quality of reporting of SCI cases to achieve greater understanding of epidemiology of SCI in Indonesia.

Rehabilitation of patients with spinal cord injury in Greece

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Introduction

In Greece patients with acute spinal cord injury (SCI) are hospitalized in orthopedic, neurosurgery or specialized spine-surgical departments of general hospitals. Usually in the first month post SCI they are transferred to rehabilitation departments.

Aim

To study the prevalence of traumatic and non-traumatic SCI among Greek patients, who are hospitalized in public or private Rehabilitation Departments in January 2014.

Material and Methods

Data were collected through tele-communication with 21 Rehabilitation Centers (total rehabilitation beds 1696) in 10 different areas of Greece.

Results

In general rehabilitation departments 1552 patients are being hospitalized and out of them 89 patients with post-acute SCI. Fifty six men (62,92%) & 33 women (37,07%) with mean age: 54,39 (8 - 89 years old), 50 with traumatic lesion (56,17%) and 39 (43,82%) with non-traumatic lesion (ischemic lesion, AV malformation, infection, tumor, herniated disc, etc.), 58 with paraplegia (65,16%), 31 with tetraplegia (34,83%), 39 (43,82%) with AIS A, 50 (56,17%) with incomplete lesion (AIS B,C,D). Twenty one patients in 7 public rehab centers (24,13%) and 68 in 14 private (76,4%). SCId patients are dispersed in 21 different centers and the average number of patients is 3 per center (min 2, max 12).

Conclusions

Nowadays in Greece with approximately 11,000,000 inhabitants, Physical and Rehabilitation Medicine (PRM) has made great progress with increasing number of PRM doctors (200 in total) with specialized knowledge. The sub-specialization of non-medical members of rehabilitation team is also increasing. Unfortunately the dispersion of SCId-patients in many different PRM centers does not permit the specialized services to improve further in quality and to reduce costs.

Traumatic and non-traumatic spinal cord injury incidence and care paths in a region in the center of Italy

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Introduction

In Italy the incidence of Traumatic and Non-Traumatic Spinal Cord Injury (TSCI and NTSCI) is not currently subject to a formalized monitoring plan that aims at defining the health care and assesses the adequacy of the interventions in the acute phase and rehabilitation. Objective: Collection of the incidence of TSCI and NTSCI and the evaluation of care pathways going from the harmful event to the possible entry into a rehabilitation program.

Materials and Methods

A pilot study was carried out in Umbria Region in 2013 (pop. 886 239 in 2012) through the only Spinal Unit (USU) of the Region, linked with all the emergency facilities of the area. Collection of data was performed using: medical records of patients discharged with SCI diagnose; voluntary reporting from Hospital Departments throughout the Region; monthly collection of prevalence of cases on index day.

Results

In Umbria 35 patients with SCI were enrolled in the study, of which 19 (54 %) presented TSCI and 16 (46%) NTSCI. The incidence is 39.5/million inhab., (21.4 TSCI and 18.1 NTSCI). The difference in gender (M/F) is respectively 8:1 vs 2:1 and average age is 59 vs 62 yrs. At 47%, falls are the most common etiology for TSCI, followed by vehicle accidents 32%, sport injuries 16%, others 5%. Almost half of the TSCI are the consequence of injuries: work 16%, domestic 32%. Average age in TSCI caused by falls is higher (66 yrs). Falls happened mostly from August to November. In NTSCI etiology is osteo-degenerative in 50% of the cases, vascular in 19%, neoplastic in 19%, infective in 6%, and toxic in 6%. ASIA Impairment Scale in TSCI resulted A 26%, B 21%, C 37%, D 11% and UNK 5%. In NTSCI: A 12,5%, B 12%, C 19%, D 44% and UNK 12,5%. In TSCI the neurological level of injury is divided: Cervical 47,36%, Dorsal 26,31%, Lumbar 21,05%, UNK 5,26%. In NTSCI: Cervical 37,5%, Dorsal 43,75%, Lumbar 12,5%, UNK 6,25%. All of the TSCI cases attended the ER, while only 43,75% of NTSCI cases did. The majority (78,94 %) of TSCI cases was hospitalized at USU, 10,52% attended a different rehabilitation centre, 5,26% were discharged home and 5,26 % attended a care community. Half of NTSCI attended USU, 31,25% were discharged home, 12,5% went to a different Hospital Department and 6,25% to a rehabilitation centre. The intermediate steps between the ER and the rehabilitation center were, on average, 1,5 for TSCI (range 1-4) and 2, 1 (range 1-5) for NTSCI. Of all the TSCI 31,57% were treated in the acute phase with Methylprednisolone (NASCIS protocol). No treatment was dispensed in 10,52% of the cases, UNK in 47,36%, other in 15,58%. The mean time within the injury and the admittance at the rehabilitation center was 29 days in TSCI and 38 days in NTSCI.

Conclusion(s)

Despite the limitations related to the small study population, Umbria Region is a good sample of the Italian population. The evaluation of incidence of TSCI shows the presence of a high percentage of NTSCI. Care pathways are well classified for TSCI, and the possibility of different and fragmented paths seem possible for NTSCI.

Osteodensitometry in individuals with spinal cord injury: where and how to measure

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Introduction

Osteoporosis is a common secondary complication after SCI. The diagnosis of osteoporosis is amongst others based on osteodensitometry. According to the WHO, bone density is assessed by DXA at the lumbar spine, the hip and the forearm. A T-score of ≤ -2.5 is classified as osteoporotic. Since individuals with SCI present fractures mainly in the lower limbs, several authors have suggested to assess bone density at fracture prone sites. Peripheral QCT was proposed as a valid method to assess bone strength. However, the appropriate procedure of osteodensitometry in the SCI population is still unclear. Therefore, the aim was to investigate the practicability of osteodensitometry using DXA versus pQCT, to test which sites are most sensitive for the classification of an osteoporosis and to estimate a fracture threshold.

Method

Women and men with a traumatic SCI, aged >18 years were included. Bone mineral density was assessed by DXA at the lumbar spine, hip, knee, distal tibia and by pQCT at the distal Tibia. T-scores were calculated. Frequency of and reasons for not performing bone scans either by DXA or pQCT were noted. Number and location of bone fractures since SCI were registered. Odds ratio was calculated and ROC-analysis was used to calculate a fracture threshold and its related sensitivity/specificity.

Results

A total of 27 women (age: 53.2 ± 12.6 years, years post injury: 21.9 ± 12.8 , AIS A/B/C/D: 17/5/2/3) and 43 men (age: 50.2 ± 13.3 years, years post injury: 18.0 ± 13.6 , AIS A/B/C/D: 25/7/5/6) were involved. A frequency analysis revealed that DXA-scans were performable in 95.7% of the hips, in 88.6% of the lumbar spines, in 38.6% of the knees and in 51.4% of the distal tibias. Bone density measured with pQCT at the distal tibia was realisable in 97.1% of the cases. Main reasons for not performing bone scans were inappropriate positioning of the patients due to contractures, pain or spasticity. The T-scores of the DXA scans revealed that 4.8% of the LWS, 55.2% of the hips, 24.3% of the knees and 74.1% of the distal tibias were classified as 'osteoporotic'. In addition, 77.6% of the pQCT scans assessed at the distal tibia were classified as 'osteoporotic'. A total of 43 fractures post SCI were noted in 48.1% of the women and in 39.5% of the men. According to ROC analysis, T-score of the hip discriminated best between individuals with and without fractures (AUC 0.91; CI 95% 0.78-1.0). A T-score of -2.45 at the hip was identified as fracture threshold (sensitivity: 83.3%, specificity: 84.6%). The odds of having a fracture with a hip T-score below -2.45 was 37.8 (CI 95% 7.5-188.6) times the odds of having a fracture with a hip T-score above -2.45.

Conclusion

Osteodensitometry was practicable with pQCT and DXA, except for the knee and tibia scans with DXA. Bone density at the tibia was found to be sensitive for the diagnosis of an osteoporosis in individuals with SCI and thus might be an important site to assess changes in bone density. However, hip scans seemed to be superior to tibia scans to identify individuals with SCI at high versus low fracture risk.

Enhancing equity and access to specialised care in persons with spinal cord injury living in rural regions of NSW, Australia

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Introduction and Aim

Timely access to appropriate primary and specialized health services are more difficult for people with spinal cord injury (SCI) living in rural communities than for those residing in metropolitan areas. Additional to a general workforce shortage and undersupply of health practitioners, few rural health professionals are specifically skilled or adequately resourced to address the unique, often complex needs of the SCI population. The aim of this service development project was to improve access to health services and quality of care provided to people with a spinal cord injury (SCI) living in rural areas through collaboration, communication and capacity-building.

Materials and Methods

The Rural Spinal Cord Injury Service (RSCIS) was established in 2007 with recurrent funding by NSW Ministry of Health based on the results of a successful pilot study (Middleton et al, 2008). A "hub and spoke" model comprises a metropolitan-based multidisciplinary (5 FTE) team supporting five Rural SCI Coordinator positions within Local Health Districts (LHDs). The model is supported by local line management articulated through service level agreements, with SCI specific support and linkages being provided by the Spinal Outreach Service in Sydney. Summary statistics for process measures and outcome data were analysed.

Results

Over five years, 564 people with SCI living in rural NSW had a full medical and multidisciplinary assessment by the RSCIS within their local community. Forty-six clinic visits were conducted covering all LHDs, with 46-59% of patients assessed each year being new to the service. 6,562 health issues have been identified in this patient group and management actioned. Forty-one medical and multidisciplinary education sessions were provided to over 500 rural clinicians across all LHDs, building capacity with numerous resources developed to support rural clinicians and general practitioners. Having sufficient local capacity and, in particular, a single local point of contact (rural coordinator) was shown to facilitate more timely and effective discharge planning because metropolitan-based health professionals often lack a full understanding of regional peculiarities that helps to anticipate problems and find solutions. Early diagnosis of secondary complications, such as recurring autonomic dysreflexia, hydronephrosis, pressure ulcers or syringomyelia has allowed specialist intervention through timely referral, preventing deterioration in health, function and quality of life.

Conclusions

Promoting local expertise, knowledge and ownership of issues and solutions is crucial for creating successful and sustainable networks. Clear linkages have been established between the rural sector, Spinal Outreach Service and Spinal Units promoting a model of integrated care, with recurrent funding for rural coordinators supported locally.

Reference

Middleton JW et al. Issues and challenges for development of a sustainable service model for people with spinal cord injury living in rural regions. Arch Phys Med Rehabil 2008; (89):1941-7.

The implementation of the New Zealand based international upper limb surgery registry

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Introduction and Aims

Since 2007 an international consensus group of therapists has worked to develop protocols for the measurement of functional outcomes following upper limb surgery on tetraplegia persons. This consensus effort established a system by which data could be collected to determine the relative effectiveness of reconstructive hand surgery versus conventional rehabilitation. The aim of this paper is to describe one specific aspect of this effort; the implementation of a clinical registry designed in New Zealand (NZ) to store both collated retrospective data, and more comprehensive prospective outcomes data.

Methods and Materials

Following discussions with eight international units clinical information and outcomes measures were agreed upon for use in this specific population. The International Classification of Function Disability and Health (ICF) was agreed as the conceptual framework. Inclusion criteria included referral to a hand clinic for clinical assessment for suitability for tendon transfer surgery. Clinical data was collected regardless of acceptance of surgery thereby creating a self-selected control group. Additionally in NZ retrospective data was sourced and collated from the records kept by one hand surgeon (AGR). All patients were classified according to the International Classification of Hand Surgery for Tetraplegia (ICSHT) and where feasible the American Spinal Injury Association (ASIA) Impairment Scale (AIS).

Results

The NZ dataset now comprises of 32 years of clinical information. From 1982 to 2014, a total of 348 persons with tetraplegia were assessed as suitable for surgery. Of those 218 individuals underwent surgery and 130 declined the intervention(s). A prospective data set was created in 2010 and comprises 20 surgery individuals and 13 individuals who have declined surgery. A total of 1431 surgical procedures have been undertaken on these 218 individuals. The majority of procedures were directed towards (i) restoration key pinch grip, (ii) elbow extension and (iii) grasp. There are a large number of 'one off' procedures which is common with this necessarily individualized surgery. Within the full cohort the prospective group comprised of 33 individuals reviewed and tested at the agreed time points using the full battery of measures introduced in 2010. Of these, 20 individuals have had 183 surgical procedures undertaken, predominantly bilateral simultaneous surgeries. Two surgical and a single rehabilitation complication(s) were reported.

Conclusion

A registry has been created that ensures when a person with tetraplegia faces the prospect of elective surgery accurate information is readily available regarding all aspects of surgery options, rehabilitation requirements including time frames, and expected functional outcomes. This ensures a more evidence based approach that is client-centred orientated. The NZ registry might serve as an example for other registries particularly as the ISCOS data sets are incorporated into clinical practice. The ultimate goal is to connect registries or merge data from existing registries for research purposes.

Centralized spinal cord injury care in Finland - increase in incidence of traumatic injuries

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Introduction and Aims

The acute care, sub-acute rehabilitation and life-long follow-up of the patients with spinal cord injury (SCI) was centralized in Finland into three University Hospitals; Helsinki, Oulu and Tampere after the new Health Care Act in the 1st of May 2011. The aim of the study was to determine the incidence and evaluate the characteristics of newly injured patients with traumatic spinal cord injury (TSCI) admitted in the two out of three spinal cord injury centres during the first year after centralization. Furthermore, our intention was to monitor the implementation of centralized care throughout the catchment areas.

Material and Methods

The study design is prospective population based cross-sectional epidemiological study in the Oulu and Tampere SCI centres in Finland covering 3 065 946 (56.5%) of the population during the study period in the year 2012. In both hospitals the designated rehabilitation teams evaluated all the patients with a new spinal cord injury and persisting neurological symptoms. Epidemiological characteristics were collected and classified using the International SCI Core Data Set. Data were analyzed as a whole, but also grouped by age and region for further analyses.

Results

In a 1-year period, 77 new patients with TSCI were admitted to study centres. In the whole catchment area, the mean annual incidence of TSCI was 25.1 per million and in the hospital districts with SCI centres the incidence was even higher, 38.1 per million. The mean age of the patients was 58.7 years. Falls were the leading cause of injury (n=50, 64.9%) and the injury resulted in tetraplegia at 70.1% (n=54) of the cases. In the group of patients over 60 years old 85.4% were injured by falling and the proportion of cervical injuries was 81.3%. From those cervical injuries 74.3% were above level C 5. Alcohol was a contributing factor in 39% (n=30) of the cases in the whole sample and 58.6% in the patients under 60 years old. In this group the majority of the injuries (72.4%) took place over the weekend, from Friday to Sunday.

Conclusions

The incidence rates of TSCI were markedly higher than were expected. The epidemiological features of TSCI follow the trends of developed countries highlighting the increasing incidence of cervical lesions due to falling among the elderly. Prevention should target falls of elderly and binge drinking of younger patients. Centralization needs to be further promoted in the areas outside of SCI centres own hospital districts. The results require to be confirmed by the extended follow-up.

Expected activity outcome versus participation objectives

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Introduction

The needs of the patients and their relatives are the focus of the rehabilitation process and are controlled by the interdisciplinary target agreement process. The patient defines together with the rehabilitation team his personal participation objectives in rehabilitation (top down approach). On the basis of the anamnesis, expected outcomes and specific assessments, after a discussion with the patient or relatives, the participation objective (target category TG) is chosen and the corresponding activity objectives defined at the interdisciplinary admission meeting. The expected outcomes of the Consortium's clinical practice guideline (CPG) are a realistic clinical and therapeutic discharge objective achievement as regards independence and participation for patients with a complete paraplegia. For patients with an incomplete paraplegia, generalised expected outcomes cannot be defined.

Methods

Retrospectively, clinical data of 53 patients who were at the SPC between 2011 and 2012 for initial rehabilitation were assessed. Patients with an accident- or sickness-caused paraplegia, with an ASIA classification of A - D were included. The treatment focuses of the occupational therapy (OT) for in-patient care, the defined target categories, the SCIM III and the OT procedure during the 3rd monthly check-up were analysed. The independence of the patient reached on discharge was compared with the expected outcome (activity and assistant type) (CPG).

Results

Data of 53 patients were extracted. The SCIM III score had an mean score = 68 (10-99). For the TG of living 39 patients reached A4 (living at home with support from reference person living in the same household), sociocultural living 40 patients reached B4 (independent participation in public life / leisure activities or hobbies outside of the living area with technical aids without personal support) and for TG work 13 patients reached C5 professional retraining after in-patient stay. For all patients, the treatment focus of the OT was to "reach the highest possible level of independence in everyday life and supply with suitable tools". For only 10 patients, outpatient OT on discharge was necessary. In the 3-month check-up, in 48 patients the examination of the aids supply is considered to be necessary. The expected outcomes were used in 35 patients, in 33 patients the independence potential was reached in accordance with CPG.

Conclusion

Factors such as an example the health before the occurrence of paraplegia, physical constitution, age, accompanying sickness and/or injuries, but also the environment and networking & participating in the community also influence the target achievement. Targets during the rehabilitation stay are necessary so that patients with a paraplegia reach the highest level of independence in his participation and have a joint target achievement with the patient for the interdisciplinary team. Important is that the target setting is based on the expected outcomes so that the target achievement is realistic.

Radiation induced myelopathy in a patient with diffuse large B cell lymphoma

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Case Study

A 20-year-old male with no significant previous medical history presented with a fever, mild coughing over 2 months. A chest computed tomography scan with contrast showed right lung mass, biopsy confirmed diffuse large B cell lymphoma. He was treated chemotherapy and radiation therapy to a total dose 36Gy delivered in 18 fractions for four weeks. After that, he received autologous peripheral blood stem cell transplantation. Two years later, he developed right leg sensory loss and bladder failure and over two months period he became nearly complete paraplegia state. MRI revealed signal change with enhancement at C4-T7 spinal cord. He underwent T1, 2 laminectomy for biopsy and it was compatible with radiation induced myelopathy in histopathology without evidence of malignancy. At that time, he received steroid pulse therapy, but his symptoms were not improved. Two months after hospitalization, he had severe posterior neck and right arm radiating pain. In addition, right hand weakness was newly developed. MRI revealed extension of lesion from lower medulla to T10 spinal cord. In CSF study, negative cytology and no oligoclonal bands were detected. One months later after conservative therapy without steroid pulse, his upper extremity symptoms were improved and the swollen and enhanced cord lesion was significantly decreased in follow up MRI. Right hand weakness was improved but both leg weakness was still remained.

Discussion

Radiation myelopathy (RM) mostly occurs between six months to three years after ionizing radiation therapy for tumors in the area in which some parts of the spinal cord are inevitably exposed. The risk of RM is dose dependent and the chance of RM significantly increases with doses higher than 61 Gy. The most common MRI finding at cervical cord RM is a long segment of low signal intensity on T1-weighted and high signal intensity on T2- weighted images plus variable edema and enhancement. In our case study, the patient's radiologic findings rapidly progressed and spontaneously regressed. During that period, patient's symptom was not improved significantly.

Conclusion

Our case suggests that RM can be developed at a relative low dose and the prognosis of severe form RM may be not good.

The effect of eight-week low-intensity handrim wheelchair practice on the physical strain of novice able-bodied participants

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Introduction and Aims

Propelling a manual handrim wheelchair is a new task for persons with a lower limb disability, which must be learned at the start of rehabilitation. Handrim wheelchair propulsion is a cyclic bimanual task with a relatively low mechanical efficiency and is associated with overuse injury in long-term wheelchair users. Low-intensity practice has been shown to improve the propulsion technique, peak power production and mechanical efficiency, however little is known about the effects of practice on the glenohumeral contact force. Therefore the purpose of this study was to evaluate the effect of 8-week low-intensity wheelchair practice on shoulder load in combination with propulsion technique and mechanical efficiency.

Material and Methods

18 Novice able-bodied subjects were pair-matched and randomly assigned to an experimental group (n=9) and control group (n=9). The experimental group received 8 week of low-intensity practice (30% HRR) for two 30-minute trials per week on a motor driven treadmill. During the last minutes of three steady-state 4-min trials of the standardized pre- and post-tests, kinematic, kinetic and physiological data were collected. These data were subsequently analyzed to compare the two groups on changes in glenohumeral joint compression (using a musculoskeletal model), mechanical efficiency and propulsion technique.

Results

The experimental group showed a decrease in glenohumeral contact forces; the peak joint force during the push reduced from 251.3 to 203.3N vs. 243.2 to 249.3N in the control group and the mean reduced from 99.4 to 72.9N vs. 91.0 to 89.6N in the control group. Furthermore the experimental group increased in mechanical efficiency and improved their propulsion technique from a high-frequency pattern with high negative work to a low-frequency pattern with less negative work.

Conclusion(s)

The decrease in shoulder load and increase in mechanical efficiency both indicate a decreased mechanical strain on the upper body because of the low-intensity practice. Possibly an improved propulsion technique helps to prevent overuse injuries of the glenohumeral joint.

Diagnostic methods and therapy in acute cases of SCI with concurrent osteoporosis or osteopenia - DMGP osteoporosis team

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Introduction

The Dachverband Osteologie (DVO) developed in 2009 a comprehensive guideline for the diagnosis and therapy of osteoporosis. Osteoporosis associated with SCI was not discussed in this guideline.

Goals

The development of recommendations for diagnosis and therapy in cases of acute onset SCI with concurrent risk factors of osteoporotic fractures, based on the DVO-guideline.

Results

According to the DVO-guidelines, the diagnosis for all patients with anamnestic and clinical risk factors for osteoporotic fractures via osteodensitometry should happen within six to eight weeks after onset of the SCI, if possible. Any prior osteoporosis-therapy should be continued. Based on therapy with cortisone, the limiting T-value should be set at -2,0 in accordance with DVO-guidelines. In cases with lower resulting values, a base therapy with calcium and vitamin D supplements, as well as specific medication with specific medication like resorption-inhibitors/osteoanabolics is recommended. For patients with T-values between -1,0 and -2,0 a base therapy with calcium and vitamin D is recommended. A higher risk for the development of periarticular ossifications during a therapy with aminobisphosphonates and osteoanabolics was not recorded. We refer to the DVO-guideline for the development of osteonecrosis of the jaw (BONJ) during bisphosphonate therapy.

Conclusions

The recommendations for therapeutic measures in cases of osteoporosis or osteopenia and acute SCI implement a more sensitive approach to the problem which all SCI Centers require. However, these recommendations are based on a low evidence level. Thus further studies are needed to assess the true benefit of specific osteoporosis therapies on fracture risk in individuals with SCI.

Two surgical treatment case reports of elderly patients with odontoid fracture

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Introduction and Aims

Odontoid fracture was often seen with fall situation in aged people. Generally considered, surgical treatment should be performed for type II odontoid fracture, but conservative treatment was chosen often in elderly cases because of those basic conditions. Many recent published clinical data and literatures showed high rates of nonunion and mortality. We report our treatment experience of two cases of elderly patients with odontoid fracture and discussed about desirable treatment strategy.

Material and Methods

Case 1) 79 years old, female. She fall down from window and hit her head. Although neurological deficit was not confirmed, she complained severe neck pain and was transferred to our service. CT revealed odontoid fracture (Anderson & D'Alonzo type II). Takotsubo cardiomyopathy was confirmed on admission, and she also suffered pulmonary embolism while having conservative therapy. Internal fixation with odontoid screw was performed after risk-benefit was deeply considered. Postoperative clinical course was good and she is training in rehabilitation hospital at present. It was considered carefully whether additional posterior fixation is needed or not, because slight instability was confirmed at fixation site. (Case 2) 82 years old, female. She met traffic accident while sitting in the back seat. No neurological deficit was confirmed, but CT revealed odontoid fracture (Anderson & D'Alonzo type II). Although internal fixation with odontoid screw was performed initially, rigid fixation was not achieved. Posterior fixation (C1 lateral mass screw -- C2 laminar screw) and removal of odontoid screw was performed later. She had good postoperative course and discharged to home after having rehabilitation training.

Results

Both of two cases achieved improved general status and became independent after the anterior fixation. But rigid fixation were not achieved with odontoid screws. One of them had posterior fixation later and return to normal daily life.

Conclusion

Two surgical cases of elderly odontoid fracture was reported. With considering about risk-benefit, surgical fixation should be performed for type II Anderson & D'Alonzo fracture even in elderly age. Posterior fixation might be a better method than odontoid screw fixation for such elderly osteoporotic patients.

The effects of a self-management intervention on an active lifestyle in persons with aging spinal cord injury: a randomized controlled trial

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Introduction and Aims

Many persons with aging spinal cord injury (SCI) show a serious inactive lifestyle, which may lead to de-conditioning, physiological and psychological deficits, and secondary health conditions. Therefore, encouraging active behaviours is important, for which behavioural strategies such as self-management interventions are needed. Such interventions have shown to be effective in preventing health problems and in modifying behaviour. Self-management interventions generally incorporate behavioural and active learning strategies in addition to knowledge transfer. In this way self-management skills like self-efficacy, proactive coping and problem solving skills will be enhanced and will support behaviour change. However the effects of a such an intervention has never been evaluated in persons with aging SCI. Therefore this study aims to evaluate the effectiveness of a 16-week self-management intervention on physical activity and self-management skills in persons with aging SCI.

Material and Methods

A multicentre randomized controlled trial. Persons with an SCI (> 10 yrs since injury, aged 28 to 65 yrs, able to use a hand-rim wheelchair) were randomly assigned to the intervention (self-management) or the control group (information provision). During the 16-week self-management intervention (one home-visit, 5 group sessions and 5 individual sessions) active lifestyle was stimulated and self-management skills were taught. Data was collected at baseline (T0), 16 (T1) and 42 (T2) weeks after baseline. Primary outcome measure was level of daily physical activity (self-report/objectively measured). Secondary outcome measures were self-managements skills, stage of behaviour change and attitude. Multilevel regression analyses will focus on the differences between the intervention and the control group on the outcome measures at the three test moments.

Results

34 persons were included in the intervention group (age 49±10 yrs; TSI 20±7 yrs; 25% complete lesions) and 32 persons in the control group (age 49±17 yrs; TSI 26±9 yrs; 28% complete lesions). Currently the last data are collected and analysed. Results will be available at the time of the ISCOS 2014 congress.

Conclusion(s)

This trial provides knowledge on the effects of a self-management intervention on active lifestyle in persons with an aging SCI.

Is conservative treatment as effective as surgical treatment in management of traumatic central cord syndrome?

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Introduction

Acute Traumatic Central Cord Syndrome (TCCS) is a clinical entity characterized by following features: 1) a motor deficit causing a predominant weakness of the upper limbs 2) bladder dysfunction and 3) varying degrees of sensory loss. Most of recent studies favour surgical treatment and have studied outcomes of surgical management. There is scarcity in the literature about study comparing surgical with conservative management. The purpose of this retrospective study was to compare the improvement in motor score improvement and functional status in surgically and conservatively treated patients with TCCS and to determine appropriate surgical indications.

Materials and Methods

Between March 2005 and Dec 2012, 106 consecutive patients with TCCS were admitted to our spinal unit. All the patients were divided into three groups based on the etiology of TCCS : 1) fracture and fracture dislocations, 2) Prolapsed Inter Vertebral Disc (PVD) 3) spinal stenosis without bony fracture. Out of these only stable injuries, i.e. only patients with PVD and spinal stenosis group were considered for our study. Thus, 44 patients were excluded and 62 patients who met the criteria were recruited in the study. Out of these 32 were treated surgically and 30 by conservative methods. The following data was collected for each patient: sex, age at injury, cause of injury, type of injury and treatment, admission, discharge and final-visit motor status, FIM/SCIM score, bladder and bowel involvement, spasticity, WISC scale, capabilities of upper extremity(hand function). Complications, Length of ICU and hospital stay, rehospitalisation rate, neurological and bladder & bowel recovery time as well as the total hospital cost was also noted.

Results

Average age was 53.72 yrs in surgical and 55.37 in conservative group. Causes included falls (50% in surgical, 33% in conservative), road traffic accidents (40% in surgical, 60% in conservative) and others. Mean follow up time was 3.39 and 3.66 years in surgical and conservative group respectively. Hospital stay in surgical group averaged 51 days while it was 55 in conservative. Hospital cost was Rupees 320000 in surgical and 124000 in conservative groups. Neurological recovery time was 8.73 and 11.03 months in surgical and conservative groups respectively.

Conclusion

There has always been controversy in the literature regarding management of TCCS. Our study proves that there has been statistically significant improvement in upper and lower limb motor scores, spasticity grade and SCIM score in both surgical and conservative groups (p value < .001). However there was a longer hospital (p value .68) and ICU (.74) stay in conservative group, and neurological (.62) and bowel, bladder (.43) recovery was delayed in this group. This however was not statistically significant. Thus we conclude that patients having central cord syndrome secondary to PVD and spinal stenosis can be managed equally effectively conservatively.

Lessons from a Klebsiella outbreak in a SCI unit in the Netherlands

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Introduction

Multidrug-resistant bacteria can cause a life threatening infection. In The Netherlands the incidence of multidrug-resistant bacteria like Klebsiella and MRSA are slowly increasing in the last decade. An outbreak of a multidrug-resistant bacteria increases the morbidity and mortality rate and also prolonged hospital stay. Klebsiella outbreak: In the SCI unit of the UMCG Rehabilitation Centre, a third patient with an UTI by a Klebsiella pneumoniae, ESBL (CTX-M-I, TEM, SHV), Carbapenem-susceptible was discovered. This was 3 months after the first patient with these Klebsiella was admitted in SCI unit, and came from the ICU of the UMCG hospital multidrug-resistant. After consultation of the department of Medical Microbiology all admitted patients were cultured. In total five patients were colonized of which one came out to be an unexpected case. The outbreak management protocol was enrolled immediately. All colonized patients were tetraplegia.

Lessons

The department of Medical Microbiology discovered that their warning system did not detect the slowly increased amount of Klebsiella colonized patients in the hospital due to a 2 weekly count only. Overall the mean hospital stay is 8 days. In the SCI a tetraplegia patient is admitted for 4 to 6 months. Furthermore the Klebsiella seems a longer survivor as expected before. It attaches to the surface very easily. Therefore cleaning frequency was immediately increased. All patients with antibiotics were nursing in protective isolation because especially patients given quinolones are at high risk to be colonized by the Klebsiella. The toilet/shower chair (e.g. Carendo) seems to play a role in transmission. The tetraplegia patients with multidrug-resistant bacteria should be given their own toilet/shower chair to prevent an outbreak. This is because of the difficulties to clean it properly. After the outbreak the Carendo is not allowed to be used in one of the other wards in the rehabilitation centre to prevent spread of bacteria. 6 months later during a reorganisation of the wards the department of Medical Microbiology advised if an amputee or a multi trauma patient would be admitted in the SCI unit to admit these patients in another room than the patients with SCI. All patients should be cultured (throat and rectum swab) at admission and 2 weekly, because of colonization pressure and unknown carriers.

Conclusion

Rehabilitation centres have an important role to discover in time colonisation for example by proactive screening to prevent an outbreak of multidrug-resistant bacteria in the rehabilitation centre, in the referral hospitals and in the region. Management of SCI units should be aware of the risks of spread of (multidrug-resistant) bacteria. They should take precautions to minimize the morbidity of all patients admitted in the rehabilitation centre. This is possible by improve infection prevention measures like hand hygiene and reduce antibiotic selection pressure.

Swallowing problems revealed an unusual late complication 25 years after complete spinal cord injury

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Introduction

Perforation of the oesophagus after anterior cervical spine surgery is a rare, but a well-recognized complication. In previous studies the incidence is 0.02-1.5% (1) for the whole group and most cases appear relatively soon after surgery. In patients with complete tetra paresis it can be hard to recognize this complication due to loss of sensory function. An earlier report in this field describes a case as late as 9 years after anterior surgery (2). Our patient debuted with diffuse swallowing symptoms more than 24 years after surgery.

Case Report

This report describes a 47 years old man with a complete Spinal Cord Injury (SCI) AIS A, C5 after a traffic accident in 1988. He had acute surgery with anterior fusion C5 to C7 and posterior stabilization C4 to C6. He has been well rehabilitated, living with help from personal assistance and has been working part time. During autumn 2012 he reported diffuse swallowing difficulties. The patient did not suffer from any other common symptom of late complication due to tethering and/or cysts in the spinal cord, such as ascending motor or sensory symptoms, worsening of pain, autonomy dysreflexia, sweating or problems from bowel and bladder. The patient did not have any pulmonary problems which are also common in these cases. Finally, in spring 2013 oesophagoscopy revealed a perforation of the posterior wall of oesophagus and a metallic plate did penetrate the wall. A CT scan of the cervical columna showed that the anterior fixation was lying loose in the soft tissues in front of the vertebrae C5 to C7. The posterior fixation was still in correct place and the neck was stable. There were no signs of osteitis in the vertebrae or infection in soft tissues such as abscesses. In May 2013 he had surgery at the department for Plastic surgery at Uppsala University Hospital, Sweden. The anterior fixation was extracted and the wound covered with a flap from the hip. The operation was performed as a teamwork by orthopedic-, plastic-, and otolaryngeal surgeons. A team from the SCI unit at the department for Rehabilitation medicine provided support for the care of the patient with complete tetra paresis during the pre- and postoperative phase in order to prevent further complications. The patient stayed at the hospital 16 days. Today he is completely recovered after surgery and is back to his normal SCI life.

Discussion

It is important to take diffuse symptoms in SCI patients seriously. Due to the injury, with following loss of sensory function, the patients often have difficulties in describing the problem/sensation and it is not easy to make a correct diagnosis. In our case it took almost 25 years before the loosening of osteosynthetic material led to perforation of the oesophagus with diffuse and descreet swallowing symptoms. We strongly recommend referral for oesophagoscopy in patients with SCI who have had surgery with anterior approach and have swallowing problems, even if they are descreet.

Ref

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Prevalence and determinants of shoulder problems in persons with spinal cord injury: a literature review

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Introduction and Aims

Many persons rely on hand-rim wheelchair propulsion after spinal cord injury (SCI). However, hand rim wheelchair propulsion, weight reliefs and transfers have shown to be physiologically and mechanically straining with a risk on repetitive micro trauma and consequently "overuse" injury. The aim of this study is to review the literature on prevalence and the determinants of changes in shoulder structure, shoulder pain and shoulder range of motion (ROM) in persons with SCI.

Material and Methods

Literature search (English) in PubMed on keywords (in Title or Abstract): "Spinal cord Injury" OR "tetraplegia" OR "Paraplegia" AND "Upper extremity" OR "shoulder". For the specific searches "Pain" and "range of motion" were added. Retrieved abstracts were screened for eligibility.

Results

602 papers were identified, 15 papers describing changes in shoulder structures. In total, data of 667 shoulders (428 paraplegia (PP), 143 tetraplegia (TP), 91 non specified) were examined. Only 1 paper described structural changes in the acute phase. Twelve studies were cross-sectional, one a retrospective chart study and only two were longitudinal. Rotator cuff tears (RCT) and changes of the acromioclavicular joint (AC joint) were most often found. RCT was more prevalent and AC joint arthritis was more severe in persons with SCI compared to able bodied persons. Determinants of changes in shoulder structures were: higher age, female gender, longer time since injury (TSI), higher body mass index and TP. The search for pain identified 174 papers of which 49 had shoulder pain as study outcome. Most concerned populations with chronic SCI. Data of 7151 persons with SCI were analyzed, 2349 TP, 2229 PP and 2573 not specified. Mean shoulder pain prevalence was 48% (range 3-100) in the acute phase and 50% (range 3-85) in the chronic phase of SCI. Determinants of shoulder pain were: TP, complete injury, non-athletes, spasticity, shoulder pain at start rehabilitation, previous shoulder trauma, lower functional scores, no physiotherapy in the acute phase, using manual wheelchair propulsion, female gender, higher age and limited shoulder ROM. The search for ROM identified 97 papers, of which 11 papers had shoulder ROM as study outcome. Data of 1405 patients (595 TP, 629 PP and 181 ns). Mean shoulder ROM prevalence was 40% (range 9-70%) in the acute phase and 30% (range 9-70%) in the chronic phase. Determinants of limited shoulder ROM were: TP, co-existent head injury, pressure sore, spasticity, male gender, longer TSI, lower functional score, poorer health and shoulder pain.

Conclusions

Shoulder problems are a significant problem in persons with SCI. Clinicians should be aware that especially persons with TP, higher age, co-existent health problems, previous shoulder problems and longer TSI are at risk to develop shoulder problems. There is a need for longitudinal comprehensive studies including radio diagnostics and biomechanical evaluation.

Surgical correction of fixed cervical kyphotic deformities by circumferential resected correction and instrumented reconstruction

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Introduction

Cervical kyphosis is a potentially debilitating and challenging condition that can result in progressive deformity and neurological decline. The treatment of cervical kyphotic deformity is challenging. Though it is generally accepted that surgical correction is warranted in cases of progression of kyphosis or neurological decline, the choice of ventral, dorsal, ventral-dorsal stage approaches remains debatable.

Objective

To evaluate safety and efficacy of surgical correction of fixed cervical kyphotic deformity by circumferential resected correction.

Materials and Methods

8 patients treated surgically for fixed cervical kyphosis and myelopathy were followed for a mean of 2 years (range, 10 --36 months). The study group consisted of 6 males and 2 females, with an average age of 28 years (range, 14--60 years). The principal etiologies of cervical deformity were idiopathic, post laminectomy , advanced spondylosis , post Traumatic and Rheumatoid cervical spine . All patients underwent preoperative flexion-extension cervical spine radiography to determine the flexibility of their deformity. All patients underwent intra-operative neuromonitoring with SSEPs, MEPs. Circumferential resection and correction was performed in same sitting .anterior decompression through corpectomy and discectomy was followed by posterior instrumentation (pedicle screw fixation or lateral mass fixation followed by posterior resection (laminectomy ,facectomy and pedicle removal) and correction. this was followed by anterior augmentation with or without instrumentation. Postoperative fusion was assessed on dynamic radiographs and in questionable cases, CT scans. Patients typically underwent clinical assessment at 6 weeks, 3 months, 6 months, 1 year and 2 year postoperatively. Preoperative and postoperative patient functioning was stratified mJOA scale and the Visual Analogue Scale (VAS) was used to evaluate pain intensity or paraesthesia.

Results

The mean preoperative cervical Cobb angle as measured from the C2--C7 was 32° (range 20--67°), and improved to +5° at final follow-up, yielding an average correction of 30°. Neurological assessment of all the patients, using the modified Japanese Orthopaedic Association score and visual analogue scale score, was improved significantly after surgery. None of the patient had post-operative infection. At the time of most recent follow-up, solid bony arthrodesis and maintenance of correction occurred in all patients.

Conclusion

The treatment of fixed cervical kyphosis with myelopathy using circumferential resection and correction& instrumented stabilization is safe and effective however it is technically demanding; Furthermore, such surgical techniques can produce measurable improvements in neurological function and achieve high fusion rates.

Evidence-based design to build an online community in the field of spinal cord injury: the platform paraforum as a case in point

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Introduction and Aims

Health organizations are increasingly present online through websites that provide health information to consumers. In producing these websites, health organizations invest significant resources: health information is created by groups of experts in the respective field as a resource for the community. These websites are important educational endeavors. They foster the growth of health literacy that is at the core of self-management of health conditions. Yet, these websites can play a major role also as instruments to gain insight into the characteristics of a specific population affected by a health condition. Thanks to the advancement of the Web 2.0, websites that support interactivity can be used by health organizations and health professionals to identify needs and gaps in the resources people have at disposal to self-manage their health conditions. In order to do this, however, it is crucial to enhance collaborative attitudes of users, and to develop clear processes and standards for managing content, and creating and translating knowledge.

The objective of this presentation is to identify the challenges of building an online community of patients/consumers who proactively contribute to the exchange of information and experiences online. This issue will be addressed by illustrating the development of the online community of paraforum (www.paraforum.ch), a consumer oriented website in the field of spinal cord injury (SCI), developed by Swiss Paraplegic Research on behalf of Swiss Paraplegic Foundation which was launched in December 2013.

Material and Methods

The development of the online community of paraforum will be explained by analytically relying on the emergent research field of evidence-based design of online communities, in the light of main principles of technology-enhanced health communication.

Results

Three are the main challenges of starting new online communities in the field of healthcare. The first is to carve out a useful niche by choosing the scope of the community, in terms of breadth of topics to cover, activities to support and value gained for the community. The second is to make strategic choices by addressing its compatibility and integration with other communities. This goal can be achieved through a number of design approaches by specifically leveraging early participants to attract later ones, and setting expectations about the future evolution of the community. The third challenge is to reach a critical mass to enable multi-level communication.

Conclusion

Despite the claimed potential of online communities in the field of health, little empirical research has studied how these communities can start and develop to become important networks for health communication. This paper proposes to advance current knowledge on this issue by presenting what worked/did not work in the case of the platform paraforum. Moreover, it highlights ways for health institutions to build synergies and to optimize efforts and resources in the development of online endeavors.

Centralized spinal cord injury care in Finland - Incidence of non-traumatic spinal cord injuries

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Introduction and Aims

The acute care, sub-acute rehabilitation and life-long follow-up of the patients with spinal cord injury (SCI) has been centralized in Finland into three University Hospitals in Helsinki, Oulu and Tampere after the new Health Care Act in the 1st of May 2011. The aim of the study was to determine the incidence and evaluate the characteristics of newly injured patients with non-traumatic spinal cord injury (NTSCI) admitted to the two out of three spinal cord injury centres during the first year after centralization. Second aim was to evaluate implementation of centralized care throughout the catchment areas.

Material and Methods

The study design was prospective population based cross-sectional epidemiological study in the Oulu and Tampere SCI centres in Finland covering 3 065 946 (56.5%) of the population during the study period in year 2012. In both hospitals the designated rehabilitation teams evaluated all the patients with a new spinal cord injury and persisting neurological symptoms. Data was recorded according to the International Spinal Cord Injury Core Data Set for the whole catchment area. In addition, ICD-10 codes were obtained to specify aetiology of injury. Progressive neurological diseases such as multiple sclerosis or amyotrophic lateral sclerosis were not included in the study.

Results

In a 1-year period 49 new patients with NTSCI were admitted to study centres. In the whole catchment area the mean annual incidence of NTSCI was 16.0 per million. The incidence was 32.1 per million in the hospital districts with SCI centres, and 8.9 million in the other hospital districts referring patients to the SCI centres. Five (10%) injuries were complete, while 32 (65%) patients were classified as ASIA Impairment Scale (AIS) D. Proportion of more severe NTSCI (AIS A-C) was lower in the hospital districts with SCI centre (13%) when compared to other hospital districts (42%). The mean age of the patients was 57.5 years and 31 (63%) were male. The injury caused tetraplegia in 21 (43%) cases. Vertebral column degenerative disorders were the leading cause (n=24; 49%). Other causing factors were malignant tumours (n=12; 25%), vascular disorders (n=7; 14%), benign tumours (n=3; 6%), infections (n=2; 4%) and syringomyelia (n=1; 2%). Surgical operations were done in 43 (88%) cases, while only 4 (10%) patients needed intensive care.

Conclusion

The first year incidence of NTSCI was 16.0 per million after centralization of SCI care in Finland. Non-uniform distribution of NTSCI over the catchment area may indicate imperfect centralization and true incidence may even be higher. Vertebral column degenerative disorders were the most common aetiology causing nearly half of the new NTSCI. Paraplegia was more prevalent than tetraplegia and most of the injuries were motor incomplete. The results need to be confirmed by the extended follow-up.

Experience from the spinal cord injured interest organization in Cambodia

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Introduction

In Cambodia, the law on the Protection and the Promotion of the Rights of Persons with Disability has been entered into force on July 2009 and United Nation Convention of Right of Persons with Disability was ratified on 20 December 2013 and entered into force on 19 January 2013. Persons living with spinal cord injury in Cambodia are not significantly taken into account as appropriate. They have met barriers to full and equal participation, education, jobs and reasonable accommodation in the society. Interviews and quality of life research have shown need for improvement in almost in all aspect of their life. Important tasks for the organization have been to improve understanding of their disability, improve mobility skills in wheelchair, educate about prevention of pressure ulcers and urinary tract infection, provide role models, increase confidence and take action against discrimination within the society. Cambodian Spinal Cord Injury Association has held its second annual seminar and first general assembly on 24-25 March in 2013. A total of 40 SCI persons have had a follow-up by the outreach team, 21 females and 19 males. Mean age was 39 years with a range between 22 to 73 years. A total of 6 SCI persons have so far joined the peer-group training project.

Conclusion

In our experience, a SCI interest organization has an important role to benefit, improve quality of life of for persons living with SCI.

Compressive cervical myelopathy caused by single level soft cervical disc herniation : evaluation of clinical and radiological factors affecting postsurgical clinical outcome

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Study Design

Retrospective study.

Objective

To assess pre- and postoperative clinical and radiological findings and to investigate the surgical results and prognostic factors influencing the outcome for patients with soft cervical disc herniation with myelopathy.

Method

A total of 20 patients admitted in our hospital were treated surgically with anterior cervical decompression and fusion for single level cervical discogenic myelopathy were evaluated. Clinical and radiographic features were reviewed to evaluate the surgical results and prognostic factors. Average duration of follow up was 26 months with minimum duration of 12 months. Factors studied were duration of myelopathy, Pavlov's ratio, preoperative dural canal body ratio, preoperative canal stenosis grade, signal intensity changes on MRI and pre- and postoperative severity of myelopathy. The severity of myelopathy was evaluated according to the Japanese Orthopaedic Association(JOA) scoring system and Nurick's grade. The clinical outcome was judged using three grading systems (Herkowitz's scale, Nurick's grade and Japanese Orthopaedic Association score).

Results

Male were predominant 5.7:1. Average age was 44.8 years. C5-6 was the most frequently involved level. Gait disturbance, hand grip weakness and hand numbness were the most obvious signs. Average duration of myelopathy symptoms was 35 days. Magnetic resonance(MR) images showed central disc herniation in 13 cases and paracentral in 7 cases. Cord signal changes were seen in 16 cases. Decreased T1W with increased T2W signal changes seen in 2 patients. Preoperative JOA scores was 9.5, which became 12.8 postoperatively. Postoperatively, 15 patients showed favorable results (excellent and good outcome) according to Herkowitz's scale.

Conclusion

Preoperative duration of clinical symptoms, severity of myelopathy at the time of surgical intervention and cord signal intensity on MRI influence the outcomes in cervical discogenic myelopathy. In all patients, developmental narrow spinal canal was the primary contributing factor inducing the myelopathy. No difference in outcome in patients as related to preoperative dural canal -- body ratio, preoperative canal stenosis grade and type of disc herniation.

Outcomes in relation to discharge destination for a group of newly injured patients discharged from a spinal cord injury centre in the UK

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Introduction and Aims

Although it is widely suggested that discharge to an accessible environment will facilitate the spinal cord injured (SCI) individual fully reintegrating in to their society, in the UK there is little empirical evidence identifying outcomes associated with discharge destination. This lack of evidence presents difficulties for the clinician when arguing the benefits of the provision of suitable accommodation as well as for service commissioners when planning services. Furthermore there is little evidence identifying if notably better reintegration outcomes occur in those who are discharged to accessible accommodation over those who are provided with suitable accommodation at a later date.

This presentation aims to:

- Identify the discharge destination and disposition of a group of UK based SCI individuals on discharge from their first episode of specialist SCI rehabilitation.
- Identify the residential situation of these subjects at one year post-discharge and compare this to their vocational status and levels of community activity at one year post-discharge.

Material and Methods

Subjects were aged 18+ and a convenience sample of 74 newly injured SCI individuals at the point of discharge from rehabilitation. Data collected by a survey of medical records at the point of discharge and via postal survey at one year post-discharge. 48 subjects contributed data to both phases of the study.

Results

This previously unpublished study identified that 50% of subjects experienced a delay to discharge. Subjects who were discharged to their previous accommodation were significantly less likely to experience a discharge delay than those discharged to a Nursing Home. Although adaptations to property were still outstanding for 38.3% of subjects on discharge, those who were discharged to accommodation that had already been adapted or did not require adaptations were significantly more likely to be vocationally active on discharge. These subjects were also more likely to be vocationally active at one year post discharge and to engage in social and general activities in the community more frequently. This relationship was not exhibited in those subjects who were provided with adaptations/accessible accommodation post-discharge.

Conclusions

Discharge to a Nursing Home facility is related to higher level injuries as well as more frequent and lengthy delays to discharge. The potential impact of difficulties in securing funding for these forms of placement are discussed in addition to the impact of these delays on SCIC services. Improved vocational and social outcomes occur in those SCI individuals who are discharged to a physically enabling environment. That these findings are not supported in those who secure an accessible environment later suggests that there may be an optimal window for provision of suitable accommodation if improved outcomes are to be obtained. The potential for alternatives to the current system of adaptation provision need to be explored.

Quantitative comparison of 4 subscales linked to the international classification of functioning, disability & health category b152 Emotional functions

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Introduction and Aims

Functioning is an important outcome for rehabilitation practice and research. Various instruments exist to assess domains of functioning in people with spinal cord injury. To enable comparison of functioning information, the International Classification of Functioning, Disability, and Health (ICF) provides a comprehensive framework. The objective of this study is to demonstrate how to establish qualitative and quantitative comparison of functioning information based on the ICF. More specifically, the aims are to create a metric from commonly used instruments which are linked to the same ICF category, to equate these metrics, and to provide a standardized reporting format based on ICF qualifiers.

Material and Methods

Psychometric study using data from the community survey of the Swiss Spinal Cord Injury cohort study (SwiSCI). Participants who completed sub-scales which map on to b152 based on established linking rules from relevant modules of SwiSCI: N=1420 for Basic Module; N=500 for Personal factor Module. Rasch analysis was performed to examine the properties of subscales linked to ICF category b152 Emotional functions as a case in point. Person abilities of the four subscales were equated and transformed to range from 0-100 and translated into ICF qualifiers (no, mild, moderate, severe, complete problem). Existing cut-points of Hospital Anxiety and Depression Scale-Depression (HADS-D) were used to determine critical levels in emotional functioning and the three other scales were interpreted in reference to these cut-points.

Results

The four subscales, comprising 4 single items relating to mood, HADS-D, and the positive and negative affect subscales of the Positive Affect Negative Affect Scale (PANAS-PA and PANAS-NA) respectively were linked to b152 and included for analysis. With minor or no adjustments, the subscales showed good reliability, item fit, and unidimensionality. All were invariant with respect to level and completeness of paraplegia. One HADS-D item showed differential item functioning for age and two HADS-D items for language of the questionnaire (German or French). When translated to ICF-qualifiers, all items indicated moderate to severe problems in b152. Only HADS-D and PANAS-PA cover the continuum below and above the established clinical cut-point of depression of the HADS-D. The four single items relating to mood and most items of PANAS-NA are located above the clinical cut-point of depression for the HADS-D.

Conclusion

Exemplified by one ICF category, this study illustrates the utility of the ICF framework to facilitate standardized reporting of functioning information. This study provides evidence that knowledge about clinical cut-points from one sub-scale can inform the interpretation of findings from other scales once those have been equated. Further empirical investigations are recommended to validate the responsiveness of the identified cut-points across scales.

Review of outcome assessment (ASIA and SCIM III) following rehabilitation at the Northwest Regional Spinal Injuries Centre Southport UK: an update

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Introduction and Aims

To Review and Update a previous Benchmark Standard for expected outcomes of rehabilitation in spinal cord lesion patients treated at the North West Regional Spinal Injury Centre Southport United Kingdom.

Materials and Methods

100 consecutive SCL patient notes of patients admitted to NWRISIC during 2012 were reviewed at completion of rehabilitation with the American Spinal Injury Association Impairment Scale (ASIA) measuring neurological motor and scores and corresponding Spinal Cord Independence Measure (SCIM III) scores. Scores Data was stored and analyzed using Microsoft Excel programme. Functional Independence achieved as measured by the SCIM III score was correlated with the neurological motor score and subsets of the SCIM III score. Data was stratified by Age of Patient, Gender, Level of Injury and ASIA and SCIM III grades. Data was compared with a previous study performed in our unit in 2008 for testing this correlation subject.

Results

Of 100 notes Complete Data was available for 61 patients. Our Review confirms the Results of the Previous Study of 2008. The AIS motor score correlated highly with the SCIM III value in a linear fashion. The largest range of SCIM scores was found in patients with motor scores between 41 and 60. However, the most variability in scores was observed in self care components.

Conclusion

This review confirms our previous findings in concurring with a benchmark for current standards achieved by our SCL patients following rehabilitation (1). The current tools of measuring standards of outcome of rehabilitation can be applied confidently in setting up rehabilitation services for SCL patients.

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Salisbury assessment method (SAM) for determining the neurological level and ASIA impairment scale in patients with spinal cord lesion

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Introduction and Aims

Standard method of examination to determine the neurological level (NL) and ASIA Impairment Scale (AIS) in patients with spinal cord lesion was observed to take between 15 minutes and 45 minutes depending on the level and completeness of the lesion in addition to other factors like decisiveness and quickness of the responses of the patients. Inter observer variability was identified in previous studies, and there was disagreement in determining NL mainly of T12 and L1 and thoracic myotomes. Disagreement of around 16% to 18% was also noted between muscle grades, strong agreement was for grade 0 and weakest for grade 3. We developed a quick assessment method for determining the neurological level and ASIA Impairment Scale in a busy outpatient clinic with minimal staff support. We compared the accuracy and the time taken in determining the NL and AIS by the SAM with the standard method.

Methods

Two experienced spinal injuries consultants examined a total of 7 patients to determine the NL and AIS using the standard method. A third spinal injuries consultant examined the same 7 patients using the SAM. The differences in the NL and AIS between the SAM and standard method were calculated and compared. One patient was excluded due to inconsistent response.

Results

Standard deviation in the difference of the neurological level of injury was 1.4 levels, and the Standard deviation in the difference in AIS was 0.37 grades determined by the two methods. Mean time taken by SAM was 4.6 minutes. Mean time taken by standard method was 24.1 on an average; SAM took 19.5 minutes less than the standard method.

Conclusion

NL and AIS were determined in a significantly shorter time by using SAM. There were differences in the neurological level of injury determined by the two methods but agreement in the AIS grade. SAM may be useful in a busy outpatient setting with minimal staff to determine the NL and AIS and to screen for change in neurology. Further studies with a larger group of patients are required to establish the validity of this method.

Neurological deterioration following early or sudden verticalisation in SCI patients: a case series

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Introduction

Postural hypotension leading to neurological deterioration in patients with biomechanically stable spine and head-up tilt tests leading to hypotension and arrhythmias were described in the literature. We would like to share our experience with three patients who had neurological deterioration due to a possible early or sudden verticalisation.

Material and Methods

Case series of 3 patients admitted at the Duke of Cornwall Spinal treatment center at the Salisbury District Hospital (UK) for further management of multisystem dysfunction and rehabilitation. The ISNCSCI was used to compare the neurological level before and after a sudden verticalisation.

Results

Patient-1 had C5 AIS D spinal cord lesion following a motor cross accident. He underwent C3/C4 anterior cervical decompression and fusion with cage. Patient-2 had a L2 AIS D spinal cord lesion following a decompression and fusion T10/T11. Patient-3 had a C7 AIS D spinal cord lesion following a spinal cord infarct at C5 to T4 levels. All of them suffered hypotension and deterioration of the neurological level with verticalisation. Their neurological status was assessed by the **ISNCSCI**.

Discussion and Conclusion

Sudden or early verticalisation of patients following spinal cord injury can lead to deterioration in neurology and should be avoided. Stabilisation of autonomic function leading to resolution of vasovagal hypotension and brady arrhythmias was noted to occur in 3-6 weeks. Remodelling of disrupted blood-spinal cord barrier (BSCB) was identified to take place in 21 days post injury. Therefore we recommend bed rest for at least 3-6 weeks especially in people with cervical spinal cord lesions. Tilt table studies will be helpful to assess the integrity of autonomic function before verticalising the patients for the first time.

Traumatic central cord syndrome: neurological and functional outcome, an experience from a regional spinal injuries centre

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Introduction and Aims

To study the demographics, injury characteristics, neurological and functional outcomes of patients with traumatic central cord syndrome (CCS) who were managed in a regional Spinal Injuries Centre.

Materials and Methods

Prospective study of 21 consecutive patients with CCS admitted over a two year period. Outcomes were analysed using ASIA Impairment Scale (AIS), Length of Rehabilitation (LOR) and discharge destination. Functional outcome, utilising Spinal Cord Independence Measure (SCIM- III) scores, was measured at commencement of mobilisation and at discharge.

Results

Mean age of patients was 58.77 years (range, 44-81). Fall was the commonest cause (86%), followed by road traffic accidents (9%) and sports (5%). C5 was the commonest level and AIS C was most common. Eight patients (38%) were treated surgically at the referring hospital and thirteen patients (62%) conservatively at the Centre. Average length of active rehabilitation for CCS was 53 days (9-110). The surgically treated patients had longer LOR, 61 vs 48 days, however this was not statistically significant ($p=0.121$).

Neurological improvement by one AIS grade was noted in 67% of patients. AIS D was commonest (76%) at the time of discharge. Functional improvement was noted in both groups in SCIM scores (Mean 27.75, SD 22.72 for surgical group and Mean 25.38 SD 23.70 for non-surgical group), however there was no statistically difference between the two groups ($p = 0.82401$). Outcome comparison did not reveal significant difference to discharge destination.

Conclusion

Outcomes were not significantly different between surgically and conservatively managed Traumatic Central Cord Syndrome.

Report of 9 operated cases of neuropathic spinal arthropathy (Charcot-Spine) : reflections on the diagnosis, treatment and prevention

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Aims

Report of nine cases of surgically treated Charcot-Spine (CS) in six spinal cord injured patients, in our institution from 2004 to 2013 in order to precise the diagnosis criteria, the appropriate surgical treatment and the way to prevent such a complication.

Methods

Retrospective analysis of these cases includes

- etiology of spinal cord injury, ASIA neurological level and impairment scale,
- previous spinal surgery,
- post -- SCI CS delay, clinical signs and location of CS,
- radiological signs on X-rays (sitting and lying positions), CT-scan and MRI analysed on sagittal T1 and T2--weighted images.
- surgical treatment modalities, complications and re-operations, follow-up.

Main Results

Etiology of spinal cord injury was traumatic in four cases (two of them occurred in childhood), ischemic in the other two. Every patients had a upper thoracic spastic paraplegia (neurological level between Th1 to Th6) ; five of them were AIS A, one of them AIS C.

Five of six patients had spinal surgery before developing CS (3 cases of long arthrodesis for scoliosis, 2 cases a laminectomy for Sacral Anterior Root Stimulator implantation). The last one presented a thoraco-lumbar scoliosis with "spontaneous arthrodesis » of many spinal levels.

The mean diagnosis delay since injury was 16 years (3 to 31). Various clinical signs may lead to diagnosis : grinding and cracking noises (4 cases), loss of sitting balance (3 cases), back pain resistant to morphine (3 cases), flaccidity (3 cases), increasing spasticity (2 cases) or autonomic dysreflexia (2 cases).

On the opposite, radiological signs were constant : intervertebral disc destruction (with gas on CT-scan), vertebral endplates destruction with perivertebral osseous reconstruction. Local kyphosis increased at least fifteen degrees in sitting position. Discs and endplates evolved to the same signal (hypo-T1 and hyper-T2) on MRI. Surgery performed was always a circumferential arthrodesis with a mean post-surgery follow-up of 5 years (from 6 months to 10 years). Two patients requires early re-operation, one for materiel disconnection and one for infection. Three patients developed a second location of CS at the upper adjacent level to posterior instrumentation, from 1 to 6 years after first CS surgery, and were treated following the same modality.

Conclusions

The diagnosis of this late and rare complication of spinal cord injury, which may be revealed by different clinical situations, relies on a specific network of radiological proofs. The only treatment consists in a circumferential arthrodesis of involved segment considering that the posterior osteosynthesis must include the whole sub-lesional mobile spine in order to avoid the occurrence of another location of CS. Any surgery concerning sub-lesional spine in a spinal cord injured patient should be carefully considered in order to prevent the risk of progression to a neuropathic spinal arthropathy.

Usefulness of the international spinal cord injury pain (ISCIP) classification in the pain management: a retrospective study

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Introduction and Aims

Pain, either nociceptive or neuropathic following spinal cord injury (SCI) is a frequent symptom, often difficult to manage for both individuals with SCI and clinicians. The aim of this study was to investigate the epidemiology of pain types in patients with SCI according to the ISCIP classification.

Materials and Methods

Files of individuals with SCI were retrieved at the Centre for Pain Medicine Nottwil from January 2011 to December 2013. Socio-demographic data and clinical data were evaluated and ISCIP classification was applied. Correlations between data were explored.

Results

Sixty-six individuals (17 females and 49 males) with a mean age of 51 years (± 13) had spinal cord injury pain (SCIP); with a lesion older than 5 years in 67% of patients and a pain history older than 5 years in 54% of patients. AISA Impairment Scale (AIS) grade A was predominant (41%), followed by AIS D (38%), C (12%) and B (9%). 58% of patients showed a spinal cord lesion, 19% had a combined spinal cord and cauda equina lesion and 23% had a cauda equina lesion only. The etiologies were traumatic and non-traumatic in respectively 97% and 3% of patients. Patients had severe pain (mean intensity: 8.2 (± 1.6) on a 0 to 10 numerical scale) at one site (46%), 2 sites (39%) or 3 to more sites (15%). The health-related quality of life assessed by the SF-12 Health Survey was low (mean physical component 29.3 ± 9.4 ; mean mental component 42.9, ± 12.4). Mild to severe depression and anxiety assessed by the Hospital Anxiety and Depression Scale (HADS) were present respectively in 53% and 56% of patients. According to the ISCIP classification, nociceptive pain was present in 55% (musculoskeletal pain) and 3% (visceral pain) of the patients. At-level, below-level neuropathic SCIP and other neuropathic pain were observed respectively in 53%, 42% and 5% of patients. Unknown pain type was found in 7% of patients. At-level SCIP was found in 74% of patients with AIS A lesions, followed by 50% in AIS C, 36% in AIS D and 33% AIS B. Below-level SCIP was present in 83% of patients with AIS B lesions, followed by 50% in AIS C, 44% in AIS A and 28% AIS D. 57% of patients with a spinal cord lesion had nociceptive pain, 34% had at-level SCIP and 67% below-level SCIP. 62% of patients with a combined spinal cord and cauda equina lesion had nociceptive pain (47% musculoskeletal, 15% visceral), 80% had at-level SCIP whereas 8% had below-level-SCIP. 53% of patients with cauda equina lesion had nociceptive pain while 77% had at-level-SCIP. Patients with a complete lesion showed significantly more frequent neuropathic pain ($p=0.021$) and more frequent at-level SCIP ($p=0.004$) compared to those with an incomplete lesion.

Conclusion

The use of the ISCIP classification in clinical setting is mirroring the very complex pain situation in patients with SCIP and might be an important step for adequate pain therapy. This need to be further investigated according to ISCIP pain types.

Osteoporosis in spinal cord injury: a retrospective study

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Introduction

Osteoporosis is a well known complication following spinal cord injury (SCI). Bone metabolism is affected following SCI and this is thought to be due to immobility, loss of weight bearing and neuroendocrine mechanisms. The risk of developing osteoporosis increases when there are additional risk factors in patient's past medical history. If untreated osteoporosis can lead to fractures especially in long bones and vertebrae with long term complications in SCI patients.

Methods

Retrospective analysis of fifty patients with SCI. Data collected from patients' notes, DXA scans and telephone interview with consent. Patients with SCI for six years or more were included. These patients had a minimum of 3 DEXA scans and we looked into their T-scores, Z-scores and BMD (bone mineral density).

Results analysed against risk factors, level of injury, nonpharmacological and pharmacological treatments, occurrence of long bone fractures and vitamin D levels, the effect of fractures on quality of life.

Results

Our findings showed that a significant number of patients developed fractures; some of them were on Bisphosphonates. Lumbar spine T-scores for paraplegic patients have improved in comparison to hip T-scores. Our study was however limited as we did not look into the time from SCI to date of commencement on Bisphosphonates and the date of fractures. Deterioration of T scores could not be correlated with supplements, use of standing frame or FES.

Conclusion

Paraplegic patients were more prone to lower limb long bone fractures as compared to tetraplegics. Lumbar spine T-scores in paraplegics have improved in comparison to hip T --scores.

Keywords

SCI, osteoporosis, T-scores, vit D, long bone fractures

Treatment of shoulder pain in persons with spinal cord injury: a literature review

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Introduction and Aims

Many persons rely on hand-rim wheelchair propulsion after spinal cord injury (SCI). However, hand rim wheelchair propulsion, weight reliefs and transfers have shown to be physiologically and mechanically straining with a risk on repetitive micro trauma and consequently "overuse" injury. Shoulder pain prevalence in persons with shoulder pain therefore, is present in about 50% of the persons both during the acute and chronic phase of SCI.

The aim of this study is to review the literature on effect of treatment of shoulder pain in persons with SCI.

Material and Methods

Literature search in PubMed on following keywords (in Title or Abstract): "Spinal cord Injury" OR "tetraplegia" OR "Paraplegia" AND "Upper extremity" OR "shoulder". AND "treatment" OR "intervention" OR "therapy". Retrieved abstracts were screened for eligibility.

Results

253 Abstracts were retrieved of which 17 included interventions to decrease shoulder pain in persons with SCI as outcome. Only one paper included persons in the acute phase after SCI. Interventions tested included exercise (6), Magnetic field (1), Hand cycling (1), resistance training (1), acupuncture (1), acupuncture and Trager therapy (1), power assisted wheels (1), nitroglycerine plasters (1), Arm-crank ergometry (1), educational protocol (1), platelet rich plasma (PRP) (1) and service dog (1). Study sample size varied from only 5 (exercise) to 140 (wheelchair seat adaptation). Only five studies were randomized controlled trials (RCT), three on exercise interventions, one on a standardized education protocol and one on acupuncture. All other studies were case series, of which only one included a control group. Follow-up time ranged from 0 to 52 weeks (median 14 weeks). Most studies reported a significant decrease of shoulder pain after the intervention as measured with the pain numeric rating scale or the Wheelchair User's Shoulder Pain Index (mean: 48% decrease (range 33-66%)). Treatment with PRP, arm-crank ergometry and the educational protocol showed no significant effect on shoulder pain.

Conclusions

Shoulder pain is a significant problem in persons with SCI. Evidence on how to treat shoulder pain in persons with SCI best is hardly available. Surprisingly, no publications on operative interventions (such as for rotator cuff tears or biceps tears) are published. This review shows that there is a need for well designed (multicenter) interventions studies on shoulder pain with longer follow-up in persons with SCI.

An integrated approach to meaningful community based rehabilitation following spinal cord injury

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Introduction

The Spinal Integrated Community Care Service (SICCS) established safe, meaningful community reintegration as an integral component in the complex and specialised rehabilitation needs of patients at the North West Regional Spinal Injuries Centre.

This holistic service provides a phased discharge to the individual's chosen lifestyle following a life changing event and was achieved through partnership agreements with third sector providers supported by a multi professional team comprising Doctors, AHPs, Nurses and Social Care staff.

This community based service aims to enable individuals to maximize their independence, optimize physical capacity and establish a routine of ongoing activity/fitness once in the community environment.

Materials And Methods

The patients in the cohort are moved from hospital to the community settings immediately following acute rehabilitation. Specialist staff from the Spinal Injury Centre (SIC) outreach to the community patients and utilise a variety of exercise based activities such as hand cycling and swimming alongside functional task sessions such as wheelchair skills and bed mobility.

Nursing and therapy goals are worked towards in 'real time', using local rather than hospital facilities, therefore patients translate their newly acquired skills into meaningful situations such as using public transport or managing catheterization in public conveniences.

The patients experience and appreciate the needs and benefits of maximizing physical capacity and fitness during active rehabilitation and post discharge.

A mixed method approach is used throughout to measure the outcomes from acute injury to final discharge destination.

Quantative measures include the Functional Spinal Injuries Measure to identify rehabilitation progress, Oxford muscle grading is completed at admission, during active rehabilitation and pre discharge.

In those with incomplete injuries, endurance measures such as 6 minute walk test, 10m walk to determine speed, Timed Up and Go for function and Berg Balance are used. Qualitative measures such as social interaction and compliance with therapy post discharge from the acute setting were also observed.

Patients on the community pathway are discharged an average of 19 days earlier with a greater likelihood of continued uptake of sporting and social opportunities.

The key benefits have been:

- Functional gain- measured using ASIA motor score and SCIM-3.
- A unanimously reported overall improvement in quality of life measured using formal psychometry, patient report measures and LISAT-11. Patient affect was measured using HAD and GHQ12, with Locus of Control and identification of coping strategies measured using LoS and COPE.

Summary

SCI patients are achieving more meaningful community re integration when treated by specialist services without the constraints of an institution.

Extra spinal fractures in traumatic spinal cord injury (SCI): prevalence and characteristics

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Introduction and Aim

Spinal injury resulting in spinal cord injury (SCI) is usually a result of high force trauma and could result in multiple trauma. Extra-spinal fracture as the most commonly associated injury is acknowledged but not widely reported. The diagnosis of extra-spinal fractures in the SCI population is made more difficult due to absence of pain.

Our aim was to investigate the prevalence of concomitant injuries among the acute SCI population and to create awareness of frequency, location and characteristics of extra spinal fractures.

Materials and Methods

We retrospectively reviewed admission documents of all patients with a new onset SCI and admitted to Midland Centre for Spinal Injuries between January 2000 and September 2008. Only adults with Traumatic SCI were included. The extra-spinal fractures were grouped by anatomic sites, demographics and mode of injury.

Results

Of the 702 patients included, 25% had extra-spinal fractures and nearly 12% of these patients had multiple injuries. Injuries to chest (37%) were most common, followed by injury to upper extremity (26%). Paraplegics, men and those involved in motor vehicle accidents had the highest incidence. There were a small percentage of individuals mostly involved in domestic falls who sustained extra-spinal fractures with either no resultant column injury and/or no neurological deficits.

Conclusion

The extra spinal fracture incidence varies by gender, injury level and the etiology of injury. Although extra spinal fractures are not uncommon, knowledge is limited due to lack of literature. Further elucidation of these injury patterns will enable expedient evaluation and appropriate management of these individuals.

Experience of spasticity management using intra-thecal drug delivery system (ITDDS) at Midland centre for spinal injuries

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Introduction and Aims

Spasticity has varied definitions and this complicates its valid and reliable assessment. Literature has shown up to 78% of sample populations of individuals with chronic Spinal Cord Injury (≥1 year post-injury) have symptoms of spasticity. Intrathecal baclofen (ITB) is becoming a popular modality given the high incidence of unpleasant effects with oral medications in management of severe spasticity. This surgical method of pharmacotherapy unfortunately is not without complications.

In this study, we present our institutional experience with ITB therapy, emphasizing complication avoidance and lessons learned. Also present a Quality of Life (QOLi) survey.

Material and Methods

Observational retrospective study. Electronic patient records and case notes reviewed looking into demographic details, injury details, spasticity management and outcome including complications and Quality of life survey.

Results

There were a total of 27 patients with ITDDS; four of these were followed up elsewhere so excluded. Of the 23 (SCI-19; Cerebral palsy-2; Multiple sclerosis-1; Traumatic brain injury-1) only 18 were implanted at our centre. The most frequently noted complications were catheter related (n=5; 27%). Others include meningism, intrathecal bleed and pump cavity infections. Spasm control was satisfactory in over 75% with ITDDS and almost all had more than 2 Ashworth scale improvement on trial doses. 1 pump ex-tubation and no pump malfunctions.

Conclusion

We report a slightly higher incidence of catheter related complications. No pump failure. We can speculate that diligent follow up not exceeding 12 weeks as practiced at our centre can help in detecting catheter related problems early can prevent progressing to pump malfunction.

Minimally invasive posterolateral approach for cervical pedicle screw fixation using 3D Navigation System

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Introduction

To avoid lateral misplacement of cervical pedicle screws(PS), we applied new posterolateral approach.

Material and Methods

PSs were used for cervical fractures in 13 cases. 44 PS from C2 to Th2 were used. The mean age of the patients was 58 years. Posterolateral small skin incision was applied and PSs were inserted using Iso-C 3D navigation. We analyzed bleeding volume, surgical time and complications.

Results

The average bleeding volume was 103ml and surgical time was 170 minutes. No complication and no lateral PS misplacement were occurred. Only one PS was deviated medially (2.3%).

Discussion

To keep correct oblique angle of PS leads to no lateral deviation and reduces muscle damages by this direct approach.

Conclusion

Posterolateral approach is not only minimally invasive but also safe.

Spinal arterio-venous malformation (AVM) in a traumatic spinal cord injured (TSCI) with intra-thecal baclofen (ITB) pump - a diagnostic dilemma

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Introduction and Aims

Spinal cord vascular malformations (arterial and venous) represent a heterogeneous group of blood vessel disorders that affect the spinal cord parenchyma either directly or indirectly. This group consists of spinal arteriovenous malformations (AVMs), dural arteriovenous fistulas (AVF), spinal hemangiomas, cavernous angiomas, and aneurysms. Our aim is to report diagnostic dilemma in diagnosing a case of Spinal AVM in TSCI individual with an ITB pump.

Materials and Methods

A 71 year old individual with a known TSCI following a train accident fifty years ago. He became wheelchair dependent after 45 years of independence and finally required an ITB pump.

Results

In 2011 at one of the pump refill clinics he presented with subjective sensory disturbances in his lower limbs with vague feeling of discomfort. Examination failed to demonstrate any neurological deterioration except reduced tone. He reported no bladder or bowel disturbance.

MRI whole spine was organised which showed features of myelomalacia. ITB dose was reduced due to new onset hypotonia.

After 3 months he reported no improvement despite further dose reductions and a repeat MRI demonstrated changes reported as vascular in etiology.

Embolisation of bleeding AV fistula following MR Angiography (MRA) restored his functional status.

Conclusion

Vascular lesions should be considered in people presenting with subjective changes in neurology especially those with pre-existing neurological deficits/concurrent management with ITB. MRI is sensitive in diagnosing vascular lesions but has limitations in early diagnosis of AVM. Familiarity with unusual presentation due to AVMs is helpful in organising early MRA.

Purtscher's retinopathy in traumatic spinal column injury: case report

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Introduction and Aims

Purtscher retinopathy is a well-known, but seldom observed, member of traumatic retinopathies. It was first described by Purtscher more than a century ago and an exact etiology still defies to date. Since its first description, a similar retinal appearance has also been described in a variety of conditions including acute pancreatitis, crush injury, long bone fracture, orthopaedic surgery and childbirth.

Our aim is to report a case of Purtscher's retinopathy in a person with TSCI; discuss this rare haemorrhagic and vasoocclusive vasculopathy with a view to create awareness:

Materials and Methods

A 45 years old man as a front seat passenger wearing seat belt was involved in a head on collision road traffic accident. He sustained Hangman fracture (C2), wedge fracture of T8/T9 and anterior superior part of endplates of L1/L2. He was neurologically intact. Two days after air ambulance transfer (Six days after trauma) to our unit, complained of central cloudy blurred vision in his right eye.

Results

He was reviewed by an ophthalmologist who was able to conclude changes in visual acuity, however was unable to perform confrontation visual field testing due to the patient being managed conservatively for traumatic spinal column injury. A fundoscopy examination revealed changes consistent with Purtscher's retinopathy. No active treatment suggested. He was followed up on an outpatient basis.

Conclusion

Although rare, this sight threatening condition is reported in other conditions but not in spinal column injury. Knowledge about ophthalmological conditions in spinal column injury is helpful in identifying the condition early and prevent permanent blindness.

Predictors of musculoskeletal pain in the upper limbs in individuals with spinal cord injury

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Introduction

The increasing on the upper limbs demand after spinal cord injury is associated with higher occurrence of musculoskeletal pain in individuals with spinal cord injury (SCI).

Objective

The aim of this study was to characterize SCI subjects with musculoskeletal pain in upper limbs and to determine which variables can predict the musculoskeletal pain in these individuals.

Study design

Cross-sectional retrospective study.

Methodology

Data of 564 subjects were submitted to an exploratory and descriptive analysis to characterize the SCI subject with upper limb pain. The odds ratio was calculated using logistic regression model, assessing the relation between explanatory variables (gender, age, level of injury, completeness of injury, time of injury, body mass index, type of mobility and locomotion aid device) and occurrence of pain.

Results

The odds of having musculoskeletal pain was two times higher among woman and tetraplegic patients; the frequency of individuals with pain was two times higher in those over 40 years of age than in those aged less than 25 years; individuals with less than 1 year of injury was a predictor of musculoskeletal pain compared with those located in other quartiles (1.1-2.7, 2.7-6.9 and more than 7 years of injury). There was no difference when compared wheelchair with ambulating subjects. Conclusion: The odds of having musculoskeletal pain in SCI was higher among the female gender, tetraplegic subjects, age over 40 years, and subjects with less than 1 year of injury.

Keyword

Spinal cord injury; rehabilitation; upper limb; shoulder; pain

Interventions aiming at return to work for spinal cord injury patients: a systematic review

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Introduction and Aims

Return to work is an ultimate and important goal in the field of rehabilitation medicine as it adds to quality of life through improving social contacts, self-esteem and financial independence. Employment rates following spinal cord injury, however, are low. The aim of this review is to investigate the effect of interventions aiming at return to work or education in people with spinal cord injury.

Material and Methods

The following databases were searched: MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL), CINAHL, PsycINFO and SPORTDISCUS. Trials registers (clinicaltrial.gov) were searched to identify ongoing trials. Randomized controlled trial (RCT) and non-randomized controlled studies (NRS) describing an intervention aiming at return to work or education in a spinal cord injury (SCI) population were selected.

Data were extracted using a data collection form designed according to the checklist of the Cochrane Handbook. Primary outcomes were return to work or education rate and duration of employment. As secondary outcomes, an evaluation of the intervention was performed, investigating the setting, starting date, frequency and duration of the intervention and team-members involved.

Results

Five hundred and eighty nine studies were withheld for screening on abstract and title of which 75 studies were included for full text screening. Finally 14 studies were retrieved for inclusion. The included studies involve a total of 2221 patients, of which many studies were case series or case studies. Only one study was of high quality. In this study the return to work rate is 26% for competitive return to work, comparing to 2.3% and 10.5% in the control groups. Other, low quality studies, describe return to work rates from 36 to 100%.

Conclusions

Evidence that a vocational rehabilitation programme based on the principles of supported employment integrated in a multidisciplinary team enhances return to work for spinal cord injury patients is based upon one RCT. Since the vast majority of studies included in this review are of low methodological quality, further research is needed.

Frost's mechanostat theory in spinal cord injury: putting theory into practice

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Introduction and Aims

Evidence shows that if muscle force is below a certain set point, i.e. if muscles are paralyzed, bone tissue is lost. The goal of this cross-sectional study was to investigate Frost's mechanostat theory in spinal cord injured subjects.

Material and Methods

The study included 31 complete paraplegics (AIS A, mean duration of paralysis: 5.6±6 years) divided according to the neurological level of injury compared with 50 controls. All were examined with peripheral quantitative computed tomography (pQCT XCT-3000, Stratec Medizintechnik, Germany) in the tibia. Images were taken at 66% of the tibia's length (bone area/muscle area ratio).

Results

In controls muscle area was highly correlated with bone area obtained from p QCT. In paraplegics statistically significant higher ratios bone area per unit of muscle area vs. controls were found ($p < 0.001$).

Discussion

The relationship between bone and muscle was consistent in able-bodied and predictably altered in those with spinal cord injury, a clinical disease affecting bone and muscle. The result could be partially explained by the bone steady state while muscle was already in steady state and suggests that we can interfere to the bone area/muscle area ratio many years after paralysis to protect bone and muscle in SCI subjects.

Effects of whole body vibration on H-reflex and spasticity after spinal cord injury: a pilot study

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Introduction and Aims

To investigate whether whole body vibration (WBV) therapy reduces ankle or knee spasticity and maximum amplitude of Hoffman reflex(H-max)/M-max ratio of gastrocnemius muscle (GCM) in patients with spinal cord injury.

Material and Methods

Patients with ankle or knee spasticity, modified Ashworth scale(MAS) \geq grade 1, were included. Those who were age below 20 or had a history of cerebro- or cardiovascular disease were excluded. Patients were allocated to two groups; conventional therapy group (n=5) and WBV group (n=5). Patients in the WBV group received 20-minute sessions of WBV for 5 days a week, and for 2 weeks. The vibration parameters used to produce whole body movement were 20 Hz frequency and amplitude 4. Assessments were done at baseline and at the end of treatment period (after 2 weeks). The primary outcome parameter was knee and ankle spasticity measured by MAS. Secondary outcomes were H/M ratio of GCM, strength of knee extensor and flexor, ankle dorsiflexor and plantarflexor measured by manual muscle testing.

Results

Spasticity of ankle dorsiflexor, but not other muscles, improved in WBV group after 2 weeks of treatment compared with conventional therapy group. H/M ratio decreased in WBV group, whereas it increased in conventional therapy group. Muscle strength revealed no difference between two groups.

Conclusions

These findings suggest that WBV therapy can be useful for reducing ankle spasticity in patients with spinal cord injury

Acoustic radiation force impulse imaging of lower limb muscles in spinal cord injury: a pilot study

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Introduction and Aims

The aim of this study was to evaluate shear wave velocities (SWVs) of lower extremity muscles in patient with spinal cord injury and normal population via acoustic radiation force impulse imaging (ARFI), and correlation between the SWV values and spasticity.

Material and Methods

Six patients with spinal cord injury (SCI) and 5 healthy adults participated. We applied the acoustic radiation force impulse technique and measured shear wave velocities (SWVs) of gastrocnemius muscle (GCM) and long head of biceps femoris muscle (BF). Spasticity of ankle and knee joint was assessed by modified Ashworth scale.

Results

Three patients with SCI had spasticity. Patients with spasticity had significantly faster SWVs for GCM than those without spasticity and normal control (Mann-Whitney U test, $p=0.016$ and 0.023 , respectively). The SWV values of GCM correlated with the ankle spasticity (Spearman rank test, $p=0.023$). The SWV values for BF were slower in patients without spasticity and normal control, but were not significant. There are no significant correlation between the SWV values for BF and the knee spasticity.

Conclusion

ARFI demonstrated a difference in muscle stiffness in the GCM between patients with spastic SCI and those without spasticity. This finding suggest that spasticity management should be focus on stretching the stiff muscle. Further studies with larger sample size need to be conducted to validate our results.

Actual situation of spinal cord injury patients in Albania

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In this presentation the authors want show the actual situations of spinal Cord injuries in Albania.

Methods

We analyzed data from spinal injured patients admitted to the Trauma Center Hospital in Tirana on 2013. This hospital is the only one that have the minimal characteristics to admitt acute SCI patients. We recorded information about sex, age and severity of the injury, lenght of stay, complications and treatments.

Results

There were 195 patients admitted to our hospital during 2013. Motor vehicle accidents, falling and violence are the main causes of trauma. Female were 30% (57) of the total patients. 15% (29) had complete neurological deficit ASIA-A, 19 patients showing a complete paraplegia and 10 patients a complete tetraplegia). 42% (82) of them underwent vertebral surgery. Mean period of hospitalization was 15 days (3 days to 2 months). 15 % (30) of the patients had bed sores developed during the hospitalization period. After surgery all the patient went home because of lack of rehabilitation center.

Conclusion

The management of spinal cord injured patient in Albania is far from the minimal standard of care for this population if compared to other european Countries. Effort should be done to improve the medical care, rehabilitation and integration for those patients.

Antibiotic treatment urinary tract infections in patients with spinal cord injury

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Introduction and Aims

Urinary tract infections are frequent in patients with a spinal cord injury (SCI). In rehabilitation centre Heliomare these urinary tract infections are standard treated with the broad-spectrum antibiotic Ciprofloxacin. There is a risk that patients be treated with insufficient or too broad due to insufficient treatment or unnecessary resistance. The question is whether Ciprofloxacin is the drug of first choice.

Materials and Method

Retrospective file search under SCI with a urinary tract infection, which have been clinically recorded in the period 2011-2012 on the SCI departments in Rehabilitation centre of Heliomare.

Results

116 Urine culture were included at 73 SCI patients with a urinary tract infection. The *Escherichia coli* was the most common cultured micro-organism in the urine. In 67 of the 106 urine culture (63.2%) were Amoxicillin/clavulanate as Nitrofurantoin both sensitive in the antibiogram. At 56 urine culture (52.8%) showed Ciprofloxacin to work effectively.

Discussion and Conclusion

From the results found in urine cultures and corresponding antibiograms, Ciprofloxacin is not necessarily the means of first choice. On this basis, Amoxicillin/clavulanate or Nitrofurantoin would rather be chosen. However when giving Nitrofurantoin, the chance at a complicated urinary tract infection, there is undertreated. There may be a consideration be made to patients with a SCI in good condition, the first choice primary to treat with the narrow-spectrum antibiotic Nitrofurantoin. The conclusion of my research is that at these selected patient group, SCI with complicated urinary tract infection, Amoxicillin/clavulanate should be the first choice.

AusCAN Access program enables independent data capture in research on tablets and and laptops

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Introduction and Aims

Patient-reported outcomes (PROs) are critical components of research since they enable the participant to actively engage in research and provide information using PROs. Participants with tetraplegia often have physical barriers to completing paper-based and electronic-based PROs independently. The aims of this study were to (1) to enable participants in the Western Australian site of the AusCAN Risk Tool for Sitting-acquired Pressure Ulcers study to complete the online self-report questionnaires independently using assistive technology on either a laptop computer or tablet (iPad); and (2) to support participants' access needs throughout the 3 years of the study.

Material and Methods

An online database was developed for AusCAN Risk Study, including twelve PROs for participants to complete. Access to this database was assessed using a universal design assessment framework. Key principles for assessing participants needs were applied to individuals with tetraplegia (1). Assistive technology was identified and purchased in consultation with the state spinal unit's senior occupational therapist and the hospital's assistive technology consultant. A manual of operations for all the assistive technologies was written and pilot tested with a research assistant who has tetraplegia (C5).

Results

There are twelve PROs in the AusCAN Risk study. They range in length, response type (e.g. click of a radio button and free text boxes). The most basic actions required of the participants using a laptop were: onscreen cursor movement, "click" selection, text entry, dual key actions keys, and page scrolling. The assistive technologies purchased the laptop were: Kensington Orbit Trackball with Scroll Ring, Wireless Remote Mouse, IntelliKeys USB Keyboard, Wivik Onscreen keyboard, Smart Nav 4:AT, Microsoft Lifechat LX-2000 (Microphone head set), Dragon Naturally Speaking 12 Premium. When using the tablet (iPad), the basic actions required of the participant were: initial setup position of the iPad, pressing the physical buttons to power on and/or access the home screen, touch to select on-screen, and a slide action on-screen. The assistive technologies purchased were: Mouthstick stylus, Caduceus Stylus, SALT (Shallow Angle, Light Touch), a Rugged case- Griffin Survivor Extreme Heavy Duty Case, and iPad Mount. The cost of the assistive devices was AUD\$1,989, this was in addition to the costs of the laptop computer (AUD \$1,188) and iPad (AUD\$569). The total cost for the AusCAN Access assistive technology equipment was AUD\$3, 746. Additional running costs included a split level table (AUD\$299), duplicates of several items (such as styli), and an internet data plan (AUD\$30 per month).

Conclusions

AusCAN Access is an assistive technology program that enables independent access to the 12 PROs at the Western Australia site for AusCAN Risk study. Participants can use this "mobile internet café" to complete their online self-reports on the spinal unit or study's lab.

A novel evidence based electronic decision tool for pressure ulcer identification

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Introduction and Aims

The risk factors that are associated with the development of a pressure injury (PI) are varied and conflicting in the literature. A large multisite international prospective study is underway in Australia and Canada that aims to determine the factors associated with a PI or suspected deep tissue injury (DTI). The identification of a PI injury or DTI is an endpoint and this "diagnosis" needs to be evidenced-based and reliable for all sites across Australia and Canada. The aims of the study were: (1) to develop an evidence-based skin inspection electronic decision tool for identifying a PI or DTI in a multisite international prospective study; and (2) collect additional spinal cord injury-specific (SCI-specific) signs of skin changes that may be associated with a PI or DTI.

Methods

Two wound care experts reviewed the NPUAP/EPUAP pressure injury staging guidelines (1) The key "diagnostic" signs for each of the four PI stages and DTI were itemised and overlapping signs were noted. A list of additional SCI-specific signs was generated with an international group of wound care experts. The additional signs that were not exclusively indicative of a pressure injury were identified by the expert group and removed (e.g. increased hyperreflexia). The diagnostic and SCI-specific signs were translated into an electronic tool with inbuilt logic that calculates the presence of a PI or DTI, over 7 anatomical locations on the pelvis.

Results

The tool has been piloted in several studies where signs of a PI or DTI were exclusion criteria. There are two levels in the decision tree: (1) identifying if the skin is open or intact; and if intact, (2) identifying any of the 14 descriptors for intact skin. If open skin is present, the severity of the open PI is assessed using categories 2-4 (1). If intact skin is identified, there are 6 key logic functions in the electronic database that calculate if a PI or DTI is present. The final tool has been completed on 11 participants with no previous history of an open PI. No open PIs have developed in these participants but the baseline visit, three of eleven participants had intact skin signs that are not diagnostic of a PI or DTI. Of these 2/11 participants had brown staining on the skin over the coccyx/sacrum; 1/11 participants felt pain and had brown staining on the left greater trochanter that felt warmer than adjacent skin; 1/11 participants has indicated brown staining on the right posterior aspect of the femur (linea aspera) and 1/11 participants had brown staining over both ischial tuberosities on the pelvis.

Conclusion

An electronic decision tool for identifying a pressure injury and suspected deep tissue injury was empirically developed using embedded logic functions. It has been tested, piloted and it is presently used in the international multisite study, AusCAN Risk Assessment for Sitting-acquired Pressure Ulcers.

Management of grade 4 pressure ulcers in spinal cord injury (SCI) : review of outcomes following implementation of new pathway

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Introduction

After SCI pressure sores with underlying changes on MRI suggestive of osteomyelitis are a common secondary health condition. In addition to significant financial cost to NHS, the patient's quality of life is significantly affected by long periods of bed rest. There is significant variation in management of grade 4 pressure sores with little evidence for best practice. Until recently our management strategy was debridement, VAC therapy, and 6-12 weeks IV antibiotics, with an average length of stay (LOS) in hospital of approximately 6 months and correspondingly long waiting list for admission.

Methods

After discussion with the MDT and other SCI centres a new pathway was agreed. The strategy was debridement with primary closure where possible, antibiotic regimen based on tissue culture, 3 weeks post-operative pressure relief then gradual mobilisation and discharge at week six.

Results

Since May 2013 six of 14 cases were managed on the new pathway (8 did not meet the criteria for primary closure). Two had slight initial wound breakdown which were managed with VAC/PICO. There are no recurrences to date. The mean LOS was 68 days (vs 148 days on the old pathway).

Conclusions

Clinical outcomes are good. LOS was significantly reduced leading to reduced waiting time and an improved preadmission pathway. The aim is to see and treat patients within 2 weeks from referral. Further studies are required to assess the role of imaging; the role of debridement and tissue sampling; optimal surgical strategy (primary closure vs flap); and the antibiotic strategy.

Pressure ulcer prevention: experiences of individuals with spinal cord injury

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Introduction

Pressure ulcers/injuries are a serious complication following spinal cord injury. The experiences of individuals with a history of pressure injury and those without are critical to determining strategies required to prevent pressure injuries. The aims of this ethnographic study were: 1) to explore the experiences, activities, barriers and enablers of individuals with spinal cord injury in pressure injury prevention; and 2) to inform the development of a new pressure injury prevention self-management program for individuals with spinal cord injuries.

Methods

Eleven participants with spinal cord injury with a history of at least one pressure injury were recruited and were interviewed for approximately 1.5 hours using a semi-structured format. All data was transcribed verbatim. Visual inspection of transcribed data and field notes were taken. Data was uploaded and the content was analysed using the program NVivo (V9) (QRS, 2012). One senior occupational therapist researcher with wheelchair/pressure management and spinal cord injury expertise and the research assistant used a collaborative approach to discuss emerging themes and sub themes. This iterative coding process was discussed and a consensus was reached during regular meetings.

Results

The major themes that resonated across all participants were:

- 1) Barriers, Struggles and Challenges to effective pressure ulcer prevention;
- 2) Motivation, which encompassed community and social involvement; leisure; and productivity;
- 3) Resources, such as education, equipment; the healthcare system; peers and family; and psychosocial strategies;
- 4) Self-management, including the need for individualised self-management; self advocacy and self-knowledge; awareness; and preventative action. These results support the need for an evidenced-based, complex intervention that is a personalised pressure ulcer prevention using a self-management framework. The results also support the use of theoretical models to underpin the program such as the Theory of Planned Behaviour, the Goal Setting Theory and the Health Belief Model.

Conclusions

A new pressure injury prevention self-management program has been developed using published guidelines as its foundation [1]. This new program's theoretical underpinnings, behaviour change techniques (e.g. motivational interviewing, instruction, goal setting), and modes of delivery (e.g. demonstration, video vignettes) are derived from the themes and sub themes that emerged from this qualitative study. This program will be the treatment arm in a randomised controlled trial.

Pressure management support surfaces prescribed by health care professionals in Western Australia

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Introduction

Pressure ulcer prevention is a priority in spinal cord rehabilitation and support surfaces such as wheelchair cushions are thought to be key ingredients. A new randomised controlled trial (RCT), AusCAN Prevent™, will be assessing and providing support surfaces within its individualised, pressure ulcer prevention, self-management program for individuals with spinal cord injuries (SCI) in WA. In preparation for this RCT, a study was undertaken to identify the categories, models and sizes of prescribed pressure management surfaces; and to identify gaps in providing this equipment in WA.

Methods

Five occupational therapists and one physiotherapist developed a questionnaire focused on 6 categories of equipment for pressure ulcer management:

- (1) wheelchair cushion, backrest, tilt and recline;
- (2) bathroom equipment;
- (3) additional sitting surfaces (e.g. car seat);
- (4) beds;
- (5) mattresses; and
- (6) protectors and offloading devices for heels, feet and elbows.

All health care professionals who have worked with individuals with SCI in the past 3 years in WA were invited to complete the questionnaire. The survey was distributed to 144 contacts within Western Australia via email with a link to the online survey.

Results

Nineteen health care professionals met the inclusion criteria and 14 fully completed the online survey.

Prescription of wheelchair cushions, wheelchair tilt or recline features and mattresses were commonly prescribed (>80%); wheelchairs, wheelchair backrests, bathroom equipment and beds were prescribed by 60-78% of the respondents; and additional sitting surfaces, protection and offloading devices were prescribed by <43% of the respondents. The following themes were identified as gaps in providing pressure ulcer prevention equipment:

- (1) services -- lack of services to support change in modifiable risk factors (e.g. smoking), limited availability of proactive services (e.g. yearly seating reviews), lack of timely referral, lack of available therapists, too long to secure equipment;
- (2) funding -- limited funding, limited range of surfaces funded, restricted range of available products;
- (3) knowledge -- impact of inexperience in rural areas, lack of knowledge about equipment, lack of evidence to support pressure ulcer prevention equipment use, lack of knowledge about equipment from supplier;
- (4) equipment -- prolonged time to receive equipment, lack of sample / trial equipment from suppliers; and
- (5) self-management -- individuals with SCI access to health care professionals needs to be easier and they need to contact health care professional sooner when skin changes occur.

Conclusions

The results indicate that additional sitting surfaces and protection/offloading devices will most likely need to be assessed and provided in the RCT AusCAN Prevent™ program and that evidence-based knowledge of equipment, timeliness of this service and early detection of skin changes also need to be addressed in this pressure injury prevention program. The gaps in pressure injury prevention identified by these health care professionals are aligned with gaps that individuals with SCI have identified in this research

Age related differences in shoulder joint biomechanics during manual wheelchair propulsion

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Introduction and Aims

There is a high incidence of shoulder pain in manual wheelchair users that has been associated with increasing age and duration of wheelchair use. With increasing age, the shoulder joint is more prone to injury due to the biomechanical changes commonly caused by rotator cuff muscle degeneration. The aim of this study was to quantify biomechanical differences between younger and older participants during manual wheelchair propulsion. It was hypothesised that the older group would demonstrate kinetic differences (increased push rate and reduced push efficiency) and kinematic differences (increased change of inclination angle of the humerus and increased relative muscle activity) from the younger group.

Material and Methods

Two groups of 5 participants (younger and older) with no previous experience pushing a wheelchair completed a pushing test on a wheelchair ergometer. During the test, force imparted at the push rim was measured using the Sensewheel, an instrumented wheelchair wheel measuring with 6 degrees of freedom. The TrignoTM Electromyography system was used to record change in inclination of the humerus and shoulder joint muscle activity.

Results

The results demonstrated no significant difference between the groups in the kinetic parameters measured. The older group demonstrated a larger change in inclination of the humerus during the test, significantly so in the frontal plane ($P = 0.05$). Although not statistically significant, the older group demonstrated higher muscle activity during the test, particularly for the Anterior Deltoid and Infraspinatus muscles. Baseline external rotation muscle strength was strongly associated with normalised Infraspinatus muscle activity during the test across both groups ($P = 0.04$).

Conclusion

The older group achieved similar kinetic output as the younger group during the wheelchair test. To achieve this required a larger change in inclination angle of the humerus and greater normalised muscle activity around the shoulder. The demonstrated kinematic differences theoretically predispose the older group to shoulder injury during manual wheelchair propulsion.

16:35 - 17:10
Keynote 3 - Horsewell
Auditorium

Consumer initiatives in the comprehensive management of spinal cord injury: best practice and policy

J Horsewell

The role of SCI consumers in all aspects of SCI management has become more visible and more influential over the past decade. In Europe this has been marked by the establishment, in 2006, of a pan-European SCI consumer umbrella organisation, the European Spinal Cord Injury Federation (ESCIF). Following its mission "to improve the quality of life of people living with spinal cord injury throughout Europe", the federation has served to support the efforts of its member organisations to improve health and social service provisions for people living with SCI in their countries, and to promote the collaboration between SCI consumers and SCI professionals throughout Europe.

The major driving conviction behind ESCIF is that SCI consumers possess a unique insight into living with SCI that gives them knowledge and experience that can complement and benefit that of SCI professionals. Further, ESCIF believes that SCI consumers have not only the right but also the obligation to contribute their expertise to the comprehensive management of SCI; an area that was earlier the sole preserve of SCI professionals.

ESCIF has carried out a number of fact-finding investigations and projects designed to identify and formulate standards of best practice in SCI management from the perspective of SCI consumers. The conclusions of these studies have been posted as reports on the federation's website, but also presented at international conferences -- not least at earlier ISCoS meetings.

The ideas and practice of SCI consumer self-advocacy and empowerment is spreading throughout the world and, once again, this development is being driven and supported by contacts and co-operation within the SCI consumer community. The Global SCI Consumer Network was launched in 2012 and, although this network is still in its infancy, it has created and consolidated ties between consumer groups both within and between world regions.

The final "frontier" for SCI consumers is, perhaps, that of SCI research. Traditionally, the role of the consumer in SCI research has been that of "respondent" or "subject" ... In-keeping with the more active role of consumers in other areas of SCI management, SCI consumers are now demanding a role as active stakeholders who should be involved in prioritising research areas as well as the design of specific projects.

In conclusion, it may be enough to quote the (now) widespread slogan of the international disability community "Nothing about us without us".

17:10 - 18:40

Workshop 5 - End of life decisions in spinal cord injury: a consumer right to have a choice?) Tuesday PM Auditorium

End of life decisions in spinal cord injury: a consumer right to have a choice?

C Kiekens¹; G Jacquemin²; M Post³; A van Nunen¹; A Viaene¹; A Scheel-Sailer⁴

¹Belgium; ²Canada; ³Netherlands; ⁴Switzerland

An overview of the Belgian (and Dutch) legal framework for euthanasia (and in the Netherlands also medically assisted suicide) applicable since 2002

A van Nunen, Belgium

Different cases of SCI patients in Belgium with a request for termination of life, including a case of suicide

A Viaene, Belgium

The legal framework in Switzerland, where medically-assisted suicide is legalised conform with Swiss regulations with the right for self-determination

A Scheel-Sailer, Switzerland

Round Table

Chair: Charlotte Kiekens, Belgium

Panel: G Jacquemin, Canada

Panel: M. Post, The Netherlands

Panel: A van Nunen, Belgium

Panel: A Viaene, Belgium

Panel: A Scheel-Sailer, Switzerland

17:10 - 18:40

Oral Session 6: Sexuality Tuesday PM
Brussels Room

Are surgical sperm retrieval techniques necessary in men with spinal cord injury and presenting with lower motor neuron lesions?

JG Previnaire¹; JM Soler²; R Mieusset³

¹Centre Calve, Fondation Hopale, 62600, France; ²Centre Bouffard-Vercelli, Cerbere, France; ³CHU Toulouse, Toulouse, France

Introduction and Aims

Semen alterations in men with supraconal spinal cord lesion (SCL) are characterised by normal sperm concentration but extremely impaired sperm motility and viability. These alterations seem to occur in the first weeks post injury. Assisted reproductive techniques are often required when these men with chronic SCL start a parental project. However, very little is known about sperm characteristics in men with lower motor neuron lesions (LMN). These lesions occur after infarction of the artery of Adamkiewicz which arises from the aorta, usually between T9 and L2, and is responsible for most of the supply to the lower cord.

Material and Methods

Only men with LMN lesions and anejaculation were included. Penile vibratory stimulation (PVS) was first performed in all. In case of persistent anejaculation, PVS was then performed at a week interval on midodrine, with increased dosage starting from 7.5 mg, up to 30mg. Prior to the PVS procedure, the patient was catheterised to completely empty the urine. A buffering medium was then instilled into the bladder. After the procedure the bladder was catheterised again to empty the retrograde fraction. All exams were performed at the assisted procreation centre (CECOS), CHU Paul De Viguier, Toulouse.

Results

74 consecutive SCL men were included. They all suffered a traumatic SCL, with fractures at the level of T12 or L1, and presented a motor complete LMN lesion (AIS A or B), with neurological levels of lesion at L2 or above (n=50) or below L2 (n=24). All patients were on intermittent catheterisation. Patients had a mean age of 37 years [range: 17-66], and a mean evolution time of 77 months [range: 10-355]. Ejaculation was obtained in 32 patients (43 %). Pure antegrade ejaculation was found in 7 patients, pure retrograde ejaculation in 19, and mixed antegrade and retrograde ejaculation in 6. When present, antegrade ejaculation was non projectile. Semen characteristics of 26 patients were analysed for a total of 53 samples (1 to 7 ejaculation per patient) representing 234 PVS sessions. Oligospermia was found in 91% of the ejaculates, and total necropermia in 65%. When present, the motility of the spermatozoa was diminished in 95%. Sperm cryopreservation was possible and proposed in only 7 patients out of 26.

Conclusion

In SCL patients with chronic LMN lesions, the ejaculation is difficult to trigger. The semen quality obtained with PVS was much poorer than in supraconal spastic patients, and allowed cryopreservation in only a minority of patients. Further studies are needed to assess whether, at a chronic stage, a better sperm quality can be obtained with surgical sperm retrieval than with ejaculation. If not, sperm retrieval in the early stage should be considered necessary in this specific population of men with SCL.

Survey of sexuality issues in community-residing people with spinal cord damage in Australia

PW New; K Currie

Rehabilitation Services, Caulfield Hospital, Alfred Health, Caulfield, Australia

Introduction and Aims

Sexuality issues are recognised as an important priority for patients with spinal cord damage but tend to be neglected in research and clinical programs. Spinal cord myelopathy (SCM) due to non-traumatic spinal cord damage is believed to be more common than traumatic spinal cord injury (SCI) in many countries. However, SCM patients tend to be less well studied. The objective of this project is to present the results from a national survey of community-residing people with spinal cord damage, and to compare the results to a sample of non-disabled controls.

Methods

A comprehensive questionnaire was developed after literature review, feedback from people with spinal cord damage and clinical experts in the field. The questionnaire included questions about demographic characteristics, quality of life (International Spinal Cord Society [ISCoS] Dataset), frequency of different sexual activities, sexual desire, partner and relationship issues, and the occurrence of any episodes of sexual abuse. Patients with SCI and SCM also had the following collected: ISCoS core dataset, aetiology of spinal cord damage, functional abilities, Spinal Cord Secondary Conditions Scale, ISCoS sexuality datasets, sexual disability and body esteem, and sexual education needs. Questionnaire was completed between September 2013 and April 2014.

Results

Up to 31/1/2014 the questionnaire was completed by 179 non-disabled controls, and 109 people with spinal cord damage (SCM=39, SCI=70). Most respondents were female (n=167, male=122, transgender=1), and the median age of all respondents was 40 years. 81 people were never married, 166 were married or in a defacto relationship, 7 were widowed and 33 separated or divorced. Most (n=266) people described themselves as exclusively heterosexual, 10 were gay or lesbian and 12 were bisexual.

Most people (n=107) with spinal cord damage were more than 1 year post-damage and had paraplegia (n=61). Most (n=55) people reported they received no education or information regarding sexuality or sexual health during their inpatient rehabilitation and most (n=73) reported that they would have liked to have had more information regarding sexuality during their inpatient rehabilitation. Most (n=81) people with spinal cord damage reported that their sex life was worse compared to pre-morbidly. Most (n=81) reported sexual dysfunction due to the spinal cord damage -- most commonly due to inability to achieve orgasm (n=47), absent erections (n=47), and inability to ejaculate (n=40). Most people (n=96) had a sexual partner since their spinal cord damage. Detailed analysis of results will be conducted after completion of the data collection, including sub-group analyses.

Conclusions

There is scope to improve the education provided to people with spinal cord damage during rehabilitation and this may improve aspects of their sexual functioning and satisfaction.

Effects of anticholinergic agents on efficacy of penile vibratory stimulation to obtain ejaculation in spinal cord injured males

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Hypothesis and Aims of Study

In spinal cord injured (SCI) males use of antimuscarinics and injection of botulinum toxin in the detrusor are the suggested treatments to treat neurogenic detrusor overactivity (NDO). Penile vibratory stimulation is the first line treatment in neurogenic anejaculation. In a previous evaluation we found a reduction of success rate of PVS in detrusor areflexia induced by anticholinergic agents. The aim has been a prospective study of success rate of PVS related on treatment of OAB in SCI males patients.

Study Design, Materials and Methods

120 SCI males with NDO due to upper motor neurolesion (UMNL) and anejaculation were submitted from september 2005 to april 2013 to PVS inside our protocol for sexual rehabilitation after SCI. All the patients were under treatment by antimuscarinic drugs or submitted to botulinum toxin injection into detrusor muscle. All patients were submitted to two PVS test, during the period of maximal effect of the treatment of NDO as first line treatment to obtain anterograde ejaculation using Ferticare personal System with a frequency of 90 Hz or more and amplitude between 2.5 and 3 mm. All patients that obtained anterograde ejaculation were submitted to spermiogram. In front of failure of the test, on answer and consent of the patient, we adopted as method of surgical sperm retrieval a testicular sperm extraction (TESE) with crioconservation.

Results

Ejaculation by PVS was obtained only in 21 patients (17%). In 15 patients non responders we repeated the PVS test at appearance of NDO before retreatment with botulinum toxin in front of reappearance of NDO. In these cases we obtained anterograde ejaculation with good fertilization potential.

Interpretation of Results

Use of PVS represents the first step in our neuroandrological program to restore ejaculation and to obtain good quality material: the method is simple and cheap. In the past literature related on this procedure referred higher success rate than what is today obtained. The observation is that concomitant use of antimuscarinic drugs and/or botulinum toxin into detrusor has high potential to reduce the effect.

Concluding message

In front of these observations today in our protocol is mandatory to inform the patient about this situation related on a multidisciplinary approach of sacral area dysfunctions in SCI . To achieve better results with PVS before a program of surgical sperm retrieval it's possible to temporary reduce antimuscarinics or to try before botulinum toxin reinjection.

Need, use and provision: the providers' perspective on healthcare services for women with SCI during pregnancy and childbirth

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Introduction and Aims

A growing number of women with spinal cord injury (SCI) decide to become mothers. During pregnancy, women with SCI need and use different healthcare services. The few studies examining the use of healthcare services by disabled women have identified physical and non-physical barriers in accessing services. Physical barriers include inaccessibility to enter into practices or not having appropriate equipment. Non-physical barriers relate to lack of knowledge about disability, attitudes about disability and unfamiliarity in treating women with disabilities. There is a lack in research about how the needs of pregnant woman with a disability are accommodated. In this study, we examine the use of healthcare services by women with SCI during pregnancy and childbirth from the perspective of the service providers.

Material and Methods

A qualitative study using individual key informant interviews was conducted. Healthcare professionals (e.g. gynecologists, obstetricians, midwives) who have supported women with SCI through pregnancy and childbirth participated. Interviews were audiotaped and transcribed verbatim. The transcribed text was analyzed using qualitative content analysis based on the behavioral model for health service use by Andersen (1995).

Results

Interviewees noticed a number of barriers for pregnant women with SCI in using healthcare services, which included inaccessibility to facilities, unsuitable equipment, healthcare provider's lack of knowledge about SCI, and limited information tailored to women's needs. Furthermore, some health providers were surprised that women with SCI wanted to give birth spontaneously. Most healthcare professionals valued the experience of supporting a woman with SCI through pregnancy and childbirth, and stressed the importance of patient-provider communication.

Conclusions

A substantial portion of the healthcare providers, e.g. gynecologists, obstetricians, midwives and anesthesiologists, had no previous knowledge of the medical needs of women with SCI during pregnancy and childbirth. The gaps in knowledge about pregnancy and reproductive healthcare needs of women with SCI should be addressed in order to optimize existing services.

FMRI changes during sexual stimulation in women with SCI versus able-bodied women: a pilot study

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Introduction and Aims

Laboratory studies have documented the impact of various levels and degrees of spinal cord injuries (SCIs) on human female sexual responses. Similar responses have been elicited in models of spinal cord injured animals. In laboratory studies, psychogenic genital responses which are under sympathetic control have been found to correlate with the preservation of pinprick and light touch sensation in the T11 dermatomes whereas reflex genital arousal responses and orgasm have been correlated with an intact sacral reflex arc. These reports, however, have not been substantiated with real time imaging in humans. In light of this, the aim of this pilot study was to determine the feasibility of using fMRI of the spinal cord to identify activity in the lumbosacral spinal cord during sexual responses in able-bodied women and whether alterations in this activity could be discerned in women with SCIs.

Material and Methods

Subjects: Two women with C5 AIS D SCIs, one with T10 AIS A SCI; 9 female control subjects. Human subjects approval and consent was obtained for all subjects. **Methods:** Functional MRI of the lower thoracic, lumbar and sacral spinal cord was performed using a 3T whole-body MRI system. Subjects underwent three sexual stimulation protocols: Psychogenic erotic audio-visual stimulation, reflex self-stimulation and combined psychological and physical stimulation. The psychogenic and reflex protocols included beginning and ending 1.5 minute baselines. The psychogenic protocol included two 5 minute epochs with erotic audiovisual stimulation with an interspersed 3 minute rest. The reflex protocol include two 1.5 minute stimulation periods and a 1.5 minute rest. During combined stimulation participants viewed films and then self-stimulated for 20 minutes or until orgasm was achieved. Due to the potential for artifact, images acquired during orgasm were excluded from the analysis.

Results

During AV stimulation subjects with AIS D injuries both had positive fMRI responses in the area of the intermediolateral columns (IML) while only 1 subject had activity in area of the dorsal commissural nucleus (DCN) of the thoracolumbar cord. In the subject with the T10 AIS A lesion, there was no activity in either area. During combined stimulation, thoracolumbar responses were similar between all three SCI subjects but sacral cord responses differed greatly across patients and as compared to healthy controls.

Conclusion

Results prove feasibility and provide in-vivo demonstration of sexual responses in the injured and intact spinal cord through the use of spinal fMRI. Key regions involved in the central nervous system control of sexual arousal were identified and results are consistent with those observed in animal and human studies of sexual responses. Future studies using this technology and its potential to assess neuroplasticity associated with various treatments are warranted.

Women's experience of sexuality after the occurrence of non-traumatic spinal cord injury

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Introduction and Aims

A healthy sexuality is recognised as a human right and yet it is often neglected in research and rehabilitation after spinal cord injury. The incidence of spinal cord injury from non-traumatic causes (NTSCI) is frequently greater than traumatic causes (TSCI) and is a condition commonly associated with chronic medical conditions and older ages. The incidence of NTSCI is increasing with population aging and given women's longer life expectancy, it is expected that the numbers of women with NTSCI will increase in the future.

Research has predominantly focused on TSCI, male sexuality and biomedical factors, while little is known about psychosocial factors despite indications of their greater importance. The transferability of knowledge on sexuality between the conditions is not known as there are significant differences between TSCI and NTSCI in aetiology, demographics and outcomes, with functional outcomes for NTSCI generally better than for TSCI. Furthermore given women's positioning at the nexus of limiting culturally constructed notions of ageing, disability and sexuality, research is particularly needed to explore sexuality for women with TSCI.

This research thus explored how women experienced and conceptualised sexuality after NTSCI with the aim of gaining insight into the experience of sexual adjustment.

Materials and Methods

Participants were twelve females with a mean age of 67.8 years, who had experienced damage to the spinal cord from causes other than trauma. Qualitative data were collected via semi-structured face-to-face interviews of conducted in July to September 2013. Data were analysed using thematic analysis.

Results

Several major themes typifying participants' experiences of sexuality were identified: While sexuality after NTSCI occurred in a context of disrupted normality its importance was clear and there were common or significant barriers to sexual adjustment as well as factors that facilitated it. Within both the barriers and facilitators of sexual adjustment the impact of physical impairment and regained functionality was significant but the effect of social constructs regarding sexuality, disability, gender and aging were more profound, with rigid adherence to norms by participants and others typically serving as barriers while flexible norms served to facilitate sexual adjustment.

Conclusion

These findings have clear implications for sexual rehabilitation services to recognise the importance of sexuality to women, to be informed by the influencing factors identified in this study and thus provide sexual rehabilitation services in ways which better support women's sexual adjustment after SCM

17:10 - 18:40

Oral Sessions 7: Physical Capacity & Fitness Tuesday PM
Paris Room

Ischemic preconditioning improves arm-crank exercise performance in spinal cord-injured individuals through local mechanisms

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Introduction and Aims

Ischemic preconditioning (IPC) is originally described as a powerful intervention to protect the heart from damage after prolonged ischemia. The well-established cardioprotective effects of IPC are present locally, but also in remote areas (rIPC). Interestingly, recent studies revealed that IPC enhances exercise performance in able-bodied subjects. No previous study examined the impact of IPC in spinal cord injury (SCI). Therefore, we examined whether IPC applied to the arms can improve arm-crank performance in SCI subjects. Secondly, we examined whether IPC has remote effect on exercise performance, by studying whether IPC to the lower limbs (i.e. rIPC) improves arm-crank exercise performance in SCI.

Material and Methods

In a randomized, cross-over study, 10 SCI individuals (37±12 years) with a complete thoracic lesion (AIS A) reported 3 times to our laboratory. Subjects performed a maximal arm-crank test (10 W/min) on each occasion. In a randomised order, the arm-crank test was preceded by IPC (4X5-min 220mmHg bilateral arm occlusion), rIPC (4X5-min 220mmHg bilateral leg occlusion), or a control intervention (4X5-min 20mmHg bilateral leg occlusion). Maximal workload (in W), peak oxygen consumption (in ml/O₂/kg/min), peak respiratory quotient, maximal heart rate (in bpm), peak lactate concentration (in mmol/L), and perceived exertion (using a 6-20 BORG-scale) were examined. Paired Student's t- tests were used to examine whether IPC (IPC vs control) and/or rIPC (rIPC vs control) improves arm-crank exercise performance.

Results

IPC resulted in a significant increase in maximal workload (control: 96±22 vs IPC: 101±22 W; $P=0.046$). We found no difference between IPC and the control condition for maximum oxygen consumption (control: 23.3±5.1 vs IPC: 23.9±5.1 ml/O₂/kg/min; $P=0.42$). Further analyses revealed no significant differences between the IPC- and control-trial in peak respiratory quotient ($P=0.66$), maximal heart rate ($P=0.20$), peak lactate concentration ($P=0.36$) and perceived exertion ($P=0.28$).

When examining the rIPC, we found no differences between the rIPC and control-trial for maximal workload ($P=0.85$), maximal oxygen consumption ($P=0.42$), peak respiratory quotient ($P=0.09$), maximal heart rate ($P=0.79$), peak lactate concentration ($P=0.35$) and perceived exertion ($P=0.43$).

Conclusion(s)

This is the first study to examine the impact of IPC on exercise performance in SCI individuals. We found that IPC significantly improved maximal workload during an incremental arm-crank exercise test in SCI individuals, despite the lack of changes in oxygen consumption, lactate production and maximal heart rate. In contrast to IPC, we found no effect of rIPC on exercise performance. This suggests that the impact of IPC on exercise performance is likely regulated through localised, rather than remote mechanisms.

The effects of hybrid cycle versus handcycle exercise on metabolic syndrome, inflammation and visceral adiposity in people with spinal cord injury

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Introduction and Aims

The seriously inactive lifestyle observed in many people with spinal cord injury (SCI) is strongly associated with a high prevalence of risk factors for cardiovascular disease. Physical exercise training has been shown to have positive effects on these risk factors. The purpose of this study was to examine the effects of a hybrid cycle versus handcycle training program on metabolic syndrome, inflammatory status and visceral adiposity in people with long-term SCI.

Materials and Methods

Nineteen inactive wheelchair-dependent individuals (aged 28-65 years; age at onset SCI \geq 18) with paraplegia or tetraplegia for at least 9 years have completed this 16-wk multicenter randomized-controlled trial. The hybrid group (N=9) performed a hybrid cycle (functional electrical stimulation (FES)-induced leg exercise combined with voluntary arm exercise) training program, while the handcycle group (N=10) performed a handcycle program. Both groups trained twice a week, 30 min at 70% heart rate reserve. Outcome measures obtained pre and post the program were metabolic syndrome components (waist circumference, blood pressure, high-density lipoprotein cholesterol (HDL-C), triglycerides (TG) and insulin resistance), resting inflammatory status (C-reactive protein (CRP), interleukin-6 and -10 (IL-6 and IL-10), and visceral adiposity (trunk and android fat). Differences between pre and post measurements were examined using a two-factor (time x group) mixed measures ANOVA.

Results

Overall significant reductions were found for waist circumference (3.5%, $p=0.001$), diastolic blood pressure (7%, $p=0.03$), insulin (26%, $p=0.004$), homeostasis model assessment-estimated insulin resistance (HOMA-IR; 26%, $p=0.006$), CRP (16%; $p=0.05$), IL-6 (26%; $p=0.04$) and IL-6/IL-10 ratio (32%; $p=0.03$). In contrast, no significant main effects for time were observed for systolic blood pressure, TG, HDL-C, glucose, IL-10, and trunk and android fat. For all outcome measures, there were no significant differences between groups.

Conclusion

Since both the hybrid cycle and handcycle group showed similar positive effects on metabolic syndrome components and resting inflammatory status, there was no notable benefit of FES-induced leg exercise above handcycle training alone.

Nutritional status and body weight change of patient with spinal cord injury in Korea

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Introduction and Aims

Following spinal cord injury(SCI), wasting of muscle mass has been occurred due to several causes including denervation, disuse and metabolic change. It could provoke secondary complications so proper nutritional assessment and management are important. As body composition changed after SCI with increasing fat mass, rate of weight loss and conventional body mass index are not accurate to measure body composition. The purpose of this study is assess of nutritional status, weight change and body composition using bioelectrical impedance measurement in patient with SCI in Korea.

Material and Methods

Adult SCI patients were included who were admitted in department of physical medicine and rehabilitation in Severance hospital from April, 2013. Ideal body weight was estimated by Broca's index considering paralytic level. Laboratory data, weight and height were collected at admission, ideal body weight and nutritional requirement were calculated base on these data and a dietitian evaluated current amount of intake. Bioelectrical impedance was measured using the Inbody S10 multifrequency analyzer(Biospace).

Results

Total 87 patients were assessed. Weight loss rate after onset was -10.49 \pm 4.28% in male tetraplegic, -4.99 \pm 4.04% in male paraplegic, -1.69 \pm 4.78% in female tetraplegic and -0.65 \pm 4.90% in female paraplegic patients. Body fat proportion is 21.80 \pm 4.35% in male tetraplegic, 19.54 \pm 4.36% in male paraplegic, 29.45 \pm 4.11% in female tetraplegic and 28.45 \pm 4.35% in female paraplegic patients. Current calorie intake percentage compared with requirement considering paralytic level was 89.53 \pm 4.52% in male tetraplegic, 78.35 \pm 4.07% in male paraplegic, 139.04 \pm 4.94% in female tetraplegic and 106.19 \pm 4.08% in female paraplegic patients. Current protein intake percentage was 89.53 \pm 4.52% in male tetraplegic, 93.90 \pm 4.19% in male paraplegic, 91.89 \pm 4.52% in female tetraplegic and 87.62 \pm 4.21% in female paraplegic patients. 32.1% of patients were classified as "overweight" using the standard calculation for body mass index(BMI) and 50.6% of subject were categorized into "over-fat" according to body fat proportion. The correlation (Pearson's r) between the BMI and the body fat proportion was 0.395(p=0.000).

Conclusions

As improper nutrition is one of the major factor for increasing morbidity and complications, nutritional assessment and education should be done in early stage of injury. According to our study, the rate of weight loss is higher in male patients than female (p=0.001) and the neurologic injury level was associated with the rate of weight loss (p=0.002). Comorbidity and the occurrence of complications did not affect the body weight reduction rate. The conventional BMI did not reflect body fat composition accurately. Regular analysis of body composition and modulating of nutrition and exercise program are needed.

Physical capacity of persons with a spinal cord injury for at least 10 years

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Introduction and Aims

A good physical capacity is important for people with a spinal cord injury (SCI) since it is positively related to e.g. performing activities, returning to work, and quality of life. Not much is known about the physical capacity of people living with a SCI for at least 10 years. Therefore, the purpose of this study was to study the impact of time since injury (TSI) on the physical capacity of persons with SCI for at least 10 years.

Material and Methods

Cross-sectional study. Persons with SCI (N=208) in three strata: 10-19, 20-29 and 30 years or more after SCI, age at injury 18-35 years and dependent on a wheelchair for longer distances. All participants were screened for contraindications to perform a graded wheelchair exercise test. Physical capacity (peak power output (POpeak) and peak oxygen uptake (VO2peak)) were assessed on a wheelchair treadmill. The effect of TSI on physical capacity in people with a tetraplegia and paraplegia was studied with an one-way ANOVA (TSI strata) and linear regression analyses (TSI in years) with correction for lesion and personal characteristics as possible confounding factors.

Results

Of the participants, 25% was not able to perform the exercise test mainly due to not being able to use a hand rim wheelchair or contraindications. Non-participants in the exercise test (N=52) were significantly older (51 ± 9 vs. 48 ± 8 years, $p=0.04$), had a longer TSI (27 ± 10 vs. 24 ± 8 years, $p=0.03$), had more often a motor complete lesion (88% vs. 76%, $p=0.05$), and tetraplegia (76% vs. 55%, $p=0.01$). In the group with tetraplegia, no significant differences were found between TSI strata in VO2peak (10-19yrs: 1.1 ± 0.5 l/min; 20-29yrs: 1.3 ± 0.4 l/min; >29yrs: 1.1 ± 0.4 l/min, $p=0.40$) or POpeak (10-19yrs: 40 ± 25 W; 20-29yrs: 42 ± 22 W; >29yrs: 45 ± 27 W, $p=0.83$). This is in contrast with the group with paraplegia, which showed a significant difference in POpeak between TSI strata (10-19yrs: 68 ± 24 W; 20-29yrs: 67 ± 25 W; >29yrs: 62 ± 23 W, $p=0.03$) but not in VO2peak (10-19yrs: 1.7 ± 0.6 l/min; 20-29yrs: 1.5 ± 0.5 l/min; >29yrs: 1.3 ± 0.2 l/min, $p=0.07$). After controlling for confounders, no significant associations were found for the group with tetraplegia. In the group with paraplegia, TSI was significantly associated with POpeak ($p=0.001$) and VO2peak ($p=0.002$), after controlling for confounders. Those with the longest TSI had the lowest POpeak and VO2peak.

Conclusion

TSI did not seem to have an effect on the physical capacity of people with a tetraplegia, which might be explained by the high percentage of people with a tetraplegia that was not able to perform the exercise test. In people with paraplegia the physical capacity was significantly lower in those with a TSI longer than 30 years, indicating that the group with a long TSI needs extra attention to keeping them fit.

Multidimensional fatigue during rehabilitation in individuals with recently acquired spinal cord injury

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Introduction and Aims

Fatigue (especially multidimensional fatigue) is an under-rated and under-reported issue for patients with a recently acquired spinal cord injury (SCI). Therefore, the first objective of this study is to assess multidimensional fatigue in SCI patients in post-acute rehabilitation, and determine the association of multidimensional fatigue with demographics, SCI related variables, and adjustment. The second goal is to describe course of fatigue during the rehabilitation phase. Finally the changes in fatigue during post-acute rehabilitation are related to demographic, SCI-related variables and the adjustment variables.

Material and Methods

In this longitudinal cohort study, 70 participants (90% of eligible patients) completed self-reported questionnaires at admission, and in the week before discharge. Questionnaires used assessed demographics, SCI related variables, multidimensional fatigue (subjective experience of fatigue, cognitive and emotional aspects of fatigue and the physical activity level), and psychological adjustment. Stepwise regression analysis on the dimensions of fatigue were computed to determine the proportion of variation explained adjustment indices. Differences between fatigue scores at admission and discharge were computed and related to the adjustment variables.

Results

Fatigue scores are very high at admission for all dimensions of fatigue. Demographic variables were weakly associated with subjective fatigue and concentration fatigue (13% and 16% explained variance respectively). SCI related variables were moderate associated with the same subscales (22% and 16% respectively) of which pain was the most important. Adjustment explained the largest proportion of variance on each of the fatigue subscales (ranging from 29 to 52%). Stepwise regression showed diverging associations between the different dimensions of fatigue with adjustment measures. Fatigue decreases significantly between admittance and discharge from the rehabilitation ward. The change in fatigue scores can best be predicted by anxiety at discharge for all fatigue scales except for motivation, in which case depression at admission explains the largest proportion of the variance.

Conclusion

Different aspects of fatigue can be distinguished. These aspects do have different patterns of correlations with the adjustment variables, which change over time. At both measurements the psychological aspects explain a large proportion of the variance of fatigue. At discharge the importance of the affective adjustment variables, especially that of anxiety, increase. Level of fatigue is very high at the start of the rehabilitation, it decrease during rehabilitation but stays significant higher than that of healthy subjects.

Effects of wearing a cooling vest during exercise on thermoregulation of spinal cord injured individuals

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Introduction and Aims

Individuals with a spinal cord injury (SCI) have a disturbed thermoregulation, which is partly due to the loss of sympathetic regulation below the lesion. Therefore, SCI individuals show a larger increase in core body temperature (T_c) skin temperature (T_{skin}) above the lesion compared to able-bodied controls during exercise. Cooling strategies may be beneficial to reduce the thermophysiological strain for SCI individuals. Therefore, the aim of this study was to examine the effects of a cooling vest on thermoregulatory responses of SCI individuals during sub-maximal exercise in the heat.

Material and Methods

Seven men (26-54 years) with a low lesion (T5<) were included to participate in this randomized cross-over study. Subjects performed a maximal arm-crank exercise test, followed by two 45 minute sub-maximal arm-cranking exercise tests (with and without cooling vest, in randomised order) at 50% of maximal power output and an ambient temperature of 25°C. During submaximal exercise, we continuously measured T_c (ingestible pill + telemetry), T_{skin} (skin thermistors at 10 places, divided into upper and lower body skin temperature), and heart rate (Polar chest band). Moreover, ratings of perceived exertion (RPE) and thermal comfort were asked every 3 minutes.

Results

Exercise resulted in an increased T_c, upper body T_{skin}, heart rate, RPE and thermal comfort (all $p \leq 0.01$). The cooling vest effectively decreased upper body T_{skin} temperature ($P < 0.01$), increased the core-to-skin temperature gradient ($P < 0.01$) and resulted in a lower thermal comfort score ($P = 0.02$). However, the cooling vest did not impact on T_c, heart rate, lower limb T_{skin} and RPE responses during exercise (all $P > 0.05$).

Conclusion(s)

Wearing a cooling vest during arm-crank exercise in SCI individuals effectively lowered upper body T_{skin}, and improved thermal comfort score during exercise. Nonetheless, we found no evidence that the cooling vest reduced thermophysiological responses under temperate ambient conditions.

17:10 - 18:40

Oral Sessions 8 (Free Communication: General) Tuesday PM
Berlin/Cop Room

The effect of sleep apnoea severity on neuropsychological function in people with acute quadriplegia and obstructive sleep apnoea

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Introduction and Aims

Obstructive sleep apnoea (OSA) is highly prevalent following spinal cord injury (SCI). OSA is known to impair many areas of neuropsychological function in both able-bodied and chronic SCI patients. The aim of this study was to investigate the effect of OSA severity on neurocognitive performance, mood and quality of life, in patients with acute quadriplegia and OSA.

Material and Methods

105 acute quadriplegic patients (95 male) aged 18-85 years ($M=45.61$, $SD=16.30$) participated across 10 international sites. An overnight sleep study and neuropsychological (NP) testing was performed on average 60.64 days since injury ($SD=39.30$, $range=5-187$). NP testing assessed attention and information processing (paced auditory serial addition task (PASAT), symbol digit modalities test (SDMT)), memory and learning (rey auditory and verbal learning task (RAVLT), digits forwards (DF) and digits backwards (DB) subtests of the WAIS), mood (hospital anxiety and depression scale (HADS), profile of mood states (POMS)) and quality of life (assessment of quality of life (AQoL)). Univariate linear regressions were performed to investigate the variability in neuropsychological function explained by OSA severity (quantified with the apnoea hypopnoea index (AHI)). Subsequent multivariate stepwise linear regressions were performed to include the following covariates: age, premorbid intelligence (NART), gender, body mass index (BMI), days since injury, likely OSA prior to injury (MAPI), and sedative medication use.

Results

AHI was associated with performance on the PASAT ($p<.001$), SDMT ($p<.05$), RAVLT immediate recall ($p<.05$), DF-WAIS ($p<.005$) and DB-WAIS ($p<.05$). In models including AHI and all covariates, OSA severity remained a significant predictor for performance on the PASAT (AHI $B=-20.19$; NART $B=1.26$; Age $B=-0.74$; *adjusted R² 20%*; $p<.001$) and DF-WAIS (NART $B=0.06$; AHI $B=-0.94$; *adjusted R² 14%*; $p<.001$). Age and premorbid intelligence were frequent and significant contributors to neuropsychological performance across memory, learning, attention and information processing.

Conclusions

Sleep apnoea severity was associated with attention and information processing performance, and tests of memory that involved immediate recall and information processing. More severe OSA was associated with poorer performance. Including covariates in the models highlighted the importance of premorbid intelligence and age. Higher premorbid (pre-injury) intelligence and being younger appeared to lessen the effects of sleep apnoea on performance, however these protective factors were insufficient to counter the damage done to attention, immediate recall and information processing by OSA. These findings have important implications for neuropsychological functioning and skill acquisition during rehabilitation. This project is proudly supported by the Transport Accident Commission. Additional support provided by the National Health and Medical Research Council (scholarship 616605).

16:46

Women with spinal cord injury in Bangladesh

A Aziz

Handicap International, Bangladesh, Bangladesh, United Kingdom

Objectives

The purpose of the study is to explore family & social attitudes towards women with spinal Cord Injury in Bangladesh and to discover the challenges that women with Spinal Cord Injury face in their family, in their conjugal life and in their community.

Methodology

To conduct this study a qualitative methodology was selected to explore the lived experience of women who have experienced with spinal cord injury; thirty eight subjects were selected through convenience sampling from CRP, Mirpur, Dhaka & also from home visits at Manikgong & Norshingdhi. Data was collected through face to face, semi-structured interview. Interviews were transcribed and field notes had been taken to record non-verbal observations). Data was analyzed using a thematic coding system.

Result

After reviewing the data from women with Spinal Cord Injury in Bangladesh, it is evident that family, social and physical barriers play a vital part in restricting their re-integration into mainstream education and paid work. In Bangladesh, women with disabilities are considered as economically unproductive and socially unacceptable. Problems arise in marriage & conjugal life due to culturally accepted superstition, folk believes and dowry system. As a result women with spinal cord injury are given lower priority in their own family & the community. It was found that this group of women experience both physical and emotional abuse.

Conclusion

The life of women in Bangladesh is such that survival is a way of life. Bangladeshi women are confined by the unfair, unjust and undue freedom of male members of their families. There has been much talk about improving the downtrodden position of women, equal rights for women, and so on. But still there is far cry from anything like equality. Of course many development Organizations are rendering services to this group. So, if these organizations remain patient, one day this dream become reality. To establish their (women with spinal cord injury) rights these organizations have to fight against the destructive dowry system, the primitive judicial system and traditional superstition, folk belief because the victims of these underdeveloped systems are usually these women. Now it should be tried to find out the situation concerning women with disabilities in Bangladeshi society from some of the socioeconomic phenomena.

Responsiveness and minimally detectable differences of the GRASSP Version 1.0: a Canadian multi-centre study

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Introduction and Aims

GRASSP Version 1.0 is a clinical impairment measure designed specifically to assess the upper limb after traumatic cervical spinal cord injury (SCI). The GRASSP consists of 5 subtest scores that characterize the upper limb; it captures subtle changes in neurological impairment during the acute, sub-acute, and chronic phases of recovery. Psychometric properties of reliability (inter/test retest) and validity are well established.

Responsiveness and minimally detectable difference (MDD) testing is required to establish use in efficacy and interventional studies. Aims: 1) To develop responsiveness and MDD of the GRASSP, 2) To establish how the measure can be applied in clinical trials and interventional studies as a tool to define effectiveness of new therapies; and 3) To establish endpoints that may be useful in trials including participants with incomplete injuries.

Methods

A prospective longitudinal study including 55 individuals with acute traumatic cervical SCI was conducted as a multi-centre study. Serial testing consisted of GRASSP, International Standards for Neurological Classification for Spinal Cord Injury (ISNCSCI), Spinal Cord Independence Measure (SCIM), Capabilities of Upper Extremity Questionnaire (CUE) administered 0 to 10 days, 1, 3, 6, and 12 months post injury. Analysis: The standardized response mean (SRM) for GRASSP, ISNCSCI, SCIM and CUE were calculated for the 0 to 3, 6 and 12 month, pairs of data. Smallest real difference (SRD) was calculated for each subtest of the GRASSP. Pearson correlation coefficients were calculated to define concurrent validity across the recovery profile.

Results

SRM values for GRASSP strength and sensation scores were 0.20 to 0.30 larger than the related ISNCSCI SRM values at the (0 to 3, 6, 12 month pairs of data). MDD values for all subtests range between 2.76 and 9.23. Concurrent validity between SCIM/CUE and GRASSP range between 0.632 and 0.874 across the recovery profile.

Conclusion

SRM values and longitudinal construct validity demonstrate the responsiveness of GRASSP scores. MDD values determine that a change in unilateral strength of more than 5 points, sensation more than 3 points and prehension more than 3 points is the result of clinical change and not error. Subtleties that the GRASSP characterizes are valuable in determining change over time; optimizing the field's ability to detect new efficacious treatments specific to traumatic tetraplegia.

Funding and Acknowledgements

Ontario Neurotrauma Foundation, Rick Hansen Institute, Physiotherapy Foundation of Canada, Canadian GRASSP Longitudinal Study Group.

Spinal cord injury rehabilitation and mental health (SCReaM)

NAL Warner; A Gall; G Ikkos

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Introduction and Aims

There have been recent concerns that those with combined mental-health disorders (MHD) and long-term physical health conditions have poorer clinical-outcomes. In the Spinal Cord Injury (SCI) population, there is a relatively high prevalence of pre-existing MHD due to the link between SCI and suicide-attempt. The aim of the study was to investigate whether people with pre-existing MHD do improve during rehabilitation following a SCI and whether people with pre-existing MHD have poorer outcomes from SCI rehabilitation than those without pre-existing MHD.

Material and Methods

Rehabilitation-outcomes of those discharged from the London SCI Centre (LSCIC) from April 2007 to April 2013 with a pre-existing MHD were investigated. A retrospective matched case-control study was used to compare the Spinal Cord Independence Measure (SCIM) between those with a SCI and pre-existing MHD and those without. We matched patients by gender, level of injury and ASIA impairment grade, age and year of injury. ISCOS core data was collected and analysed. MHD was categorised using ICD-10 categories. The outcomes were also compared to published expected outcomes (Aidinoff et al (2011)).

Results

64 cases were identified and matched. There were 42 males and 22 females. The mean age of cases was 48 years. The most common cause of injury was fall. Primary psychiatric diagnoses were: Major affective disorder (20), alcohol-related disorder (16), substance misuse (3), anxiety, stress-related and somatoform disorder, schizophrenia (6) and non-affective psychosis (9), personality disorder (4) and self-harm (6). The study found that overall those with MHD improve during SCI rehabilitation and that benefit is as great as for those without MHD. Furthermore, the outcomes were favourable when compared to published expected outcomes. However, those with complete injuries, paraplegia, anxiety as a co-morbidity and schizophrenia or non-affective disorder as a primary psychiatric diagnosis had poorer than expected outcomes. We also found a significant difference in discharge destination; almost all controls were discharged to private-residence compared to just under half of those with a pre-existing MHD.

Conclusions

The study demonstrates the effectiveness of rehabilitation in those with pre-existing MHD and justifies the additional mental health resources needed. Our results demonstrate similar functional outcomes suggesting it may be the mental health needs that contribute to the difference in discharge- destination. Clinicians and commissioners should be aware of these findings to ensure that patients with MHD have full access to this service. It will be beneficial to further study and understand factors influencing discharge and discharge destination for this patient group.

Psychometric evaluation of the spinal cord Independence Measure-III

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Introduction and Aims

To evaluate the discriminate validity and the precision of the Spinal Cord Independence Measure-III (SCIM-III) in youth with spinal cord injury (SCI).

Methods and Material

Cross-sectional multi-center study of 108 youth with chronic SCI. The SCIM-III, Functional Independence Measure (FIM) and FIM+5 were administered to 108 youths with SCI ranging between 4 and 21 years of age. Discriminant validity was evaluated by comparing differences in mean scores between youths with paraplegia and tetraplegia and complete and incomplete injuries. Coefficient of skew for the SCIM-III was calculated and evaluated to coefficient of skew for the FIM and FIM+5.

Results

Statistically significant differences were found in mean SCIM-III scores between children with paraplegia and tetraplegia ($p=0.0006$) and between children with complete and incomplete injuries ($p=0.0026$), providing preliminary evidence of discriminant validity. Differences in mean SCIM-III scores among American Spinal Injury Association Impairment Scale (AIS) categories were statistically significant ($p<0.0001$) for AIS A and D, AIS B and D and, AIS C and D but not for AIS A and B ($p=0.963$), AIS A and C ($p=0.5480$) or AIS B and C ($p=0.6259$). The distribution of FIM and FIM+5 scores were skewed to the left indicating that more scores fell at the high end of the scales. In contrast, the distribution of the SCIM-III showed less skew, indicating that the majority of scores fell within the middle of the scale with fewer scores at the extreme ends of the scale. Values for Coefficient of skew for the FIM and FIM+5 were .67 (.65-.70) and .75 (.73-.78), respectively. The SCIM-III had the lowest coefficient of skew at .53 (.50-.55). These results suggest minimal ceiling (2%) and floor effects (2%) for the SCIM-III.

Conclusion

This is the first report on the psychometric properties of the SCIM-III in youth. Results suggest that the SCIM-III has good discriminate validity for paraplegia and tetraplegia but not for discriminating among AIS A,B and C. The SCIM-III has an item content range across the spectrum of functional ability. Further work is needed to determine the appropriateness of SCIM-III items for children and to establish reliability and responsiveness of the scale.

Caring for the caregivers: wellbeing in adults with spinal cord injury in comparison to their caregivers

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Introduction and Aims

The sudden onset of a spinal cord injury (SCI) presents significant challenges, not only for the injured person, but also for family members and friends who often become caregivers. This may impact interpersonal relationships, roles, social and leisure activity, employment, psychological wellbeing and health-related quality of life (HR-QOL). Although HR-QOL has been frequently studied in persons with SCI, being shown to be associated with significantly diminished HR-QOL in dimensions such as vitality, physical functioning, bodily pain, general health, and so on, it has been less well investigated in the caregivers of those with SCI. The aim of this current study was to compare HR-QOL of the caregiver of the person with the SCI to the HR-QOL of persons with SCI or to able-bodied controls.

Materials and Methods

The Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) was used to measure HRQOL in adult people with recent SCI (n=88) and their caregivers (n=40), as well as a sample of able-bodied adults (n=30).

Results

Compared to the able-bodied controls, the SCI group as a whole had lower HR-QOL in most of the SF36 dimensions, including physical functioning, physical role, bodily pain, and social functioning with a trend for older age (65 years and above) to further adversely influence HR-QOL on some of the SF36 dimensions. In comparison to the able-bodied controls, caregivers were found to have lower HR-QOL in physical role, vitality, social functioning, emotional role and mental health. A trend existed in the group of older caregivers towards having worse HR-QOL in physical functioning and general health, however, in contrast tending towards having higher HR-QOL in the emotional role and mental health dimensions.

Conclusion

These findings have important implications for providing targeted strategies to care for caregivers as part of rehabilitation and follow up for adults with SCI.

Impact of electric muscle stimulation on orthostatic hypotension in persons with acute spinal cord injury

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Introduction and Aims

Orthostatic hypotension (OH) is defined as a decrease in systolic blood pressure (BP) of at least 20mmHg, or a reduction in diastolic BP of at least 10mmHg, upon the change in body position from a supine position to an upright posture, regardless of the presence of symptoms. The presence of OH as a consequence of blood volume redistribution during verticalisation is a common condition that affects 74% of the patients with spinal cord injury (SCI). Using electric stimulation (ES) of lower limb muscles was found to be effective in stabilizing BP during upright position in the early stage of SCI. However, the impact of ES of the abdominal muscles on BP during verticalisation in patients with SCI is unknown. Therefore, the aim of the study was to compare the impact of 3 different types of ES on BP stabilization and on the incidence of OH.

Methods

Women and men, at least 18 years of age, following an acute, traumatic SCI above T6, American Spinal Injury Association (ASIA) Impairment Scale A/B/C and a diagnosis of OH (by tilt table test) were eligible for the study. Each patient underwent randomly three different types of ES while being positioned on a tilt table. The following sessions were planned within 10 consecutive days: A) ES of the abdominal muscles, B) ES of the lower limb muscles (Mm. gastrocnemii, hamstrings, Mm. quadriceps), C) Combination of A and B, D) Control session (=diagnostic session). For the ES session "B" lower limb muscles were stimulated to produce a milking mechanism from distal to proximal, to pump the venous blood from the peripheral to the central part of the body. ES was applied with surface electrodes and fixed stimulation parameters (biphasic rectangular, 35Hz, 300µs pulse width) with individual mA, depending on each patient's sensibility. In each session, tilting progressed in 15° increments every three minutes, from 0° to 70°, except from 60° to 70°. Within each interval BP (systolic, diastolic, mean arterial pressure) was measured.

Results

A total of 14 patients (3 women, 11 men; median age: 30.0 years (21.5;42.7), median days post injury: 49.0 d (32.0;110.8) and a lesion level between C4 and T4) were recruited. BP (systolic, diastolic, mean arterial pressure) did not differ statistically significantly between the interventions A, B, C or D at any verticalisation-degree ($p > 0.05$). Although statistical significance was missed, BP was more stable within the sessions A, B, or C compared to D (e.g. up to 30% at a degree of 30°). In addition, independent of the type of stimulation A, B or C, patients reached a higher degree of standing with ES compared to the intervention D.

Conclusion

There seems to be a tendency to a clinical benefit of ES for the treatment of OH in individuals with SCI. With respect to limited time resources in clinical daily routine, ES of the abdominal muscles might be most feasible to stabilize BP during verticalisation.

Digital media use, participation, and quality of life among youth with spinal cord injury

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Shriners Hospitals for Children, Chicago, Chicago, USA

Introduction and Aims

While there is an abundance of information describing increased digital media use for typically developing youth, there is limited knowledge specific to youth with disabilities. This study examined digital media use among youth with spinal cord injury (SCI), and the relationship to participation and quality of life (QOL).

Material and Methods

Participants included youth ages 8-18 with SCI who were enrolled from three Shriners Hospitals for Children sites in the United States. Youth completed a project-specific questionnaire about their digital media use, the Pediatric Quality of Life Inventory, and the Children's Assessment of Participation and Enjoyment. Descriptive statistics were used to summarize use of digital media, and Pearson Correlation Coefficients were used to assess relationships between variables.

Results

Ninety-six youth participated: 65% were ages 13-18 (Overall Mean=13.8 years, SD=3.3); 58% male; 63% Caucasian. Youth had been injured an average of 6.7 years (SD=4.7), 68% had paraplegia, and 59% complete injuries (AIS A). Youth ages 8-12 reported sending a mean of 8 texts per day (median=0; range=0-80); and ages 13-18 a mean of 121 (median=25; range=0-1000), with 26% texting more than 5 hours per day. Youth spent at least 30 minutes each day using the following digital media: watching TV/movies (89% of youth ages 8-12/86% of youth ages 13-18), playing videogames (80%/50%), internet chatting (32%/52%), texting (17%/64%), on social network sites (17%/53%), talking on the phone (14% /30%), and emailing (0%/11%). Among all youth, playing more videogames was related to poorer social ($p=0.042$), school ($p<0.001$) and psychosocial ($p=0.005$) QOL; watching more TV/movies was related to lower psychosocial QOL ($p=0.024$); more internet chatting was related to decreased school QOL ($p=0.022$); and more time emailing was related to reduced physical QOL ($p=0.036$). Time spent internet chatting was related to participating in fewer activities ($p=0.037$). When looking at age groups separately, a pattern emerged in that increased digital media use among older youth was most consistently related to decreased school QOL, whereas increased media use among younger youth was related to decreased QOL in areas of physical, school, social, and overall psychosocial functioning.

Conclusion(s)

Youth reported spending a considerable amount of time daily on digital media, but increased participation in digital media was related to lower QOL in many areas. Digital media has become a core mechanism of communication, particularly among young people. Future research should identify appropriate amounts of digital media use for various age groups; such information can be used to provide youth and families with guidelines for healthy media use.

Support

Funded by Shriners Hospitals for Children, #9143.

17:10 - 18:40

**Workshop 2B: Analyzing factors influencing decision making in management of sub axial cervical and thoraco lumbar spinal injuries and proposing suitable treatment Tuesday PM
Colorado Room**

There is still no clear consensus on the optimal management of traumatic injuries of vertebral column which leads to spinal cord injury. There has been no prospective randomized control study so far in this field. The low level of evidence available is compounded by shortcomings in study design.

Management strategy differs from surgeon to surgeon with varying results. Decisions of conservative /surgical management, surgical approach, levels of fixations, need for decompression etc lacks uniformity.

Hence there is an urgent need for a universally accepted algorithm for management of sub axial cervical fractures.

In the proposed workshop, various factors to be considered for effective management of Sub Axial Cervical Spine injuries like fracture morphology, neurology etc will be discussed.

The current evidence for management of Sub Axial Cervical spinal injuries will be presented and prevailing controversies in this regard will be discussed in an effort to come to a consensus.

The findings of the study presently being done (protocol enclosed) to develop Spine Trauma Study Group's Treatment Algorithm for Management of Sub axial Cervical Spinal Injuries will be presented.

We hope that the deliberations will help the participants and the Spine Trauma Study Group to get a better understanding in the field. The deliberations will also be useful for improving the patients overall functional outcome and more importantly simplify and standardize the treatment protocols in management of Sub Axial Cervical injuries patients

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Wednesday, September 03, 2014

09:35 - 11:05

Oral Session 9 Physical Capacity/Fitness Wednesday AM
Auditorium

Peer support training program for individuals with spinal cord injuries in Greece: effects on motivation for exercise and functional ability in ADL

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Introduction and Aims

Incidence of traumatic Spinal Cord Injury (SCI) in Greece, mainly due to motor vehicle crashes, is amongst the highest in Europe. At the same time, Greece is still one of the few European countries, if not the only one, that manages SCI in a non-systematic haphazard way, despite recent clear evidence demonstrating the devastating effect on survival and other outcomes. Peer support programs in the form of short training camps is a wide spread concept around the world, often comprising an integral part of the system of care following SCI. Alli Opsi, a non-governmental organization in Greece has developed and conducted peer support training camps for people with SCI since 2007. Despite numerous anecdotal statements and strong testimonials on the effect of peer-support training programs being available, there is very limited scientific evidence about their actual effect on people with SCI. The purpose of the present paper is to present the effect of this program at the level of the participant's functioning as well as their motivation for exercise through the theory of Self Determination.

Material and Methods

All twenty participants of the training camp (16 men, 4 women) with SCI participated in the study (mean age 32.90 years) The neurological level was examined according to International Standards for Neurological Classification for Spinal Cord Injuries, and the level of functioning according to the Spinal Cord Independence Measure (SCIM) III. The Behavioural Regulation in Exercise Questionnaire II - BREQ II was used to examine the level of self-determination for exercise. Assessment was performed at the start of the program, at the end and 3 months after the completion.

Results

Non parametric and parametric analyses showed statistically significant improvement in all three basic themes of SCIM III at completion and three months after the end of the training camp as compared to the baseline assessment. However there was not any significant improvement of the level of self-determination for exercise between the measurements.

Conclusions

The present study pointed out the positive effect of the peer support training camp «Alli Opsi» in improving functional level of individuals with SCI. Such evidence could encourage the conduction of larger multi-national studies, the expansion of such programs and their integration into health services for individuals with SCI.

Prevalence of low inspiratory muscle strength during inpatient spinal cord injury rehabilitation

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Introduction and Aims

Spinal cord injury (SCI) often affects respiratory muscle function. Low inspiratory muscle strength (IMS) may predispose to hypoventilation, reduced lung and chest wall compliance, atelectasis, pneumonia, and eventually respiratory failure. Nevertheless, low IMS can go unnoticed and therefore untreated. The aim of the present study was to determine the prevalence and possible predictors of low IMS in those persons with SCI who have impaired lung function.

Material and Methods

This study was conducted in 4 SCI-units in the Netherlands. Forty persons (35 men and 5 women) with SCI above Thoracic 12 who had impaired lung function (forced expiratory volume in one second < 80% predicted) were included. Fifteen persons had motor complete tetraplegia, 15 incomplete tetraplegia, 9 motor complete paraplegia, and 1 incomplete paraplegia. Mean (SD) age was 46.8 (14.3) years and median [IQR] days after injury 79.5 [58-112]. IMS (determined by maximal inspiratory pressure at the mouth: MIP) was measured 4 weeks after the start of active rehabilitation or shortly after removal of the trachea stoma. Low IMS was defined as MIP ≤ 60 cmH₂O. Normal IMS was defined as MIP > 60 cmH₂O.

Results

Mean (SD) MIP was 56.2 (26.2) cmH₂O. Twenty-four (60%) persons had low IMS. Of these, 8 persons had complete tetraplegia, 11 incomplete tetraplegia, 4 complete paraplegia, and 1 incomplete paraplegia. Persons with low MIP were significantly older (52.3 versus 38.7 years) and had significantly lower forced vital capacity (2.5 versus 3.5 liter) than persons with normal IMS. Those with low IMS did not differ from those with normal IMS with respect to lesion level, lesion completeness, history (chest or lungtrauma, or mechanical breathing support), or self-reported limitations in respiratory function.

Conclusion

The prevalence of low IMS in persons with SCI who have impaired lung function during inpatient rehabilitation was high. Older persons and those with worse lung function were at increased risk. Lesion characteristics, additional respiratory trauma, or self-reported limitations in respiratory function were not associated with low IMS. In conclusion, we emphasize the need for objective measurements of IMS in all persons with SCI who have impaired lung function. Type of lesion, medical history or self-reported complaints do not seem to allocate those at risk of low IMS.

Lung function and respiratory muscle strength as predictors for pneumonia in individuals with spinal cord injury?

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Introduction and Aims

Pneumonia is still the leading cause of death in individuals with spinal cord injury (SCI). To improve prevention, it is important to know modifiable predictors of pneumonia. Lung function and respiratory muscle strength are modifiable and may be potential predictors of pneumonia. Therefore, the aim of this study was to analyze which lung function or respiratory muscle strength parameter is the best discriminator between individuals with and without pneumonia and to estimate a risk threshold for this factor.

Materials and Methods

A retrospective cohort study of individuals with SCI, lesion level C4 to T12, age >18 years was performed. Lung function as well as in- and expiratory muscle strength of individuals with or without pneumonia but no other respiratory diseases were extracted from medical records of one specialized SCI rehabilitation center. Receiver Operating Characteristics (ROC) were calculated for each lung function and respiratory muscle strength parameter of individuals with motor complete and incomplete SCI separately in order to find the best parameter to discriminate between individuals with and without pneumonia. Odds ratio was calculated and ROC analyses were used to calculate a pneumonia risk threshold and its related sensitivity/specificity.

Results

In total, 287 patients (mean \pm SD; age 48 ± 15 years, height 175 ± 9 cm, weight 73 ± 16 kg, time post injury 12 ± 13 years) were analyzed; 50 patients with pneumonia (34 complete, 16 incomplete lesions) and 237 without pneumonia (193 complete, 44 incomplete lesions). In the motor complete sub-group, maximal inspiratory pressure (MIP) was the best discriminator between individuals with and without pneumonia (AUC 0.87; 95% CI: 0.80-0.95). The gender, age and lesion specific reference value (100%) was identified as pneumonia risk threshold with a sensitivity of 77.4% and a specificity of 90.2%. The odds of having a pneumonia in individuals with a MIP below their lesion level adjusted reference value was 28.1 (95% CI: 10.8-73.1) times the odds of having a pneumonia in individuals with MIP above reference values. For individuals with incomplete SCI, a peak expiratory flow (PEF) of 7.04 l/s and a MIP of 93.5 cmH₂O were identified as discriminators between individuals with and without pneumonia with both sensitivity and specificity of 100%.

Conclusions

MIP is the best discriminator for all SCI individuals between those with and without pneumonia. Therefore, MIP values below threshold values may be a predictor for pneumonia in individuals with SCI. Inspiratory resistance training should be promoted to prevent patients with inspiratory muscle strength below threshold values from pneumonia.

Exploring the associations between participation in economic activities and Spinal Cord Injury-Functional Index (SCI-FI) domains

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Introduction and Aims

Ability to perform functional activities (FAs) after spinal cord injury (SCI), and participation in social and economic activities (working for salary, homemaker, continuing with education, etc.) are primary rehabilitation outcomes. Data from the U.S. National Spinal Cord Injury Statistical Center indicated 11.8% persons with SCI to be employed one year post-injury and 34.9% twenty years post-injury. Therefore, it is important to determine the relationship between FAs and participation in economic activities (PIEA). The Spinal Cord Injury Functional Index (SCI-FI) assesses FAs in five domains (ambulation, basic mobility, fine motor, self-care and wheelchair) administered as Computerized Adaptive Tests (CATs). CATs use an iterative process to select items that match an individual's FA, thereby, reducing the burden of administration while maintaining precision. Interpretation of SCI-FI scores is facilitated by use of functional ability levels (FALs) that describe key FAs corresponding to a score. There are five FALs for all the domains except fine motor, which has four FALs. Our aims are to:

- 1) explore the association between PIEA and SCI-FI domains; and
- 2) interpret the SCI-FI domain scores in terms of differences in FALs for those PIEA and those not PIEA.

Material and Methods

Cross-sectional analyses of data from Jun-Oct, '11 were performed from a multi-site study of U.S. National SCI Model Systems, administering SCI-FI CATs to persons with SCI (N=269) stratified by level of lesion, completeness and time since injury. PIEA captures information regarding the primary occupation since SCI, and not PIEA refers to being unemployed since SCI. To examine the association between PIEA and FAs, regression analyses were performed with the SCI-FI domain scores as the outcome variable and PIEA as independent variable after controlling for age, gender, education, marital status, time since injury, and completeness and diagnosis (paraplegic/tetraplegic) of injury. Next, the SCI-FI domains for which PIEA was found to be a significant predictor, was/were examined for FALs for PIEA and not PIEA groups.

Results

Mean age and time since injury were 43.8±15.5 and 6.8±8.7 years respectively. 71.7% were men, 35.7% married or living with partner, 31.2% university educated, 40.1% PIEA, 38.3% with complete injury and 52.8% tetraplegic. PIEA was found to significantly predict ($\beta=0.126$, $t=2.261$, $p<0.05$) the basic mobility (BM) domain ($R^2=0.303$, $F(8,242)=13.124$, $p<.001$). FAL for those not PIEA was lower by one level (third versus fourth FAL).

Conclusions

BM domain of SCI-FI distinguishes people who participate and those who do not participate in economic activities. Studies with larger sample sizes are required to further investigate the association between SCI-FI domains and participation in economic activities. Prospective longitudinal studies are envisaged to examine the changes in association over time.

Clinical application

BM domain of SCI-FI demonstrates potential for use in vocational rehabilitation intervention.

Physical activity outcomes following SCIPA com: preliminary results

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Introduction and Aims

The Spinal Cord Injury and Physical Activity in the Community Program (SCIPA Com) is an original initiative that promotes re-integration of people with spinal cord injury (SCI) into a physically active lifestyle post-discharge from rehabilitation services. This program spans across communities in Australia and New Zealand. The main objectives were to reduce the multifaceted barriers faced by people with SCI regarding accessibility, affordability, assistance, and support from their community in an endeavour to increase physical activity levels among individuals with SCI.

Material and Methods

A quasi-experimental investigation was conducted to analyse the outcomes of SCIPA Com, an eight-to-twelve week community-based physical activity program customized for people with SCI. This program presented two stages: 1) training of exercise professionals via the Train the Trainers Spinal Cord Injury (T3-SCI); 2) and implementation of accessible physical activity programs in community fitness centres for individuals with SCI. The Physical Activity Recall Assessment for Individuals with SCI (PARA-SCI) was utilised to estimate leisure time physical activity (LTPA) levels among two distinct groups: physically active and inactive individuals with SCI at the time of baseline assessments. Subjects were assessed in four different stages to detect changes in LTPA levels: baseline, immediately after SCIPA Com, three and six months after SCIPA Com. Participants were also questioned whether or not they continued physical activity training after intervention and the reasons for cessation.

Results

30 trainees (15 active and inactive) with SCI performed eight-to-twelve weeks of supervised physical activity training. The inactive group presented a significant increase in LTPA levels after intervention compared to baseline (Friedman $p < .002$). Post hoc Wilcoxon sign tests showed significant increased post intervention and for 3 and 6 month follow-ups ($p < 0.028$) compared to baseline. There was an observable decline over time mostly related to financial constraints however this did not reach statistical significance. The physically active group maintained LTPA levels in all four assessments, demonstrating no significant change over the period of training or any follow-up (Friedman test $p > 0.449$).

Conclusions

The provision of customized physical activity programs for individuals with SCI increased LTPA levels of those physically inactive before participation in SCIPA Com. The results support collaborations between health professionals and community health and fitness centres for post-charge maintenance of physical activity levels among people with SCI. Rehabilitation professionals can inform and mediate the process of community re-integration of individuals with SCI and advise exercise professionals on safe and efficient delivery of a physical activity programs in the community. Moreover, health care system's involvement with funding and health promotion campaigns is essential to promote long-term adherence to physical activity.

Motivation camp in alpine skiing for persons with spinal cord injury, a pilot study

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Introduction and Aims

It is well documented that physical activity promotes a healthier life and less complications for persons living with Spinal Cord Injuries (SCI). Even so, the level of physical activity is low in this population. In Norway, large seasonal weather variations with cold and snowy winters cause great barriers to being physically active for persons with SCI. In order to change the sedentary exercise habits to a more active life style, different motivation strategies can be used. Sunnaas Rehabilitation Hospital offers a one week winter camp with alpine sit-skiing for persons with SCI. Professional ski-instructors, as well as active sit-skiers (peer-consultants), work together with the health-professionals at the camp. The aim of this pilot study was to evaluate the participants' opinion about the camp.

Material and Methods

The pilot study included 8 persons with SCI (AIS A-D), 1 woman and 7 men. The mean age was 33 (22 to 45) years. The evaluation methods used were printed questionnaires with open and closed questions, filled in at the first and the last day of the camp.

Results

The goals of the participants were to learn how to manage slalom or sit-skiing, to be inspired to be physically active during winter-time, have fun and share experiences with others with similar injuries. All of them were very satisfied with the week. One quoted: "It has meant a lot - a sense of empowerment on the slope and living in an apartment that is not adapted. I lived alone without helpers!" One with an incomplete injury said: "I can actually ski! I have found an outdoor activity that I can cope with". A sit skier said: "I have been able to see that there are opportunities for winter fun for me as well."

Conclusions

A motivation camp for winter sport for persons with SCI seems to give motivation for being physically active during winter season. The pilot study demonstrated that the participants experienced coping with alpine skiing, both standing and sit-skiing. Sunnaas Rehabilitation Hospital will continue with these motivational winter sports camps.

09:35 - 11:05

Oral Session 10 (Free Communication: GU/GI) Wednesday AM
Brussels Room

Optical detection of urinary tract infection, a feasibility study in children and potential diagnostic method in people with spinal cord injury

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Background

Lower urinary tract infection (LUTI) is a common and important urological condition that requires early diagnosis and treatment. Diagnosis is based on history and clinical symptoms confirmed by positive urine culture, which although feasible for the general population, it is not readily applicable in young children and individuals with spinal cord injury (SCI) where a reliable history and changes in sensation are lacking. As UTI-induced bladder inflammation is associated with an increase in perfusion and oxygen consumption, an optical method akin to oximetry capable of detecting changes in bladder oxygenation could provide early detection of LUTI.

Objectives

To determine if monitoring bladder oxygenation as a measure of bladder mucosal inflammation using transcutaneous near-infrared spectroscopy (NIRS) allows detection of the presence or absence of LUTI in children.

Material and Methods

A convenience sample of children referred to a pediatric urology clinic with an acute LUTI, and a control group, were studied. Diagnosis was confirmed by history, physical examination, laboratory investigations and culture. Participants had transcutaneous measurement of an absolute measure of tissue oxygen saturation (TSI%) in their bladder wall, and a quadriceps muscle control site, using a spatially resolved wireless NIRS device. Average measures of bladder wall TSI% (B.TSI%) and quadriceps TSI% (Q.TSI%) and their differences (TSI.diff) were calculated and compared between those with LUTI and controls by performing a two-way repeated analysis of variance.

Results

Thirty-four patients met the inclusion criteria (LUTI n=12 and controls n=22). Comparing LUTI to controls B.TSI% and TSI.diff values were significantly higher in the LUTI group ($p < 0.0001$), while Q.TSI% values were not significantly different.

Conclusions

NIRS optical monitoring of an absolute measure of bladder wall oxygenation may offer a means of screening for LUTI where history and/or clinical signs are not available or adequate. A clinical trial to examine feasibility of bladder NIRS and validity of NIRS-derived B.TSI% and TSI.diff indexes in diagnosis of LUTI in people with SCI is warranted.

Influence of spinal cord area and neuropathic pain on cardiovascular changes in patients with spinal cord injury during urodynamic investigation

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Introduction and Aims

Patients with a spinal cord injury (SCI) show a decline in cross-sectional spinal cord area (SCA) within the first year after injury (Freund 2013) and often experience neuropathic pain (NP) below the level of lesion (Teixeira 2013). Furthermore, cardiovascular changes, namely systolic (SBP) and diastolic blood pressure (DBP) can occur in response to noxious and non-noxious stimuli (e.g., urodynamic investigation, UDI). We investigated trauma-induced anatomical changes in the spinal cord and NP in order to explore their relationship to cardiovascular changes during UDI.

Material and Methods

15 chronic SCI patients (5 tetraplegics and 10 paraplegics), mean age 48 ± 11 years and mean duration of injury 14 ± 9 years, underwent continuous cardiovascular monitoring during UDI. Structural changes were assessed using cross-sectional SCA at level C2 (i.e. above the lesion level) of T1-weighted magnetic resonance images. The European Multicenter Study about SCI (EMSCI) pain questionnaire was used to assess the presence of NP.

Results

Overall, SCA (61 ± 10 mm²) correlated negatively with changes in SBP ($R=0.78$, $p=0.001$) and DBP ($R=0.61$, $p=0.017$). The presence of below-level NP correlated positively with changes in SBP and DBP: Patients with below-level NP had significantly smaller changes in SBP (32 vs. 64 mmHg, $p=0.017$) and DBP (12 vs. 23 mmHg, $p=0.001$) compared to those without NP.

Conclusion

The extent of structural changes in the spinal cord is associated with cardiovascular changes during UDI: The bigger the SCA, the smaller are the changes in SBP and DBP. Moderate changes in SBP and DBP in patients with NP might result from a reduced capacity to modulate sensory information during UDI (i.e., bladder distension).

Is Botulinum Toxin really potentiated by aminoglycosides?

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Introduction

Botulinum toxin (Tox) has a well defined role among neuro-urologists for the treatment of neurogenic overactive bladder. Before detrusorial injections of Tox is often necessary antibiotic prophylaxis in order to prevent urinary tract infections - whose estimated risk is about 28% - (1).

In some cases aminoglycosides (Ams) are the lonely suitable antibiotics, also if they could strengthen the Tox action with the potential comparison of neurological symptoms (2). We report our experience about the association of Tox injected into the bladder and Ams used as antibiotic prophylaxis.

Materials and Methods

From January to June 2013 26 patients underwent detrusorial injections of Tox previous the single intravenous injection of Gentamicina 3-5 mg/Kg. In all were used 200/300 UI of Onabotulinum.

Results

Patients were evaluated at 24 and 72 hours, after 1 week and then after 1 month. None complication was reported or detected, especially neurological symptoms. Moreover 19 subjects, formerly treated with Tox, reported the same benefit on the bladder symptoms with the same duration.

Conclusions

We have not observed adverse events due to the association of Gentamicina and Tox. Therefore the antibiotic prophylaxis with Ams is feasible and safe and these data could be very important in times of antibiotic-resistance.

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Am J Clin Dermatol 2005;6 141-150

Bowel management in children after spinal cord injury: an observational study

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Introduction and Aims

Childhood spinal cord injury (SCI) is rare but like adults a majority will have neurogenic bowel dysfunction (NBD). Little is known about bowel management and its impact on quality of life in children and little evidence exists to support care. This study aimed to describe NBD management amongst children with SCI, its effectiveness and impact on quality of life (QoL).

Materials and Methods

Three UK spinal centres recruited children attending for routine outpatient follow up for a single structured interview using an adapted NBD questionnaire previously used in SCI adults. QoL was assessed with PedsQL and Disabkids validated measures where 100 is the highest possible rating, higher scores suggest better QoL. Questionnaires were completed by the child, parent and child or parent alone as appropriate to the age of the child.

Findings

Seventy two children recruited; 9 had full bowel control and were excluded from analysis: mean age 12 years (SD 4.6yrs), 65% males, cervical SCI 41%, thoracic 57%, lumbar 2%, 73% incomplete, mean duration of SCI 6 years (SD 4.8yrs); 13% ambulant, 75% participated in sport regularly, 78% stood regularly, 92% did daily stretches. Mean dietary fibre intake 4.6 portions daily. Fifty two (82%) reported they had a bowel routine: 9(12%) used transanal irrigation, 4(6%) antegrade continence enema, 35 (56%) conservative management. Conservative management comprised gastrocolic reflex 14%, abdominal massage 10%, digital rectal stimulation 12%, digital evacuation 10%, rectal stimulants 42%, oral laxatives 29%. Autonomic dysreflexic symptoms associated with bowel management were reported by 17%, faecal incontinence monthly or more 25%, flatus incontinence 49%, 30% wore a pad sometimes/always. Abdominal pain was reported by 41%, bloating 25% and constipation 49%. Bowel management was completed in 30 minutes or less by 61%, 6% in more than 1 hour. Assistance with bowel care was required by 67%, provided mostly by parents (82%). Life was organised around bowel care, and seen as a problem by 40%, impacting friendships (11%), staying away from home (27%) and school life (24%). Mean Disabkids total score (excluding 'treatment scale') 8-16 years 80, 4-7 years 66. PedsQL total mean score 63(children without chronic disease mean score 83). Children reporting pain during bowel care and use of pads scored significantly lower on QoL scores. Children reporting faecal incontinence monthly or more were significantly more likely to report NBD as a problem ($P=0.001$) and that it interfered with friendships ($P=0.05$). Respondents ≥ 12 years were more bothered than younger children by bowel management, episodes of faecal incontinence and reported more impact on friendships and social activity. Those needing help with NBD management had a lower PedsQL social inclusion score ($P=0.03$).

Conclusions

Bowel management amongst children with NBD is ineffective for a significant minority of children with a reported rate of faecal incontinence and abdominal pain twice that of adults. NBD management outcomes have a significant impact on some aspects of QoL in SCI children.

Neurogenic bowel after Spinal Cord Injury (SCI): the perceived importance of identified concerns to persons with SCI and health care professionals

AS Burns¹; D St.-Germaine²; A Guindon³; SL Hitzig⁴; JJ Delparte¹; BC Craven¹; M Connolly⁵; D Wolfe⁶

¹Brain and Spinal Cord Rehabilitation Program, University Health Network - Toronto Rehabilitation Institute, Toronto, Canada; ²Faculty of Nursing, Université Laval, Quebec City, Canada; ³CIRRI, Quebec City, Canada; ⁴Institute for Life Course and Aging, University of Toronto, Toronto, Canada; ⁵Faculty of Applied Health Sciences, Brock University, Saint Catharines, Canada; ⁶Lawson Health Research Institute, London, Canada

Introduction and Aims

Neurogenic bowel dysfunction (NBD) following SCI is a barrier to community participation and adversely impacts quality of life. Persons with SCI rate bowel function as more important than walking. The objective of the current study was to determine and contrast the perceived importance of identified concerns and challenges related to NBD following SCI.

Methods

Persons with SCI (n = 19) participated in phenomenological (qualitative) interviews to identify specific concerns and challenges related to living with NBD following SCI. Identified concerns and challenges were incorporated into a questionnaire which was administered to persons with SCI (n = 43) and health care professionals with SCI experience (n = 16). Participants rated the perceived importance of identified concerns (1-10). The specific concerns/challenges included cost & equipment requirements, emotional impact, diet, impact on education & employment, intimacy & relationships, social participation, loss of spontaneity, travel, availability of appropriate and consistent assistance, loss of autonomy, lack of predictability, medical complications, pain or discomfort, physical effort of routine, physical experience (smell, touch, etc.), and time requirements.

Results

Persons with tetraplegia rated the following as most important:

- (1) loss of autonomy,
- (2) emotional impact,
- (3) social participation,
- (4) time requirements, and
- (5) loss of spontaneity.

In comparison, the highest rated concerns for persons with paraplegia were

- (1) loss of spontaneity,
- (2) time requirements,
- (3) impact on travel,
- (4) emotional impact, and
- (5) social participation.

Concerns were similar for both groups with the exception of loss of autonomy, which was the issue of greatest concern to persons with tetraplegia. Persons with paraplegia also rated impact on travel as important; while this concern fell just outside the top five for individuals with tetraplegia (6th). Health care professionals rated impact on intimacy & relationships and lack of predictability as issues of great importance; but they did not rate time requirements, loss of spontaneity, or impact on travel as being among the five areas of greatest concern.

Conclusion

NBD has a profound impact on the quality of life following a SCI. Persons with tetraplegia and paraplegia rated the following as particularly important: emotional impact, social participation, time requirements, loss of spontaneity, and impact on travel. The biggest discrepancy related to loss of autonomy; rated as most important by persons with tetraplegia compared to 14th for persons with paraplegia. The perception of health care professionals differed; and they did not rate time requirements, loss of spontaneity, and impact on travel as being among the five areas of greatest importance.

Bariatric surgery for morbid obesity in two patients with spinal cord injury

SW Wong¹; S Appleton²; T Barnes¹; M Coggrave¹; E Pounds-Cornish¹; M Farouk²; M Belci¹

¹National Spinal Injuries Centre, Stoke Mandeville Hospital, Aylesbury, United Kingdom; ²Department of General Surgery, Stoke Mandeville Hospital, Aylesbury, United Kingdom

Introduction and Aims

Despite well-documented outcomes of bariatric surgery in ambulatory patients¹, little information is available regarding weight loss surgery in patients with spinal cord injuries (SCI). We report a first case series on the effect of bariatric surgery in patients with SCI.

Methods

Patient A (28 years old, T12 incomplete paraplegia, AIS: C) reported a weight gain from 120kg to 180.3kg and patient B (44 years old, T10 incomplete paraplegia, AIS: B) reported a weight gain from 126.5kg to 134.3kg after SCI. Despite intensive dietetic treatment including very low caloric diet, anti-obesity medication and active physiotherapy program, ongoing weight gain had significantly affected their ability to perform activities of daily living including transferring and mobilizing. Considering the significant morbidity and mortality risk¹, A laparoscopic Roux-en-Y gastric bypass was successfully performed in March 2012 for patient A and May 2013 for patient B. Both patients were discharged with a prescription of a general multivitamin / mineral preparation, vitamin D supplements and thiamine supplements.

Results

For the first 7-months after surgery, total weight loss was 32.4 kg for patient A and 22 kg for patient B. There were important clinical improvements in body mass index (kg/m²) (Patient A: 59.8 to 49.8; Patient B: 48.3 to 40.8); mid-upper arm circumference (cm) (patient A: 53.8 to 42; patient B: 32.9 to 29.1); triceps-skinfold thickness (mm) (patient A: 43.8 to 20; patient B: 41.6 to 36.2); mid-arm muscle circumference (cm) (patient A: 40 to 40.9; patient B: 32.9 to 29.1); total cholesterol (mmol/L) (patient A: 4.5 to 3.5; patient B: 4.4 to 4.1); HDL-cholesterol (mmol/L) (patient A: 1.1 to 1.2; patient B: 1.4 to 1.4); LDL-cholesterol (mmol/L) (patient A: 2.7 to 1.8; patient B: 1.7 to 1.5); triglycerides (mmol/L) (patient A: 1.5 to 1.1; patient B: 1.7 to 1.5); 25 hydroxy-vitamin D (ummol/L) (patient A: 20.6 to 33.9; patient B: 30.8 to 68.9); folate (ng/mL) (patient A: 1.4 to 16.9; patient B: 6.4 to 9.4); ferritin (ng/mL) (patient A: 85 to 179; patient B: 229 to 93); vitamin B12 (pg/mL) (patient A: 250 to 274; patient B: 701 to 422). In addition, patient A has shown functional improvement from baseline, 7 months and 18 months [6 minutes walking distance²: 91, 144 and 190m and Berg balance score³: 19 (2 elbow crutch), 51 (2 elbow crutch) and 44 (one elbow crutch)].

Conclusion

This first case series describes morbidly obese SCI patients who has undergone gastric bypass surgery in a UK-based SCI centre. It highlights the provision of bariatric surgery as an option to consider if all non-surgical interventions have been tried. We hope presentation of this case could be useful to healthcare professionals in dealing with similar cases.

References

1. National Institute for Health and Clinical Excellence: Guideline on the prevention, identification, assessment and management of overweight and obesity in adults and children. NICE 2006, London
2. Van Hedel HJ, Wirz M, Curt A. Spinal Cord 2006; 44, 352-356.
3. Lemay JF, Nadeau S. Spinal Cord 2010; 48, 245-25

"Superior mesenteric artery syndrome" - a rare presentation and challenge in spinal injury rehabilitation

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Background

Obstruction of third part of Duodenum (D3) is very rare cause of gastric outflow obstruction. Rapid weight loss is the biggest risk factor. Patients seen in acute rehabilitation settings not uncommonly have a period of rapid weight loss.

Clinical Details and Management

We report two cases of Superior Mesenteric Artery Syndrome (SMAS). The patients presented differently, one with repeated, refractory Autonomic Dysreflexia and severe spasticity and one with nausea, abdominal discomfort and vomiting. CT abdomen with contrast identified dynamic duodenal (D3) obstruction against the posterior structures by narrow angled Superior Mesenteric Artery, gastric distension and, in one of the cases, dilatation of left renal vein (Nutcracker phenomena). Both patients responded well to optimising nutrition in different ways and details will be discussed. Surgery could be successfully avoided.

Implications

Superior mesenteric artery syndrome is an atypical cause of high intestinal obstruction, frequently occurring in patients who have had rapid weight loss during spinal injury rehabilitation. It may co-exist with left renal vein dilatation "nutcracker phenomena" or "Wilkie's Syndrome". Associated neurogenic Bowel dysfunction due to the nature of spinal injury, could possibly contribute to delay in diagnosis.

Learning Points / Conclusion

1) Clinicians should consider risk of SMA syndrome in spinal injury patients with rapid weight loss. 2) Early diagnosis is possible if there is a high index of suspicion and CT abdomen with contrast and angiography. 3) SMA syndrome can be successfully treated by aggressive nutritional management. This may be with TPN (Total Parenteral Nutrition), Nasojejunal (NJ) tube, or Duodenojejunostomy.

Outcomes of neurogenic bowel dysfunction management in Thai patients with chronic spinal cord injury

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Introduction and Aims

The goals of neurogenic bowel dysfunction (NBoD) management in spinal cord injured (SCI) patients are regular bowel care with appropriate faecal consistency according to type of NBoD -- soft form stools for reflexic bowel and firm stools for areflexic bowel. We, therefore, studied the outcomes of NBoD management in chronic SCI patients i.e., faecal consistency, faecal continence and related factors; and compared their management and outcomes with those of non-SCI volunteers who were used as the control group.

Material and Methods

Chronic SCI patients (post-injury > 6 months) who visited Rehabilitation services at Maharaj Hospital, Thailand, were asked to complete the International Spinal Cord Injury (ISCI) core data sets including basic bowel and quality of life data; the NBoD score (NBoDS), the Bristol stool chart and the nutritional questionnaire. The prevalence of NBoD severity, faecal consistency, faecal incontinence and methods used for defecation were analyzed and compared between SCI patients and the control group.

Results

There were 100 SCI patients (75 males) and 100 control subjects (41 males) recruited. In the SCI group, 83% had a reflexic bowel. Using the Bristol stool chart as reference, the prevalence of faecal consistency were as follows: 53% hard-lumpy stool, 38% firm-soft stool and 9% loose stool. According to the NBoDS, 33% had more severe large bowel dysfunction, 23% had faecal incontinence more than 1 time / month, 66% defecated 2-6 times / week and 68% used less than 30 minutes for defecation. The main method to assist defecation was use of an enema (44%) and the supplementary method was digital evacuation (36%). When using a multivariable linear regression model, the volume of water intake per day, duration of defecation, perianal skin problems and psychological health satisfaction were significantly related to faecal consistency ($p=0.016$, $p=0.009$, $p=0.004$ and $p=0.018$, respectively) in the SCI group. When compared to the control group, the prevalence of faecal consistency - firm to soft stools (38% vs 94%) and faecal incontinence (23% vs 0%) and factors related with bowel management all showed statistically significant differences ($p < .001$).

Conclusions

Most of the chronic spinal cord injury patients had reflexic bowels. They needed some method to assist defecation and to control faecal incontinence. Their stools were hard and lumpy, not firm to soft as recorded by the control group. Faecal consistency was related to the volume of fluid consumed, time used for each defecation, perianal skin problems and psychological health satisfaction.

09:35 - 11:05

**Workshop 6: Challenges in defining functional outcomes and Minimal Clinically Important Differences (MCIDs) for distinct clinical trial populations Wednesday AM
Paris Room**

Challenges in defining functional outcomes and Minimal Clinically Important Differences (MCIDs) for distinct clinical trial populations

J Steeves¹; A Blight²; L Jones²; K Tansey²; J Horseywell³; K Anderson²; J Guest²; A Curt⁴

¹Canada; ²USA; ³Denmark; ⁴Switzerland

Concepts and constraints for the determination of study endpoints in early phase clinical trials

Andy Blight, United States of America

What might be a meaningful endpoint for one type of acute SCI may not be meaningful for a person living long-term with a different level or severity of SCI

Linda Jones, United States of America

Comparing and contrast the statistical concept of minimal detectable difference (MDD) with MCID

John Steeves, Canada

What are the roles of clinical investigators and SCI participants/consumer advocates in defining MCIDs for acute therapeutic interventions? At this time, can the field of SCI research determine specific MCID thresholds?

Moderated Panel Discussion with Audience Participation

Chair:

Keith Tansey, United States of America

Panelists:

Jane Horseywell, Denmark

Kim Anderson, United States of America

James Guest, United States of America

Armin Curt, Switzerland

Participants:

John Steeves, Professor, ICORD at UBC & Vancouver General Hospital

Kim Anderson, Associate Professor, U. Miami

Andrew Blight, Chief Scientific Officer, Acorda Therapeutics

Armin Curt, Professor, U Zurich & Spinal Cord Program at Balgrist University Hospital

James Guest, Professor, U Miami

Jane Horseywell, President, European Spinal Cord Injury Federation

Linda Jones, Program Officer, Craig H. Neilsen Foundation

Keith Tansey, Associate Professor, Emory University

09:35 - 11:05

**Prevention Symposium A: Prevention of SCI, what works & what doesn't Wednesday AM
Berlin/Cop Room**

Prevention of SCI due to RTCs – What works and what doesn't

Michael Fitzharris, Australia

Prevention of SCI due to Water accidents – What works and what
doesn't

Hendon Murray, United States of America

Prevention of SCI due to Sports – What works and what doesn't

Andrei Krassioukov, Canada

Prevention of SCI due to Violence – What works and what doesn't

Eric Weerts, Belgium

Prevention of SCI due to Falls – What works and what doesn't

H S Chhabra, India

Prevention of SCI due to Falls in Turkey – What works and what
doesn't

Kamil Yazicioglu, India

Screening of

40 second

AVs on

Prevention

11:35 - 13:05

Workshop 7: Symposium on sexuality and spinal cord injury: the state of the art Wednesday AM Auditorium

Symposium on sexuality and spinal cord injury: the state of the art

F Courtois¹; L Marson¹; M Alexander¹; C Hultling²

¹USA; ²Sweden

Workshop Introduction

F Courtois, Canada

Translation to and from: What does basic research add to our knowledge of SCI sexual response and treatment

L Marson, USA

Sacral connections: Urologic concerns and their interaction with sexuality and sexual function

F Courtois, Canada

Opportunities for treating female sexual dysfunction after SCI

M Alexander, USA

Male sexual function and SCI: wanting more than erections and ejaculations

C Hultling, Sweden

Panel Discussion

F Courtois, Canada

M Alexander, USA

11:35 - 13:05

Oral Session 11(Free Communication: Basic Science/Clinical Trials) Wednesday AM
Brussels Room

Recruiting patients with acute spinal cord injury for clinical studies: lessons learned

A Frotzler¹; J Krebs¹; G Mueller¹; IM Velstra¹; AK Brust¹; S Tesini¹; M Baumberger²

¹Clinical Trial Unit, Swiss Paraplegic Centre, Nottwil, Switzerland; ²Acute Medicine and Rehabilitation, Swiss Paraplegic Centre, Nottwil, Switzerland

Introduction and Aims

Many clinical studies focus on patients with acute spinal cord injury (SCI). However, the number of patients with acute SCI is limited. Furthermore, several studies may have the same inclusion criteria. This may overburden patients with acute SCI as they are still in the process of coping with this life-altering event, especially when they are confronted by multiple requests for study participation. We have therefore established a process for the study recruitment of patients with acute SCI in order to limit the burden caused by study participation requests. The knowledge of the participation rate and the factors leading to study participation or refusal are crucial for planning future clinical studies and ensuring voluntary, informed consent. We have therefore evaluated the willingness of patients with an acute SCI to participate in clinical studies and the feasibility of delivering preliminary information regarding clinical studies early during rehabilitation.

Materials and Methods

The investigation took place in a private SCI rehabilitation center with 140 beds. There were 30 running clinical studies with in- and outpatients, whereof 24 focused on patients with acute SCI admitted for their first rehabilitation. Inpatients with an acute SCI were screened according to the study eligibility criteria from June to December 2013. A brochure with a short description of the study aims was given to the eligible patients as soon as their medical condition allowed. The number of patients wishing the detailed patient information of eligible studies and the number of those who were willing to actively or passively participate in a study were collected.

Results

A total of 77 patients, 18 women (mean age: 51.2±18.1 years) and 59 men (mean age: 61.6±23.3 years) with acute SCI (AIS A=30, B=11; C=15, D=20, E=1) were screened. Seventeen patients were not contacted due to a poor general condition (n=15) or due to lacking language skills (n=2). We were able to give the brochure to the eligible patients within 41.2±21.9 days after SCI. At that time, the investigated patients were 21.9±16.2 days after intensive care. A total of 32 patients were interested in getting the detailed study informations; 14 were undecided and 14 refused to participate in clinical studies. The main reason for refusal was the duration and intensity of the daily rehabilitation program. Thus, 26/60 eligible patients (43.3%) participated in clinical studies (1-3 studies, sequentially) during their first rehabilitation. Approximately 65% of the patients agreed to the use of their medical data for retrospective studies.

Conclusion

It was feasible to approach eligible patients concerning clinical studies within six weeks after SCI, and approximately 40% were willing to participate in clinical studies. A low recruitment rate and the difficulty to realize measurement time points earlier than six weeks after SCI should be considered when planning future studies with acute SCI patients.

Autonomic function in spinal cord injury by heart rate variability analysis

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¹Clinic for Spinal Cord Injuries, Glostrup hospital / Rigshospitalet, 2100, Denmark; ²Department of Cardiology, Gentofte University Hospital, Copenhagen, Denmark; ³(2) Department of Clinical Neurophysiology, Rigshospitalet, Copenhagen, Denmark; ⁴Department of Clinical Neurophysiology, Rigshospitalet, Copenhagen, Denmark; ⁵Department of Medicine, Div. Phys. Med. & Rehab., ICORD, Vancouver, Canada; ⁶(8) Department of Neuroanesthesiology, Rigshospitalet, Copenhagen, Denmark; ⁷Department of Cardiology, Rigshospitalet, Copenhagen, Denmark; ⁸Clinic for Spinal Cord Injuries, Glostrup hospital / Rigshospitalet, Copenhagen, Denmark; ⁹Spine Unit, Department of Orthopedic Surgery, Rigshospitalet, Copenhagen, Denmark

Introduction and Aims

Spinal cord injury (SCI) often results in severe dysfunction of the autonomic nervous system (ANS). C1-C8 SCI affects the supraspinal control to the heart; T1-T5 SCI affects the sympathetic column directly and T6-T12 SCI leaves sympathetic control to the heart intact. Heart rate variability (HRV) analysis can serve as a measure of autonomic regulation. The aim of this study was to investigate changes in HRV patterns- and alterations in patients with acute traumatic SCI.

Material and Methods

Patients who met the inclusion criteria were as soon as possible after their SCI cardiac rhythm monitored a.m. Holter for 24 hours. Additional Holter recordings were performed one, two, three, and four weeks after SCI. HRV analyses were performed both in the time and the frequency domain.

Results

Fifty SCI patients were included. In the time domain analysis a significant increase in standard deviation of the average normal-to-normal sinus intervals in all 5-minute segments of a 24-hour recording (SDANN) was seen in the first month after injury ($P < 0.005$). This increase was only significant in C1-T5 incomplete patients and in patients who did not experience one or more episodes of cardiac arrest when observing subgroups of patients. Significant lower values of Low Frequency Power, Total Power and the Low Frequency Power over High Frequency Power ratio were seen in the C1-T5 SCI patients compared to T6-T12 SCI patients.

Conclusion

The rise in SDANN in the incomplete C1-C8 patients could be due to spontaneous functional recovery on the basis of synaptic plasticity or remodelling of damaged axons. Our comparison in the frequency domain variable between the C1-C8, T1-T5 and T6-T12 patients suggests that the ANS dysfunction differs in the 3 groups and that a sympathovagal balance in both the C1-C8 and T1-T5 SCI patients has yet to be reached.

Human iPS cell-derived oligodendrocyte precursor cells can enhance the remyelination of demyelinated axons after spinal cord injury in adult mice

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¹Orthopaedic Surgery, Keio University School of Medicine, Tokyo, Japan; ²Pediatrics, Keio University School of Medicine, Tokyo, Japan; ³Physiology, Keio University School of Medicine, Tokyo, Japan

Background

There have been many reports that transplantation of neural stem/progenitor cells (NS/PCs) promoted functional recovery after spinal cord injury (SCI) in rodents and non-human primates and stem cell therapy is becoming a reality to treat SCI patients. Potential mechanisms of functional recovery after NS/PC transplantation was not only reconstruction of neural circuits by grafted cells derived neurons (Nori *et al*, PNAS 2011) but also remyelination of demyelinated axons by grafted cells derived oligodendrocytes (Yasuda *et al*, Stem cells 2011). Recently, we have developed a new differentiation protocol, which enables to induce oligodendroglial differentiation of human iPSC-derived NS/PCs *in vitro*. In this study, we sought to determine whether human iPSC-derived oligodendrocyte precursor cells (hiPS-OPCs) can promote functional recovery after SCI.

Methods

We induced hiPS-OPCs from pre-evaluated safe iPS cell line, 201B7 and quantified differentiation rate of three neural lineages *in vitro*. Contusive SCI was induced at Th10 level as reported previously and hiPS-OPCs were transplanted into the injured spinal cord of NOD-Scid mice. In the control group, phosphate buffered saline was injected instead of cells. Behavioral analysis using Basso Mouse Scale (BMS) was performed until 12 weeks after SCI, followed by histological analyses. We also performed immune-electron microscopic analyses.

Results

The differentiation efficiency into oligodendrocytes significantly increased in hiPS-OPCs compared to hiPSC derived NS/PCs *in vitro*. The transplantation group showed a better functional recovery in BMS score, compared to the control group. A large number of the grafted cells were survived and differentiated into oligodendrocytes predominantly as well as neurons and astrocytes. Interestingly grafted hiPSC derived mature oligodendrocytes migrated into the white matter of the injured spinal cord. Histological analysis of luxol fast blue staining revealed that myelinated areas in the transplantation group were significantly larger than the control group. Findings of immune-electron microscopy elucidated the remyelination of the demyelinated axons by the grafted hiPSC derived mature oligodendrocytes.

Conclusion

hiPSC-OPC transplanted into the injured spinal cord contributed to the remyelination of demyelinated axons, resulting in restoration of motor function. These findings suggested that hiPSC-OPC is a useful source of cell therapy for SCI.

AAV-NG2-antibody: new gene therapy improving conduction deficits and facilitating function after SCI

VL Arvanian¹; HA Petrosyan¹; V Alessi¹; J Levine²

¹Northport VAMC, Northport, USA; ²Stony Brook University, Stony Brook, USA

Introduction

Our intracellular recordings from individual motoneurons and axons revealed injury-specific impairments of axonal conduction after thoracic (T10) lateral hemisection (HX) and contusion SCI in adult rats (Arvanian et al., 2009; Hunanyan et al., 2011; 2013). We have determined that a unique transmembrane chondroitin sulphate proteoglycan (CSPG), NG2, may induce block of axonal conduction, but other CSPGs tested did not (Hunanyan et al., 2010). We further found that infusion of anti-NG2 monoclonal antibodies (NG2-Ab, Tan et al., 2006) for 2 weeks via intrathecal catheter connected to a minipump partially improved synaptic transmission, retrograde transport of Fluororuby and locomotor function after HX (Petrosyan et al., 2013). To prolonge and improve delivery of NG2-Ab, we collaborated with Dr. Levine, who successfully created novel construct, i.e. cDNA of NG2-Ab. There are three aims: (1) Determine which of AAV serotypes will induce best transduction of neurons and glia. (2) Insurt ND2-Ab cDNA into this AAV serotype (determined in 1). (2) Examine effects of this new gene therapy on physiological conditions of served projections and recovery after SCI.

Methods

Experiment 1: One group of adult rats receive T10 contusion and intraspinal injection of AAV1, AAV2, AAV5, AAV9, AAV10 and AAV11 serotypes. Other group received T10 contusion and intrathecal administration of AAV10. We found that intraspinal AAV10 induced best transduction of neurons and glia. Intrathecal AAV10 induced a comparable with intraspinal robust transduction.

Experiment 2: AAV10 construct expressing NG2-Ab has been successfully created (Collaboration with Dr. Levine and PENN vector core).

Experiment 3: We examined effects of AAV10-NG2Ab in combination with Neurotrophin NT-3. Adult rats received HX or contusion SCI at T10 level and intraspinal injections of AAV10-NG2Ab and AAV10-NT3. Locomotor tests: BBB, automated CatWalk, narrowing beam and irregular grid. Terminal electrophysiology: single-cell intracellular recordings in L5 segment from individual axons and motoneurons; responses were evoked by electric stimulation of spinal pathways rostral/caudal to the injury epicenter.

Results

We found improved locomotor function and transmission in rats that received intraspinal injections of AAV10-NG2Ab plus AAV10-NT3 following HX and/or contusion SCI. Improvements induced by AAV10-NG2Ab/AAV10-NT3 are significantly better compared to (i) recently reported improvements induced by NG2-Ab administered via osmotic minipump after HX SCI (Petrosyan et al., 2013) and (ii) improvements induced by intraspinal injections of Chondroitinase-ABC plus AAV10-NT3 after contusion SCI (Hunanyan et al., 2013). Importantly, we have observed improved bladder function as well. Effects of intrathecal administration of AAV10-NG2-Ab and AAV10-NT3 to be examined further.

Time window and mechanism of myelotomy in the treatment of acute traumatic spinal cord injury in rats

L Jianjun¹; Y Degang²; H Anming²; Y Mingliang²; G Rui³; L Jiedu²; G Feng²; Z Xin⁴

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Introduction and Aims

Pathophysiological mechanisms underlying spinal cord injury (SCI) partially involve edema and formation of a hematoma. Myelotomy seems to be a promising intervention. However, the appropriate timing and mechanism of myelotomy are still unknown in SCI. Here we aimed to determine the timing of microsurgical myelotomy in an animal model of SCI and study the underlying neuroprotective mechanism by observing its effect on the edema or autophagic activity after SCI.

Material and Methods

The SCI model was contusion-induced with a NYU impactor. Adult female rats were randomly divided into the following groups: laminectomy alone (sham group", SG), laminectomy plus contusion ("contusion group", CG) or laminectomy plus contusion followed by myelotomy at 8 h, 24 h or 48 h (8h-MTG, 24h-MTG or 48h-MTG). Functional recovery was evaluated via the open-field test and the inclined plane test every week after SCI. The percentage of spared white matter area (SWMA) and ultrastructure characteristics of the injured dorsolateral spinal cord were determined on the 42nd day after SCI. Other adult female rats were randomly assigned to SG, CG, or 24h-myelotomy group (24h-MTG). Functional recovery was evaluated via the open-field test and the inclined plane test every week after SCI. Spinal cord edema was determined by measuring the water content. The protein expressions of LC3-II, AQP4 and AQP9 were analyzed by Western blot, and the mRNA expression of LC3-II, Beclin-1 and mTORC1 were detected by real-time quantitative reverse transcriptase polymerase chain reaction.

Results

Compared with the CG, all myelotomy groups showed higher BBB scores and mean angle values in an inclined plane test, and had greater percentages of SWMA. In addition, rats in the 24h-MTG showed a higher behavior scores, intra-axonal fraction and myelin fraction than those in 48h-MTG. Myelotomy suppressed the protein and mRNA expression of LC3-II or beclin-1 post-injury and increased the mRNA expression of mTORC1 in the 24h-MTG post-injury. The LC3-II protein expression was significantly and negatively correlated with BBB scores post-injury. Compared with the contusion group, myelotomy significantly downregulated the expression of AQP4 and AQP9 and reduced injury-induced edema after SCI.

Conclusion

Myelotomy up to 48 h after SCI improves recovery in rats. The potential time window of myelotomy may be between 8 h and 24 h after SCI. Myelotomy-induced neuroprotection in a rat model of SCI was likely mediated by inhibition of autophagy activation by the upregulation of mTORC1 expression and by inhibition of edema. Myelotomy reduces edema in rats with SCI, possibly via inhibition of AQP4 and AQP9 expression.

Low immunogenicity of iPS derived neural stem cells

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Objective

Previously, we reported the effectiveness of induced pluripotent stem cell-derived neural stem cells (iPSC-NSCs) transplantation for spinal cord injury in rodents (Tsuji et al, PNAS 2010; Nori et al, PNAS 2011). With the increase of the need for the allo-transplantation, several reports about immunogenicity of iPSCs have been published in recent years. According to their reports, even in the syngeneic settings, undifferentiated iPSCs are more immunogenic than their ECS counterparts and rejection will be occurred (zhao et al, Nature 2011), immune rejection occur in allogeneic settings, but not occur in syngeneic settings (Araki et al. Nature 2013), their immunogenicity have not been adequately addressed. Furthermore, with respect to immunogenicity of iPSC derivatives, there are few reports and it remains one of the great obstacle for regenerative medicine. In this study, we evaluated the immunogenicity of mouse iPSC-NSCs *in vitro* and *in vivo*.

Materials and Methods

Several neurospheres derived from iPSC lines (2A4F, 2A3F) and fetus NSCs of C57BL/6J mice were used in the present study. Molecular surface markers (MHC class I, II, CD40, CD80, CD86 etc) and immunological gene expression (Hormad, Zg16, Retn etc) of these NSCs were evaluated by flow cytometry and RT-PCR. These NSCs were transplanted into the intact spinal cord or subcutaneous lesion of C57BL/6J (syngeneic) and BALB/Ca (allogeneic) mice. In vivo bioluminescent imaging (BLI) was used to evaluate the survival of transplanted cells chronologically.

Results

In vitro: NSCs present minimal expression of these surface markers and there were no expression of immunological gene expression. Immunogenicity of iPS-NSCs was low similar to that of fetus NSCs. In accordance with repeating the passage, these expressions slightly increased. *in vivo*: The NSCs, which were transplanted into spinal cord and subcutaneous tissue, survived in the syngeneic mice (graft survival rate was 100% at 28 d after transplantation). In contrast, all the NSCs grafted into the subcutaneous tissues were rejected in the allogeneic host (graft survival rate: 0%). Interestingly, the grafted iPSC-NSCs as well as fetus derived NSCs evaded the acute rejection even in the spinal cord of allogeneic host (graft survival rate: 60-80% at 28 d after transplantation).

Conclusion

We evaluated the immunogenicity of mouse iPS-NSCs and mouse fetus NSCs *in vitro* and *in vivo*, and found that iPSC-NSCs exhibited low immunogenicity and well survived after transplantation in the allogeneic setting. These results suggest the feasibility of allograft of iPSC-NSCs for spinal cord injury with low dose immunosuppressant.

Proton magnetic resonance spectroscopy of the cervical spinal cord

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Introduction and Aims

Proton magnetic resonance spectroscopy (MRS) is a valuable tool for the noninvasive investigation of pathological processes involving the central nervous system, and has gained increased acceptance by clinicians. However, few MRS studies of the human spinal cord have been reported because of technical challenges including the relatively small size of the spinal cord, strong susceptibility changes in the region, and pulsatile flow of the cerebrospinal fluid around the cord. These factors limit the signal-to-noise ratio (SNR) that can be obtained. This study was conducted to demonstrate the feasibility of, and describe an optimal protocol for, MRS of the spinal cord.

Material and Methods

Twenty healthy volunteers were studied using a 3.0 T MR system (Discovery MR 750, GE Healthcare). The volume of interest was prescribed along the main axis of the cord between C2 and C3 and a Point Resolved Spectroscopy (PRESS) sequence was used. Six outer volume saturation bands were applied around the volume of interest. MRS data were quantified using an LC Model. Sequence optimization was performed by varying the setting for TE, TR, and the number of repetitions, with or without cardiac gating.

Results

Improved spectral quality with a high SNR (≥ 4) was obtained using a TE 30ms, TR 2000ms, and 512 averages with cardiac gating compared with using a TE 35ms, TR 3500ms, and 256 averages without cardiac gating. The first protocol provided a reliable fit for N-acetylaspartate, creatine, and total choline in average (Cramer Rao lower bounds $<20\%$).

Conclusions

MRS of the cervical spinal cord is feasible and an optimal protocol was described. MRS of the spinal cord is a promising tool for diagnosis because it provides additional information that is complementary to other conventional imaging methods.

Inhibition of poly(ADP-Ribose) polymerase activity by 5-AIQ modulates autophagy induced by experimental spinal cord trauma

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Introduction and Aims

Although it is known that spinal cord injury (SCI) induces necrosis and apoptosis, its relationship to autophagy is uncertain. Autophagy is implicated in various pathological states in the nervous system, such as neurodegenerative diseases, cerebral ischemia, and traumatic brain injury. However, the contribution of autophagy to neural tissue damage after SCI has not been extensively investigated. Moreover, Poly (ADP-ribose) polymerase (PARP), a nuclear enzyme activated by strand breaks in DNA, plays an important role in the tissue injury associated with stroke and neurotrauma. Recently, several studies have broadened the role of poly(ADP-ribosyl)ation in cell killing showing that PARP-1 activation also occurs during apoptosis, and inhibition of PAR formation impairs activation of the apoptotic machinery leading to PAR-dependent mitochondrial dysfunction and rapid release of apoptosis-inducing factor. Despite its pathogenetic relevance, the involvement of PARP-1 in autophagy and the regulatory mechanisms underlying energetic derangement during PARP-1 hyperactivation associated to SCI, are still elusive. The aim of the present study was to investigate the involvement of autophagy after SCI and the role of PARP-1 in the cell's decision to commit to autophagy following DNA damage.

Material and Methods

SCI was induced by the application of vascular clips (force of 24g) to the dura via a four-level T5-T8 laminectomy, and 5-AIQ (3 mg/kg), a new synthetic inhibitor of PARP, was administered at 30min, 1hour and 6 hours after injury. In the present study the markers of autophagy expression were evidenced by transmission electronic microscope (TEM), western blot analysis for Beclin-1, microtubule-associated protein light chain 3 (LC3), p-AKT and mTOR in neural tissue after SCI and after treatment with 5A IQ.

Results

Taken together our results clearly detected elevated levels of Baclin-1, LC3 and pAKT as well as AIF and Bax after SCI, whereas treatment with 5-AIQ significantly reduced autophagy activation.

Conclusion

PARP-1 inhibition could produce its protective effects by affecting Akt, that can produce significant cytoprotective effects by phosphorylating such apoptosis-regulatory proteins, and modulating the autophagic response.

11:35 - 13:05

Workshop 8: Implementing the international spinal cord injury data sets through web-based registries: experiences from Netherlands and Victoria, Australia Wednesday AM
Paris Room

F Biering-Sørensen¹; HJR Slootman²; SAHB van Langeveld²; M Graco³

¹Denmark; ²Netherlands; ³Australia

Implementing the Dutch Spinal Cord Injury Data Sets

HJR Slootman, The Netherlands

Inter-rater reliability of the Dutch Spinal Cord Injury Data Sets

SAHB van Langeveld, The Netherlands

Embedding the International Spinal Cord Injury Data Sets into usual care

M Graco, Australia

Future for the utilization of the International SCI Data Sets

F Biering-Sørensen, Denmark

11:35 - 13:05

Prevention Symposium B: Prevention of SCI, what works & what doesn't Wednesday AM
Berlin/Cop Room

Screening of 10 min AV on Prevention

Comments from audience on 40 second AVs

Prevention of SCI due to Non Traumatic Etiology – What works
and what doesn't

Peter New

Prevention of SCI in the Netherlands – What works and what
doesn't

Casper van Koppenhagen

Panel discussion: Factors determining success or failure of
Prevention program

Panelists: M Fitzharris, Herndon Murray, Andrei Krassioukov, Douglas
Brown, Eric Weerts, Kamil Yazicioglu & Casper van Koppenhagen

Moderator: H S Chhabra

15:20 - 16:10

Tea and Coffee break with poster viewing. Poster Session 2
Exhibition/Poster Area

Spinal metastasis, mobile ability, and key person living together are predictors of discharge destination for cancer patients

T Enishi¹; S Kondo²; Y Nakamura²; N Sato²; S Katoh²

¹Tokushima University Hospital, Tokushima, Japan; ²Rehabilitation Medicine, Tokushima University Hospital, Tokushima, Japan

Introduction and Aims

Identifying factors associated with different discharge outcomes of patients with cancer are valuable to practitioners and program managers. This information will enable better case planning and management across the system; patients and their family can also use this information in forming their expectations of their hospitalization and the possible outcomes of their hospital stay. The aims of this research is to examine factors associated with discharge destination after rehabilitation for cancer patients.

Material and Methods

We examined factors associated with discharge destination after rehabilitation for cancer patients treated by our department in Tokushima University Hospital, Japan from September 1, 2010 to August 31, 2011. This study received ethics approval from the Tokushima University Hospital Ethics Board. The authors declare no conflict of interest.

Results

Univariate analysis demonstrated the significant correlation among FIM motor score at discharge, FIM cognitive score at discharge, mobile ability, walking aids, spinal metastasis, and key person living together. Multinomial logistic regression revealed significant differences in spinal metastasis, mobile ability, and key person living together as factors associated with discharge destination.

Conclusion

These findings show that spinal metastasis, mobile ability, and key person living together are most significant predictors of discharge destination. This study will be a useful resource for those considering which type of facility (i.e. home or nursing facility) is more suitable for patients. Our data will allow staff to create better-tailored rehabilitation programs.

Intradetrusor injection of onabotulinumtoxinA improves urodynamic parameters and quality of life of patients with spinal cord injury

RS Ferreira

Urology Division, Dr. Henrique Santillo Rehabilitation Center - CRER, Goiania, Brazil

Introduction and Aims

Traumatic spinal cord injury (SCI) is often associated with neurogenic bladder dysfunction. The major objective of any treatment in patients with detrusor overactivity is to preserve kidney function. Patients with neurogenic bladder dysfunction frequently struggle with urinary incontinence that may severely affect their quality of life (QoL). Oral antimuscarinics agents have been widely used as a first-line treatment option for urinary incontinence. However, this class of medications is ineffective in some patients and may also cause systemic side effects, such as dry mouth, constipation or blurred vision. Intradetrusor injection of botulinum neurotoxin type A is a minimally invasive procedure to treat bladder dysfunction. This treatment has become a second-line option for patients who are unable to tolerate anticholinergic drugs or whose clinical response to these drugs is unsatisfactory. The goal of this study was to evaluate the impact on QoL and urodynamic parameters on patients with SCI who were treated with intradetrusor injections of onabotulinumtoxinA (OnabotA).

Material and Methods

We designed a prospective study to evaluate 82 consecutive patients with spinal cord injuries (SCI) and detrusor overactivity over a 24-week who were treated with intradetrusor injections of 300 U OnabotA (Botox®, Allergan) into 30 different sites of the urinary bladder wall sparing of the trigone. Urodynamic evaluation was performed in accordance with the recommendations set forth by the International Continence Society (3). Bladder compliance, maximum cystometric capacity (MCC) and maximum detrusor pressure (Pdetmax) were recorded for each patient. QoL scores were obtained by applying the Qualiveen questionnaire. Evaluations were performed at baseline and at 4, 24 and 36 weeks of treatment. The Wilcoxon test was used to compare baseline numerical variables at 24 weeks. The significance level was set at 5%.

Results

Of the 82 patients 66 (80.4%) were male. The mean age of patients was 30.84 ± 7.73 years old. After 24 weeks, the MCC increased from 157.36 ± 33.53 to 481.91 ± 149.74 mL ($p < 0.001$). We determined a decrease of the Pdetmax from 82.01 ± 21.97 cm H₂O to 30.89 ± 24.45 cm H₂O ($p < 0.001$). Furthermore, the bladder compliance increased from 12.89 ± 3.25 mL/cm H₂O to 40.21 ± 25.10 mL/cm H₂O ($p < 0.001$). Scores in the Qualiveen questionnaire that focused on the specific impact of urinary dysfunction were decreased from 3.28 ± 0.49 to 1.89 ± 0.81 ($p < 0.001$). Importantly, the Qualiveen scores related to the QoL index increased from -1.38 ± 0.35 to -0.75 ± 0.59 ($p < 0.001$). No systemic effects following OnabotA treatment were observed in the present study. In six patients (7.3%), no changes were determined in urodynamic parameters or in QoL scores, and one patient actually presented with a reduction in bladder compliance.

Conclusions

Intradetrusor injections OnabotulinumtoxinA resulted in a significant improvement in urodynamic.

Physical activity and quality of life in persons with spinal cord injury in Odisha, India

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Physiotherapy, SVNIRTAR, Cuttack Dt, India

Introduction and Aims

Advances in the medical management of spinal cord injury (SCI) have resulted in increased patient longevity. Rehabilitation is not complete without the full inclusion and participation of people with disabilities in the physical and psychosocial environment. Quality of life (QOL) is a valid health indicator in persons with spinal cord injury and correlates strongly with community life. During the last decade, quality of life has been monitored in subjects with spinal cord injury (SCI) in various countries but there is a lack of information about QOL of SCI patients in Odisha, India. The aim of this study was to find the QOL of SCI patients in Odisha and find out the relationship between physical activity and QOL.

Material and Methods

84 persons (76 males, 8 females with mean age of 32.54 +10.75) were interviewed. The average length of time since the onset of injury was of 26.73 (SD 23.94) months. QOL and Physical activity was measured by World Health Organization Quality of Life Measure Abbreviated version (WHOQOL- BREF) and Physical Activity Scale for Individuals with Physical Disabilities (PASIPD).

Results

Pearson correlation showed a strong positive association between level of Physical activity and all domains of WHOQOL-BREF ($p < 0.05$). Multiple regression analysis showed physical activity and employment are significant predictors of QOL.

Conclusion

The findings of the study showed that persons with SCI in Odisha enjoy a lower QOL and reduced Physical activity. The results suggest that interventions promoting physical activity and generating employment for SCI patients may help them achieve a better QOL.

From zero to established spinal cord injury nursing in haiti - the positive effect on patient care

FJWV Stephenson¹; C Schwager²

¹Haiti SCI Working Group, Port au Prince, Haiti; ²Swiss Paraplegic Centre, Nottwil, Switzerland

Introduction

Haiti, the poorest country in the western hemisphere, has always had a fragile health service infrastructure, which was exacerbated by the January 2010 earthquake. Anecdotally patients who had sustained a spinal cord injury were discharged home after a few days in hospital. Many patients died within the first 1-2 yrs due to overwhelming urinary sepsis and pressure ulcers.

Methods

The authors describe the creation and establishment of the first SCI Rehabilitation Unit in Haiti, and discuss the implementation and challenges of SCI nurse education and nursing care that is ongoing throughout Haiti, both of which are having a dramatic, positive effect on patient outcomes.

Results

Recent follow up research has confirmed that the initiatives have reduced the morbidity and mortality rate in the four years since SCI nursing was introduced, although there remain challenges for the vulnerable patients who have sustained a spinal cord injury.

Participation in physical activity in persons with spinal cord injury -- a comprehensive perspective and insights into gender differences

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Introduction and Aims

To prevent secondary conditions and to improve and maintain health, regular physical activity is recommended as an important component of a health-promoting lifestyle for persons with spinal cord injury (SCI). However, participation in physical activity is low in persons with SCI, especially in women. The objective of this study is to identify (1) categories of functioning, the environment and personal factors that influence participation in physical activity in persons with SCI and (2) gender differences within identified factors.

Material and Methods

An explorative qualitative study design using both focus groups and individual interviews based on a semi-structured interview guide was used. Twenty-six persons (13 female, 13 male) participated in the study. Statements were linked to categories or chapters of the four components of functioning (body structures, body functions, activities and participation) included in the International Classification of Functioning, Disability and Health (ICF) and a recently developed list of personal factors. The number of categories mentioned by each person were counted. An in-depth analysis of the statements was performed to identify relevant associations across different categories and gender differences.

Results

Sixty-seven categories and four chapters from all components of functioning and environmental factors included in the ICF and 33 subdivisions of personal factors were found to be associated with physical activity in persons with SCI. Thereof many showed both a positive and negative association with physical activity. Differences between women and men were found in 22 domains. The identified gender differences could be assigned to areas of gender roles, social support, athletic identity, interests, and general behavioral patterns.

Conclusion

This study provides to a comprehensive perspective on aspects associated with participation in physical activity in persons with SCI and presents a first step towards the identification of gender differences. The results should be validated by further quantitative research.

Comparison of bacterial strains and antibiotic susceptibilities in urinary isolates of spinal cord injury patients from the community and hospital

ZA Han; HJ Lee; BS Lee; SB Yoon

National Rehabilitation Center, Seoul, Korea, Republic of

Study Design

A one-year epidemiological survey.

Objectives

To compare bacterial strains and antimicrobial susceptibilities of urinary isolates from hospital and community spinal cord injury (SCI) patients.

Setting

A specialized SCI unit in a freestanding rehabilitation hospital.

Methods

From June 2012 through May 2013, urine cultures were obtained from all of the newly admitted patients. Bacterial strains and antimicrobial susceptibilities were compared between patients from community and hospital settings.

Results

The proportion of Enterobacteriaceae in the total urinary isolates from hospital-dwelling patients was smaller than that from community-dwelling patients (66.0% vs. 85.5%, $P<0.001$), while the proportions of *Pseudomonas*, *Acinetobacter*, and *Enterococcus* species were relatively larger (8.7%, 6.0%, and 12.0% vs. 2.8%, 0.7%, and 2.8%, respectively, $P<0.05$). The isolates from hospital-dwelling patients showed lower susceptibility to ampicillin, amoxicillin-clavulanic acid, trimethoprim-sulfamethoxazole, and all generations of cephalosporin ($P<0.05$), and a higher prevalence of extended-spectrum beta-lactamase (ESBL)-producers (41.7% vs. 5.4%, $P<0.001$), compared with those from community-dwelling patients. The susceptibility rates to levofloxacin were lower than 50% in both community and hospital-dwelling patients.

Conclusion

Broader-spectrum antibiotics should be considered in treating nosocomial urinary tract infection of SCI patients because of the relatively wide variety of organisms and higher frequency of antibiotic-resistant strains, including ESBL-producing Enterobacteriaceae in hospital derived specimens. Furthermore, in areas with high prevalence of fluoroquinolone resistance, fluoroquinolones should be used with caution during empirical treatment for UTI in SCI patients.

Is financial hardship associated with reduced health in disability? The case of spinal cord injury in Switzerland

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Introduction and Aims

To investigate socioeconomic inequalities in a comprehensive set of health indicators among persons with spinal cord injury in a wealthy country, Switzerland.

Materials and Methods

Observational cross-sectional data from 1549 participants of the Swiss Spinal Cord Injury Cohort Study (SwiSCI), aged over 16 years, and living in Switzerland were analyzed. Socioeconomic circumstances were operationalized by years of formal education, net equivalent household income and financial hardship. Health indicators including secondary conditions, comorbidities, pain, mental health, participation and quality of life were used as outcomes. Associations between socioeconomic circumstances and health indicators were evaluated using ordinal regressions.

Results

Financial hardship was consistently associated with more secondary conditions (OR 3.37, 95% CI 2.18-5.21), comorbidities (OR 2.88, 95% CI 1.83-4.53) and pain (OR 3.32, 95% CI 2.21-4.99), whereas participation (OR 0.30, 95% CI 0.21-0.43), mental health (OR 0.23, 95% CI 0.15-0.36) and quality of life (OR 0.22, 95% CI 0.15-0.33) were reduced. Persons with higher education reported better mental health (OR 1.04, 95% CI 1.00-1.07) and higher quality of life (OR 1.06, 95% CI 1.02-1.09), while other health indicators were not associated with education. Household income was not related to any of the studied health indicators when models were controlled for financial hardship.

Conclusion

Suffering from financial hardship goes along with significant reductions in physical health, functioning and quality of life, even in a wealthy country with comprehensive social and health policies.

Correlation of MR diffusion tensor imaging and phase-contrast MR and clinical measures in cervical spinal cord injury

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Objective

To characterize diffusion properties across the segment or segments of spinal cord injury and peak cerebrospinal fluid (CSF) velocities in stenotic spinal canal resulted from the spinal injury and to correlate with clinical and electrophysiological measures in patients with cervical spinal cord injury (SCI).

Materials and Methods

Seventeen patients with cervical spinal cord injury (11 males and 6 females; neurological level of injury, C2-C7; age, 47.0 \pm 13.4 years; time since injury, 13.1 \pm 19.9 months) and 21 healthy subjects (13 males and 8 females; age, 38.5 \pm 15.7 years) participated in this study. Diffusion tensor imaging (DTI) data of the spinal cord and peak CSF velocities of the spinal canal were obtained with a Siemens 3T MR scanner. I measured the apparent diffusion coefficient (ADC) and fractional anisotropy (FA) of the spinal cord in the maximal compression, (region 1) and upper (cranial, region 2) and lower (caudal, region 3) levels to the injury level with no signal change in conventional MRI. The peak systolic and diastolic velocities of CSF were acquired with phase-contrast magnetic resonance imaging (PCMRI) in the axial plane at the region 1, 2 and 3 of the cervical spinal canal. Neurological and electrophysiological measures: American Spinal Injury Association (ASIA) Impairment Scale (AIS), ASIA motor score, ASIA sensory score, Modified Barthel Index (MBI), Spinal Cord Independence Measure III (SCIM III), somatosensory evoked potentials (SSEP) and motor evoked potentials (MEP) were assessed in patients with cervical spinal cord injury. For the statistical analysis, one-way ANOVA was performed using SPSS software package.

Results

In all case, the results indicate that SCI patients has increased ADC and decreased FA values at region 1 compared with normal controls ($p < 0.05$). Moreover, the region 2 and 3 revealed significantly higher ADC and lower FA values compared with normal control ($p < 0.05$). FA values of region 3 were correlated with AIS, ASIA sensory score, and SCIM score ($p < 0.05$). The latencies of SSEP and amplitudes of MEP were correlated with FA values at region 1 ($p < 0.05$). In the SCI patients, systolic velocities of CSF flow at region 1 were increased than normal controls. Diastolic velocities of CSF flow in region 3 were lower than normal controls ($p < 0.05$). FA values at region 1 was correlated with systolic and diastolic velocities of CSF flow ($p < 0.05$).

Conclusion

DTI can be used for a quantitative evaluation measure of the proximal and distal extents of spinal cord damage. The decrease of FA values were correlated with CSF flow, functional measurements, and with evoked potentials. More precise further studies of patients with serial follow-up and match of the results with clinical measurements to delineate the usefulness of DTI and CSF flow study should be followed.

Production of Schwann cell-sheet from rat's sciatic nerves as a new technique of cell transplantation for spinal cord injuries

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Introduction and Aims

One of the problems in cell transplantation for spinal cord injuries is the low take rate of transplanted cells. In the current transplantation technique involving injection of isolated cells into the spinal cord with a syringe, the cells are under stresses from isolation itself as well as manipulations, which may promote the death of the transplanted cells. A recently developed technique allows to collect cultured cells in a sheet form without using an enzyme. Advantages of this technique include that the cells encounter substantially less stress and that the cells can be harvested together with the extracellular matrix. As this technique allows the cells to maintain intracellular contacts and to be transplanted along with the extracellular matrix, it may provide grafts of tissue transplantation-like quality within the context of cell transplantation and may lead to a new category of transplantation technique. The objective of this study is to produce sheets of Schwann cells toward cell-sheet transplantation for spinal cord injuries, to characterize properties of the cell sheets, and to examine their survival in transplantation.

Material and Methods

Schwann cells collected from the sciatic nerve of 1-2-days postnatal rats were cultured in a petri dish coated with a temperature-responsive polymer (UpCell ®), and then collected in a sheet form without using an enzyme. The cell sheets recovered were characterized by immunostaining and microarray analyses. Furthermore, the cell sheets were transplanted to the normal and injured spinal cords, and the take rate was examined at 1 weeks after the operations.

Results

It was possible to recover sheeted Schwann cells. A number of S100-positive cells were found in the sheet. The microarray analysis revealed that the sheeted cells were more in the extracellular matrix compared to cells recovered isolated. We also demonstrated engraftment of the Schwann cell sheets in both normal and injured spinal cords at the first week after transplantation. [Conclusion] The cell sheets prepared were very fragile, and the practical procedure for cell-sheet transplantation requires to be contrived. Cell-sheet transplantation using Schwann cells for spinal cord injuries was suggested to be of potential usefulness as a new transplantation technique.

A review on the efficacy of rehabilitation robotics for upper limb training in spinal cord injury

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Introduction and Aim

Spinal cord injury occurs through various countries throughout the world with an annual incidence of 15 to 40 cases per million. Restoration of arm and hand function is a major priority for persons with a cervical spinal cord injury. In high spinal cord injury most of patients use wheelchair while they can use the powered upper limb orthoses for better function in upper limb. Nowadays few systems are currently available that ranging from Armeo to other powered orthoses that provide grip function for patients with spinal injury. Research showed that repetitive sensorimotor training is the best way to learn new skills. Researcher on arm and hand functioning is focused mainly on hand surgery, the use of functional electrical stimulation, neuro-prostheses or orthosis , in order to compensation of function loss. Armeo Therapy improves the efficiency of therapy treatments because the exercises are self-initiated, self-directed, functional and intense. There were a limited number of studies related to isolated motor training of arm and hand functioning in persons with C-SCI. The aim of the present study was to present a literature review of studies reporting use of upper limb rehabilitation robotics in patient with cervical spinal cord injury.

Method and Material

The search strategy was based on Population Intervention Comparison Outcome (PICO) method. A search was performed in PubMed, Science Direct, Google scholar, ISI web of knowledge databases by using the selected keywords. According to inclusion and exclusion criteria nine articles from 2001 to 2014 were selected for final evaluation.

Result

The results of the analysis demonstrated that robotic devices used for the upper limb. Prediction of upper-limb clinical scores in SCI is feasible using measurements from a robotic rehabilitation device, without the need for dedicated assessment procedures. Also studies about Armeo Spring demonstrated reliable value for clinical use. Because of repetition movement and practice is important factor in earlier improvement, devices such as Armeo can provide this purpose. subjects with some partial hand function at baseline had a significantly larger increase in grasp scores than subjects with no minimal hand function preserved at baseline. This suggests that the initial functional capabilities of patients can influence the benefits measured after robotic rehabilitation training.

Conclusion

The main goal of these devices is to increase the quality of rehabilitation therapy by providing well-controlled and highly repeatable conditions as well as optimized assistance to the patient. In addition these devices are able to reduce the work load of the therapist by assisting specific movements of the patients and supporting the weight of the patients arm during therapy. however a robot can never replace the multi-level interaction between patients and therapists, nor mimic the sensor-motor abilities of the hand of the experienced therapist.

Management of urinary dysfunction after traumatic and non-traumatic spinal cord injury in Norway

Tiina Rekand¹; Ellen Merete Hagen²

¹Dept of Neurology, Haukeland University Hospital, Bergen, Norway; ²Spinal Cord Injury Center, Viborg, Denmark

Introduction

Spinal cord injury (SCI) causes dysfunction of bladder emptying in majority of cases. The knowledge about management of urinary dysfunction after discharge from Spinal Cord Units in Norway is limited.

Methods

An anonymous cross-sectional postal survey was conducted in Norway among the members of the Norwegian Spinal Cord Injuries Association. A total of 400 participants, with traumatic or non-traumatic spinal cord injuries, received the questionnaire.

Results

A total of 248 subjects (62%), 180 men and 68 women answered the questionnaire. Mean age was 54 years and mean time since injury 13.4 years. More than half (64.9%) of responders were paraplegics; 84.7% of responders had traumatic spinal cord injury. A total of 164 participants (66.1%) used intermittent catheterization for bladder emptying (48.5 % women vs 72.8% men); more paraplegics than tetraplegics (77.2% vs 55.7%). Recommendations given at the Spinal Cord Units were thoroughly followed by persons who had used catheters more than 5 years. Use of incontinence pads were associated with reduced satisfaction of life. The bladder management recommendations were mostly received from specialists at Spinal Cord units (42.8%) or from general practitioners (30.8%).

Conclusions

The most common method of management of bladder dysfunction is clean intermittent catheterization. Recommendations were followed more thoroughly by persons who have used intermittent catheterization for more than 5 years. Spinal Cord Units are important source for information and guidance.

References

Ellen Merete Hagen^{1,2}, Tiina Rekand ^{1,3}

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Mother's with a spinal cord injury share their parenting experiences

T Jeji

Ontario Neurotrauma Foundation, Toronto, Canada

Introduction and Aims

Motherhood holds a significant part and role in women's life and even more so if they have/incur a disability. From pre-modern to the present modern society during their life course women spend considerable time in conceiving and raising children. Motherhood perpetuates the inherent nurturing characteristic in women. The healthcare professionals and the general public undermine the importance of sexuality and motherhood in women's lives after disability. Women incurring a physical disability such as Spinal Cord Injury (SCI) are limited in their physical functioning and under go physiological changes in the body function which challenges their capacity to fulfill motherhood and its role performance. The aim of this presentation is to gain understanding of the personal experience of women engaging in mothering and strategies and equipment utilized to negate and facilitate daily activities.

Methods

Cross-sectional design. Qualitative in-depth interviews and support group meetings. Transcripts of the interviews were analyzed using constant comparison method.

Results

The participants felt that they had children as someone to "hug", "kiss" and "love" them unconditionally. Majority of women had primary responsibility as a single parent of raising and providing for their children. The women mobilized their social networks to obtain needed social support during such major life role transition and performance of mothering chores. Women adapted childcare equipment such as roll-under crib, changing table, car seats, feeding utensils and wheelchair seat belt to care for their young children.

Conclusions

Mothers with SCI value the role of mother and the importance of performing maternal role. The women's self-acceptance of their challenges and limitations and bridging the gap by optimally mobilizing their social network to live and participate in meaningful community life positively impacts their parenting experience.

Indications for and effects of the therapy with the exoskeletons Ekso and HAL

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Introduction and Aims

The therapy of patients with a spinal cord injury is very complex. One part of it is to bring the patient to stand or maybe walk. As therapeutic devices one can use different kinds of splints or orthosis. Most of the patients "walk" by using parallel bars and/or a walking frame. These therapies are exhausting and need a long time until they are successful. The latest innovations in this sector are the Exoskeletons. These devices may help to reduce the strenuous effort the patient has to generate while standing or walking and could lead to a more effective therapy. There are different kinds of Exoskeletons with different indications for their use available. We will talk about our experiences with two of them.

Material and Methods

In our clinic we had the opportunity to test Exoskeletons from January till June 2013. There we've seen the positive effects of a therapy with such devices. Since February 2014 we do have the possibility to treat our patients with the Ekso and the HAL, two different Exoskeletons with different indications for Therapie.

Results

We have seen that the Ekso is usable to treat patients with complete paraplegia sub Th3 and with the variable assist is also good to treat patients with incomplete para- or tetraplegia. The HAL is especially for patients with incomplete para- or tetraplegia that do still have motory function in the legs of 2-3/5 after Janda. After therapy we have seen a reduction of spasticity, neuropathic pain, obstipation and, for the patients who are able to walk, we have noticed a more physiological way of walking. Next to these, the patients lost weight and showed a rising strength endurance during the therapy.

Conclusions

The therapy with Exoskeletons is a step forward in the treatment of patients with spinal cord injury. There are lots of positive side effects during therapy with these devices. With the correct indication and use they can help to make therapy more effective.

Pathway of care for fertility in men with spinal cord injury in Flanders (Belgium) and the Netherlands

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Introduction and Aims

Sexuality and reproduction are important aspects that add to quality of life. Following a spinal cord injury (SCI) most men have sexual problems such as erectile dysfunction, ejaculation disorders and poor semen quality resulting in impaired fertility. As most SCI men are young when sustaining their injury, sexuality and reproduction are very important aspects of their life. The aim of this study is to investigate the pathway of care for fertility in male spinal cord injured patients in Flanders (Belgium) and the Netherlands. By using a questionnaire, we would like to investigate how sexuality, the desire for children and cryopreservation of semen are discussed in all SCI rehabilitation centers in Flanders and the Netherlands. A second questionnaire aiming at investigating the current fertility techniques used for spinal cord injured men was sent to fertility centers in Flanders and the Netherlands.

Material and Methods

A qualitative study based on two different questionnaires was performed. Rehabilitation centers for spinal cord injury in Flanders (n=3) and the Netherlands (n=8) and fertility centers in Flanders (n=10) and the Netherlands (n=13) were invited to participate in a survey about fertility treatments in male spinal cord injured patients by filling in a questionnaire containing a combination of closed and open questions. The results of the care in Flanders and the Netherlands were compared with the results of a literature search.

Results

After a literature search, we conclude that the first line of treatment recommended for semen collection in spinal cord injured men is penile vibratory stimulation (PVS). If PVS fails male spinal cord injured patients may be referred for electroejaculation (EEJ) or surgical sperm retrieval. Evaluation of total motile sperm yields will determine the choice of assisted conception e.g. intrauterine insemination (IUI) or in vitro fertilization, intracytoplasmic sperm injection (IVF/ICSI). All literature indicates a preference for non-invasive treatments if possible. Until now our questionnaire was completed by 9 out of 11 rehabilitation settings and 11 out of 23 fertility centers. Most rehabilitation centers have verbal agreements on sexuality following SCI. Two centers have a written policy. Only 3 out of 9 rehabilitation centers suggest the possibility for cryopreservation of semen during the first stay. Our results show that PVS is the first line of therapy used for subfertility in SCI men followed by EEJ or testicular sperm extraction (TESE) in Flanders and the Netherlands. Unlike Flanders, only two of the fertility centers in the Netherlands are allowed to perform the TESE procedure. Furthermore only two fertility centers allow home-insemination with good sperm motility by the couple. Most fertility centers use ICSI because of the poor semen quality.

Conclusion

Sexuality and fertility are addressed differently in the SCI rehabilitation settings that participated in our study. To optimise the possibilities, there is a need for clear description of the pathway of care for sexuality and fertility in this population

Respiratory motor function outcomes in sitting and supine positions in patients with chronic spinal cord injury

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Introduction and Aims

The respiratory motor control deficits are the major causes of respiratory dysfunction in patients with chronic spinal cord injury (SCI). The amount of such dysfunction can vary when assessed in different body positions. Oppositely to healthy subjects, individuals with chronic SCI showed higher spirometrical outcomes in supine compared to sitting position. However, it has been shown that patients with lower thoracic SCI can perform better in sitting position. At the same time, body composition is an important factor which can modify these postural effects. It has been shown that uninjured individuals with increased body mass index (BMI) exhibited significantly lower sitting-to-supine drop in pulmonary function performance when compared to the subjects with normal BMI. Since postural and body composition factors have different effect on healthy individuals and persons with SCI, it suggest that BMI, level and severity of SCI may have complex effect on respiratory performance when assessed in sitting and supine positions. These interrelationships in SCI population have not been previously investigated. Therefore, the aim of this study was to investigate whether BMI, level and severity of SCI can affect differently the respiratory performance in sitting and supine positions.

Material and Methods

Forced Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV1), Maximal Inspiratory Pressure (PImax), and Maximal Expiratory Pressure (PEmax) were obtained in supine and sitting positions in 27 individuals, 40 ± 14 (mean ± SD) years of age, 21 males and 6 females, with chronic SCI. Thirteen participants were classified as clinically motor-complete (AIS-A or AIS-B) and fourteen were diagnosed as motor-incomplete (AIS-C or AIS-D) with cervical (n=15; 7 motor-complete and 8 motor-incomplete) or thoracic (n=12; 6 motor-complete and 6 motor-incomplete) neurological levels of SCI ranging from C2 to T12. An average BMI of these subjects was 25.35 (± 5.38). Ten participants were in normal BMI range (18.5-24.9). Two individuals were classified as being underweight (< 18.5), 12 overweight (25-29.9), and 3 obese (>30).

Results

The dynamics of functional outcomes in response to the postural changes were different in clusters that were formed according to the participants' physical and clinical characteristics. Compared to the sitting position, individuals with more severe and higher levels of SCI performed significantly better in supine position with positive correlation to their BMIs.

Conclusion

These factors should be taken in a consideration in respect of the evaluation of respiratory function, rehabilitation and sleep apnea management in individuals with chronic SCI.

Minimizing errors in tSCI clinical trials by acknowledging the heterogeneity of spinal cord anatomy & injury severity: An observational Canadian cohort

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Background

Clinical trials of therapies for acute traumatic spinal cord injury (tSCI) have failed to convincingly demonstrate efficacy in improving neurologic function. Failing to acknowledge the heterogeneity of these injuries and under-appreciating the impact of the most important baseline prognostic variables likely contributes to this translational failure. Our hypothesis was that neurological level and severity of initial injury (measured by ASIA Impairment Scale, AIS) act jointly and are the major determinants of motor recovery. Our objective was to quantify the influence of these variables, when considered together on early motor score recovery following acute tSCI.

Methods

836 participants from the Rick Hansen Spinal Cord Injury Registry were analyzed for motor score improvement from baseline to follow-up.

Results

In AIS A, B, and C patients, cervical and thoracic injuries displayed significantly different motor score recovery. AIS A patients with thoracic (T2-T10) and thoracolumbar (T11-L2) injuries had significantly different motor improvement. High (C1-C4) and low (C5-T1) cervical injuries demonstrated differences in upper extremity motor recovery in AIS B, C, and D. A hypothetical clinical trial example demonstrated the benefits of stratifying on neurological level and severity of injury.

Conclusions

Clinically meaningful motor score recovery is predictably related to the neurological level of injury and the severity of the baseline neurological impairment. Stratifying clinical trial cohorts using a joint distribution of these two variables will enhance a study's chance of identifying a true treatment effect and minimize the risk of misattributed treatment effects. Clinical studies should stratify participants based on these factors and record the number of participants and their mean baseline motor scores for each category of this joint distribution as part of the reporting of participant characteristics. Improved clinical trial design is a high priority as new therapies and interventions for tSCI emerge.

Feasibility of recruiting subjects for acute spinal cord injury (SCI) clinical trials in Canada

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Introduction

Trials of neuroprotective/neuroregenerative therapies for acute traumatic spinal cord injury (tSCI) require considerable time and resources to complete. Given the low incidence of tSCI at any single centre, multicentre collaborations are required to complete these trials in a timely fashion. Our goal was to determine the utility of using the Rick Hansen Spinal Cord Injury Registry (RHSCIR) to predict the feasibility of conducting multicentre tSCI trials within Canada.

Methods

RHSCIR prospectively recruited patients with tSCI between 2004-2013 from 18 Canadian acute care centres. Complete records of registry participants were reviewed to assess potential for trial participation. Characteristics that typically preclude trial participation (e.g. age <18 or >75 years, penetrating injuries) were quantified. Key eligibility criteria (injury-to-hospital time, admission neurology) from six published/ongoing clinical trials (STASCIS [<24 h, C2-T1, surgery within 7d], Minocycline [<11 h, C0-C8], Riluzole [<12 h, C4-8, AIS A, B, C], Sygen [C1-T9, lower extremity motor score ≤ 15], Cethrin [C4-T12, AIS A, surgery within 7d], and NOGO [C5-T11, AIS A]) were applied to the cohort. We also identified indicators of multitrauma/poor health, which would reduce eligibility for clinical trials (Glasgow Coma Scale (GCS) <13 , serious comorbidities (e.g. AIDS, dementia)).

Results

Of 2751 RHSCIR participants, the following were excluded: 301 (10.9%) due to age, 138 (5.6%) did not receive acute care at a RHSCIR site, and 60 (2.6%) due to penetrating injuries. Application of study criteria revealed eligible participants (n from 2004-2013, mean/year, range) as follows: STASCIS n=368 (37, 27-66), Minocycline n=557 (56, 33-88), Riluzole n=303 (30, 18-47), Sygen n=847 (85, 50-140), Cethrin n=301 (30, 16-60), NOGO n=414 (41, 19-78). Of RHSCIR participants with GCS/comorbidity data, 92/1148 (8.0%) had a GCS <13 and 253/1441 (17.6%) had one or more serious comorbidities that would exclude participation in most neuroprotective/neuroregenerative trials.

Conclusion

Our data demonstrates that tSCI clinical trials are feasible within Canada using the RHSCIR multicenter collaboration. However, in practice there are additional challenges recruiting subjects who satisfy the typically tight inclusion criteria, which may impact the completion and generalizability of these studies.

A hydrogen sulfide-releasing cyclooxygenase inhibitor markedly accelerates recovery from experimental spinal cord injury

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Introduction and Aims

Spinal cord trauma results in loss of motor function that is in part due to the ensuing inflammatory response. Hydrogen sulfide (H₂S) is a potent, endogenous anti-inflammatory and neuroprotective substance that has been exploited in the design of a novel nonsteroidal anti-inflammatory drugs. In the present study, we have evaluated the potential beneficial effects ATB-346, an H₂S-releasing derivative of naproxen, in a murine model of spinal cord injury (SCI).

Material and Methods

SCI was induced in mice by spinal cord compression, produced through the application of vascular clips to the dura via a T5 to T8 laminectomy. ATB-346, naproxen (both at 30 µmol/kg) or vehicle was orally administered to the mice 1 and 6 hours after SCI and once daily for 10 days.

Results

Motor function (Basso Mouse Scale of locomotion) improved gradually in mice treated with naproxen. However, mice treated with ATB-346 exhibited a significantly more rapid and sustained recovery of motor function, achieving greater than double the increase in locomotion score of the naproxen group by the 10th day of treatment. ATB-346 also significantly reduced the severity of inflammation (proinflammatory cytokines, apoptosis of neural tissue, nitrosative stress) that characterized the secondary events of SCI. Again, the effects of ATB-346 were superior to those of naproxen for several parameters.

Conclusions

These results demonstrate marked beneficial effects of an H₂S-releasing derivative of naproxen in an animal model of SCI, significantly enhancing recovery of motor function, possibly by reducing the secondary inflammation and tissue injury that characterizes this model. The combination of inhibition of cyclooxygenase and delivery of H₂S may offer a promising alternative to existing therapies for traumatic injury.

Wheelchair-specific fitness of inactive persons with chronic spinal cord injury

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Purpose

To assess

- (1) wheelchair-specific fitness of inactive persons with chronic spinal cord injury (SCI);
- (2) discriminative validity of wheelchair-specific tests for anaerobic work capacity and isometric strength; and
- (3) associations among wheelchair-specific fitness outcomes to study whether these are strong enough to predict peak test outcomes using tests for anaerobic work capacity and isometric strength.

Design

Cross-sectional study.

Participants

Physically inactive persons with chronic paraplegia ($n=20$, 15 men) or tetraplegia ($n=9$, 7 men).

Procedures

Participants used their daily wheelchair to perform peak and submaximal exercise tests on a treadmill, a 15m-overground sprint with an instrumented wheel and an isometric wheelchair push.

Outcomes

Peak power output (PO_{peak}) and peak oxygen uptake (VO_{2peak}) over the peak test, mechanical efficiency over submaximal blocks (ME_{sub1} and ME_{sub2}), highest mean unilateral PO over 5s-intervals of the 15m-test (P5-15m), and highest mean 3s-force over isometric-push tests (Fiso).

Statistics

- (1) Descriptives (mean±standard deviation) for all outcomes over the group with paraplegia and tetraplegia;
- (2) Mann-Whitney U between P5-15m and Fiso of paraplegia vs. tetraplegia; and
- (3) Pearson's r among PO_{peak}, VO_{2peak}, P5-15m and Fiso. Significance for all statistics was $p<0.05$.

Results

In paraplegia, mean±SD of PO_{peak} was 48.0±20.6W, VO_{2peak} 1.40±0.43 L·min⁻¹, ME_{sub1} 4.8±1.5%, ME_{sub2} 5.2±1.6%, P5-15m 20.0±9.6W and Fiso 531±234N. In tetraplegia, PO_{peak} was 20.8±15.6W, VO_{2peak} 0.86±0.49 L·min⁻¹, ME_{sub1} 4.1±2.2%, ME_{sub2} 4.7±3.2%, P5-15m 10.2±8.4W and Fiso 260±171N.

P5-15m and Fiso were significantly higher in paraplegia vs. tetraplegia ($p<0.05$). Pearson's r between peak test outcomes (PO_{peak} and VO_{2peak}) and P5-15m was 0.69 and 0.79 ($p<0.01$). Between peak test outcomes and Fiso, r was 0.50 and 0.64 ($p<0.01$).

Conclusions

Results suggest that

- (1) fitness levels of most inactive persons with chronic SCI were low compared to the general SCI population;
- (2) discriminative validity of the 15m-test and isometric-push test were acceptable; and
- (3) associations were relatively strong among wheelchair-specific fitness outcomes, but insufficient to predict peak test outcomes using tests for anaerobic work capacity and isometric strength.

A well thought-out protocol in transanal irrigation (TAI) permits better outcome: data and long term results in the first 100 patients

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Introduction and Aims

In January 2010, we introduced a simple morphofunctional evaluation method to evaluate patients candidate to use transanal irrigation (TAI). We report long term follow up on the first 100 patients with high success rate.

Materials and Methods

We analysed data from 106 spinal cord injury patients enrolled from January 2010 to october 2013. Six patients were rejected at the start of the study due to the presence of anatomical situation at risk, 100 patients all followed the study protocol. The method consists of diluting an iodinated contrast medium (hexabrix 320) in the water of the container. After rectal examination, the irrigation fluid, with the contrast medium, is subsequently introduced in increasing quantities, to wash the left part of the colon, with a fluoroscopic examination being performed every 100 mL. The same procedure has been performed after 2 weeks to check results of TAI and to define a personalized program. After an initial phase, the irrigation fluid dose and necessity to use drugs in association, was established for each patient on the basis of the morphofunctional characteristics of the bowel observed during the evaluation.

Results

Of the 100 patients enrolled, only 9 abandoned the procedure during the follow-up phase. The follow-up was continued by means of outpatient evaluations involving the bowel and bladder diaries. All study participants underwent 2 evaluations with X-ray examination (baseline and after two weeks) clinical follow-up varied from 7--24 months. High quantities of fluid are not necessary for irrigation (average 420 ml). During the follow-up, all study participants have continued with TAI three times a week and 54 are continuing to take oral laxatives the previous day. The bowel diaries kept by the patients receiving treatment report the disappearance of episodes of incontinence and low rate of urinary tract infection.

Conclusions

From the introduction of TAI is not high yet. In our experience, the introduction of an easy method that promotes better-reasoned use of this approach leads to a higher percentage of positive results. The efficacy of TAI is referred in data published around 50%, a correct protocol for selection and follow up of patients is not clear and no evidencies are reported on the dose of water to be used. On the other hand complications as bowel perforation are reported. This approach permits to simply resolve problems related on patients selection and to avoid complications. Actually we have 150 patients maintaining good results with this approach, none had complications. These data describe the first group of individuals who followed the protocol. The current finding is that this approach makes it possible to offer a genuine, measured and effective response not only to neurogenic bowel dysfunction but permit a better control of bladder bacteriuria with increase in efficacy of bladder management. We suggest our protocol to specialists involved in management of neurogenic bowel.

References

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Sensory gymnastics at the first stage of rehabilitation after sci including complete injury

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Introduction and Aims

To identify how significant are apraxia-caused sensor infractions for rehabilitation of motoric functions of patients with spinal cord injury (SCI) and to propose an adequate treatment. The underlying hypothesis was that the functional component is essentially present (together with the organic one) in the clinical state of patients having SCI. The aim was to prove the presence of unconscious sensor stimuli that can be used for the formation of adaptive motoric.

Material and Methods

Specially developed sensory gymnastics including percussion and exercises for joints, was applied to 17 subjects with complete transversal SCI. All the subjects were in a satisfactory state allowing motoric rehabilitation; they had more than 3 months after SCI; and they had been infracted by a symmetric injury (paraplegia or tetraplegia).

Results

In the course of the proposed treatment, all 17 subjects became able to distinguish under percussion the upper and the lower third of the shin, although before they thought that they are unable to do it. 8 out of 17 subjects became able to distinguish the outside and the inner edge of the foot.

Conclusions

A possibility of the rehabilitation of topically adequate perception of the percussion is present even for patients with complete transverse SCI. The experiments have proved the presence of unconscious sensor possibilities that are not commonly used part of the rehabilitation potential.

Foot orthoses for functional electrical stimulation-evoked cycling in paraplegic: improving range of motion while optimizing power output

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Introduction and Aims

Paraplegic cycling with functional electrical stimulation (FES) has received great attention for the maintenance and improvement of the individual's health and fitness. There has been different opinions and adoption however on the use of fixed ankle or guided moving ankle foot orthoses (AFO) that is attached to the cycle foot pedal. This study aims to investigate the inter-relation of the free moving or solid ankle range of motion with the other limb joints and the power output production during cycling.

Material and Methods

Two types of ankle foot orthoses, one solid AFO and one hinged ankle AFO, were designed and fabricated with an attached instrumented foot pedal (Garmin Edge) to measure power output during cycling. One subject with incomplete paraplegia (AIS B, T7) participated in the trial with specially designed Berkelbike for individuals with neurological disability, which was equipped with integrated FES system that corresponds to the cycling crank angle. Subject performed FES-evoked cycling with the quadriceps, hamstrings and gluteal muscles stimulated. The cycling movement was recorded using video camera and analysed using motion analysis software. The stimulation current parameters and body position were kept constant between the two AFO trials.

Results

Power output production was greater in the hinged AFO with greater range of motion in the ankle. Other leg joints had similar range of motion with solid AFO. Biomechanical analysis revealed that the use of hinged AFO with strictly controlled dorsi-plantar flexion could assist greater power output production in forward propulsion.

Conclusion(s)

This study indicates that a well-designed AFO with sagittal plane controlled movement could effectively and safely assist and optimize FES evoked paraplegic cycling performance.

Factors contributing to the effects of G-CSF neuroprotective therapy used in a clinical trial for acute spinal cord injury

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Introduction

Methylprednisolone sodium succinate therapy was conventionally used for treating acute spinal cord injuries. However, in recent years it has not been recommended due to questions regarding its effectiveness and the possibility of adverse events. Thus, numerous studies for new treatments have been performed. Granulocyte Colony Stimulating Factor (G-CSF) is generally used for neutropenia that results from cancer chemotherapy and aplastic anemia. In addition, previous research showed that G-CSF suppressed neuron apoptosis and inflammatory cytokine expression in cerebral infarction models. Thus, we designed a study for its clinical application. We investigated the neuroprotective effects of G-CSF using spinal cord injury models based on a hypothesis that G-CSF would be effective for acute spinal cord injury. In 2008, we began a clinical trial of G-CSF neuroprotection therapy for acute spinal cord injury and reported on its safety and efficacy. The purpose of this study was to determine the factors that contributed to these effects of G-CSF in patients with acute spinal cord injury.

Methods

A total of 34 cases participated in this clinical trial, which included 25 men and 9 women. Their mean age at the time of injury was 58.4 years. We analyzed four variables, including (1) age, (2) gender, (3) Body Mass Index (BMI), and (4) AIS at the time of first examination, to determine whether they contributed to subjects' ASIA motor scores at three months after injury. After narrowing down these variable by single variable analysis, we analyzed data using multiple regression analysis.

Results

Female gender and AIS B and C were found to be significant factors that contributed to improved motor function at three months after a spinal cord injury. The energy of injury tended to be lower in female cases than in male cases, the influence of which cannot be denied. Regarding AIS at the time of first examination, this result was in accord with our previous reports. The limitations of this study were a ceiling effect and the small number of cases. We analyzed the data of our clinical trial for G-CSF neuroprotection therapy for acute spinal cord injury. Female gender and AIS B and C were related to ASIA motor scores acquired at three months after spinal cord injury.

Vitamin D deficiency in spinal cord injury and related factors

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Introduction

Vitamin D deficiency is a risk factor for osteopenia, osteoporosis and bone fractures and may cause muscle weakness, musculoskeletal pain, impaired physical function, a highly prevalent condition in patients with spinal cord injury (SCI). The purpose of our study is to determine the prevalence of vitamin D deficiency and related factors in patients with SCI.

Material and Method

Forty two patients with SCI and 42 healthy controls were evaluated. The patients had at least 1 year of injury duration and they were aged between 18-55 years. Demographic data, serum 25-hydroxyvitamin D [25(OH)D], calcium, phosphorus, parathormone and alkaline phosphatase levels were recorded in both groups; the patients were evaluated with respect to injury duration, neurologic level and severity, ambulation and functional status. Spinal Cord Independence Measurement-III (SCIM-III) was used for functional assessment; Walking Index for Spinal Cord Injury-II (WISCI-II) was used to assess ambulation.

Results

The two groups were similar in age, gender and body mass index (BMI). The mean 25(OH)D level was 18.8 ± 11.63 ng/ml in the patient group and 28.03 ± 20.34 ng/ml in controls. SCI subjects had statistically significant lower mean 25(OH)D levels compared with controls. The prevalence of 25(OH)D inadequacy or deficiency (<30 ng/ml) was 85.7% in SCI patients and 71.4% in controls. Age, gender, BMI, injury level and severity, injury duration, SCIM-III and WISCI-II scores were not correlated with 25(OH)D levels in the patient group.

Conclusion

Vitamin D levels in patients with chronic SCI is lower than the normal population. Early diagnosis and treatment of vitamin D deficiency in SCI patients is important because vitamin D is related to osteoporosis also muscle strength and falls. Studies with larger sample sizes are needed to assess 25(OH)D inadequacy or deficiency and to further investigate the causes of deficiency in terms of injury characteristics and demographic factors.

The effects of robot assisted gait training on functional status in men with traumatic incomplete spinal cord injury: controlled trial

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Aim

Spinal cord injury may have functional, medical, economic, psychological and social effects. Loss of independent ambulation is important for the individuals. The primary aim of this study was to investigate the effects of robotic treadmill training on functional mobility in traumatic incomplete spinal cord injury (SCI).

Materials and Methods

Thirty patients with traumatic incomplete SCI who admitted to the inpatient clinic of the rehabilitation hospital were included in this study. All of the patients had physiotherapy 5 days in a week. Group 1, consisted of 15 patients who had robot assisted gait training (RAGT) 3 times a week, 30 minutes every sessions, for 5 weeks. All of the patients initially were evaluated sociodemographically and neurologically. Lower Extremity Motor Score (LEMS), Spinal Cord Independence Measurement-III (SCIM-III), Walking Index for Spinal Cord Injury-II (WISCI-II) were used at the baseline, at the end of the 5. week and at the 3. month after treatment. Quality of life and emotional status were assessed by Hospital Anxiety and Depression Scale (HADS) and EuroQoL Ýnstrument (EQ-5D) at the baseline.

Results

Both groups showed significant improvement in terms of WISCI-II, LEMS, and SCIM-III scores after treatment. LEMS scores in the RAGT group were significantly more improved than that of exercise group's ($p=0,017$). Functional abilities measured by the SCIM-III personal care subscores were showed significantly better improvement in the RAGT group than in the exercise group.

Conclusion

In conclusion, the results showed that RAGT is useful in terms of the improvement in the functional status and walking in rehabilitation of the patients with SCI. Future studies are still required to know the most suitable candidate, the optimal timing and protocol design for maximal benefits of RAGT in SCI patients.

Key Words

Spinal cord injury, functional status, SCIM-III, robot assisted gait training.

Use of functional electrical stimulation leg ergometry, during initial rehabilitation of spinal cord injury, to help improve lower limb muscle power

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Introduction and Aims

An RT-300 Functional Electrical Stimulation (FES) leg bike is used within the initial rehabilitation of Spinal Cord Injured (SCI) patients at the National Spinal Injury Centre, Stoke Mandeville Hospital. The aim of this study was to determine whether muscle power could be improved following eight-weeks of use.

Materials and Methods

The study was carried out over a ten-month period. Patients were referred to the study by their treating physiotherapist. The patients included in the study were adults (>19 yrs.) within initial rehabilitation following SCI, who responded to FES stimulation, and did not present with any contraindications for conventional FES leg ergometry. Muscle power was assessed using the Oxford scale. Six channels of electrical stimulation were allocated to the muscle groups chosen for strengthening in the legs. FES treatment parameters were set to provide maximal tolerable stimulation. Sessions were adjusted during each eight week period to provide optimal strengthening and progression. The aim for each patient was to participate in three sessions of leg bike ergometry each week (24 sessions in total). At the end of the eight week training period, muscle power was re-assessed.

Results

During the study period 42 patients were recruited for FES leg ergometry. The group consisted of 32 male and 10 female patients, with a mean age of 48 yrs. (19 to 78 yrs.). The ratio of complete to incomplete injuries was 1:2, with 14 patients having complete injuries (AIS A) and the remaining 28 patients incomplete injuries (AIS B, C or D). The mean time since injury of the population was 192 days (49-2587 days). Full data was collected on 41 patients (1 patient deceased during the study period). 72% of patients who attended 16 sessions or more gained improvements in muscle power. 79% of patients with incomplete injuries gained improvements in muscle power. 7% of patients with complete injuries gained improvements in muscle power. Of all the improvements in muscle power, 85% represented muscles that improved positively from Oxford scale 0, 1 and 2.

Conclusion

FES leg ergometry can help to improve muscle power in patients with SCI participating in their initial rehabilitation. However, less than 16 sessions of FES leg ergometry provides limited improvements compared to greater gains achieved over 17-24 sessions (over an eight week period). FES leg bike ergometry is most effective at improving muscle power for those with incomplete injuries and in muscles with an initial strength of Oxford grade 0, 1 or 2.

SCI subjects are well tolerating clean intermittent catheterisation more than 15 years after injury

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Introduction

More than 70 % of spinal cord injured (SCI) suffer from neurogenic bladder dysfunction, with a need of catheterisation life-long. In our SCI Unit we have since the start almost 30 years ago used clean intermittent catheterisation by the LoFric® catheter (Astra Tech). There is still a risk of renal deterioration due to high intravesical pressure. In order to control for this a regular follow up is needed. The follow up of 249 patients treated at our Unit are collected in a retrospective database.

Methods

Demographic data, bladder emptying method and results from cystometries at the year of injury and follow-up at fourth investigation 5 years later in 25 patients are analysed. A telephone interview regarding bladder emptying was performed in mean 15 years post injury.

Result(s)

Demographic data of the patients are given in Table 1. 20 subjects used CIC at first investigation, of these 3 had changed emptying regime at fourth investigation 5 years later. The volume and pressure in the bladder remained unaltered, see Figure 1 and 2. At follow-up in mean 15 years post-injury 25 subjects were interviewed. Of the subjects who used CIC 10 years earlier all remained in the CIC regime. See Fig 3. Eight subjects used anticholinergic treatment in addition to the CIC.

Gender: M/F 22/3
Age at injury: 29,2
Cervical 12
Thoracic 9
Lumbar 4

Conclusions

Volume and pressure stays stable over time. CIC is maintained over time

Sacral anterior root stimulation improves bowel function in patients with spinal cord injury

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Introduction and Aims

Even though introduced in 1976 the clinical effect of the sacral anterior root stimulator on neurogenic bowel dysfunction is sparsely investigated. We aim to evaluate the long-term effects of the sacral anterior root stimulator on bowel symptoms in a large, well defined cohort of patients with spinal cord injury.

Material and Methods

A cross sectional study was performed on patients undergone surgery for the sacral anterior root stimulator at the Department of Neuro-Urology, Bad Wildungen, Germany between September 1986 and July 2011. N = 587. A total of 277 was available for analysis.

Results

Satisfaction with the sacral anterior root stimulator was 10 (range: 0-10) on visual analog scale, and 242 (87 %) used the sacral anterior root stimulator for their bowel emptying procedure. Median Neurogenic bowel dysfunction score was 17 (range: 11-21), declining to 11 (range: 9-15) at follow-up, $p < 0.0001$; median St. Marks score changed from median 4 (range: 0-7) to 4 (range: 0-5), $p = 0.01$; median Cleveland constipation score changed from 7 (range: 6-10) to 6 (range: 4-8), $p < 0.0001$. Median visual analog score for bowel symptoms changed from 6 (range: 4-8) to 4 (range: 2-6), $p < 0.0001$. Finally use of suppositories, digital evacuation, mini enemas and patients totally dependent on assistance during defecation declined after sacral anterior root stimulator surgery.

Conclusion

The sacral anterior root stimulator has the potential to be one of the few treatment methods targeting multiple organ dysfunctions following spinal cord injury.

Nutritional status and body weight change of patient with spinal cord injury in Korea

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Introduction and Aims

Following spinal cord injury(SCI), wasting of muscle mass has been occurred due to several causes including denervation, disuse and metabolic change. It could provoke secondary complications so proper nutritional assessment and management are important. As body composition changed after SCI with increasing fat mass, rate of weight loss and conventional body mass index are not accurate to measure body composition. The purpose of this study is assess of nutritional status, weight change and body composition using bioelectrical impedance measurement in patient with SCI in Korea.

Material and Methods

Adult SCI patients were included who were admitted in department of physical medicine and rehabilitation in Severance hospital from April, 2013. Ideal body weight was estimated by Broca's index considering paralytic level. Laboratory data, weight and height were collected at admission, ideal body weight and nutritional requirement were calculated base on these data and a dietitian evaluated current amount of intake. Bioelectrical impedance was measured using the Inbody S10 multifrequency analyzer(Biospace).

Results

Total 87 patients were assessed. Weight loss rate after onset was -10.49 \pm 8.28% in male tetraplegic, -4.99 \pm 12.04% in male paraplegic, -1.69 \pm 5.78% in female tetraplegic and -0.65 \pm 4.90% in female paraplegic patients. Body fat proportion is 21.80 \pm 9.35% in male tetraplegic, 19.54 \pm 7.36% in male paraplegic, 29.45 \pm 15.11% in female tetraplegic and 28.45 \pm 7.35% in female paraplegic patients. Current calorie intake percentage compared with requirement considering paralytic level was 89.53 \pm 24.52% in male tetraplegic, 78.35 \pm 11.07% in male paraplegic, 139.04 \pm 38.94% in female tetraplegic and 106.19 \pm 19.08% in female paraplegic patients. Current protein intake percentage was 89.53 \pm 24.52% in male tetraplegic, 93.90 \pm 16.19% in male paraplegic, 91.89 \pm 31.52% in female tetraplegic and 87.62 \pm 26.21% in female paraplegic patients. 32.1% of patients were classified as "overweight" using the standard calculation for body mass index(BMI) and 50.6% of subject were categorized into "over-fat" according to body fat proportion. The correlation (Pearson's r) between the BMI and the body fat proportion was 0.395(p=0.000).

Conclusions

As improper nutrition is one of the major factor for increasing morbidity and complications, nutritional assessment and education should be done in early stage of injury. According to our study, the rate of weight loss is higher in male patients than female (p=0.001) and the neurologic injury level was associated with the rate of weight loss (p=0.002). Comorbidity and the occurrence of complications did not affect the body weight reduction rate. The conventional BMI did not reflect body fat composition accurately. Regular analysis of body composition and modulating of nutrition and exercise program are needed.

Post-rehabilitation participation restriction of spinal cord injured patient at centre for the rehabilitation of the paralysed (CRP)

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Introduction and Aims

To establish factors influencing the participation of spinal cord injury patients living in the community. The purpose was also to identify the demographic status, find out the level of participation and to investigate the barriers reported by people with spinal cord injured that restricts the participation.

Materials and Methods

Purposive sampling methods were chosen in this descriptive type of cross-sectional study. Measurement were taken when the participants living at community and 2 to 6 years after discharge. Participants were individuals with SCI between the ages of 25 and 45 years. Data from 92 persons were analyzed. Participation was measured as the sum score of "Participation scale".

Results

Among the respondents 43% had severe restriction, 23.7% had extreme restriction, 16.1% had moderate restriction, 8.6% had mild restriction and remaining 7.5% had no major restrictions in different activities mentioned in participation scale. The main barriers to participation reported were inaccessibility (77%), physical limitations (49%), poor family support (18%) and lack of self-confidence (11%). A majority of the respondents perceived their participation was sometimes sufficient in most activities such as opportunities for employment, domestic ADL, contributing financially to the family. A majority of the respondents also perceived one or more severe problems with their participation in these activities.

Conclusions

Although severity of injury and some social factors were found to be the main factors of restricting participation, some personal factors such as age at injury and education were also crucial factors. It is important to consider access to social support along with other factors in the person-environment interaction and their influence on clients' participation in rehabilitation.

Urological results after angioplasty in chronic cerebrospinal venous insufficiency (CCSVI) in multiple sclerosis (MS)

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Introduction and Aim

Bladder dysfunctions related to (MS) are well known and represent one of the major disease related on patient's quality of life. Algorithms to study and treat bladder dysfunctions are related on the stage of the disease and on prevalence of disorders of micturition cycle. Multiple sclerosis has been proposed as a possible outcome of CCSVI. Balloon angioplasty and stenting are proposed as treatment options for CCSVI in MS. Outside the trial setting, these procedures are not currently recommended as treatment. The proposed treatment has been termed "liberation therapy" though the name has been criticized for suggesting unrealistic results. We evaluated subjective and objective results on bladder function in a group of patients submitted to these procedure.

Materials and Methods

Sixteen patients with neurogenic bladder in MS had a complete functional evaluation of symptoms and signs before CCSVI definition criteria and related treatment. All patients had indications to the better way to manage their symptoms. Nine patients used self clean intermittent catheterization (CIC) with antimuscarinics in six and with botulinum toxin injection in the detrusor in 3 to obtain complete retention (first group). Seven patients maintained a spontaneous voiding with low antimuscarinic dosage using CIC 1-2 times a day (second group). After angioplasty to treat CCSVI a new set up was done to evaluate a possible positive effect.

Results

Six patients of the first group stopped CIC and anticholinergic treatments and referred the possibility to urinate but with all symptoms related on neurogenic overactive bladder. They had symptomatic urinary infections, urgency and urge incontinence with significant residual volume. One patient of this group developed bladder stones after two months from the procedure. In the second group 4 patients, in first month after the procedure, referred a subjective better control of voiding reducing use of CIC but objective data were unmodified in bladder diary and urodynamic evaluations. All patients were convinced to restore the same modalities of treatment used before treatment of CCSVI.

Conclusions

There is no known cure for multiple sclerosis. Treatments attempt to return function after an attack, prevent new attacks, and prevent disability. MS medications can have adverse effects or be poorly tolerated, and many people pursue alternative treatments, despite the lack of supporting scientific study. CCSVI has received a great deal of attention in all media, the scientific literature and on the Internet. People with MS often read extensively about the CCSVI theory and its development on Internet sites. In literature related on treatment of CCSVI authors refer a generic improvement in bladder symptoms. These preliminary data don't support these thesis. The subjective data are not related on the real objective situation and are related on the patients "desires". A register to monitor sacral area dysfunctions situation and effect of CCSVI treatment has been

Treatment of neurogenic detrusor overactivity (NDO) by combined low dosed antimuscarinics: our experience

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Introduction and Aim

Primary aim in treatment of neurogenic lower urinary tract dysfunctions after spinal cord injury (SCI) is bladder emptying by intermittent catheterization (IC) avoiding bladder overdistension and treatment of neurogenic detrusor overactivity (NDO) to achieve a low pressure reservoir to protect upper urinary tract and bladder anatomy. Anticholinergic agents are recommended as first line treatment. We report long term follow up in our experience in use combined low dosed antimuscarinics in NDO refractory to high dosage of a single drug.

Materials and Methods

Starting from September 2007 we introduced a protocol of treatment with antimuscarinics in patients with NDO with insufficient treatment outcome under monotherapy at high doses of oxybutynin (15 mg.a day) and trospium chloride (60 mg. a day) with introduction of a combined antimuscarinics treatment with the same drugs at low dosage. All patients demonstrated NDO at bladder diary and urodynamic and started with oxybutynin 7.5 mg.(2.5 mg. every 8 hours) and trospium chloride 40 mg. (20 mg. every 12 hours) Bladder diary was used as continuous control urodynamic was repeated at 3 and 6 months. 85 pts. were enrolled after sub-optimal results with monotherapy All patients had a NDO due to upper motor neurolesion: All patients used IC 4-6 times a day avoiding overdistension.

Results

56 patients continue in the use of combined antimuscarinic treatment maintaining a significant decrease of incontinence from an average of 4 to 1 event per day. Mean bladder capacity at bladder diary increased with combined treatment of 160 ml. from the value with monotherapy. In this population 13 patients stopped temporary reinjection of botulinum toxin in detrusor muscle and they don't require different treatment for NDO and are satisfied. No subjective increase of side effects related on antimuscarinics were noted. 29 patients stopped the treatment due to suboptimal results an were treated with second line options.

Conclusions

Two studies reported a doubling of the recommended dosage of a single drug (1) and a subsequent experience in combined high dosage (2). Our results are encouraging especially in a group of patients with a short time after SCI before to decide further treatment by botulinum toxin injection or neurostimulation. A combined treatment is actually proposed as an option before to decide second line treatments. Different combinations with different antimuscarinics drugs could be evaluated in the future. A combination of antimuscarinic agents at low dosage is an effective treatment strategy in patients who have failed with high dosage monotherapy.

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Inter-rater reliability of the Dutch spinal cord injury data sets

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Introduction and Aims

Collecting information on patients with spinal cord injury (SCI) is not standardized in Dutch rehabilitation centres. Recently, Heliomare and De Hoogstraat in collaboration with the Dutch Flemish Spinal Cord Injury Society (DuFSCoS) received a grant to translate and implement the International SCI Datasets in all DuFSCoS rehabilitation centres. In two consensus rounds 17 physicians of the DuFSCoS identified the Nederlandse Dataset Dwarslaesie revalidatie (NDD). Aim of the study is to test the inter-rater reliability of collecting information on patients with SCI with the NDD.

Materials and Methods

Six physicians from 3 Dutch SCI units completed the NDD on a total of 30 patients with SCI. Each patient was seen twice, by different physicians and a few days apart. Physicians collected information directly from the patient or from the medical records. They were not allowed to exchange information with their colleague. Cohen's Kappa was used to calculate inter-rater reliability of the individual NDD items.

Results

The NDD covers demographic characteristics and functioning of bladder, bowel, urodynamic system, male and female sexual functions, cardiovascular and pulmonary system, skin, pain, autonomic system, and quality of life, and showed generally high inter-rater reliability.

Conclusions

The study provides evidence for reliability of standardized collection of information on patients with SCI in clinical rehabilitation. Results from this study enabled us to improve the elektronical NDD version.

Investigation of cause of death due to trauma using autopsy imaging - possibility of death due to spinal cord injury

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Introduction

Cervical vertebral fracture with spinal cord injury is a potentially lethal form of trauma. However, in cases of polytrauma, a cervical vertebral fracture might be missed, or diagnosed only later. Here, using postmortem composed tomography (PMCT), we investigated the possible presence of cervical vertebral fractures in patients transferred to us because of traumatic cardiopulmonary arrest.

Material and Methods

Radiological investigation was performed on 74 such patients between March 2005 and March 2012. PMCT was done in 68 of 74 patients (51 males and 17 females; averaged 55.8 years). Parameters investigated included the mechanism of injury, cause of injury, cause of death, use or non-use of cervical spine CT, use or non-use of cervical multi planar reconstruction (MPR), and presence of cervical spine injury.

Results

Most common cause of injury was traffic accidents in 38 cases (55.9%), followed by falls in 20 cases (29.4%). Cause of death was obtained from the death certificate diagnosis: traumatic shock accounted for the majority of cases. Cervical MPR was performed in 37 cases (54.5%); only axial in 15 cases (21.8%). Cervical CT was not available in 16 cases (23.6%). Cervical spine injury was apparent in 11 cases (16.2%), and in 7 cases (10.3%) there was a possibility that cervical spine trauma was involved in the cause of death.

Conclusion

In traumatic CPA, as cervical spinal injury may not be properly diagnosed, further investigation is considered necessary.

Current pregnancy among women with spinal cord injury

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Introduction and Aims

With significant improvements in medical care and societal attitudes toward disabilities, growing numbers of women with physical disabilities are choosing to become pregnant and bear children. This research was conducted to address 2 questions relating to women with spinal cord injury (SCI): 1) What is the annual prevalence of current pregnancy? and 2) What sociodemographic and injury characteristics are associated with current pregnancy?

Material and Methods

Data were retrieved from the National SCI Database in the USA, including 3,054 women with SCI aged 18-49 years, who received follow-up interviews at post-injury years 1, 5, 10, 15, 20, 25, 30, and 35 during the period from 2000-2013. Current pregnancy was defined as any hospitalization during the past 12 months for the reason of uncomplicated childbirth or complications of pregnancy, childbirth, and the puerperium. Logistic regression analysis was performed to identify significant factors associated with current pregnancy. To account for potential dependence among multiple interviews of the same woman, we used the generalized estimating equations (GEE) method to estimate the magnitude of associations.

Results

The annual prevalence of current pregnancy was 2.0%. This rate varied by post-injury years (0.6%, 2.9%, 3.7%, and 0.4% for years 1, 5, 15, and 25, respectively), but did not differ by calendar year, race/ethnicity, education, employment, bladder management, and pain. The likelihood of current pregnancy decreased with increasing age at interview as well as age at injury. The odds of current pregnancy was significantly higher for women who were married, had better functional status (higher FIM score), and had greater community participation (higher Craig Handicap Assessment and Reporting Technique [CHART] mobility and occupation scores). The impact of injury etiology, neurologic category, and life satisfaction on current pregnancy became not significant after adjusting for sociodemographic characteristics, functional status, and participation.

Conclusions

The prevalence of current pregnancy among women with SCI is similar to what has been reported in a national sample of USA women with chronic physical disabilities. These findings highlight the need for educating clinicians about caring for women with SCI who become pregnant. This study also provides a foundation for further research into the pregnancy outcomes of these women and the quality of their prenatal and childbirth care.

Intake situation of meal in patients with acute traumatic cervical spinal cord injury

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Introduction and Aims

Securing of nourishment is important for progression of rehabilitation process. This study was aimed to describe the course and outcome of intake situation of meal observed in the initial treatment of cervical spinal cord injury and to determine the factors which influence poor outcome.

Material and Methods

All patients with acute traumatic cervical spinal cord injury admitted to our hospital for initial care between January 2006 and March 2009 were included in this study. Cases showed persistent consciousness disturbance or severe dementia and of death were excluded. Data concerning ASIA impairment Scale, artificial respiration, presence of tracheostomy, oral or tube feeding, complications which influenced feeding status, intervention, presence of posttraumatic amnesia, image views of the brain and spinal cord were obtained from medical charts.

Results

One hundred and eighteen cases were included. Cases consisted of ASIA impairment scale A, B, C, D and E were 19, 4, 32, 57 and 6 in number, respectively. Interventions of speech pathologists and/or food modifications were required in 45 cases (38%). At discharge, 16 (13%) patients with feeding tube and 18 (15%) still required food modification. ASIA impairment scale, artificial respiration, tracheostomy and signs of traumatic brain injury significantly affected the feeding status at discharge.

Conclusions

Tracheostomy may be a potentially avoidable factor among those of poor ingestion outcome. In order to improve feeding status, it would be an option to utilize noninvasive ventilation and to avoid tracheostomy.

Sleep problems and associated risks in young adults with pediatric-onset spinal cord injury

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Introduction and Aims

To examine the prevalence of sleep difficulties over a one year period in young adults with pediatric-onset spinal cord injury (SCI), and assess longitudinal outcomes associated with disturbed sleep.

Material and Methods

The study included 112 young adults between the ages of 19 and 29 ($M=27.14$, $SD=1.42$), who sustained a SCI prior to age 19, and had been injured for at least one year ($M=13.22$, $SD=5.12$). Participants completed interviews that included demographic information and measures of depression, life satisfaction, and perceived health at time 1 and again 12 months later. Self-reported sleep difficulties were compared at both assessments and mixed-effects regression models were used to assess longitudinal risk of outcomes as a function of sleep problems.

Results

Participants tended to have complete injuries (AIS A, 79%) and tetraplegia (55%), and were predominantly male (59%) and Caucasian (87%). Sleep difficulties were fairly common, with nearly a third or more of the participants reporting difficulty falling asleep or staying asleep within the last 2-4 weeks at time 1 ($N=34$, 30.4%) and time 2 ($N=43$, 38.4%). Sleep problems at time 1 significantly increased the risk of sleep problems at time 2 (OR 2.85; CI 1.24-6.53), with more than half of participants reporting sleep problems persisting from time 1 to time 2 ($N=19$, 55%). Demographic and injury characteristics were not significantly related to sleep problems, but those with activity limiting pain were at increased risk of sleep difficulties (OR 2.54; CI 1.48-4.34). Sleep problems emerged as a significant predictor of increased depressive symptoms ($\beta=.44$, $p<.01$), decreased satisfaction with life ($\beta=-2.13$, $p<.01$), and lower perceived physical ($\beta=-.06$, $p=.04$) and mental health ($\beta=-.06$, $p<.01$).

Conclusion

These findings underscore the importance of understanding the longitudinal course of sleep after pediatric SCI and highlight the need for future research exploring strategies to improve sleep and promote positive long-term outcomes.

The evolution of bacterial resistance of uropathogens in patients in the post-acute phase after spinal cord injury

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Introduction and Aims

In spinal cord injured patients bacterial colonization of the urinary tract is frequently quick due to alternative methods of bladder emptying. Most cases exhibit asymptomatic bacteriuria but often symptomatic urinary tract infection (UTI) may develop and even sepsis. Patients in the hospital setting exhibit colonization by nosocomial pathogens and often present significant antibiotic resistance, in spite of strong infection-control measures and targeted antibiotic therapy. The rise of bacterial resistance, including uropathogens, is alarming. The objective was to determine the pattern of colonization and the management of multidrug resistant uropathogens in patients who were hospitalized in the spinal cord unit of the University Hospital Motol during a 10 year period between 2004 and 2013.

Materials and Methods

The 3183 positive bacterial cultures from urine samples of hospitalized SCI patients were analyzed for the presence of extended spectrum β -lactamase (ESBL)-producing *Enterobacteriaceae*, multiresistant *Pseudomonas spp.* and *Acinetobacter spp.*, and methicillin-resistant *Staphylococcus aureus* (MRSA). These strains were analyzed for their role in the development of symptomatic infections and for the appropriate choice of antibiotic therapy.

Results

The presence of resistant uropathogens was shown in 485 of the analyzed urine samples. The most frequent pathogen was *Klebsiella spp.*, i.e. in 340 cases (70.1%), *Escherichia coli* in 45 cases (9.28%), *Pseudomonas aeruginosa* in 39 cases (8.04%) and MRSA in 26 cases (5.36%). Other bacteria were represented individually. Out of the four most prominent pathogens, symptomatic UTIs were caused by MRSA and *Pseudomonas aeruginosa* in 46.15%, *E. coli* in 40% and *Klebsiella spp.* in 29.71%. The least common symptomatic infection was caused by the *Acinetobacter spp.* strain (11.11%). In 46.06% of the observed group two or more pathogens were identified in the urine culture. Out of those cases, 84.23% were cultures from patients with indwelling catheter and only 15.77% were from patients using the intermittent catheterization regimen or voluntary voiding. Evaluation of the emergence of resistant bacterial strains by individual years showed that in 2005 there were 5.88% identified, in 2007 15.63%, in 2009 12.54%, in 2011 23.54% and finally in 2013 there were 19.71% of resistant bacteria of the overall identified cases.

Conclusion

The counts of enterobacteria which cause ESBL infections are on the rise as opposed to the stagnating rates of MRSA. The presence of only one type of a pathogen identified in a symptomatic UTI is more common in patients with intermittent catheterization as opposed to patients with indwelling catheter. It is important to distinguish significant bacteriuria between asymptomatic colonization and symptomatic infection thereby preventing the overuse of antibiotics and their selective effect on the microflora of hospitalized patients and on the hospital setting.

Designing of a pneumatic autolocking knee orthosis to assist patients with lower limb pareses, including post spinal cord injury

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Introduction and Aims

Pareses in lower limbs, of different etiologies, including incomplete/asymmetric paraplegia after spinal cord injury (SCI), represent a difficult task for the related neurorhehabilitation endeavors, for which currently used assistive devices still need improvements. To present the designing of an orthosis pneumatically powered, aiming to assist/rehabilitate standing and gait in needing patients. Its principle of functioning is to block the knee in extension during standing and at the moment of setting the foot to the ground (heel attack phase of the gait cycle) and to enable the automated unblock further, enabling thus for continuance of walk and providing, syncretically: anti-gravitational support, stability (with no need for the patient's intervention - that otherwise would limit its utility), the increase of the patient's autonomy and physiologic related training of these two essential and complex functions of the human body: (biped) orthostatism and locomotion.

Material and Methods

The starting point was "Long orthotic device with lock/unlock system unassisted manually or electronically for the knee mechanical joints", worked by Onose and colleagues and has already patented. Modern, updated materials and appropriate components, have been chosen, during the designing process -- to be used in the future step of its physical achievement -- and integrated, computer assisted, in the structure of this related exoskeleton, specifically within the: support material, mechanical lock/unlock effectors' system and ensemble of pneumatic control/action.

Results

It was developed a virtual designing -- based on tridimensional modeling and related simulation of how it works -- of this kind of knee ankle foot orthosis (KAFO), by integrating its three afore mentioned composing parts:

Conclusion(s)

Hopefully this optimized orthosis will improve the existent related rehabilitative capabilities. After having been produced, as prototype -- including with technical necessary homologation requirements/procedures accomplished -- we aim to test its performances on volunteers -- first on able bodied -- with respect to bioethical rules for clinical trials.

High versus moderate intensity arm-crank exercise for improving oxygen uptake and cardiovascular risk factors in spinal cord injured

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Background and Aim

Spinal cord injury (SCI) is a debilitating condition which leads to loss of sensory and/or motor function of varying degrees below the level of injury. Physical inactivity is a major risk factor for developing cardiovascular disease and early death. Physical inactivity is highly prevalent in SCI population. Maximal oxygen uptake is a predictor for cardiovascular health. In studies with able-bodied, aerobic high intensity training has been found superior compared to moderate intensity, in terms of increasing oxygen uptake and reducing risk factors for cardiovascular disease (CVD). Only a limited amount of studies have investigated the role of intensity of training during arm-crank exercise (ACE) in terms of effect on aerobic capacity and prevention of cardiovascular risk factors in individuals with a SCI. Therefore the primary aim of this study was to compare the effect from high-intensity ACE (i.e. 85-95% of peak heart rate) in 4 x 4 minute intervals, with isocaloric moderate intensity ACE (i.e. 70% of peak heart rate) on peak oxygen uptake for individuals with chronic traumatic SCI. Secondary aims were to compare the effect from high- versus moderate intensity ACE on lipid profile, fasting glucose, hypertension and resting heart rate.

Methods

10 traumatic SCI participants volunteered for 8 weeks of ACE with 3 exercise bouts per week. The participants were randomized into two groups, high intensity ACE (85-95%HRpeak), (N=5), and moderate intensity ACE (70%HRpeak), (N=5). A pre-test posttest design was used, and the participants were tested for VO₂peak, lipid profile, insulin resistance, blood pressure and resting heart rate at pre- and posttest.

Results

No significant difference between the high- and moderate intensity ACE in terms of VO₂peak was found. Although not significant there was a favorable trend towards a higher increase in mean VO₂peak in the high intensity group compared to the moderate intensity (high intensity group mean increase 8.9% (l/min), while the moderate intensity group had a minor mean decrease of 2.1% (l/min)). No significant difference in the blood glucose levels, blood pressure, lipid profile and resting heart rate was found between the two groups after 8 weeks of ACE.

Conclusions

No significant differences were found between the high and moderate intensity groups after 8 weeks of ACE. Individual differences affect our results. Our findings indicates that eight weeks of high intensity ACE may improve the aerobic capacity for chronic SCI individuals more than moderate intensity ACE. The cardiovascular risk factors such as the lipid profile seem to be improved by exercise for SCI people, but we cannot say if the intensity is the dependent factor.

Keywords

Spinal cord injury, arm crank exercise, aerobic exercise, cardiovascular disease, lipid profile.

Prevalence and risk factors of fatigue in persons with recent spinal cord injury

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Introduction and Aims

Fatigue can be defined as an overwhelming sense of tiredness, lack of energy and often a feeling of total exhaustion. Complaints of fatigue can negatively affect a persons functioning. In persons with spinal cord injury (SCI) in the chronic phase, fatigue has been found to be a common problem. However, little is known about fatigue in persons with recent SCI. Therefore, the goal of this study was to estimate the prevalence and to assess risk factors of fatigue in persons with recent SCI. Potential risk factors were: demographic- and lesion characteristics, Body Mass Index (BMI) and aerobic capacity.

Material and Methods

Wheelchair-bound persons with recent SCI in four Dutch rehabilitation centers were asked to participate. Measurements were performed two months before discharge from initial inpatient rehabilitation after onset of SCI. The fatigue severity scale (FSS) was filled out. The theoretically possible range of the FSS is 1-7 with a score >4 indicating fatigue. Furthermore, gender and age were registered, lesion level, completeness and BMI determined, and during a maximal handcycling test the peak power output (PO_{peak} in Watt) and peak oxygen uptake (VO_{2peak} in L*min⁻¹) were determined as measures of aerobic capacity. Risk factors of fatigue were assessed using separate regression analyses correcting for confounding variables when necessary.

Results

36 persons were included; 31 men/5 women, mean age 43±15 years, 67% paraplegic and 64% with motor complete lesion. Mean score on FSS was 3.3±1.3. Scores indicating fatigue were found in 30% of participants. Persons with incomplete lesion had significantly higher scores on fatigue compared to persons with complete lesion (B=-0.96, p=0.03). Furthermore, regression analysis correcting for lesion level and completeness showed that lower VO_{2peak} was related to more fatigue (B=-1.47, p=0.05). Lesion level (B=0.82, p=0.08), age (B=0.02, p=0.16), BMI (B=0.10, p=0.87) and PO_{peak} (B=-0.01, p=0.27) were not significantly related to fatigue.

Conclusions

Fatigue is prevalent and of considerable concern in persons with recent SCI. Moreover, having an incomplete lesion is a risk factor of fatigue. Therefore, rehabilitation professionals should be aware of complaints of fatigue and of possible impact on rehabilitation, especially in persons with an incomplete lesion. Furthermore, lower aerobic capacity seems to be related to more fatigue, which stresses the importance of integrating aerobic training into inpatient rehabilitation when possible.

SYMBITRON: Symbiotic man-machine interactions in wearable exoskeletons to enhance mobility for paraplegics

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Most of the systems developed to sustain gait in subjects with SCI do not consider human machine interaction approaches. SYMBITRON is an ambitious EC funded research project coordinated by University of Twente aiming at the development of a crutch-less assistive exoskeleton with human/machine interaction capabilities.

The main objective is to develop a safe, bio-inspired, personalized wearable exoskeleton that allows SCI subjects to walk without additional assistance. SYMBITRON is designed to overcome the existing technical limitations, to enhance the state-of-the-art knowledge on walking, balance and man-machine interaction, and thereby to bring independent walking with tailor-fitted, wearable exoskeletons within reach of the patient.

The project is based on a patient- instead of a technology-driven methodology. Design and control of the wearable exoskeleton and of the interface between the exoskeleton and patient are customized to the unique features (not only impairments but also remaining capacities) of each individual patient.

The objective of providing each personalized exoskeleton human-like neuromuscular properties represents a paradigm shift in the field of robot-assisted living. We aim to create a symbiotic interaction between human and the WE. Understanding of impaired human motor control, modular approach design of personalized wearable exoskeletons, Implementing biological inspired neuromuscular controllers, restoring the bi-directional information flow between paralyzed and intact body parts are the characterizing aspects of the project.

At present none of the available exoskeletons represent a credible competitor for the functionality of wheelchairs. Only a system that will allow gait at a reasonable speed, functional use of the hands, managing for stairs and obstacles as well as easy portability and maintenance will somehow be able to compete with the still winning wheelchair. The SYMBITRON bet is, because of human machine interaction specific approach, to develop an exoskeleton that can credibly add value/ functionality with respect to the performances of modern wheelchairs.

Barriers and facilitators to physical activity among active and inactive individuals with spinal cord injury living in the community

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Introduction and Aims

This study explored perceptions of active and inactive individuals with SCI on barriers and facilitators to physical activity and delivered a personalised physical activity program in community fitness centres. The aims were to a) identify the barriers and facilitators to physical activity among community dwelling individuals with SCI; b) understand differences between the barriers and facilitators perceived by physically active and inactive individuals with SCI; c) observe perception changes after a structured physical activity program; d) determine if participants engage in regular physical activity. This is a study under the Spinal Cord Injury and Physical Activity in the Community Program (SCIPA Com).

Material and Methods

Community dwelling adults with chronic SCI were recruited for a quantitative investigation utilising the Barriers to Exercise Scale (BTES, n=81) and a qualitative exploration through semi-structured interviews carried out on two occasions: before and after participation in SCIPA Com, a personalised twelve week physical activity program in community fitness centres. Subjects were divided into two groups for the qualitative analysis: physically active (n=20) and inactive (n=17).

Results

The BTES scale revealed only 14.84% were physically active individuals although 83.95% of the inactive subjects expressed interest in becoming active. The main barriers identified were costs (45.68%), lack of accessible facilities (43.2%) and assistance (29.63%). Physical and psychological issues were further reported as important barriers, alongside bad weather conditions. Thematic analysis of both physically active and inactive groups revealed similarities with results of the BTES. The main thematic differences in the physically active group were: greater interest in sports and physical activity; more likely to have experienced physical activity during rehabilitation or post-discharge; and heightened awareness to types and benefits of physical activity. Among the physically inactive group, structured physical activity programs delivered by trained exercise professionals acted as catalysts to increase their physical activity participation, whereas perceived health benefits and community support increased their motivation. The majority expressed improved knowledge and interest in continuing their activities after SCIPA Com.

Conclusions

Active individuals with SCI revealed the importance of access to information on resources and benefits of physical activity. Perceptions towards barriers and sedentary behaviours were modified after experiencing a structured physical activity program especially among inactive individuals previously unaware of accessible facilities and their physical ability. Rehabilitation professionals, SCI networks and health care systems need to intensify the conveyance of information, financial support and opportunities for physical activity to people with SCI during rehabilitation and in the community.

What can we learn from a nutritional analysis of an athlete with spinal cord injury?

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Introduction and Aim

Planning a nutritional strategy to lose weight and optimize exercise performance based on a nutritional analysis of an internationally competitive wheelchair athlete.

Material and Methods

During seven consecutive days the athlete (age: 28y; height: 165cm; weight: 75.1kg, race category: T54) filled in a nutrition protocol, which was analysed for intake of energy, protein, fat, carbohydrates, vitamins, mineral nutrients, fluid and dietary fibre. Supplements ingested by the athlete were also included for the analysis. During the week the athlete participated at an international 1500m track race.

Results

Subject's body weight was the same at the beginning and the end of the week. Average daily energy intake was 10.0MJ (2394kcal) but showed a wide range between 5.0-17.7MJ (1198-4228kcal) and did not coincide with daily training load. Energy intake was covered by fat (34% of total energy intake corresponding to 1.2g per kg body mass), protein (16%; 1.2 g per kg body mass) and carbohydrates (50%; 4.2g per kg body mass). One third of total carbohydrate intake was covered by sugar. The evening meal before competition contained a total of only 18g of carbohydrates. The meal directly after the competition contained 5.0kJ (1200kcal). Concerning the intake of fruits and vegetables, the "take 5 a day" rule was never reached (average 2-3 serving sizes per day). Although the athlete took supplements on a daily base there was an undersupply in vitamin D, vitamin B12, folic acid and potassium, whereas the amount of phosphate ingested was higher than required. Average daily fluid intake was 3684ml and mean dietary fibre intake was 32g per day.

Conclusions

The present case report shows that it seems necessary to provide some nutritional education towards a well balanced diet even to internationally competing athletes. Day to day variability of energy intake should be reduced in order to match daily training needs more effectively. In this context one has to take into account the markedly reduced daily energy demand of athletes with a spinal cord injury compared to able-bodied athletes.

Fertility, pregnancy, childbirth and parenting for persons with spinal cord injuries

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Introduction and Aims

This three-year project is run by the Spinalis Foundation and aims to provide information and raise the level of knowledge about fertility, pregnancy, childbirth and parenting for persons with spinal cord injuries (SCI). One reason for initiating this project was the inconsistent level of medical knowledge concerning these topics, which varies considerably across Sweden, as does the relevant medical care.

Material and Methods

The website www.mammapappalam.se was launched in May 2013 to provide information for both consumers and health professionals. During the first year we held lectures about pregnancy, childbirth and parenting at all major spinal units in Sweden. We also provide training on these topics to midwives and midwife students. The importance of role models to parents with SCI cannot be underestimated and one objective of this project is to establish a parent support network across Sweden. We have a very active group of almost 200 parents sharing advice and discussing parenting online in our Facebook group. We have also organized a number of get-togethers for parents with disabilities across the country. We want to encourage and support current and future parents with SCI throughout Sweden by providing knowledge and the opportunity to easily contact other SCI parents. The information on the website has received medical approval from a panel of doctors and midwives. The site presents evidence-based educational materials and hands-on tips from parents with SCI. The website will be translated into English in spring 2014. As few technical aids have been developed for parents with disabilities, they must invent their own. The website draws from these ideas and publishes innovative solutions. The ultimate goal is to increase the level of independence among parents with SCI.

Results

During the first year we have mainly focused on raising the level of medical knowledge within pregnancy and childbirth. Since the project started in January 2013 approximately 400 doctors, midwives and other health care professionals have attended our lectures about fertility, pregnancy, childbirth and parenting with SCI. The feedback has been positive. Many professionals from prenatal care units as well as spinal care units testify that this is an area in which they lack knowledge and experience. At the beginning of 2014 the parent network consists of almost 200 SCI parents across Sweden.

Conclusion

Three mothers living with SCI initiated this project. The first year has proven that there is a need to raise topics concerning becoming and being a parent with SCI further.

Challenges to establish assistive technology service provision for persons with spinal cord injuries in less resourced countries--an indian prospectiv

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Introduction

Technology has an important role to play in human's everyday life. It makes the task easier for normal persons but for the people with disabilities it makes possible. Tailor made Assistive Technologies provide opportunities to people with disabilities to lead a quality life in their environment. Assistive Technology (AT) is not just a product it is an approach which plays even more significant role in the life of someone with a severe disability such as a spinal cord injury (SCI). Assistive Devices designed to increase an individual's level of function and independence can be instrumental in providing a person with SCI the highest possible level of function after injury. SCIs in less resourced environment like India are not able to achieve maximum functional level of independence due to various factors. Lack of proper assistive technology services provisions within the existing rehabilitation facilities and lack of trained professional in this area are the significant factors. AT Service Provision for SCI should be established within rehabilitation process to make recommendations for proper Seating and Mobility systems, adaptive home/work environment, modified transportation, computer accessibility, environmental control systems and assistive devices for Activities of Daily Living (ADL) and also make them available locally. AT services are always a client centered approach in which the recommended assistive device should be made available within the process of integrated service delivery keeping in mind the various factors like affordability, usability, acceptance and appropriateness to environment. Training and follow-up is the major part of the after delivery process. In the developing countries like India the provision of Assistive Technology services for people with spinal cord injuries is not a regular practice within the rehabilitation process. Therefore, people with SCI do not get opportunities to become independent enough to be a productive member of society and also to put themselves into jobs, studies and/or business rather they become burden on the family. Presentation will provide a detailed analysis of current scenario of Assistive Technology Services provisioning, most importantly mobility and seating services as per World Health Organization (WHO) Guidelines.

Sharing best practices to improve the management and care of spinal cord injured patients

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Introduction

The Spinal Advisory Working Group was established in 2013 with a group of 5 nurses from Spinal Injury Centers across the UK, an intimate group that works to develop and implement a range of practical initiatives designed to help improve the management and care of patients with spinal cord injury. Objectives of group: Identify nursing best practices for spinal cord injury and how these can be applied across multiple centers, Spinal Injury unit exchange program, Identify opportunities for service development from manufacturers and the NHS (National Health Service) dh (department of Health) joint working initiative, Review current guidelines (where available) and identify potential revisions, Develop strategies to implement changes in UK spinal care , Learn from international experiences in the treatment of spinal cord injury.

Methods

To date an exchange with 3 units across the UK and Northern Ireland has taken place with best practices shared. The aim will be to have representation from all 11 units across the UK. Behavioural management of spinal injured patients is the topic of research that the group would like to explore. The findings will be disseminated both nationally and internationally.

Effect from high versus moderate intensity arm crank exercise on peak oxygen uptake and cardiovascular risk in individuals with paraplegia

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Introduction and Aims

Spinal cord injured individuals are physically inactive, have a low physical capacity, and higher cardiovascular mortality rate compared to able bodied. Physical activity can reduce the progression of cardiovascular disease. To our knowledge, few studies have examined the effect from high versus moderate intensity aerobic training, and there are no consort statement exercise guidelines for this group. The aim of this study was to assess the effect of high and moderate intensity on cardiovascular risk factors on persons with spinal cord injury.

Material and Methods

Ten persons with chronic paraplegia (Th4-L2, mean (SD) age 44.3 (± 10.6)) participated. After being stratified for age, the participants were randomly admitted to high intensity interval (AIT; 85%-95% of Hfmax) (n=5) or continuous moderate intensity (CME; 70% of Hfmax)(n=5) arm crank exercise intervention three times a week for a total of eight weeks. Training volumes between the two groups interventions were isocaloric. Outcomes: Waist circumference (WC), Body mass index (BMI) and Peak oxygen uptake (VO₂peak). Study design: Pre-post study design.

Results

No statistical differences were found between the two groups with regards to BMI (mean (SD);AIT: - 3.05 % (± 2.67) , CME: -3.22 %, (± 4.48); group: -3.14(± 3.49)) and waist circumference (mean (SD); AIT, -3.44% (± 2.55) CME -2.44% (± 4.89), group: -2.94 (± 3.72)). There were no significant difference in VO₂peak between AIT and CME intensity group at post testing. However, there was a tendency towards a higher increase in the Hit group (mean (SD); AIT: 8.45% (± 10.82) , CME: -- 1.83 (6.99 \pm) P=0.095).

Conclusion

There was a favorable trend towards a higher improvement in Vo₂ peak from high intensity exercise compared to moderate intensity. However, based on the small sample size, and lack of homogeneity between and within the groups, no conclusions can be made. Future randomized controlled trials are needed to confirm our hypothesis. Both interventions were feasible for our participants, and no adverse effects were experienced.

An innovation in low load plyometric training for rehabilitation and assessment of dynamic tone

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Introduction and Aims

Neurological injury resulting in upper motor neuron lesions alters the ability to modulate segmental motor gain and reflexes. Individuals with acquired brain injury (ABI) and those with incomplete spinal cord injury have limited control over lower limb (LL) hyperreflexia and this impacts on function. Rehabilitation therapists use subjective assessments of tone and /or spasticity which generally show poor to moderate reliability. Notably, these assessments request participants to be as passive as possible i.e. "just let me move you". Our objective was to develop a functional test that assesses LL stiffness (K) while actively engaging the participant and that allows individuals with limited muscle function to perform the task. Our aim was to determine if individuals with neurological injury affecting the LL are able to modulate K using this device.

Material and Methods

Lower limb stiffness was assessed during single and double leg hopping using an inclined (20degrees = 34% body mass) sleigh apparatus (Gibson et al). Sleigh hopping has been shown to be reliable (unpub data). The sleigh included a forceplate and, in combination with 3D motion analysis, joint angle and moments were calculated. Stiffness was determined using 3 methods: single joint moments and range, the peak force relative to the shortening of the LL (termed Kc)(Cavagna et al) and a field test model validated for upright hopping (termed Kd) (Dalleau et al). We developed a mathematical model for K obtained from the inclined sleigh which was consistent with Kd. We validated Kd against Kc (across 15 hopping frequencies of 5 subjects normal on 3 frequencies). We also determined which individual joint best correlated with overall LL K. To date 15 participants (6 control and 9 ABI with altered LL tone) have been assessed for LL K modulation.

Results

The inclined low friction sleigh generates a reliable (controls Intra class correlation. ICC > 0.77 for Kd) and valid (Kd correlated linearly with the gold standard Kc Normalised mean $R^2 = > 0.95$). Assessment of individual's ankle joint K was most closely correlated with Kd across a wide range of hopping frequencies, Preliminary testing of individuals with ABI shows that some participants who are not able to hop in the upright position are able to generate power to hop on the sleigh thereby enabling analysis of LL K that is not otherwise possible.

Conclusions

Individuals with neurological lesions are able to hop on an inclined sleigh which is safe and provides a research paradigm for functional tests of LL K modulation. Data from our normative group suggests that during low load hopping LL K is dominated by the control of the ankle K. As a clinical field test this has prospects for SCI research and assessments.

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Treadmill exercise testing in subjects with incomplete spinal cord injury

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Introduction and Aims

Exercise testing provides important information about exercise capacity. In persons with incomplete spinal cord injury (SCI), ergometer cycle exercise is frequently a testing mode of choice. However, using a treadmill exercise protocol normally yields a higher maximal oxygen uptake compared to using an ergometer cycle protocol. To our knowledge, no treadmill exercise protocol is established for persons with incomplete SCI. The objectives of this study were to investigate cardiovascular responses at maximal workloads during a new treadmill exercise protocol designed for persons with incomplete SCI (called the Sunnaas protocol) compared to a Modified Bruce protocol, and to examine if the persons with incomplete SCI during these protocols were able to achieve established criteria for maximal oxygen uptake.

Material and Methods

Ten men and one woman with chronic incomplete SCI (AIS D), with a mean age of 45 (± 12) years, height; 178 (± 9) cm and weight; 84 (± 14) kg, were recruited from inpatients at Sunnaas Rehabilitation Hospital. All subjects completed two treadmill exercise tests until exhaustion, one using the Sunnaas protocol and one using a Modified Bruce protocol, in a randomized order. The Sunnaas protocol has slower speed and inclination increases than the Modified Bruce protocol. The subjects were tested with at least one day in between, and at the same time of the day. During the tests, they were not allowed to use any assistive devices or to grip/rest their arms on the handrail. Oxygen uptake (VO_2), respiratory exchange ratio (RER), ventilation (VE), and heart rate (HR) were measured continuously during both tests. Blood lactate was measured two minutes into recovery. The criteria for maximal oxygen uptake were; achievement of a VO_2 -plateau ($< 1.5 \text{ ml/kg/min}$ increase with increased workload), $\text{RER} \geq 1.15$, blood lactate level $\geq 5 \text{ mmol/l}$, and 95 % of predicted maximal HR, using the formula $220 - \text{age}$.

Results

The results showed an average of 2.4 ml/kg/min (7 %) higher $\text{VO}_{2\text{max}}$ in favor of the Sunnaas protocol ($37.3 \pm 11.5 \text{ ml/kg/min}$ vs. $34.9 \pm 11.4 \text{ ml/kg/min}$, $p = 0.018$). There were small differences in maximal HR (175 ± 11 vs. 173 ± 13 , $p = 0.334$), lactate level (7.54 ± 2.9 vs. $6.98 \pm 3.21 \text{ mmol/l}$, $p = 0.089$) and RER (1.19 ± 0.07 vs. 1.15 ± 0.08 , $p = 0.085$). Maximal ventilation was higher using the Sunnaas protocol (104 ± 38 vs. $95 \pm 37 \text{ l/min}$, $p = 0.007$). The pre-set criteria for maximal oxygen uptake were achieved for most of the subjects, similar in both protocols.

Conclusions

Persons with incomplete spinal cord injury, that have a reduced walking function, exhibited a higher $\text{VO}_{2\text{max}}$ when using the Sunnaas treadmill protocol compared to using a Modified Bruce protocol, and they were able to achieve established criteria for maximal oxygen uptake. Thus, the Sunnaas protocol might be a promising treadmill test protocol for persons with incomplete spinal cord injury in providing information about their exercise capacity.

Transverse myelitis, a cause of refractory neurogenic bladder

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Introduction

Transverse myelitis (TM) can cause a variety of neurological symptoms. Almost all patients with TM have co-existing neuropathic bladder dysfunction (NBD) however; the course of NBD is variable. The aim of the study was to identify the course of bladder changes associated with TM and effects of management.

Patients and Methodology

A prospective study on all TM patients diagnosed and followed up in our spinal rehabilitation centre was carried out since 2011. All relevant data were recorded, including initial investigations, management and follow up investigations. All patients had concomitant skeletal neurological insult.

Results

In two years, 8 patients were diagnosed with TM. Their average age was 9.37 (range 4 to 15 years). Two patients (25%) were tetraplegic, the remaining 6 patients (75%) were paraplegic. All patients had an ultrasound scan and Urodynamics for evaluation of NBD. All had neurogenic detrusor over activity (NDO) with a mean maximum detrusor pressure of 44 cmH₂O (range 5-112). The management involved clean intermittent catheterisation in 6 patients (75%) and spontaneous void in the remaining 2. Motor function was regained completely in three patients and partially in two whilst the remaining 3 are still wheelchair bound. Bladders remained neuropathic in all patients. Four patients (50%) rely on intradetrusor Botox injections and 6 (75%) continue taking anti-muscaranics for persistent NBD.

Conclusion

TM invariably leads to NBD. Importantly, this dysfunction appears to persist even with improvement of neurology. Patients with NBD secondary to TM require long term follow up to optimize lower urinary tract function.

Job matching in vocational rehabilitation of persons with spinal cord injury: approaches from return to work and organizational research

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Introduction and Aims

Successful and permanent return to work (RTW) for persons with spinal cord injury (SCI) requires that their work-related capabilities and characteristics be compatible with the demands and characteristics of their job.

Therefore, job placement programs in vocational rehabilitation (VR) of persons with SCI aim at matching work-related skills and needs with the demands of the intended job and the characteristics of the workplace. In this process, job matching tools are important for job-specific assessment and documentation of the goal setting and goal evaluation process. This study aims to provide an overview on research involving job matching in the fields of RTW and organizational research with a specific focus on VR of persons with SCI.

Material and Methods

We performed a systematic literature review on research involving job matching in the fields of RTW and organizational research with a specific focus on VR of persons with SCI.

Results

We found that recent RTW research aims at developing a conceptual framework for VR of persons with disabilities and at establishing health condition-specific information on various aspects influencing RTW. A biopsychosocial framework is proposed for conceptualizing the RTW process which could also be applied for job matching in VR of persons with SCI. However, generic assessment tools which have been developed in RTW research have shortcomings regarding three essential requirements for job matching of persons with SCI: (1) They are not occupation-specific and do not include the demands and characteristics of particular occupations; (2) they are not health condition-specific and do not capture work-related limitations and needs of persons with SCI; and (3) they do not comprehensively address the fit between occupational and individual attributes and environmental factors influencing RTW. In organizational research, particularly in the areas of career selection and vocational psychology, job matching has been studied more extensively than in the RTW context with different types of person-job fit having been investigated. This research, however, has dealt almost exclusively with non-disabled individuals and does not address person-job fit in a comprehensive way. On the other hand, organizational research aimed at developing occupational information systems such as the Occupational Information Network (O*NET), which may help to devise job matching tools that address occupation-specific demands and characteristics in VR of persons with SCI.

Conclusion

VR on persons with SCI represents a case in point of the need for job matching tools that comprehensively address occupation- and health condition-specific aspects in RTW. Persons with SCI suffer from multiple health condition-specific limitations and are faced with various environmental barriers to work, leading to them being able to perform a limited spectrum of occupations. A health condition-specific assessment tool for job matching in VR of persons with SCI is a desideratum that could profit from the integration of existing research approaches in RTW and organizational research.

The feasibility and effectiveness of the self-help e-health program PsyFit in persons with spinal cord injury

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Introduction and Aims

Persons with spinal cord injury (SCI) often experience depressive symptoms. Providing those with mild to moderate symptoms with an internet-based psychological self-help program might counteract these symptoms without the need of in-person counseling or psychotherapy, filling a gap in the Stepped-Care Model. PsyFit is an online self-help program designed for use by non-disabled persons with depressive symptoms. It is based on positive psychology, mindfulness and cognitive behavioral therapy. Aim of this pilot study was to examine the feasibility of PsyFit in persons with SCI and to examine the impact on mental health and depressive symptoms.

Methods and Material

Fourteen persons with SCI were included in two Dutch rehabilitation centers. All had finished outpatient rehabilitation and were known to have mild to moderate depressive symptoms by their rehabilitation psychologist. Each participant was assigned to two out of the six PsyFit modules. Each module took four weeks to complete. Feasibility criteria were the number of participants completing one and two modules, mean progress per module, the number of positive evaluations by participants and the number of technical problems. Mental health and depressive symptoms were measured using the Mental Health Inventory-5 (MHI), Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) and Center for Epidemiological Studies Depression scale (CES-D) before and after the intervention. During the intervention, telephone contact was kept every two weeks to inquire about the progress, experiences and questions of the subjects.

Results

Of the seven participants who completed the study, seven completed one module and two fully completed two modules (i.e. module progress of 100%). Overall (N=14) mean progress of module 1 was 75% and of module 2 39%. Reasons for drop-out were psychological barriers, illness and low priority. It appears that willingness and sufficient ability to reflect on one's own situation are required to benefit from this program. All seven completers evaluated PsyFit as a useful program and most considered it helpful for other persons with SCI. Six technical problems were reported by two participants and concerned browser compability. Suggestions for improvement were to increase program flexibility (e.g., to be able to change the day of the start and end of the weekly exercise). Mean difference scores (N=7) on the outcome questionnaires all reflected improvement of mental health and depressive symptoms (MHI +5.7; WEMWBS +4.1 and CES-D -4.4).

Conclusion

PsyFit was evaluated as a potentially useful e-health program and all completers considered it helpful for other persons in a similar situation.

Coherence and patient empowerment in the rehabilitation process

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Introduction and Aims

Rehabilitation of persons with a spinal cord injury is an interdisciplinary task dependent on highly specialized professionals. At the Spinal Cord Injury Centre of Western Denmark we recognized a need to optimize the rehabilitation process and patient outcome and developed a systematic approach to rehabilitation. The aim of the project is to improve the quality of the rehabilitation process through individualizing and involvement of patients in planning. Patients take responsibility for their own efforts. Training and rehabilitation should take place in everyday activities on the ward as well as in the training facilities and should occur throughout the day.

Material and Methods

An experienced interdisciplinary team of project managers from the research unit at the Centre have planned, described and introduced seven consecutive steps of well-defined interventions, each limited to a period of two to four weeks and followed by systematic evaluation by all involved patients and team members. The project managers follow the interventions closely in order to support staff and patients. Nine to ten patients and their rehabilitation teams are included in the interventions:

- 1] daily interdisciplinary coordination meeting
- 2] setting specific and individual goals for the week
- 3] functional training in daily life
- 4] optimizing ward rounds
- 5] cooking as a group activity twice weekly
- 6] physiotherapy in widened frames (regarding time and place)
- 7] daily individual schedule made by patient and team. Patients are involved in all interventions, except 1].

Results

Presently, interventions 1] and 2] are completed and 3] is launched. Evaluation of 1] was conducted by questionnaire to 14 staff members, 13 answered (93%) and 100% of them were positive about the intervention; five (38%) of the responders suggested, that the coordination meetings should continue unchanged, while eight (62%) wanted the meetings to continue with a few adjustments. Evaluation of 2] was conducted by questionnaire to 24 staff members. 22 (92%) responded and 9 patients (100%) responded. Seven (32%) staff members wanted the specific goal setting to continue unchanged, while 14 (64%) wanted a continuation of the specific goal setting with a few adjustments. One didn't answer this question. Nine patients participated in the intervention, and five (55%) responded that specific goal setting should continue unchanged, while three (33%) wanted the specific goal setting to continue with minor changes. One didn't answer this question. As a result of the completed and evaluated interventions we have implemented 1] and 2] in a slightly adjusted form as a method that applies to all patients and staff at the Centre.

Conclusion

Changing the rehabilitation process into more individualized programs is possible, but is dependent on the motivation and flexibility of the staff and a high level of support from management.

Long term effect of intra-detrusor Dysport (abobotulinumtoxin-A) injection on urodynamic parameters of patients with neurogenic bladder dysfunction

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Purpose

We studied the effect of repeated intra detrusor injection (I.D.D.) on urodynamic parameters of patients with neurogenic bladder dysfunction.

Methods and Materials

This was a retrospective study of 51 patients, who had 3 or more episodes of (I.D.D.) injection for treatment of neurogenic bladder dysfunction from 2004 -2011. In this study 33 patients were male and mean age of the patients was 45 years (range 17-84). Male to female ratio was 1.8:1. 37 patients were draining their bladder by intermittent self catheterization, 9 patients had suprapubic catheter, 3 patients had indwelling urinary catheter and 2 patients were voiding on urge. All the patients had prior documented neurogenic bladder detrusor dysfunction on VCMG, secondary to either spinal cord injury/spinal cord deformity/spinal degenerative disease. They were further followed up with repeated urodynamic studies at variable intervals to monitor their bladder functions. The repeat doses of I.D.D. injection were administered if either the patient's symptoms returned or on follow up urodynamic study, a repeat dose was indicated. The VCMG results of before the first dose of intra detrusor dysport injection were compared with the urodynamic study results after the last dose. The intervals between the intra detrusor dysport injections were also analyzed.

Results

All the patients were operated as day case and no one required prolonged stay for either UTI or bleeding. Mean time interval between the two I.D.D. injection was 13.19 months (range 3-26). Mean time interval between the I.D.D. injection & the Urodynamic study was 7.39 months (range 2-21). Mean no of I.D.D. injection was 3 (range 3-10) & mean dose of Dysport was 772.35 units (range 500-1000). The urodynamic study revealed the mean decrease in maximum detrusor pressure (MDP) from 54.11 cm of water (range 7-123) to 35.01 cm of water (range 2-111) was 19.10 cm of water (-35.29%). This was statistically significant (p value 0.002108). The mean increase in post void urine residual was from 224 cc. (range 5-700) to 332.92 cc. (range 40-1200) was 108.92 cc. (32.44%). This was statistically significant (p value 0.0075). The mean increase in maximum cystometric capacity (MCC) was from 213.17 cc. (range 39-514) to 254.1 cc (range 31-515) was 40.27 cc (15.84%). This was not statistically significant (p value 0.11027).

Conclusion

We conclude that repeated I.D.D. injection in patients with neurogenic bladder dysfunction results in sustained improvement in urodynamic parameters which are sustained over prolonged period.

Life quality, aggressiveness and psychological variables in patients with spinal injuries that practice and do not practice sport activities

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Aim of the Research

To evaluate the relationship existing between the psychological variables (anxiety, depression,) aggressiveness, rumination, extroversion and quality of life in paralysed patients practicing or not practicing sport activities.

Materials and Methods

Standard tests have been carried out to evaluate Anxiety, Depression and Extroversion (CBA), of Rumination(R), Irritation (I) and life Quality (SF-36 SG) on 90 patients with spinal injuries divided into 2 groups, one practicing sport activities and one not. The statistical investigation has been conducted using the Analysis (ANOVA) variance and the simple Regression line.

Results

The group practicing sport presents a much higher score with regard to quality of life ($P<0.001$) compared to the other group not practicing any sport activities. Depression, ($P<0.0004$), Extroversion ($P=0.042$), Irritation ($P<0.0046$) and Rumination ($P<0.0075$) present a much higher score in the group not practicing any sport activity. It does not seem to be any significant difference in the state of anxiety.

Conclusions

Our data demonstrate the importance of sport in improving the quality of life: the group of subjects who practice sport showed a better mood state (as demonstrated by a lower score in depression and aggression) than those who do not practice sport. In previous studies we demonstrated that this better mood is related with an increased capacity to socialize and build new friendships in people who play sports the. Anxiety remains unchanged in both groups.

The comparison of the body composition and metabolism intensity in athletes with spinal cord injury with and without spasticity

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Introduction

Metabolic intensity in athletes or persons with spinal cord injury (SCI) is dependent on muscle mass, the degree of damage, spasticity and load intensity involved. Athletes are more pronounced in lean mass, but in persons with SCI the body composition can be affected by spasticity and the increase in the amount of lean tissue as well obesity and can be one of the reasons for complications in chronic SCI. This is due to the lack of sufficient load intensity. A person with a SCI is subjected to the changes in the body composition (decrease in the lean body mass and increase in fat mass), which can lead to secondary complications. They are associated with decreased physical activities and obesity.

Aim

Compare the SCI athletes wheelchair users with spasticity and without spasticity.

Methods

Calorimetry method is used to determine the metabolic intensity, the necessary energy consumption and the body composition of a particular athlete. Energy consumption and production of energy involved in the composition of the substance is determined by analyzing the measurements of oxygen consumption (VO₂) and carbon dioxide (VCO₂) emitted. Athletes cardiovascular system is evaluated by a complex load test, when the lactate analysis are taken. During the complex load test various indicators are analysed to evaluate the major body systems' response to the load and adaptability to the load.

Results

The athletes - wheelchair users from the Republic of Latvia were involved in the investigation, men (30) who were divided accordingly into 2 groups with and without spasticity with regular physical load - 7 ± 1 years (6,8), 2 days a week, for 2 hours, age 32 ± 2 years, weight 75 ± 2 kg, height 178 ± 1 cm and body mass index (BMI) 24 ± 1 . The maximal load athletes reached the average absolute load of 150 ± 5 W (130) or the average relative load of 2.0 ± 0.2 W / kg. That means within 6 minutes the heart rate decreases to 103 ± 2 .

Conclusions

Athletes with increased spasticity are more pronounced in muscle mass as well as energy consumption values as compared with athletes without spasticity. It is essential for the further objective recommendations for working out optimal load and nutrition regime for different rank sportsmen with different level of lesion.

Is bladder ultrasound alone effective for detecting calculi? A prospective audit of surveillance in a national spinal cord injury service

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Introduction and Aims

Urinary tract infections (UTI's) are the most frequent medical complication in patients with spinal cord injury (SCI) and a major cause of morbidity. The main purpose of urology review is to preserve renal function and minimize morbidity. Spinal cord injured patients with bladder catheter have a 9-fold risk for bladder stones. Most bladder calculi in SCI are struvite (magnesium ammonium phosphate), less radiopaque and therefore less visible by x-ray. The aim of this re-audit is to compare the findings of bladder ultrasound and bladder x-ray with the gold standard of invasive urological techniques, to explore the possibility of reducing exposure to radiation further and examine the relationship between urinary bladder calculi, bladder management technique, urine culture and symptoms in SCI patients with calculi.

Materials and Methods

28 SCI patients were referred for urology review, those with abnormal ultrasound findings or poor ultrasound visualisation then had bladder x-ray as per protocol. Each of these patients then had urinalysis and further invasive urological investigation/treatment -- cystolithopaxy.

Results

- Greatest incidence of calculi in patients with SPC AND IDUC.
- All cases detected by x- ray alone had SPC and non ultrasound visualisation of the bladder.
- Bladder ultrasound alone diagnosed 36 % bladder calculi compared to 18% by X-ray alone.
- US and X-ray combined diagnosed 46%.
- 6/28 patients (21.4%) had no growth, colony count < 1000 cfu/ml.
- 22/28 patients (78.6%) had significant culture.

Conclusions

- Our patients have a higher incidence of calculi than the general population, ultrasound is the modality of choice for detecting calculi.
- Routine surveillance is warranted.
- Change in practice with the introduction of saline infusion to distend those bladders decompressed around a SPC should reduce the overall radiation exposure to patients at greatest risk of bladder stone formation and the development of SCC (Squamous cell carcinoma).

Acute treatment, repatriation, rehabilitation and compensation for those injured abroad

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Introduction and Aims

To highlight the complications faced by those who sustain traumatic SCI whilst abroad as they pass through acute treatment, medical repatriation and then SCI rehabilitation in their home country, including consideration of the related legal and insurance issues.

Materials and Methods

As a workshop the authors will present their experience assisting those with traumatic SCI, as they move along the pathway of acute treatment overseas, medical repatriation, rehabilitation in their home country, then pursuing insurance and legal claims related to their expenses and future needs. We will present a case study concerning a young British man who sustained a cervical SCI in a diving accident in South Africa. During the course of his repatriation he developed a grade IV pressure sore.

Results

The availability of suitable acute care for those who sustain SCI whilst abroad is highly variable. The methods and timescale for their transfer to a specialist trauma or SCI centre is influential on their long-term outcome. Prior to attempting long-haul medical repatriation, careful risk assessment needs to be undertaken to ascertain the patient's fitness to fly, the risks posed by remaining in the current treatment centre and the potential benefits of earlier arrival at the specialist centre in their home country. Insurance and funding issues have to be addressed early to ensure that they do not delay the medical repatriation. If coverage is denied by the travel insurer this may require the intervention of specialist lawyers. The medical repatriation needs to be carefully planned, to minimise the risk, including appropriate staffing during the flight to be able to adequately monitor the patient's condition and respond to foreseeable complications. It is crucial that arrangements have been made in the home country for admission to a specialist SCI/trauma centre. On admission, the patient's condition and the treatment received to that point in time need to be carefully reviewed to identify any sub-optimal steps taken, or aspects to the patient's condition that have been overlooked. If necessary remedial or alternative surgery should be performed and then a full programme of multi-disciplinary spinal rehabilitation undertaken. The patient should meet with lawyers specialist in both SCI and travel law to consider whether any claims arise out of the initial traumatic incident, or the medical repatriation. If they do those lawyers will need to consider jurisdiction, what is the applicable law, and what steps can be taken to try and ensure full compensation for that Claimant's life-long SCI related needs. It should not be assumed that any legal claims can only be pursued in the country in which the accident occurred.

Conclusion

Sustaining spinal cord injury whilst abroad presents multi-faceted complications for the patient, clinicians, those involved in the medical repatriation, travel insurers and lawyers. A multi-disciplinary approach is needed to achieve the optimal outcome medically, socially and financially.

The SensoriMotor Rehabilitation Research Team (SMRRT) of the Canadian Institutes of Health Research (CIHR): a model for knowledge translation

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Introduction and Aims

The SMRRT, an emerging team of the CIHR, regroups researchers from Université de Montréal, Université Laval and McGill University, and research centers (CRIUGM, CRIR and CIRRI), as well as the stroke units of 3 rehabilitation hospitals (IRGLM, JRH and IRDPQ) and neuroscientists on campus. The SMRRT is one of the 7 teams funded by CIHR for 5 years (2011-2016) under the Regenerative Medicine and Nanomedicine Grant Program. The principal objective of SMRRT is to study the recovery mechanisms of the central nervous system after injury and to propose innovative interventions for the rehabilitation of patients with a spinal cord injury (SCI) or a stroke. The specific aims of SMRRT are 1. Create a partnership with researchers, clinicians and clinical managers of spinal lesion and stroke units to standardize clinical and laboratory evaluation measurements and to use laboratory facilities to characterize impairment and disabilities as well as to evaluate and guide therapeutic approaches for patients; 2. Develop new therapeutic interventions with emphasis on sensorimotor enhancement through biomechanical, haptic, virtual reality and pain relief approaches; 3. Evaluate or quantify the effects of new interventions; 4. Develop a research-clinical model of knowledge translation (KT); 5. Promote evidence-based rehabilitation post-stroke and SCI; 6. Implement clinical-research platforms in the hospitals; 7. Carry out animal experiments, in parallel, in cats and rats, to study fundamental aspects of clinical issues such as the study of different spinal lesions and the role of the cortex in spinal plasticity.

Material and Methods

Led by 5 Principal Investigators (co-authors) with Dr Serge Rossignol as the designated PI, the team includes 25 researchers (neuroscientists and clinical researchers) with expertise in the recovery of sensorimotor function and imaging of the brain as well as clinicians (collaborators) from various disciplines in the hospitals. Graduate students and post-doctoral fellows are competitively funded. The PIs have organised 4 day-long meetings and will host an International symposium in 2014.

Results and Conclusions

The team is well-established halfway into its funding cycle. The clinical research platforms are functional and clinicians are using a common set of outcome measures to document the clinical profile and to evaluate change over time. Clinical evaluations are complemented by research laboratory evaluations and imaging to characterize the patient's pathophysiological and biomechanical deficits and lesions. The findings help identify appropriate interventions and stimulate ongoing research protocols. Innovative approaches under development include multisensory stimulation, strengthening specific muscle groups during walking, pain relief, and the integration of mental practice into usual clinical practice. The implementation of routine magnetic imaging and transcranial magnetic stimulation techniques, as well as parallel experiments in animal stroke models are being investigated.

Hybrid assistive limb HAL® exoskeleton in the rehabilitation of chronic and acute spinal cord injured patients

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Introduction and Aims

Locomotion training represents a well-established and widely spread therapy in the rehabilitation of spinal cord injured patients. The hybrid assistive limb (HAL®) exoskeleton now offers the unique technical advancement of locomotional training in conjunction with a biofeedback mechanism accomplished by movement support synchronously to the patients voluntary drive detected via emg electrodes on the hip and knee flexor and extensor muscles. The aim was to identify the effect of HAL based locomotion training in the rehabilitation of these patients.

Materials and Methods

Monocenter, prospective study. A total of 12 patients including 9 chronic (>12months) and 3 acute (<6months) spinal cord injured patients were enrolled in this investigation. Each patient completed a 3 month cycle of daily (5 days a week) exoskeletal based treadmill training. Primary outcome measurements were changes after 3 month of training in either functional mobility (10MWT/WISCI II, 6MWT and TUG), neurological changes according to the American Spinal Injury Association Impairment Scale and the performance during the treadmill training (speed, distance) compared to the findings at baseline.

Results

All patients improved significantly in terms of functional mobility and their performance on the treadmill after 3 months of training compared to the results at baseline. The increase of the WISC II Score in 4 of the chronic subjects gives proof to an improved gait pattern. Further analysis shows significant differences between the two subgroups (acute vs. chronic).

Conclusion

HAL®-based locomotion training is a useful adjunct to the variety of existing SCI- rehabilitation programs, leading to improvements in gait pattern and every-day life -independency for the patient.

Analysis of trunk muscle strength and balance according to the functional classification of Brazilian paralympic wheelchair basketball athletes

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Introduction

The trunk muscle strength and balance have great importance to define the class of wheelchair basketball (WCB) athletes. This study aims to quantify and correlate trunk muscle strength and balance among high-performance Paralympic WCB athletes with their functional classification.

Methods

Forty-two male athletes of mean age 28.3 ± 7.4 years (16-46) with functional classifications homologated by the São Paulo WCB Federation underwent trunk muscle strength and balance assessment. These athletes were distributed among the four WCB classes as follows: class 1.0 n=11; class 2.0 n=11; class 3.0 n=9; and class 4.0 n=11. Trunk strength was evaluated in the extensor and flexor muscles using the Biodex® isokinetic dynamometer in isometric form, with amplitude 15° . The athletes performed a set of 10 repetitions with 15 seconds of rest between each repetition. Trunk balance was evaluated using the Balance Master® equipment and the limits of stability (LOS) test was used in adapted form. While seated on a bench, the athletes made voluntary trunk movements in eight directions in the frontal and lateral planes. The movements were made in clockwise direction, around a perimeter that the patients could view on a monitor and which represented the 100% displacement limit given by the equipment.

Results

There were significant differences in comparisons of muscle strength and LOS indices in the classes 1.0 vs 3.0, 1.0 vs 4.0 and 2.0 vs. 4.0. There was moderate negative correlation between trunk muscle strength in flexion and maximum excursion ($r=-0.68$; $p=0.02$). There was a strong positive correlation in class 3.0 between trunk muscle strength in extension and maximum excursion ($r=0.92$; $p=0.001$).

Conclusion

There was no correlation between the isometric muscle strength of the trunk flexors and extensors and LOS, according to the functional classification of the WCB athletes.

Public review: the National Institute of Neurological Disorders and Stroke (NINDS) spinal cord injury common data elements (CDE) recommendations

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Introduction and Aims

The National Institute of Neurological Disorders and Stroke (NINDS) initiated development of spinal cord-specific Common Data Elements (CDE) as part of a project to develop data standards for funded clinical research in all fields of neuroscience. By developing these data standards for clinical research, the NINDS Spinal Cord Injury (SCI) CDE initiative strives to increase the efficiency and effectiveness of clinical research studies, increase data quality, facilitate data sharing, and help educate new clinical investigators.

Design and Method

Working Groups (WG) consisted of diverse experts met regularly to develop a set of spinal cord injury-specific CDEs, selecting among, refining, and adding to existing, field-tested data elements from national registries and funded research studies. The composition of each WG included clinical research experts in each disease area.

Results

The first iteration of the NINDS spinal cord injury-specific CDEs spans 9 domains: (1) demographics; (2) care history/comorbidity; (3) functional; (4) electrodiagnostics; (5) participation/quality of life; (6) pain; (7) psychological (8) imaging; and (9) neurological. A CDE website is now providing this information by uniform names and structures for each element, a data dictionary, and template case report forms. This new product developed by the SCI CDE Working Group was vetted through the greater spinal cord clinical research community. The latest information to be provided at this meeting will include recommendations with examples of how the SCI CDEs may be used by a research study, demonstrations of navigating the NINDS CDE website and selecting SCI CDEs from the website, and explanation of how to submit feedback on the CDEs.

Conclusion

The NINDS encourages the use of the CDEs by neurological clinical research community in order to standardize the collection of research data across studies. Even though the formal public review period has ended, the NINDS welcomes feedback on the CDEs. In addition, as the clinical research landscape changes, the CDEs will evolve in parallel.

Support

The support for this project was funded by HHSN271201200034C.

New rehabilitation programme for spinal cord injured persons in Estonia supporting them to find employment - pilot study

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Introduction and Aims

Haapsalu Neurological Rehabilitation Centre (HNRC) piloted a rehabilitation programme designed for adults with spinal cord injury (SCI) in order to support their everyday life. The piloting was financed thorough European Social Fund. The aim of the programme was to provide team-based and client-centred approach with a main orientation to support the participants in finding an appropriate job or maintain the current job. In the abstract the experience is introduced.

Material and Methods

There were 20 participants (17 male and 3 female). The average age of the participants was 30.65 years. The independence of the participants was varied (SCIM 13-100). The first group consisted of participants with high-level SCI, therefore all were wheel-chair users and highly dependent on assistance. The second group varied in their characteristics of SCI, but were all walkers, either independent or with an aid. The third and fourth group included more varied participants. All of them used wheel-chair for moving. Quantitative and qualitative data analysis was used.

Results

The rehabilitation period lasted three continuous weeks for all the groups. During the rehabilitation period approximately 53.3 ± 5.78 (average \pm SD) hours of active therapies were provided, as well as 12.13 ± 2.62 (average \pm SD) hours of counselling services and 26.83 ± 17.86 hours of medical services. The participants were approximately active for 4.79 hours per day. The amount of active therapies was the highest for the second group as included the most clients with problems connected to physical aspects of working (e.g. poor balance, quick tiredness etc). The highest amount of counselling services and medical help was needed in the first group. The work-related results were good: ten participants started to use active means of labour market in order to find appropriate job, five participants continued working, and two participants started new education. The participants valued the most individually set goals, active rehabilitation days, possibility to be socially active. They also appreciated theoretical information about labour market and entrepreneurship. They thought 3-week rehabilitation was with optimal length but the programme could have included several of those periods.

Conclusions

The programme was successful: the goals were achieved, the discussions were initiated, and the experience for future developments was gained. Homogenous target-group and therefore more concrete base for planning rehabilitation are the main characteristics that support successful approach. More than three hours of activities per day are appreciated by the participants. Good rehabilitation programme is seen to be consisting more than one rehabilitation periods.

Effect of neurogenic bowel dysfunction on quality of life of spinal cord injured patients

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Introduction

Spinal cord injury (SCI) affects colorectal motility, transit time and emptying at defecation. Most SCI patients suffer from constipation and faecal incontinence which result in restricted social activities and impaired quality of life (QoL). The aim of our study was to investigate the effect of neurogenic bowel dysfunction and QoL in SCI patients and to determine the characteristics of patients with neurogenic bowel dysfunction.

Material And Method

One hundred two SCI patients (45 women, 57 men) were admitted to the study. The patients had at least 3 months of injury duration and they were older than 12 years. The patients in the spinal shock period, who had a pressure ulcer, and cognitive problems or any history of disease related with the bowel were excluded. Demographic characteristics, injury duration, neurological level and severity, bowel emptying methods and consumption of fiber, history of bowel education program were recorded. Neurogenic bowel dysfunction score (NBDS) was used to evaluate QoL and Walking Index for Spinal Cord Injury-II (WISCI-II) was used to measure ambulation level.

Results

The mean age of the patients was 43.1 ± 15.6 years; the median injury duration was 70 months (3-540 months). NBDS was significantly higher in complete injuries, the patients with lower WISCI-II scores and lower daily ambulation duration, the patients who did not have a bowel education program, had lower fibre consumption . Gender, age, injury duration, defecation frequency before the injury and hospitalization were not correlated with NBDS score.

Conclusion

QoL related with neurogenic bowel dysfunction in SCI patients was better in incomplete injuries, the patients with high ambulation potential, the patients who had a bowel education program and had higher fibre consumption. Bowel education program and increasing fiber intake should be highlighted especially in severe SCI patients.

The effects of FES in standing position combined with passive stepping on spasticity in spinal cord injury patients: a study protocol

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Introduction and Aims

Lower limb functional electrical stimulation (FES) is beneficial for people with spinal cord injury (SCI) and can be applied in standing position by using the Erigo Pro® equipment. The aim of this study is to evaluate the effects of the FES in standing position, combined with passive stepping ('FES standing stepping') on outcome measures, based on different International Classification of Functioning, Disability and Health (ICF) categories. The primary hypothesis is that FES standing stepping therapy is more effective in reducing spasticity than standing alone treatment.

Materials and Methods

A cross-over study will be conducted where participants will be randomly divided into 2 groups. One group will receive 30 min of standing table treatment, three times a week during 4 weeks. After a washout period of 1 week, the patients will receive 30 min of FES standing stepping three times a week during 4 weeks. The other group will receive the same treatments, but in reverse order. FES standing stepping incorporates verticalisation together with a locomotion robot while lower limb FES is applied in correspondence with the stance and swing phase of the locomotion cycle. All patients will receive standard SCI in-patient rehabilitation throughout the study. The inclusion criteria are: post-acute posttraumatic SCI (above level L1, AIS A or B), spasticity, and no other health conditions that may influence the study protocol. The primary outcome measure is spasticity measured by the modified Ashworth scale and a patient self-reported Numeric Rating Scale. Secondary outcome measures are frequency of defecation, tendon reflexes, Penn spasm scale, quality of sleep and wellbeing. Adverse events will be monitored. Measurements of spasticity and tendon reflexes will be collected before and after every standing table treatment and before and after every FES standing stepping session. Other outcome measures will be assessed before, halfway and at the end of every one-month period.

Results

Statistical analysis will evaluate differences in outcome measures in the standing only treatment versus FES standing stepping therapy.

Conclusion

This will be the first study comparing FES standing stepping with standing treatment in patients with SCI.

Stress incontinence predictive factors after sacral posterior roots rhizotomy

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Aims

The Brindley procedure used since the 80's, consist of the implantation of a stimulator for sacral anterior-roots combined with a rhizotomy of the dorsal sacral roots to enable micturition. Patients suitable for the procedure are patients with detrusor overactivity and with a spinal cord lesion without impairment of sacral reflexes. But, rhizotomy of sacral dorsal root S2 to S4 abolish sacral hyperreflexia and may lead to the decrease of urethral pressure and loss of continence reflex adaptation and thus induce stress incontinence.

Method

In this retrospective study, we reviewed the records of 131 patients implanted with a neurostimulator in two spinal cord injury reference centers, competent in implantation, programming the neurostimulator and follow-up of these patients: the Rehabilitation Centre of L'Arche and the Department of Physical Medicine and Rehabilitation of the University Hospital of Nantes. Among these 131 patients, 96 were included. The criteria of inclusion were patients who could perform independent transfers. In these 96 patients with Finetech-Brindley stimulator implanted, we studied the incidence of stress incontinence one year after surgery and looked for predictive factors of stress incontinence one year after sacral dorsal roots rhizotomy: age, sex, injury level between T10 and L2, previous urethral surgery, incompetent bladder neck, MUCP (Maximal urethral closure Pressure) before surgery less than 30cmH2O, compliance before surgery less than 30. Patients with remaining involuntary detrusor contractions with or without incontinence after surgery were excluded.

Results

One year after the surgery, 10.4 % of the included patients had stress incontinence. Urethral pressure significantly decreases of 18% after sacral posterior roots rhizotomy ($P=0.002$). Our study highlighted only one significant predictive factor of stress incontinence after rhizotomy, the incompetent bladder neck ($p=0.002$).

Conclusions

As the screening of patient undergoing Brindley procedure is essential to aim an optimal post-operative result, from this study, we propose a pre-operative check-up to select the population of patient that may benefit from Brindley procedure.

Ambulatory blood pressure monitoring in spinal cord injury

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Introduction and Aim

Cervical Spinal cord injury (SCI) interrupts autonomic pathways controlling the heart and smooth muscles in blood vessels leading to disturbed cardiovascular homeostasis. This may present as dramatic daily fluctuations in blood pressure (BP) with episodes of extremely high BP and low BP. This study investigated how a 24-hour BP monitoring can be used to objectively identify BP fluctuations as well as point to interventions which may relate to these fluctuations.

Material and Methods

A 68 year old man with a traumatic SCI C1, AIS A, in ventilator- and pacemaker dependent, experienced daily fluctuations in BP accompanied by symptoms and sign of both autonomic dysreflexia and orthostatic hypotension, two months post injury. He had been treated for hypertension prior to his injury. Due to the large fluctuations in BP he was unable to follow the rehabilitation program.

A 24-hour ambulatory BP monitoring was performed using MeditechCardXplore ambulatory BP monitor. The BP monitor recorded systolic BP, diastolic BP and heart rate at 15minutes intervals during the daytime. and at 30 minutes intervals during the night-time. A diary completed by nurses accompanied the measurement in order to identify procedures, subjective symptoms and objective signs.

Results

BP was related to observed signs and symptoms. There were important correlation between timing of bolus (500 ml) in nasogastric feeding tube during daytime and fluctuations in BP.

After changing from intermittentinfusion to continuous infusion during daytime, a new 24-hour ambulatory BP monitor showed reduction in BP fluctuations during daytime, a heightened diastolic BP on average, and reduction of symptoms and signs.

Conclusions

Ambulatory BP monitoring is a useful tool to assess fluctuations in blood pressure and heart rate during a 24-hour period. This technique can detect possible life-threatening events, identify triggers, and help to improve the treatment in order to maximize rehabilitation and minimize patients' discomforts. Ambulatory BP is especially useful in patients with a cervical or high thoracic SCI.

Fitness for traumatic spinal cord injuries

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Introduction and Aims

Spinal cord injury (SCI) is a devastating situation that can lead to various medical complications and multiple systems consequences. Physical activity decreases and the metabolism changes after SCI. The independence is restricted and the risk of cardiovascular disease increases because as a result of the decreasing functional capacity. In spite of the importance of the exercises in SCI, the specific programs have not been established yet. Circuit training consistings of upper extremity resistive exercises that help to improve the strength, mobility and endurance. There are limited studies in the SCI patients with elastic bands and arm crank ergometry. The aim of this study was to compare the effects of the two type circuit exercises in terms of functional, cardiovascular and psychological status in the long-standing traumatic complete paraplegic patients.

Material and Methods

40 Male SCI patients were included in this study. The patients between 18-53 ages were included in the study, because of VO₂max decreases by aging. The patients with the injury level 4th and 12th thoracic vertebrae is chosen, because of autonomic dysfunction. For homogenization, complete injuries with American Spinal Injury Association Impairment Scale (AIS) level A were preferred.

Only the SCI patients with traumatic etiology were included in the study, because SCIs with other etiologies may have different problems. All patients had cardiac examination and there were no contradictions for doing exercises. Participants were divided to two groups (n=20) with a computer program. All patients were evaluated at the baseline and at the after 8. weeks. The clinical characteristics and physical examination findings were recorded. Radial pulse and blood pressure were measured with a sphygmomanometer before the exercise program and before and after exercise test done after exercise program for 8 weeks. Body weight, blood biochemistry, Beck depression Scale, SCIM III were measured before and after exercise program for 8 weeks. Both groups did exercises according to heart rate with polar heart rate monitor (at 60 % of max heart rate). SPSS 10.0 program was used for statistical analysis.

Results

Functional independence level increased statistically and significantly increase as measured by the SCIM-III total, respiratory, sphincter management and mobility scores in both exercise group but better results in arm crank ergometry (p<0.05). BDI scores were improved in both groups. We have observed significant of increase in the HDL and decrease in the cholesterol level in both groups. BMI reduced significantly only in the arm crank ergometry group.

Conclusion

As a result, 8-week both exercise type were successful in terms of the improvement in functionality and biochemistry, psychology in the traumatic complete paraplegic patients. But exercises with elastic bands cheaper and application easier at home.

Adolescent spinal cord injury rehabilitation; international similarities and differences of rehabilitation outcomes

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Introduction and Aims

Functional outcomes and limitations in Spinal Cord Injury (SCI) rehabilitation can be affected by physical, cultural and psychological variances. The aim of this review was to examine the rehabilitation journey and outcomes of two adolescent SCI centers to determine comparability. Direct comparison will help to identify whether there are any international differences in the rehabilitation of this group and determine possible alternate rehabilitation strategies and processes for clinicians. The items of review were chosen to take a broad look at the rehabilitation spectrum, transfers, lower body dressing, bowel and bladder care.

Methodology

A retrospective review was carried out of 10 patient clinical notes from the National Spinal Injury Centre (NSIC) and the Shepherd Center. Key aspects of rehabilitation and clinical outcomes were compared. A monthly informal discussion of the rehabilitation process (via Skype) between staff also took place to help clarify aspects of each center's rehabilitation process. Time from date of onset of SCI to date of admission to each center was recorded as well as length of time spent in rehabilitation. Inclusions criteria included subjects both male and female, 13--18 years, with a sudden onset functionally complete C5-T12 injury, with no significant co-morbidities. Exclusion criteria included age 12 years or younger, with dual diagnoses, orthopedic deformities and functionally incomplete injuries. All function was recorded via the functional independence measure (FIM).

Duration of time to meet rehabilitation milestones and independence was also recorded (at admission, discharge and post discharge follow up/review).

Results

The average time from onset of SCI to admission to the Shepherd Centre was 12.2 days as compared to 4.4 weeks to the NSIC. The Shepherd population included 4 tetraplegics and 6 paraplegics (all AIS A). The NSIC population included 5 tetraplegics and 5 paraplegics all functionally complete (but 2 AIS B & 2 AIS C). Patients arrived at both centers being dependent for bladder management and discharged with similar function. Similarly 100% of both the NSIC and Shepherd groups were admitted without ability in bowel care, by discharge patients from both centers increased independence. With respect to dressing patients came into both centers with the same level of dependency and increased function to relatively the same amount by discharge. However, the largest difference between centers functionally was transfers. There was an improvement in all functional areas upon follow up for both centres.

Conclusion

The review highlighted that there are international differences in the process of rehabilitation and expected levels of independence achieved by discharge for adolescents with SCI. Some adolescents go on to perfect skills at home achieving independence some months later. This review from two prominent SCI centers should evoke introspection into the processes and treatment of adolescents with SCI to facilitate maximum functional potential and quality of life of this unique group.

Perinatal care for women with spinal cord injuries: results from workshop in Vancouver, British Columbia, Canada

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Introduction and Aims

The majority of women with spinal cord injuries (SCI), experience regular fertility, are capable of becoming pregnant and giving birth vaginally. However, these women often encounter barriers to becoming a mother. More specifically: physically inaccessible care settings, negative attitudes based on myths and values, and a general lack of knowledge about the interaction of pregnancy, labour, delivery, and parenting among care providers. These barriers can prevent women and their partners from pursuing a pregnancy, and/or result in poor perinatal care experiences as well as poor maternal and infant outcomes.

To tackle the status quo, the authors planned and facilitated a meeting of stakeholders with interest and expertise in perinatal care and spinal cord injury (from rehabilitation, maternal and fetal care, community/consumer, and policy making backgrounds).

The aim of the workshop was to determine gaps and solutions in the provision of perinatal care to women with spinal cord injuries.

Materials and Methods

Content experts and stakeholders from across Canada were identified and invited to participate in a one day workshop held in Vancouver, BC (November 28th, 2013). An online pre-workshop survey was sent to 30 participants to elicit anonymously their opinions related to the needs of women with SCI at each stage of perinatal care. 19 responses were received; representing clinicians, researchers and consumers. Four team members individually reviewed the results for thematic content then met to compare emerging concepts. Resulting themes were summarized and presented to the 25 workshop participants who further analyzed and distilled the survey findings through group processes and consensus building conducted on the day of the workshop.

Results

Three central themes emerged from the survey data: Knowledge, Access and Collaboration. Participants determined that the first step in improving perinatal care for women with spinal cord injuries is to use the findings from this project to create a "roadmap" outlining the key areas of need at each stage of perinatal care for women with spinal cord injuries.

Conclusion

This study sparked connections and a call to action within the SCI/rehab/obstetric community. The proposed roadmap will inform clinical care, research, education, policy change and social reform via collaborations between clinicians, researchers and consumers.

Acknowledgements

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Successful ventilator weaning in dysphagic spinal cord injured patients

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Introduction and Aims

Typically the process of weaning from ventilation requires a respiratory wean whereby a patient is taken off invasive ventilation whilst keeping the tracheostomy cuff inflated to prevent the aspiration of secretions. This leaves a dilemma with the cuff and stops any attempts at speech. For patients with swallowing problems (dysphagia) the cuff often remains inflated for prolonged periods, making speech difficult and compromising laryngeal functions such as cough and swallow.

In our unit, we have employed a laryngeal wean, whereby the cuff is deflated early on in the wean, to encourage the return of laryngeal sensory and motor function with expiratory airflow which is assessed using flexible nasendoscopy.

Methods

A retrospective review of referrals made to the Speech and Language Therapy (SLT) Service at the London Spinal Cord Injury Centre between March 2002 and January 2014.

Analysis of 230 patient outcomes when using a laryngeal wean approach on successful wean from ventilation, decannulation, return to oral intake and means of communication.

Results

- Total of 230 patient referrals - 86% patients diagnosed with dysphagia;
- 42% had tracheostomies and 93% with dysphagia;[96% of those with Trache had Syspphagia]
- On discharge: 75% successfully decannulated;
- 18% required ongoing ventilation via tracheostomy, either 24 hours or overnight only;
- We have used the Scale of Swallowing Ability to reflect outcomes: 82% return to oral intake;
- All 230 patients were able to communicate verbally and did not require any communication aids

Conclusions

Teams should consider employing a laryngeal wean, by trialling early cuff deflation when weaning from ventilation especially in those patients with suspected dysphagia as this enhances sensation in the larynx, encourages speech, cough and improves swallowing. Flexible nasendoscopy should be used to assess laryngeal function and swallowing.

Perceptions of patient-centered care in individuals with spinal cord injuries/disorders

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Introduction and Aims

Individuals with spinal cord injury/disorders (SCI/D) are affected disproportionately by barriers to care, including poor communication with providers and failure to receive individualized care that accommodates patient preferences. It is imperative that care provided to individuals with SCI/D be patient-driven, equitable, and aligned with principles of patient-centered care (PCC). Thus, the objectives were to: (1) examine perceptions of patient-centered care in individuals with SCI/D; and (2) evaluate perceived differences in PCC concepts between U.S. Veterans and non-Veterans (civilians) with SCI.

Material and Methods

We collected data via a cross-sectional mailed national survey, with a 4-week follow-up for non-respondents, which included validated measures of PCC concepts: global PCC experience, consultation and relational empathy, patient activation, shared decision-making, and chronic illness care. Participants were individuals with SCI receiving care from the U.S. Department of Veterans Affairs (VA) or SCI Model Systems (n=422). We evaluated overall perceptions of PCC and computed bivariate comparisons for civilians vs. Veterans with SCI/D.

Results

Veterans (vs. civilians) with SCI/D were older (61 vs. 51 years, $p<.0001$) and a greater proportion were male (94% vs. 78%, $p<.0001$) and African-American (31% vs. 19%, $p=.05$). The groups did not differ in perceptions of global practice experience, empathy/holistic care, or shared decision-making measures of PCC. Veterans (vs. civilians) with SCI/D reported lower overall patient activation scores (57 vs. 62, $p=0.04$), and a smaller proportion were in higher stages of activation (stages 3 and 4; $p=0.02$). Patient perspectives of chronic illness care were better in Veterans (vs. civilians) with SCI/D (3.4 vs. 3.0, $p=0.0002$).

Conclusion

VA and Model Systems show strengths in different aspects of PCC provision. Civilians with SCI/D report very high scores in patient activation. Veterans with SCI/D report care highly aligned with the chronic care model, which satisfies many concepts necessary for provision of PCC. Veterans with SCI/D could benefit from additional efforts to improve activation/engagement in care, while civilians with SCI/D may benefit from a focus on providing coordinated, patient-centric care aligned with the chronic care model. Results can be used to develop optimal strategies to improve PCC delivery and outcomes for SCI/D and other rehabilitation cohorts.

Wilkie syndrome following acute traumatic spinal cord injury (TSCI) complicating inpatient rehabilitation

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Introduction and Aims

Wilkie's syndrome also known as SMA or Body Cast syndrome is an unusual cause of post prandial abdominal discomfort, nausea/vomiting, and weight loss. It results from compression of the third part of the duodenum by the Superior Mesenteric Artery. First described (autopsy) in 1861, pathologically defined in 1927 by Wilkie's comprehensive series of 75 patients.

To report a case of Wilkie's syndrome in a person with TSCI; discuss this rare gastro-vascular disorder with a view to create awareness.

Materials and Methods

A 77 year old gentleman sustained TSCI as a result of mechanical fall. He was managed with anterior cervical discectomy and fusion (ACDF). On admission to the Midland Centre for spinal injuries for goal oriented structured rehabilitation, he had a past history of NIDDM, Hypertension and Cancer Prostate. He also reported a weight-loss since admission for ACDF.

Results

His rehabilitation was interrupted due to post prandial nausea & violent vomiting with bloated feeling resulting in further weight loss. Examination revealed cachexia. Systemic examination was unremarkable with no guarding or rigidity and normal bowel sounds/digital rectal examination. Laboratory work up revealed anaemia; hypoalbuminemia & hyponatremia.

Plain-X-Rays revealed gastro-duodenal dilatation. Wilkie's syndrome considered and commenced on pro-kinetics conservative management with NG Tube; Left lateral decubitus position post meals and. This alleviated his symptoms and was able to gain weight which enabled his participation in rehabilitation activities.

Conclusion

Although rare, Wilkie's syndrome should be considered as a differential diagnosis in the predisposing diagnostic categories including spinal cord injury. Also conservative management can help alleviate symptoms.

Patient perspectives on the components of a self-management program for individuals with traumatic spinal cord injury: results from a national survey

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Introduction and Aims

Given the increasing emphasis on the community management of spinal cord injury (SCI), strategies that could be developed and implemented in order to increase patients' involvement and control of their medical treatment and its subsequent effects are required. A self-management program could be one approach to address these complex needs, including secondary complications. Thus, the aim of the current study was to determine the relevant components of a self-management program for individuals with traumatic SCI.

Material and Methods

Individuals with SCI were recruited by email via the Rick Hansen Institute (Vancouver, British Columbia, Canada) as well as an outpatient hospital spinal clinic. Data were collected by self-report using an on-line survey.

Results

A response rate of 48% was achieved (n=99). The components of a self-management program that were rated as "very important" by the greatest proportion of participants included: exercise (n=53; 53.5%), nutrition (n=51; 51.5%), pain management (n=44; 44.4%), information/education on aging with a SCI (n=42; 42.4%), communicating with health care professionals (n=40; 40.4%), problem solving (n=40; 40.4%), transitioning from rehabilitation to the community (n=40; 40.4%), and confidence (n=40; 40.4%). Overall, 74.7% (n=74) of the sample rated the overall importance of the development of a self-management program for individuals with traumatic SCI as "very important" or "important". Almost 40% (n=39) of the sample indicated a preference for an internet-based self-management program. The highest proportion of participants indicated a preference for having individuals with a similar level of injury (n=74; 74.7%); a preference for having individuals of a similar age (n=40; 40.4%) was also noted.

Conclusions

The importance assigned to the modules on exercise and nutrition is consistent with our previous, qualitative research and a wellness/health promotion approach for self-management in this population. This research could be used to develop and pilot test a self-management program for individuals with traumatic SCI.

Impact of psychological characteristics in self-management in individuals with traumatic spinal cord injury: results from a national survey

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Introduction and Aims

To identify some of the psychological characteristics in self-management (i.e., self-efficacy, mastery, patient activation) that are associated with depression in individuals with a traumatic spinal cord injury (SCI).

Material and Methods

Individuals with SCI were recruited by email via the Rick Hansen Institute (Vancouver, British Columbia, Canada) as well as an outpatient hospital spinal clinic. Data were collected by self-report using an on-line survey.

Results

Individuals with depression had lower self-efficacy (67.9 versus 94.2, $P<0.0001$), mastery (18.9 versus 22.9, $P<0.0001$), and patient activation (60.4 versus 71.6, $P<0.0001$) as well as higher anxiety (9.0 vs. 5.5, $P<0.0001$), compared to their non-depressed counterparts. A logistic regression determined that lower self-efficacy and mastery scores, as well as less time since injury were associated with depression status ($P=0.002$; $P=0.024$, $P=0.02$, respectively). Individuals with higher anxiety scores were almost 1.5 times more likely to be depressed, while older age was positively associated with depression status ($P=0.016$, $P=0.024$, respectively).

Conclusions

Interventions for depression in SCI, including (a) self-management program/training, should target factors such as self-efficacy and mastery, which could improve secondary medical complications and overall quality of life.

Mountain time trial in handcycling: pilot study on exercise intensity and predictors of race time

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Introduction and Aims

Handcycling is becoming increasingly popular in people with spinal cord injury for both mobility and sports. To achieve the best handcycle performance in daily life or sports a good training program is essential. However, the best training regime for handcyclists who want to compete in a mountain time trial (the HandbikeBattle) is unclear since the exercise intensities during such trial are unknown. Furthermore, analyzing predictors (e.g peak power output, classification, body mass and/or mass of the handcycle) of the race time might also be helpful to optimize the performance. Therefore, the aim of this pilot study was to analyze the exercise intensity during a mountain time trial in handcycling and to determine predictors of the race time.

Material and Methods

40 Participants with a spinal cord injury participated in a 20.2 km handcycling mountain time trial. The heart rate (HR) was monitored in 17 of the 40 participants during the race to determine the exercise intensity. Exercise intensity was expressed relative to the heart rate reserve (%HRR). Two weeks prior to the race all participants also completed laboratory tests to ascertain anthropometric measures as well as peak values for power output (PO_{peak}), oxygen uptake (VO_{2peak}) and heart rate (HR_{peak}).

Results

The mean race time was 4 hours and 1 minute (SD: 1 hour and 24 minutes). The mean exercise intensity during the race was 70±7%HRR. The exercise was mainly (73% of the race time) at a vigorous intensity (60-89%HRR), with 29% of the total time in the 80-89%HRR zone. The strongest predictors for the race time were mean %HRR during the race (R²=57%), waist circumference (R²=39%), PO_{peak} (R²=38%) and VO_{2peak} (R²=32%).

Conclusions

A 20 km mountain time trial in a handcycle is intensive. Recreational handcyclists showed a lower mean exercise intensity due to regular stops. Faster race times were achieved in those individuals with a lower waist circumference, greater fitness levels and ability to perform at higher average exercise intensities during the race.

Prophylaxis of spinal cord injury urinary tract infection therapeutic trial (ProSCIUTTU) : protocol

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Introduction and Aims

Urinary tract infections (UTI) are very common in people with Spinal Cord Injury (SCI). They are increasingly difficult and expensive to treat as the organisms that cause them become more antibiotic resistant. Among the SCI population, there is a high rate of multiresistant organism (MRO) colonisation. Non-antibiotic prevention is needed to prevent UTI without increasing resistance. Probiotics has been reported in several in vivo and in vitro studies to be beneficial in preventing UTIs in post-menopausal women.

The main aim is to determine whether probiotic therapy with *Lactobacillus reuteri* RC-14 and/or *Lactobacillus rhamnosus* GG (LGG) is/are effective in preventing UTI in people with SCI compared to placebo. Secondary aim is to determine whether there is a change to MRO colonisation.

Method

This is a multi site randomised double-blind double-dummy placebo-controlled factorial design study conducted in the state of New South Wales in Australia. All participants with known neurogenic bladder as a result of spinal injury who met inclusion criteria and gave written consent were enrolled. The trial is registered with the Australian New Zealand Clinical Trials Registry (ACTRN 12610000512022) and commenced in April 2011. The study is expected to run over 3 years.

Subjects were randomised into 1 of 4 arms - RC14 + LGG, RC14 + placebo, LGG + placebo or 2 placebo capsules. Randomisation is stratified by bladder management types and inpatient status. Randomisation occurs following subject's compliance at Day 4. Central pharmacy is responsible for randomisation and distribution of intervention for the entire study. Clinicians and subjects remain blinded. Each subject will be enrolled for a 6-month study period, which includes 24 weeks of treatment unless primary endpoint is reached.

Subjects are assessed at Day 0, 3 months and 6 months. Evaluations conducted are: intervention issues, quality of life assessment (SF-36) and microbiological swabs of rectum, nose, groin, urine culture and urinary catheters for subjects with indwelling catheters. A bowel questionnaire is administered at Day 0 and 3 months to assess effect of probiotics on bowel function. Subjects are also contacted fortnightly by telephone. Subjects who ceased intervention early will be followed up until the end of the study period.

The primary endpoint is time from randomisation to occurrence of symptomatic UTI. The secondary endpoint is time to change of MRO colonisation status.

All analyses of outcomes will be by intention to treat. The primary analysis will be a simple comparison of proportions using chi-squared tests to test the main effect of each treatment. Secondary analysis will be performed using logistic regression to adjust for covariates and to quantify the relationship between these covariates and infections.

If these probiotics are shown to be effective in preventing UTI and MRO colonisation, they would be a very attractive alternative in combating the alarming rate of antibiotic resistance.

Mirabegron in treatment of neurological overactive bladder in multiple sclerosis patients: preliminary results

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Introduction And Aim Of The Study

Mirabegron is a selective β_3 -adrenoceptor agonist; the β_3 subtype has been identified in bladder smooth muscle tissue (detrusor muscle). In the human bladder, the β_3 -adrenoceptor subtype was identified to promote detrusor relaxation and urine storage. These observations suggest that drugs acting at β_3 -adrenoceptors may have therapeutic potential that was confirmed in clinical trials in patients with OAB.

In this preliminary study we evaluate the potential of mirabegron, a selective β_3 -adrenoceptor agonist, for treatment of neurological overactive bladder (OAB) symptoms in patients with Multiple Sclerosis (MS)

Materials And Methods

A, multi-centre Open Study to Evaluate the Efficacy and Safety of Mirabegron in Neurogenic OAB Subjects affected by multiple sclerosis (MS) . An open study was conducted. The patients (n = 29) were enrolled into 2-week run-in period followed by 10 weeks a treatment period. when received mirabegron 50 mg daily.

We evaluated 29 Patients (8 Man and 21 woman ≥ 18 years of age) that were enrolled in the study. All patients had diagnosis of SM > of 3 years and a previous treatment with antimuscarinics with low efficacy. Primary endpoint was change from baseline to end-of-treatment in mean number of micturition episodes per 24 hr. Secondary endpoints included changes in mean volume voided per micturition; mean number of urinary incontinence, urgency urinary incontinence, and urgency episodes per 24 hr; severity of urgency; . Safety parameters included adverse events, and post-void residual volume. The patients performed 3 visits : visit 1 screening and run in, visit 2 baseline and start of treatment and visit 3 at the end of treatment after 8 weeks.

Results

Mirabegron 50 mg daily resulted in a statistically significant improvement in mean change from baseline to end-of-treatment in the primary endpoint of micturition frequency (3.1 micturitions/24 hr). Mirabegron had a statistically significant effect versus baseline for secondary endpoints, statistically significant reductions from baseline to end-of-treatment in urgency episodes (2.3) and a statistically significant increase in mean volume voided per micturition (50 ml).

Mirabegron also resulted significant improvements in incontinence episodes (2.0 episodes/24 hr).

The percentage of patients classified as "responders" at end-of-treatment defined as improvement of at least one category for patients' assessment of treatment benefit was 70 %.Patients with no results was seven.No change in EDSS.There were no serious adverse events during the therapy;

Conclusions

The effectiveness of the treatment is demonstrated by the disappearance of urgency or reductions of micturition frequency .The majority of patients revealed a preference for this therapy and has expressed the desire to continue therapy with mirabegron.Mirabegron was efficacious and well tolerated in neurological patients with OAB symptoms and heralds the first of a new class of oral pharmacological therapy for OAB for more than 30 years. without the disadvantage of antimuscarinics effects.

Initial transfer subscore in Berg balance scale: Is a predictor of walking outcome in patients with spinal cord injury?

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Introduction and Aims

To investigate the usefulness of initial measurement tools to predict walking outcome in patients with spinal cord injury (SCI). In patients with SCI, the parameter for ambulatory function is an important tool for rehabilitation outcomes. Based on many studies so far, it is possible to expect ambulatory outcomes according to different levels of SCI. Still, there are many cases of SCI patients who have different ambulatory activity despite of same level of injury. In the meantime, there have been few simple and appropriate parameters to predict the walking prognosis in spinal cord injury. So we investigate the usefulness of measurement tools including BBS (Berg balance scale), lower extremity motor score (LEMS) in the beginning of rehabilitative treatment with the walking index for spinal cord injury (WISCI) level at the point when the measured score reached a plateau value.

Material and Methods

We reviewed medical records of 70 patients with SCI. A skillful experts assessed the subscore and total score of Berg Balance Scale (BBS), WISCI level version II, LEMS at the beginning of rehabilitative treatment and at the point of a plateau or maximal value. The statistical analysis included the non-parametric Spearman rank correlation between initial score of BBS, LEMS, and WISCI level at plateau point. The results were found to be statistically significant at $p < 0.05$.

Results

Forty six of 70 patients were men. Mean age of subject was 48.5 ± 17.4 years old (range 8-76 years). Average interval between the initial and the final examination was 52.4 ± 45.6 days. First, there was a strong correlation between the initial transfer subscore in BBS and WISCI level at plateau ($r = 0.813$, $p < 0.001$). Second, there was a moderate correlation between the initial total score in BBS and WISCI level at plateau ($r = 0.676$, $p < 0.001$). Third, there was a strong correlation between the initial LEMS and WISCI level at plateau point ($r = 0.798$, $p < 0.001$).

Conclusion

The transfer subscore of BBS can be measured conveniently in the beginning of rehabilitative treatment period. A strong correlation of the initial transfer subscore of BBS with the WISCI level at plateau point provide clinical support for their use as the valuable predictor for later walking outcome in patients with SCI.

Sexuality and sexual satisfaction in Korean men with complete spinal cord injury

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Introduction and Aims

The purpose of this study was to elucidate the sexual activity and perceived sexual satisfaction of Korean male people with complete spinal cord injury (SCI) and to identify factors which influenced the sexuality and satisfaction.

Material and Methods

161 male people with complete SCI participants in Korea completed face-to-face interview as well as structured questionnaire of 52-items.

Results

62.7% (n=101) of participants had engaged in sexual activity. Employee (or self-employed), longer time since injury, the experience of direct education regarding sexual activity during early rehabilitation period were positively associated with sexual activity. However the level of spinal cord injury (paraplegia or tetraplegia) and the presence of medical complications were not related to sexual activity. Among 101 sexually active male with complete SCI, the degree of post-injury sexual satisfaction was as follows: 8 (7.9%) sexually satisfied, 30 (29.7%) sexually neither satisfied nor dissatisfied and 63 (62.4%) sexually not satisfied. Lower level of education, unemployed status and lack of sexual information or education during early rehabilitation period was associated with sexual dissatisfaction.

Conclusions

The present study results showed socioeconomic factors such as employment state and education level had more impact on sexuality and sexual satisfaction rather than the degree of physical impairment. Also more direct person-to-person sexual rehabilitation counselling instead of supplying educational materials during early rehabilitation period influenced both sexual activity and sexual satisfaction.

Factors that influence employment after spinal cord injury in South Korea

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Introduction and Aims

To investigate employment status after spinal cord injury (SCI) and identify personal, family, and injury characteristics those affect their employment in South Korea

Material and Methods

Participants were 334 community-dwelling persons 20--64 years of age who had sustained SCI for more than one year. Investigators visited each participant's home to carry out the survey. Bivariate and binary logistic regression analyses were performed to identify personal, family, and injury characteristics that influenced employment after SCI.

Results

Employment rate decreased significantly from 82.5% to 27.5% after SCI. Logistic regression showed that the probability of employment was higher in men than women, and in individuals older than 45 years at the time of injury than those aged 31--45 years of age. Moreover, employment was higher in individuals injured for longer than 20 years than those injured for 1--5 years and in individuals with incomplete tetraplegia than those with complete paraplegia. Employment was lower in individuals with SCI caused by industrial accidents than those injured in non-industrial accidents.

Conclusions

Injury characteristics are the most important predictors of employment in persons with SCI. For persons with lower employment rate, individualized vocational rehabilitation and employment-support systems are required.

The effect of various air-filled cushion and sitting posture change in spinal cord injured patients

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Objective

To investigate the effects of air mattress and sitting posture change on seat interface pressure in spinal cord injured patients and normal subjects.

Methods

Ten spinal cord injured patients and ten normal subjects were included. Peak pressure on seating area was measured in upright sitting posture on a wheelchair using CONFORMat™ System (Tekscan, Boston, USA). We measured pressure in each conditions, without air cushion, with low-priced air-filled cushion, low-priced air-filled cushion covered with newspaper, 5 cm and 10 cm air-filled cushion (ROHO™). We also measured pressure in three kinds of sitting postural conditions, upright sitting posture, 20° posterior leaning posture, 20° trunk forward flexion posture in the condition of each air-filled cushions. All subjects went through body composition test. We used repeated measure ANOVA, Mann-Whitney test and Spearman correlation coefficient for statistical analysis.

Results

In upright sitting position with no cushion, average of peak pressure on buttock were significant higher in spinal cord injured patient compared with normal subjects ($p \leq 0.05$). In upright sitting position, there were significant decrease in peak pressure on buttock after applying all kind of air-filled cushion except low-priced air-filled cushion covered with newspaper. The largest extent of peak pressure relief in upright sitting posture was leaded by 5 cm air-filled cushion (ROHO™). But there was no statistical difference between the air-filled cushions. The extent of pressure relief in all kinds of air-filled cushions was higher in spinal cord injured patients compared with normal subjects. But there was statistically significant only in 5cm air-filled cushion (ROHO™). There was no statistical difference between three kinds of sitting posture. The peak pressure on buttock without cushion and skeletal muscle mass was strongly negatively correlated in normal subjects ($p \leq 0.05$).

Conclusions

In this study, we confirmed that peak pressure of spinal cord injured patients on buttock in sitting posture is much higher than normal persons. Air filled-cushion can reduce the peak pressure on buttock in sitting posture significantly regardless of kinds of cushion. Also, we could be aware that peak pressure on buttock in sitting posture is negatively correlated with skeletal muscle mass.

Utilization of health care services in persons with spinal cord injury

A Gemperli; B Trezzini; M Brach; M Brinkhof
Swiss Paraplegic Research, Nottwil, Switzerland

Objective

To examine incidence and patterns of health care utilization in adults with spinal cord injury.

Material and Methods

National survey in Switzerland on 492 adults with spinal cord injury. Analysis of cross-sectional data on visits to general practitioner, medical specialists and hospital consultations during the last 12 months.

Results

93.1 percent of persons at least once met a general practitioner during the last year, 64 percent at least once for an acute situation. 82 percent visited an urologist, with a similar rate for men and women. 77.5 percent of women visited a gynecologist. The most visits per patient, when a primary care provider was visited, was for physiotherapists (median of 40 visits/year), followed by chiropractor (median of 30 visits/year) and psychologist (median of 20 visits/year). 35.9 percent had an in-patient hospital visit during the last year. Mean number of visits was 2.1 days and average length of stay for the visits was 22.7 days. Long hospitalizations are independently associated with tetraplegia and having no home support.

11.2 percent reported at least one situation with medical services needed but not received during the last year. There was no single main reason for not having received medical service. Main health issues were problems with bladder and bowel.

Conclusions

Patients with spinal cord injury show a high rate of health care utilization. In general, the health care system works well in providing services for the average patient, with inadequate supply in some instances. The identification of rates and patterns of health care utilization helps in future planning of resource allocation and targeting interventions.

Effects of long-term standing and gait training on brain plasticity and fitness in paraplegia

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Purpose

This study investigated the effects of long-term standing and gait training using bilateral knee ankle foot orthosis (KAFO) on brain's neuroplasticity and functional movements in paraplegic patients with gait impairments resulting from traumatic thoracic spinal cord injury.

Subjects and Method

Five paraplegic patients (4 class A, 1 class C on ASIA scale) due to spinal cord injury between T6 and T12 level were recruited. The age of the patients was 45 ± 10 years, and disease duration was $1,650 \pm 966$ days. After a pre-training evaluation, all subjects underwent intensive standing and gait training for 90 minutes a day, 2 days a week with an average training period of 184 ± 41 days. Functional magnetic resonance imaging (fMRI) was used to evaluate the change of activation of brain regions associated with imagined and executed ankle movements after training.

Results

Post-training fMRI evaluation showed increased neural activity ($P < 0.01$), given the passive movement and movement imagination of ankle. Post-training evaluation showed increases in the walking index for spinal cord injury II (WISCI II), maximal walking distance and time. In cardiovascular function, the pulse pressure significantly decreased at post-training ($P < 0.05$). Center of pressure (COP) area during the quiet standing decreased after the intervention ($P = 0.109$).

Conclusion

This present study produced empirical evidence that long-term standing and gait training using bilateral KAFO ultimately facilitated the brain's neuroplasticity, increased WISCI II, maximal walking distance, maximal walking time, and diastolic blood pressure, and decreased COP area and pulse pressure for standing balance and walking ability improvement in paraplegic patients with traumatic thoracic SCI. Intensive standing and gait training can be used as a part of walking training strategy for the management of SCI patients with paraplegia.

Analysis of migration patterns of inpatient care in persons with spinal cord injury based on hospitalization data

E Ronca; A Gemperli

Swiss Paraplegic Research, Nottwil, Switzerland

Introduction and Aims

Health care provision is seldom tailored to the specific needs of persons with spinal cord injury (SCI), and knowledge on their particular use of health care services in Switzerland is largely missing. Switzerland is divided into 26 cantons of which each one is responsible for its own health care. With this study we aimed to evaluate whether the health care needs of persons with SCI are adequately met locally, or whether they leave their home cantons to find appropriate treatment. The specific aims were to 1) evaluate whether persons with SCI more often leave their home canton for treatment compared with the general population or other groups of patients with chronic or disabling conditions, 2) determine the factors which account for high or low rates in utilization of health care services in foreign cantons, and 3) describe the travel pattern for each canton through health utilization indices.

Material and Methods

Hospital discharge data from the Swiss Federal Statistical Office was screened for cases with ICD-10 diagnoses of SCI, obesity, arthritis and anxiety between 2010 and 2011. Hospitalizations of patients below 16 years, with SCI as the principle diagnosis and acute injuries (S14, S24, S34) were excluded. The group of SCI cases was matched with the arthritis, obesity, and anxiety cases and hospitalizations from the general population according to their age, sex and type of insurance. A generalized linear mixed-effects model was used to compute odds ratios of factors that account for differences in seeking treatment within the home or a foreign canton. Utilization indices were depicted as choropleth maps.

Results

Patients with SCI were hospitalized more often outside their home canton compared to the general population 2.03 (OR=2.0; CI=1.8-2.3). Obesity (OR=1.4; CI=1.2-1.6) and arthritis (OR=1.3; CI=1.2-1.5) also lead to higher rates of foreign hospitalizations. However, the travel patterns of persons with anxiety did not differ compared to the general population. Factors that accounted for higher rates in foreign treatment include: younger age, private insurance and complete paralysis. With the exception of lesion level C1-C3, higher levels of injury resulted in higher rates of foreign hospitalizations. The utilization indices showed large variability in utilization between cantons.

Conclusion

More severe health conditions result in higher rates of foreign treatment. The health care needs of persons with SCI may not be met adequately at a local-level. This is potentially an issue since the mobility of persons with SCI is impaired. Despite the high disease burden of the elderly SCI persons and those with a lesion level of C1-C3, these patients less often leave their home canton for treatment. It is important to provide special attention to these persons.

Management of pharyngeal fistulas after anterior cervical spine surgery: a treatment algorithm for severe complications

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Study Design

Retrospective database-query to identify all anterior spinal approaches.

Objectives

To assess all patients with pharyngo-cutaneous fistulas after anterior cervical spine surgery.

Summary of Background Data

Patients treated in University of Heidelberg Spine Medical Center, Spinal Cord Injury Unit and Department of Otolaryngology (Germany), between 2005 and 2011 with the diagnosis of pharyngo-cutaneous fistulas.

Methods

We conducted a retrospective study on 5 patients between 2005 and 2011 with PCF after ACSS, their therapy management and outcome according to radiologic data and patient charts.

Results

Upon presentation 4 patients were paraplegic. 2 had PCF arising from one piriform sinus, two patients from the posterior pharyngeal wall and piriform sinus combined and one patient only from the posterior pharyngeal wall. 2 had previous unsuccessful surgical repair elsewhere and 1 had prior radiation therapy. In 3 patients speech and swallowing could be completely restored, 2 patients died. Both were paraplegic. The patients needed an average of 2-3 procedures for complete functional recovery consisting of primary closure with various vascularised regional flaps and refining laser procedures supplemented with negative pressure wound therapy where needed.

Conclusion

Based on our experience we are able to provide a treatment algorithm that indicates that chronic as opposed to acute fistulas require a primary surgical closure combined with a vascularised flap that should be accompanied by the immediate application of a negative pressure wound therapy. We also conclude that particularly in paraplegic patients suffering this complication the risk for a fatal outcome is substantial.

Complication following spinal cord injury in Jordan

MR Alahmar; A Otom

Physical Medicine and Rehabilitation, SCI Unit/ King Hussein Medical Centre, Amman, Jordan

Introduction and Aims

Spinal Cord Injury (SCI) is a multi system injury which leads to significant morbidity and mortality. The aim of this study is to investigate the frequency of medical complications in Jordanian spinal cord injury patients, their demographic characteristics, extent and causes of their injury.

Material and Methods

A retrospective review of 190 patients who were admitted to the Spinal Unit at King Hussein Medical Center during the period March, 2008 to December, 2012 were enrolled in this study. Their demographic data, causes and extent of injury were analyzed. The American Spinal Injury Association impairment scale was used to categorise injury level and severity. The causes of morbidities surveyed were; cardiovascular, respiratory, renal complications, pressure sores, spasticity and neurogenic pain.

Results

A total of 190 cases were reviewed. The majority were predominantly males 152 (80%). The male/female ratio was 4:1, the mean age at the time of injury was 32 years. Their age ranged from (13-70 years). The vast majority was traumatic causes 167 (88%) patients of which road traffic accidents were the main cause of their injury. Non-traumatic causes were recorded in 23 (12%) patients. Among the morbidities studied, neurogenic pain was the dominant cause (45%) followed by urinary tract infection (30%), pressure sores (25%), spasticity (23%), thromboembolic complications (18%) and respiratory complications (10%).

Conclusions

The most common causes of morbidity were neurogenic pain followed by urinary tract infection and pressure sores. Effective prevention strategies should be applied as early as possible to reduce their occurrence in SCI patients. This study showed that traumatic causes and particularly road traffic accidents are the leading cause of spinal cord injury in Jordan.

The ethics of yes: sex in the hospital setting

TA Hicks

Magee Rehab Hospital, Philadelphia, USA

Inpatient rehabilitation settings aim to improve the quality of life of people with disabilities. The following presentation will focus on the ethics of sexual activity in the hospital setting. Following a spinal cord injury (SCI), many patients have questions and concerns about resuming sexual activity, as well as changes in sexual functioning. Many rehabilitation hospitals provide education on sexuality after SCI, and may serve as a testing ground for exploring sexuality. Research shows that although sexuality information provided to SCI patients has increased, many healthcare workers do not feel capable or comfortable providing sexual health information to patients and families (Esmail, Esmail, & Munro, 2001).

The following presentation will explore patient rights and provider responsibilities and liabilities through the lens of four ethical principles: autonomy, beneficence, justice as fairness, and privacy. Autonomy will explore patient's right to self-determination and competing ideals of paternalism. We will also explore both legal and ethical issues of consent for patients under 18, patients with diagnoses of SCI and TBI, MR diagnoses, and patients with a history of domestic abuse with the current partner. Themes related to beneficence include the obligation to promote the good of the patient, including access to education, medications, and sex toys/assistive devices. Discussion of the principle of justice as fairness will explore the collaboration and communication needed between patient and providers. We will also explore moralistic and values -based complexities related to areas of diversity such as religion, LGBT, and polyamorous relationships, with discussion of hospital policies and staff behavior and attitudes. Further discussion on the right to privacy will explore issues of confidentiality. Privacy will also be discussed in the context of the physical space and availability of staff during sexual activity. Case examples will be highlighted throughout the presentation to emphasize ethical principles.

Surgical improvement of arm and hand capacity in nontraumatic spinal cord injuries - an underrecognized opportunity

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¹Hand Surgery, Sahlgrenska University Hospital, Göteborg, Sweden; ²Swiss Paraplegia Center, Nottwil, Switzerland

Introduction and Aims

This study reviewed the usefulness of surgical improvement of arm and hand function in patients with non-traumatic (NT) spinal cord injury (SCI) who differ significantly from individuals with post-traumatic tetraplegia with respect to age, injury pattern, gender and socio-economic factors.

Material and Methods

The results of 14 upper extremity reconstructions in 11 patients (7 women, 4 men) with NT SCI aged 49 ± 12 (mean \pm SD) were reviewed. Key pinch strength, grip strength and first web space opening were recorded pre- and postoperatively in all patients, 5 patients (7 hands) were evaluated prospectively regarding manual dexterity. The tests were conducted preoperatively and 12 months postoperatively.

Results

All parameters were significantly improved. Strength of key pinch increased from 0.3 kg in one and zero in 10 cases to an average of 1.6 ± 0.9 (mean \pm SD) kg. Grip strength increased from 0 to 3.2 ± 4.5 kg. Maximal distance between thumb and index increased from 2.1 ± 4.1 to 6.4 ± 4.4 kg. Manual dexterity significantly increased.

Conclusions

Individuals with stable NT tetraplegia benefit from surgical rehabilitation of their upper extremities. The number of NT spinal cord injuries is likely to grow due to the increasing lifespan worldwide and therefore further studies of the functional rehabilitation of this population will become increasingly relevant.

Using technology to improve access to acute and long-term rehabilitation in spinal cord injury

A Soopramanien

Salisbury Neuro-Rehabilitation Centre, Salisbury, United Kingdom

Introduction and Aims

One of the challenges that Spinal Cord Injury Specialists face is to significantly improve access to Acute and Long-Term rehabilitation, with the shortage of specialists and rehabilitation beds. We draw on experience gathered in delivering spinal care in the UK and abroad, and the research that we carried out over the last eleven years.

Materials and Methods

In a first Randomised Controlled Trial, funded by EU from 2003, we established that Telemedicine had the potential to improve the quality of life of people with spinal cord injury, after discharge into the community. A second study, this time funded in 2007 by the Technology Strategy Board, evaluated a health hub for use in neurology, whereas it had previously nearly exclusively been used for COPD, Diabetes, Heart Failure. In the second study, we looked beyond the confines of SCI, bearing in mind that Traumatic SCI sufferers could also have associated brain injury. Extensive surveys were carried out to determine the needs of patients, their carers and professionals.

Results

They have only partly been published and the bulk of qualitative and quantitative studies are being made available on a website www.telerehabilitation.co. The results show a keen interest to use the technology to improve access to spinal rehabilitation and many useful comments are made by patients to help us shape the future for them.

Discussions

The distances that people have to travel in the UK are nothing compared to those covered in Canada or Australia, but this is a pale comfort to the ventilator-dependent or people with high tetraplegia, as any distance is too far. Based on our findings so far, work is now on-going, in partnership with software and hardware engineers, to design apps for android and non-android phone users, and adapted affordable equipment so as to reach poor and rich equally. A short film highlights our intentions on www.telerehabilitation.co. Not only are we able to organise video-consultations, provide expert advice as needed (via call centres), but also the system would allow collecting unrivalled data on general health and the process of ageing. At the same time this could be an opportunity to disseminate knowledge on SCI, as we have done in films that we have helped to produce and shown on 3 websites: www.spinalinjurycentre.org.uk/ download Outreach Film www.spinalinjury.tv www.choosingawheelchair.com

Conclusions

The model being developed in the UK could be applied in any setting. Too many people have little or no access to spinal rehabilitation. We have started contributing in a small way to reverse that situation, along the lines of what we explain above from an outpatient setting in Salisbury (UK).



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Thursday, September 04, 2014

09:35 - 11:05

Workshop 9: Sexual Health after SCI - contemporary practice standards Thursday AM
Auditorium

Sexual Health after SCI -- contemporary practice standards

S Ducharme¹; D Parashar²; HS Chhabra²; D Rohe¹

¹USA; ²India

Developing Clinical Practice Guidelines on Sexuality for People with SCI

S Ducharme, United States of America

The ABC of Sexual Functioning in Post-SCI Rehabilitation: Ability, Barriers, Culture

D Parashar, India

Sexuality after SCI: The Physician's Perspective

HS Chhabra, India

Developing an Effective Sexuality SCI Patient Education Video

D Rohe, United States of America

09:35 - 11:05

Oral Session 12: Ageing Thursday AM
Brussels Room

Change in bowel management method in persons ageing with spinal cord injury

G Savic¹; A Jamous¹; H Frankel¹; C Glass²; B Soni²; S Charlifue³

¹Stoke Mandeville Hospital, Buckinghamshire Healthcare NHS Trust, Aylesbury, United Kingdom; ²Southport and Formby Hospital, Southport and Ormskirk Hospital NHS Trust, Southport, United Kingdom; ³Craig Hospital, Englewood CO, USA

Aim

To analyse change in bowel management method in persons ageing with spinal cord injury (SCI) over a twenty year period (1990-2010).

Method

The sample consisted of 85 participants who took part in the latest 2010 round of the original 1990 British Ageing with SCI Study. Analysis included general demographic and SCI characteristics and bowel management data at baseline and in 2010 follow-up.

Results

In 2010, the sample was 80% male, the mean age was 67.7 (range 55-82) and the mean duration of injury 46.3 years (range 40-59). 44.7% of participants had paraplegia (Frankel grade A, B or C), 37.6% had tetraplegia (Frankel grade A, B or C), and 17.6% had a functionally incomplete lesion of any level (Frankel grade D). Between 1990 and 2010, 40% of participants changed their bowel management method. Manual evacuation was the most common method throughout the study (51.8% in 1990 and 49.4% in 2010). However, only 68.2% of those using manual evacuation at baseline were still on the same method in 2010; the majority changed to colostomy and few to medication, straining or transanal irrigation. The percentage of people using spontaneous/voluntary emptying decreased from 18.8% to 14.1% and for those using medications alone (including oral medication and suppositories) from 18.8% to 10.6%; most of them changed to manual evacuation or colostomy. Straining was used as the only method by 8.2% on both occasions. The use of colostomy increased from 2.4% to 14.1%, and there were three participants (3.5% of the sample) using transanal irrigation for bowel evacuation in 2010. The most frequently reported reasons for method change were: lack of control over bowel movements, increased bowel irregularity, incomplete emptying, severe constipation, frequent accidents, difficulty with toilet transfers, extensive amount of time required to complete the bowel programme and medical reasons (bowel cancer, anal abscess, prolapsed rectum, haemorrhoids).

Conclusions

More than a third of participants changed their bowel management method during the 20 year study period. Manual evacuation remained the most frequent method and the use of non-conservative methods increased over time.

Acknowledgements

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Swedish Ageing with a Spinal Cord Injury Study (SASCIS): functioning and disability and associations with socio-demographic and injury characteristics

S Jorgensen; L Norin; S Iwarsson; J Lexell

Department of Health Sciences, Lund University, Lund, Sweden

Introduction and Aims

To generate knowledge about people ageing with a spinal cord injury (SCI), we have initiated a comprehensive survey of men and women with a SCI, 50 years and older and more than ten years post-SCI (SASCIS). The aims of the present study were to describe injury characteristics and functioning and disability among people ageing with SCI, and to study the association between these variables and socio-demographic factors.

Material and Methods

Data were collected through medical records and during home visits. The level and severity of injury was defined using the American Spinal Injury Association (ASIA) Impairment Scale (AIS). Based on the AIS, the sample was divided into three groups: group 1 (C1-C8 AIS A-C; n=22), group 2 (T1-S5 AIS A-C; n=41) and group 3 (all AIS D; n=60). The Spinal Cord Independence Measure III (SCIM III) was used to assess functioning and disability. The association between variables was analyzed with multiple linear regression analyses, with SCIM as the dependent variable and sex, age, level and severity of injury, time post-SCI and cause of injury as independent variables.

Results

The sample comprised 36 women and 87 men (mean age 63 years; SD 9; 50-89). The mean age at injury was 39 years (SD 16; 7-74) and the mean time post-SCI was 24 years (SD 12; 10-56). Non-traumatic SCI accounted for 38%, followed by traffic accidents (29%). The majority was cohabiting, needed some form of assistance and used mobility devices. A large majority of the total sample (85%) reported pain. Neuropathic pain intensity was negatively associated with time post-SCI and positively associated with age at injury. There were no significant differences between groups regarding age, marital status and vocational situation. Significantly more participants with non-traumatic SCI were found in group 3, and they were older at injury and had shorter time post-SCI. The mean total SCIM III score was 65 (SD 24; 8-100). Significant differences in functioning and disability were found between the groups; the highest SCIM III scores were found in group 3 and the lowest scores in group 1. The regression analyses showed that only the level and severity of injury was significantly associated with the total SCIM III score.

Conclusion

SASCIS is the first comprehensive study of people ageing with a SCI in Sweden. Their functioning and disability varied, but overall was relatively high, despite the experience of pain, need of assistance and use of mobility devices. The level and severity of injury was the strongest predictor of overall functioning and disability. Follow-up programs and interventions should be based on the injury characteristics rather than chronological age and duration of SCI, and pain should be assessed regardless of sex, age and injury characteristics.

Emergency room visits and related hospitalizations among those with chronic spinal cord injury

Y Cao; JS Krause

Medical University of South Carolina, Charleston, USA

Introduction and Aims

Although individuals with chronic spinal cord injury (SCI) may be at greater risk of emergency room visits (ERv) or emergency room related hospitalizations (ERh) due to unintentional injuries, secondary health conditions, or chronic conditions, essentially no studies exist reporting these outcomes among those with chronic SCI. Our purpose is to identify the incidence of ERv and ERh in a cohort of 1,654 participants who average 16 years post-injury.

Materials and Methods

Cross-sectional, self-report. Inclusion criteria were:

- (1) traumatic SCI,
- (2) minimum of one year post-injury,
- (3) minimum of 18 years of age, and
- (4) some residual impairment.

Results

37% reported at least one ERv visit in the previous 12 months, with an average of 2.3 among those with at least one ERv. ERh were observed among 50%, with an average of 0.9 among those with at least one ERv. ERv were significantly related to race, with the greatest risk among black non-Hispanic participants. ERh were significantly related to injury severity, with the greatest risk among those with the most severe SCI (C1-C4). Both age and age at injury onset were significantly related to ERh, with those in the oldest age groups at greatest risk. Gender and years post-injury were unrelated to both outcomes.

Conclusions

ERv are a significant problem after SCI, particularly among Blacks. Risk of hospitalization resulting from an ERv, an indicator of severity of the consequence of the conditions leading to the ERv, is highest among vulnerable participants due to having either a severe injury or being of older in age.

Mortality and longevity after a spinal cord injury: systematic review and meta-analysis

JD Chamberlain¹; S Meier¹; L Mader¹; PM von Groote²; MWG Brinkhof¹

¹SwiSCI Study Centre, Swiss Paraplegic Research, Nottwil, Switzerland; ²Disability Policy Unit, Swiss Paraplegic Research, Nottwil, Switzerland

Introduction and Aims

Spinal cord injury (SCI) is associated with increased mortality and decreased longevity. Previous research has found mortality risk to vary according to SCI characteristics, including lesion level and severity. Understanding which sub-populations within the SCI population are at higher risk for mortality is essential for informing health policies aimed at improving mortality outcomes. With this systematic review, we aimed to 1) evaluate the variation in mortality and longevity among persons with traumatic and non-traumatic SCIs worldwide; 2) perform meta-analyses to define pooled effect estimates of outcomes related to mortality and longevity; 3) compare the mortality and longevity of persons with SCI to the general population; and 4) establish the consistency and generalizability of reported results.

Material and Methods

Relevant databases were screened for original studies reporting at least one crude measure of survival or mortality in persons with SCI. Included studies were assessed for quality according to the Centers for Review and Dissemination (CRD) guidelines. Pooled effect sizes were derived using random effects meta-analysis. Meta-analyses were stratified according to World Health Organization (WHO) regional groupings, which serve as a proxy to investigate the influence of country income and health systems on mortality.

Results

Sixty-one studies were eligible for inclusion in the systematic review. Most studies included a traumatic SCI population (TSCI). Standardized mortality ratios (SMRs) for persons with SCI ranged between 1.47 and 5.00; SMRs were higher for complete versus incomplete lesions. Among TSCI studies, median survival ranged between 4.58 and 43 years; 1-year survival ranged between 83.6% and 100.0%. We found an overall pooled estimate for in-hospital mortality of 8.2% (CI=6.5-10.3; I²=95.2%), and of 94.3% (CI=91.3-96.3; I²=96.9%) for 1-year survival.

Conclusion

To our knowledge, this is the first systematic review on mortality and longevity after SCI that has performed a meta-analysis on available data, and which has also looked specifically at in-hospital mortality. This study highlights the inconsistent reporting intrinsic within SCI literature. The lack of standardization makes it difficult to compare study results. An individual-based meta-database including data from multiple sources could help future comparisons.

Trend of age and co-morbidity in people over 65 years of age with acute spinal cord lesion (SCL)

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Introduction and Aim

There has been an increase in the age of the people diagnosed with a new spinal cord lesion over the past 30 years. Incidence of non-traumatic spinal cord lesions is increasing and this appears to be due to age related co-morbidity. Understanding of the co-morbidity is important in assessing the suitability of admission for intensive rehabilitation, goal setting and discharge planning. Aim of our study is to identify trend of the number of people over 65 years of age with acute spinal cord lesion (SCL) and to study the incidence, number and type of co-morbidity in this group.

Material and Methods

Number of people over 65 years of age was noted from the demographic data collected at the Duke of Cornwall spinal treatment centre from 1984 to 2012. 41 case notes of people over 65 years of age diagnosed with acute spinal cord lesion were reviewed.

Results

Number of people over the age of 65 years was 7 out of 42 (16.66% of inpatients), in 1984 and 24 out of 42 (57.14% of the inpatients) in 2012. This is an increase by 3.4 times. 40% of people had a traumatic and 60% had non traumatic SCL. The mean age of the patients was 73.17. 25 were males and 16 were females. Most common co-morbidity were arthritis 75.6%, hypertension 51.21%, hypercholesterolemia 31.7%, heart diseases 29.2% and diabetes 26.82%. The average of the number of co-morbidity for each patient was 2.7. 2 patients didn't have any co-morbidity. 14% of the patients had osteoporosis prior to injury.

Conclusions

Trend of people over the age of 65 years has increased by 3.4 times from 1984 to 2012. A significant number of people have multiple co-morbidity. These patients are likely to benefit from geriatric physician input to optimize their rehabilitation potential.

Sportive aging - bann or boon?

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Introduction

The benefit of physical resources during aging with SCI is discussed in expert groups for a long time. Modern medical rehabilitation settings try to gain and conserve quality of life by sporting activities. In addition to physical parameters, mental and social factors play a decisive role.

Question

How are the results of various sporting activities in elderly subjects with longterm SCI? Is there any reason to change the concept of lifelong sporting activities?

Material and Method

A structured questionnaire with open and closed questions was handed out. Data of 14 outpatient individuals with a minimum age of 60 years and a 40 years minimum duration of SCI were obtained. Data about sponsors, occupation, resent and retrospective activities of sports, actual and chronic physical disorders and a rating of the WHO-(5)-Questionnaire's well-being were gained.

Results

There are various sporting activities, which are conditioned by age. Pain and orthopedic disorders were often mentioned in relation to medical conditions. Joint related differences were pointed out due to the level of sporting activity. Particular attention must be paid to the shoulder joints. The majority of the respondents bandied about the shoulder joint as a central problem independent of practised sports level. Retrospectively the most respondents would practice wheelchairsports in despite of physical disorders in a same or even in a higher level. Prospectively exercise sports is mentioned to keep independence and fitness on a high level also in an old age.

Conclusions

Regular active sports and attended physiotherapy is important to maintain good physical condions and minimize disorders in a long term SCI. Various sporting acivities for in- and outpatients in the rehabilitation setting are helpful to conserve quality of life in a long term SCI.

09:35 - 11:05

Oral Session 13 (Free Communication: Measurement/health issues) Thursday AM
Paris Room

Psychometric validation of the Utrecht scale for evaluation of rehabilitation-participation in persons with spinal cord injury in Switzerland

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Introduction and Aims

Social participation, community integration, and quality of life are viewed as ultimate goals in rehabilitation. The USER-Participation is a newly developed ICF-based measure assessing objective and subjective participation in three scales (Frequency, Restrictions, Satisfaction). The USER-Participation has been validated in the Netherlands, but its validity as a rehabilitation outcome measure in other countries and languages is unknown. This study aimed to examine the psychometric properties of the USER-Participation in persons with spinal cord injury (SCI) in Switzerland with Classical and Modern Test Theory.

Material and Methods

We analyzed complete case data from the community survey of the Swiss Spinal Cord Injury Cohort Study (SwiSCI). Adult patients with SCI resident in Switzerland received a questionnaire including the USER-Participation, the self-report version of the Spinal Cord Independence Measure (SCIM-SR), and a quality of life measure (WHOQOL-5). We evaluated floor and ceiling effects, internal consistency, dimensionality, and concurrent validity of the USER-Participation. Internal consistency was established with Cronbach's alpha and dimensionality was investigated in a factor analysis. Concurrent validity was tested with Spearman correlation coefficients between USER-P, SCIM-SR and WHOQOL-5. The Classical Test Theory approach was complemented with a Rasch analysis of the Restrictions and Satisfaction scale.

Results

We investigated a sample of 1479 persons with a mean time since injury of 16.9 years. No scale showed floor or ceiling effects. Internal consistency was satisfactory for the Restrictions ($\alpha=0.90$) and Satisfaction scale ($\alpha=0.89$), but not for the Frequency scale ($\alpha=0.65$). Factor analysis showed four dimensions of the Frequency scale and a two-dimensional structure for Restrictions and Satisfaction, where the first factor explained >50% of the variance. Spearman correlation coefficients between the USER-Participation scales were moderate to large (range 0.37-0.52). In line with expectations, we found the strongest correlations between Restrictions and the SCIM-SR (0.58) and Satisfaction with the WHOQOL-5 (0.66). Rasch analysis of the Restrictions and Satisfaction scale showed good reliability and validity with adequate item fit and low local dependencies. We observed no differential item functioning for language, questionnaire type, gender, SCI type and degree. The ordering of thresholds was acceptable for both scales. Targeting showed a shift towards higher abilities for both scales.

Conclusion

Our results support the validity of the USER-Participation to evaluate participation among persons with SCI in Switzerland. However, several limitations of the Frequency scale were observed. Together with previous Dutch studies in multi-diagnostic groups, our findings support the international usefulness of the USER-Participation as a rehabilitation outcome measure.

Development and evaluation of environmental factor instruments for use following spinal cord injury

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Introduction and Aims

Participation in everyday activities is a key rehabilitation goal following spinal cord injury (SCI). Environmental factors may restrict opportunities for participation. Investigators have developed several measures of environmental factors, but few have been evaluated other than by their developers. Thus, the sensitivity and feasibility of these measures have not been established. Further, there is no consensus on which instruments best describe participation-environment interactions. The aims of this study were to develop new measures of environmental factors using contemporary measurement methods, and evaluate 4 publicly available instruments.

Material and Methods

Instrument development included a literature review, item classification, item writing, and cognitive testing using the Patient-Reported Outcomes Measurement Information System methodology. Ten content-area and outcome measurement experts contributed to instrument development; 200 individuals participated in focus groups and 15 participated in cognitive testing. Pilot testing involved 304 adults with SCI, stroke, and traumatic brain injury; testing with revised items involved different people with the same impairments, including 200 with SCI. We categorized environmental factor items in 6 domains: assistive technology; built and natural environment; social environment; services, systems, and policies; access to information and technology; and economic quality of life. This sample also completed the Facilitators and Barriers Survey, Measure of the Quality of Environment, Craig Hospital Inventory of Environmental Factors, and Home and Community Environment Instrument.

Results

We binned 2,273 items across the 6 domains, winnowed this pool to 291 items for cognitive testing, and recommended 274 items for pilot data collection. Five of the 6 domains correspond closely to the ICF taxonomy; the sixth domain, economic quality of life, reflects financial resources that affect participation. Pilot testing supported the reliability and validity of the social and economic environments. We used confirmatory factor analysis to identify items that may form unidimensional measures, and then evaluated fit to the Rasch model. The social environment and economic quality of life items defined hierarchical and unidimensional constructs; a subset of items measuring the built and natural environment; systems, services and policies; assistive technology; and access to information and technology also formed useful measures. The pattern of correlations among the newly developed measures and the publicly available instruments demonstrates that distinct aspects of environmental factors are measured by each instrument.

Conclusions

Measuring environmental factors is enhanced when instruments are developed using a structured and reproducible methodology. Even then, important environmental features may not form highly reliable measures. Investigators and clinicians should understand the conceptual background and methodological development of instruments in order to make a wise selection decision.

The international standards for neurological classification of spinal cord injury (ISNCSCI): consensus between expert examiners and clinicians

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Introduction and Aims

The International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) is the accepted "gold standard" for the characterisation of the nature and the extent of neural damage to the spinal cord. We will detail our experience in studying consensus between expert examiner- and clinician-assessed ISNCSCI classification of the neurological deficit.

Materials/Methods

The patients enrolled in this study were aged 18 years and over, and had sustained a clinically complete, or incomplete SCI at T12 level or above. A panel of four expert examiners (Specialist Rehabilitation Consultants, Physiotherapists, Clinical Researchers) reviewed clinician-assessed ISNCSCI charts for accuracy of classification (variables classified accurately, cumulative sum of accurate classifications per chart). Variables examined consisted of: neurological level (motor, sensory), zone of partial preservation (ZPP-motor, sensory), complete/incomplete and ASIA Impairment Scale (A-D). Illegible charts or those with missing data were returned for correction and were then included in the analysis (descriptive statistics; n,%).

Results

The ISNCSCI charts of n=20 patients, clinically complete (n=15), incomplete (n=5), C2-T12 were analysed for accuracy of classification. Percentage accuracy for all six variables examined ranged from 100% (n=2) to 50% correct (n=1). Of these, percentage accuracy for correct motor and sensory level classifications was 45% and 65% respectively. The corresponding accuracies for ZPP motor (n=10 patients) and sensory levels (n=6 patients) were 50% and 33.3%. Clinician-assessed classifications for both complete/incomplete (100%) and AIS Impairment Scale grade A-D (100%) were consistently correct.

Conclusion

We have identified significant inaccuracies in clinician-assessed ISNCSCI classification of the neural deficit, a finding which has important implications for clinical trials, and for the validation of radiological, cellular/molecular, and electrophysiological techniques for the quantification of the spinal cord lesion.

Embedding the international Spinal Cord Injury (SCI) datasets into usual care

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Introduction and Aims

In Victoria, Australia the Victorian Spinal Cord Service (VSCS) provides comprehensive care to people with SCI from accident for the rest of their lives. Until recently, the VSCS had no electronic register of its patients, and provided only limited case registration and injury surveillance information to the Australian Spinal Cord Injury Register (ASCIR). The VSCS identified the need for a secure, web-based registry that could facilitate a range of future research questions, quality improvement programs and international collaborations. With no provision for ongoing funding, an affordable, sustainable model for data entry was sought.

Material and Methods

Researchers, clinicians and service managers undertook an iterative approach to collating a dataset for the VSCS, through mapping of the clinical pathway to available national and international datasets and benchmarking with other units. This enabled a comprehensive, parsimonious dataset to be assembled and documented in a data dictionary. The dataset consists of six of the International SCI datasets, the ASCIR dataset, the Australasian Rehabilitation Outcomes Centre (AROC) dataset, five clinical indicators, time based information about the patient journey, and patient outcome measures, including the ASIA impairment scale (AIS) and the Spinal Cord Independence Measure (SCIM). This dataset was translated into a secure web-based database. The provision of search, export and clinical reporting functions were built into the system to provide a strong incentive for clinical staff to enter data. VSCS clinicians developed a protocol for how data would be collected and audited within existing resources. All clinical staff were trained in use of the database and provided with supporting documentation.

Results

Data capture for all incident cases of SCI commenced in December 2013. Twelve new cases have been registered and data entry is proceeding well. The hospital discharge summary is built into the database and over 80% of the information required for this report is automatically populated by the database. Despite some initial teething problems, clinical staff have expressed overall satisfaction with the new system. The automated discharge summary has reduced duplication and inconsistencies between disciplines and not increased clinician workloads. More clinical reports will be developed in the coming months. A thorough review of the database and systems will be conducted in April 2014.

Conclusion(s)

Thankfully SCI is a rare injury, but with this low incidence come immense challenges in our searches for improvements in health status, clinical care and community participation. It is increasingly apparent that the key to achieving these improvements lies with affordable, scalable and effective collaboration. This project has successfully developed a low-cost model for local implementation of the international SCI datasets, and established processes for embedding data collection within usual care.

Intrathecal baclofen dosage during long-term treatment in patients with spasticity due to traumatic spinal cord injuries or multiple sclerosis

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Introduction and Aims

Intrathecal baclofen is an effective treatment for severe leg spasticity but tolerance was reported during short term treatment. The aim of the present study was to investigate dosage changes during long-term treatment.

Material and Methods

Retrospective chart review. The 46 investigated patients had been treated with an intrathecal baclofen pump (Syncromed) because of severe leg spasticity for at least 7 years. Ten patients were excluded from the study due to catheter/pump failure or factors which aggravated spasticity. Of the remaining 36 patients 17 had spinal cord injury (SCI) and 19 multiple sclerosis (MS). Of the spinal patients 13 had cervical and 4 thoracic spinal cord injury. ASIA A (n=6), ASIA B (n=5), ASIA C (n=3) and ASIA D (n=3). The effect was estimated by patient/doctor dialogue, usually 4-10 times per year, in order to reduce leg spasticity and at the same time avoid an increase in leg/trunk weakness.

Results

One year after the start of intrathecal baclofen the patients needed a median dose of 189 microgram baclofen per 24 hours (range 30-385) in order to reach an optimal effect. After seven and ten years the dose had increased compared to the first year dose by 9 and 17% in patients with SCI compared to 42 and 84% in MS patients (Ttest p= 0.03 and 0.02).

Conclusion

The intrathecal baclofen dose needed to reach an optimal effect on leg spasticity in the long term is significantly increased in MS patients compared to patients with SCI and probably reflects the progressive disease course. If a large dose increase occurs in patients with spinal cord injury one should suspect pump system failure or a progressive spinal disease.

The role of the endoplasmic reticulum stress response in neural apoptosis of the injured spinal cord

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Introduction and Aims

Following spinal cord injury (SCI), oligodendrocyte progenitor cells (OPCs) that are abundantly present within the adult mammalian central nervous system proliferate around the lesion epicenter. However, most of these cells fail to differentiate into mature oligodendrocytes, hindering their potential for remyelination and functional recovery. One of the major inhibitory factors of OPC differentiation is apoptosis, which also leads to expansion of secondary injury and deterioration of neurological symptoms. There is a growing body of evidence linking the endoplasmic reticulum (ER) stress response to numerous neurodegenerative diseases. In order to elucidate the involvement of the ER stress response in apoptosis after SCI, we examined the changes of ER stress related proteins under stress conditions *in vitro* and *in vivo*. We also investigated the effect of enhancing the ER stress response by performing gene transfection *in vitro* and by administering the FDA-approved potassium-sparing diuretic amiloride *in vivo*, and studying its effect on apoptosis.

Material and Methods

In vitro studies were conducted in rat C6 glioma cells. Cultured C6 cells were treated with ER stress inducers tunicamycin or glutamate and their effect on intracellular cytokines and apoptosis was observed. Furthermore, C6 cells transfected with a vector designed to transiently express the cytoprotective ER chaperon 78kDa glucose-regulated protein (GRP78), were similarly evaluated.

In vivo studies were conducted in a T10 level contusion SCI rat model. Amiloride (10mg/kg) or PBS was intraperitoneally administered every 24 hours after injury for 28 days during which their hindlimb motor function were assessed daily. Spinal cords were dissected for Western blot analysis of ER-associated protein levels, TUNEL staining for apoptosis evaluation, and immunohistochemical analysis. *In vitro* analysis of amiloride was performed on rat cortical astrocytes.

Results

GRP78, which regulates protein folding in the ER and contributes to cell survival, was upregulated under stress conditions both *in vitro* and *in vivo*. However when the stress became excessive, expression of GRP78 decreased and the expression of the pro-apoptotic factor C/EBP homologous transcription factor protein (CHOP) increased, leading to increased cell apoptosis. Overexpression of GRP78 by gene transfection protected cultured glial cells from ER stress-induced apoptosis. In the injured spinal cord of rats, amiloride treatment significantly reduced cellular apoptosis at the lesion epicenter and reduced the expansion of apoptosis caused by secondary injury. Furthermore, the decrease in ER stress-induced apoptosis increased the number of OPCs in the injured spinal cord, and brought about a significant improvement in hind limb function.

Conclusion

Amiloride may be an effective treatment to reduce ER stress-induced apoptosis in the acute phase of SCI.

Patient-reported impact of spasticity in people with spinal cord injury (SCI): identification and assessment of patient-reported outcome (PRO) measures

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Introduction and Aims

Growing evidence suggests assessment of spinal cord injury (SCI)-related spasticity should be complemented by self-rating of spasticity, including use of patient-reported outcomes (PROs). However, PROs have not been widely used in spasticity from SCI. In this study we identify available PROs and assess key measurement properties.

Material and Methods

A literature search was used to identify PROs in this area, and key measurement properties (e.g. reliability, validity, responsiveness) were assessed using the Consensus-based Standards for the selection of health Measurement Instruments (COSMIN) checklist. This is a methodological framework for quality assessment of health measurement instruments (with a 4-level rating system: *excellent, good, fair, poor*).

Results

Two PRO measures were identified; the Patient Reported Impact of Spasticity Measure (PRISM), and the Spinal Cord Injury Spasticity Evaluation Tool (SCI-SET). Both measures have been developed from the perspective of the person with SCI, and are rated on the COSMIN checklist as *good* or *fair* for "reliability". "Content and construct validity" have support in both measures, however the PRISM has stronger foundations on content validity, rated *good*, with both measures rated as *fair* on construct validity. No evidence was available for "responsiveness", and there are concerns about "interpretability" on both measures, e.g. no data was reported on minimally-important difference.

Conclusions

PROs in SCI-related spasticity are important to assess patient impact, treatment needs and outcomes. Both PROs identified represent potential measures for use in clinical studies. The COSMIN assessment indicates that PRISM has stronger support, but the SCI-SET offers potential advantages in the scoring system used. For both measures further research is required, including research on reliability and on responsiveness, before recommendations on their use as adequate measures to assess the patient impact from spasticity in SCI can be made.

Functional hindrance due to spasticity in persons with spinal cord injury during inpatient rehabilitation and 1 year thereafter

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Introduction and Aims

Persons with spinal cord injury (SCI) can be hindered by spasticity during activities of daily living. There are no studies about functional hindrance due to spasticity in the early period after SCI. The aim of the present study was to assess functional hindrance due to spasticity in persons with SCI during inpatient rehabilitation and 1 year thereafter and to investigate associations with possible determinants of functional hindrance due to spasticity.

Material and Methods

Prospective cohort study in the Netherlands. A total of 203 persons with recent SCI from 8 specialized rehabilitation centres rated the hindrance they perceived due to spasticity in daily living. Assessments were carried out at the start of active rehabilitation (t1), 3 months later (t2), at discharge (t3) and 1 year after discharge (t4). Hindrance was dichotomized into absent or negligible and present. Multilevel regression analyses were performed to determine the course of functional hindrance due to spasticity and its associations with possible determinants, namely age, gender, cause, lesion level, motor completeness, spasticity and anti-spasticity medication.

Results

The percentage of persons that indicated functional hindrance due to spasticity ranged from 54% to 62% over time and did not change significantly over time (Ät3t1 Odds Ratio (OR)=0.85 p=0.44, Ät3t2 OR=1.20 p=0.41, Ät3t4 OR=0.91 p=0.67). The percentage of persons who experienced a lot of hindrance due to spasticity during specific activities ranged from 4-27%. The odds for experiencing functional hindrance due to spasticity were significantly higher for persons with tetraplegia (OR=2.17, p=0.0001), more severe spasticity (OR=5.51, p<0.0001) and those using anti-spasticity medication (OR=4.18, p<0.0001).

Conclusion

Functional hindrance due to spasticity occurred in the majority of the persons with SCI and did not change significantly during inpatient rehabilitation and 1 year thereafter. Factors that influence hindrance were determined.

09:35 - 11:05

Oral Session 14 (Free Communication: Systems) Thursday AM
Berlin/Cop Room

Successes and challenges with initiating SCI rehabilitation in Botswana

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Introduction and Aim

A spinal cord injury (SCI) is a devastating condition whether you live in a high or low income country. Specialized rehabilitation and medical follow-up is crucial to re-establish independence and secure acute and long term survival. Botswana, as well as many low- and middle-income countries, is lacking specialized care and mortality is high. The aim of this project was to establish a national specialized SCI-rehabilitation center, run by local staff and being an integrated part of the Botswana public health care system.

Materials and Method

After an inception phase, a three-year partnership between Ministry of Health in Botswana and the Spinalis Foundation, partly funded by Swedish government, was established. A Swedish multi-disciplinary team was on site in Botswana for varied periods of time, however present permanently for two years before a long phasing out period of 1.5 year.

Result

The clinical work started in May 2010 at the orthopedic wards at Princess Marina Hospital (PMH), the largest public hospital in Botswana. Six beds on male and three beds on female ward constituted the center - however bed occupancy was usually 12-14 patients. Initially three local staff members; a nurse, physiotherapist and occupational therapist, were allocated on full-time. In March 2011 Spinalis Botswana was allocated to a separate ward and after re-modifications the transfer was made in July. The center is now a 12-14 bed unit within PMH premises. A total of 23 staff has a permanent position at the center including; physician, head of unit, nurses, therapists, rehab coach, and health care auxiliaries. All staff have participated in training through lectures and clinical work, also in Sweden. Local clinical guidelines have been established and ISCoS protocols have been implemented. Structured collaboration with involved stakeholders, such as Motor Vehicle Accident Fund and technical aid suppliers from South Africa has been established.

The center provides acute rehab, re-rehabilitation, out-patients clinics, lifelong medical follow-up, as well as out-reach to rural villages for follow-ups. Up to this point a total of 180 patients have been assessed and assisted as needed, 100 patients undergoing rehabilitation post-acute SCI and 80 living with a SCI have been seen as outpatients or for inpatient re-rehab. Formal inauguration was in September 2013.

Some remaining challenges remain and need to be acknowledged; procurement structure for technical aids through the public health care system is not fully secured, a lack of professional career paths constitutes a risk of staff leaving. Rotating staff out from the center is at present an additional risk factor as well as delayed spinal stabilization due to lack of theater-space and neurosurgeons. Follow-up visits will be performed by the Swedish team. Conclusion: A long term commitment, and perseverance, is essential for initiating and establishing specialized care and creating new structures at the ministry levels. Additionally a long inception period for planning and preparation at site is crucial for securing sustainability

The experience of achieving a successful employment outcome following traumatic spinal cord injury; pathways and processes

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Introduction and Aims

Despite service delivery changes in Victoria, Australia over the last few years, designed to provide an early intervention vocational service in spinal cord injury (SCI) rehabilitation settings, there is substantial unrealised vocational potential in this neurotrauma group. There appears to still be barriers for people with chronic SCI to obtain and sustain employment. The experience of seeking, returning to and maintaining employment following a SCI can be complex and lengthy, requiring navigating various services, resources, legalities and entitlements; combined with the physical, environmental and psycho-social barriers that emerge along the way. Thus achieving successful and durable return to work (RTW) can be considered a significant achievement, but key in facilitating high post-injury quality of life, since employment status is the most influential factor of this for those post traumatic injury. Community SCI organisations, vocational rehabilitation providers, clinicians and academics agree that the complicated and variable pathway of RTW in Australia post SCI contributes to lowered employment outcomes. To understand more about the processes and parties involved, and how these influence individual decisions and outcomes, (as well as set the framework for further research), we need to first gain improved understanding of the RTW process, inclusive of the influence exerted on the individual by major key players. Guided by the stages of change model, and adopting an industrial ethnographic approach, this research project aims to understand (A) the experience and pathway of a person achieving successful employment after SCI, and (B) the experience and pathways of those achieving an avocational outcome.

Material and Methods

Using an ethnographic approach, thirty retrospective cases of 'exemplars' across three subgroups (ten in each) were recruited and interviewed; stable (durable) employment, unstable (temporary) employment and without employment. The interview included collection of demographic detail, and measures of life satisfaction and perceived optimism. Information regarding pathway included timelines, health services and vocational services utilised, entitlements and interventions received, stakeholders involved, barriers, facilitators and outcomes. Informed by the Transtheoretical Model of Proshaska, the interviews were semi-structured and draw from interviewee's relevant information about parties and decisions at key stages of the post-injury journey.

Results

Early results indicate that common pathways to stable employment include study pre and post injury and returning to the same or similar occupation. Majority of those unemployed had an unsuccessful attempt to RTW and now describe redefining their worker identity. On average those in employment rate higher on life satisfaction and perceived optimism than those who are not.

Conclusions

Results of this research have provided insight to and understanding of the complex experience of RTW after SCI and thus will contribute to enhancements in service delivery in Victoria.

Availability and quality of health service provision for persons with spinal cord injury

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Objective

To examine availability and satisfaction with health care providers in adults with spinal cord injury.

Material and Methods

National survey in Switzerland on 492 adults with spinal cord injury. Analysis of cross-sectional data from questionnaire about satisfaction with availability and quality of care of services offered by general practitioners and home care organizations.

Results

Satisfaction with availability was equally high with 60.3 percent and 63.8 percent reporting high satisfaction and only 17.7 percent and 12.3 percent reporting dissatisfaction with general practitioners or home care services, respectively. Similarly, rating of quality of services was high with 55.3 and 61.7 reporting high satisfaction versus 15.6 percent and 15.2 percent reporting dissatisfaction with general practitioners or home care services, respectively. A higher rated availability was associated with higher rated quality. Also, the ratings of availability and quality of general practitioners and home care services were highly similar. Main determinants of low satisfaction with general practitioners and home care services are financial hardship and reduced mobility. Older persons are more likely satisfied as well as persons from the Swiss German speaking areas, as opposed to those from the French or Italian speaking areas. Males are slightly happier with the provided services. No association of satisfaction with health care services was found with lesion level, type of injury, level of education and type of health insurance.

The number of persons who prefer a service at local reach and those who prefer a more specialized treatment at further distance is equally high. Those who are less satisfied with availability or quality prefer a more local health care service, while those satisfied rather prefer a more specialized treatment at further reach.

Conclusions

The vast majority of patients with spinal cord injury are satisfied with the availability and quality of medical services by general practitioners and home care providers. Key to good quality is a high accessibility of services at close reach. Local service provision is preferred by many persons, even if this means the provision of less specialized care. The study underlines the importance of decentralization and local roots of health care providers.

Work stress and quality of life in persons with disabilities from four European countries: the case of spinal cord injury

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Introduction and Aims

Evidence on the adverse effects of work stress on quality of life (QoL) are largely derived from general populations, while respective information is lacking for people with disabilities. We investigated associations between work stress and QoL and the potentially moderating role of socioeconomic circumstances in employed persons with spinal cord injury (SCI).

Material and Methods

Cross-sectional data from 386 employed men and women with SCI (≥ 18 work hours/week) from the Netherlands, Switzerland, Denmark, and Norway were analyzed. Work stress was assessed with the 'effort-reward imbalance' model (ERI) and the control component of the 'demand/control model'. QoL was operationalized with five WHOQoL BREF items. Socioeconomic circumstances were measured by years of formal education and perception of financial hardship. We applied ordinal and linear regressions to predict QoL and introduced interaction terms to assess a potential moderation of socioeconomic circumstances.

Results

Multivariate analyses showed consistent associations between increased ERI and decreased overall QoL (coefficient -1.55, $p < 0.001$), domain-specific life satisfaction (health -1.32, $p < 0.001$; activities of daily living -1.28, $p < 0.001$; relationships -0.84, $p = 0.004$; living conditions -1.05, $p < 0.001$) and the QoL sumscore (-2.40, $p < 0.001$). Low job control was linked to decreased general QoL (0.13, $p = 0.015$), satisfaction with relationships (0.15, $p = 0.004$) and QoL sumscore (0.15, $p = 0.029$). None of the tested interaction terms was significant.

Conclusion

ERI was consistently related to all indicators of QoL, while associations with job control were less consistent. Our results do not support the notion that unfavorable socioeconomic circumstances moderate the association between work stress and QoL among persons with SCI.

Travelling around by public transport in Belgium as a person with a spinal cord injury (SCI): a pilgrimage?

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Physical Medicine and Rehabilitation, University Hospitals of Leuven, Lubbeek, Belgium

Introduction and Aims

The use of public transport as a wheelchair user seems complicated in Belgium. It is, however, an important aspect of integration and participation in various domains of life. Also being an aspect of freedom, an easy use of public transport adds to quality of life. Therefore, it is an important rehabilitation goal for patients with SCI. The WHO World Report on Disability (WRD) mentions that a lack of continuity in the travel chain (all elements that make up a journey from starting point to destination) make the trip more difficult, possibly requiring taking an indirect route and creating longer travel times. The goal must be to have access to all vehicles and the full service area. The United Nations (UN) Convention on Rights of Persons with Disabilities states that to enable persons with disabilities to live independently and participate fully in all aspects of life, States Parties shall take measures to ensure access on an equal basis with others, to the physical environment, to transportation, to information and communications, and to other facilities and services open or provided to the public, in urban and in rural areas. The aim of our study is to find out if the measurements mentioned in the WRD and the UN Convention have been applied in Belgium.

Materials and Methods

Case study, describing a week of travelling by public transport in Belgium, of a 37 years old male patient with traumatic SCI T10 AIS A. The accessibility of the public transport system (bus, train, metro and tram) was analysed and, as the patient is a professional writer, an article with his experiences, was published daily in a national newspaper.

Results

During this week of travelling many barriers were revealed. The infrastructure of the transport was often not accessible. All journeys had to be booked 24 to 48 hours in advance to assure place and assistance. Furthermore, to take a bus, a disabled person had to be accompanied by a care giver because the busdriver is not allowed to leave his seat. Finally, communication issues between several services and the disabled person were encountered leading to practical difficulties and prolonging of transportation time.

Conclusion

Although some adaptations for disabled persons are provided, a lot of work remains to be done. It is practically very difficult and frustrating for a wheelchair user to travel in Belgium. Besides infrastructural changes, a change of attitude of society to include and accept disabled persons is warranted. As mentioned in the WRD, coordinated political action, both national and local, is needed to pass laws and ensure that laws are enforced. Additionally, it seems important that education about disability, participation in life, quality of life and consumer rights is provided. Spinal cord injury rehabilitation centers and consumer organisations have a role in research in this field as well as a responsibility in rising awareness in the society. The aim is to provide disabled people the freedom to go out and travel whenever and wherever they want, in order to enable them to participate in society as equals.

Incidence and impact of delays in referral and admission of newly injured patients to a spinal cord injury centre

J Khare¹; J Gawronski¹; L De Souza²; FRI Middleton¹; M Ferguson-Pell³

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Introduction and Aims

Internationally the lengths of stay (LOS) of newly injured SCI individuals vary significantly; in part this is due to differences in the admitting processes of individual spinal cord injuries centres (SCIC) and differences in the classification of the point of commencement of rehabilitation. Research suggests that those who are admitted to an SCIC earlier will have reduced acute and rehabilitation LOS. Additionally, those admitted to acute SCIC facilities will make greater progress during their rehabilitation stay and have fewer complications. There is little, UK based, evidence to support these assumptions.

UK based research indicates that SCI individuals are often delayed in admission to an SCIC with many also experiencing a delay in referral to the SCIC. This is of concern as delays in referral indicate a delay in accessing specialist advice on the management of the SCI individual. Complications such as pressure sores and contractures can be sustained at this time if the individual with SCI is not managed appropriately. Despite this there is little UK based evidence regarding the incidence, cause and impact of those complications.

This presentation aims to:

- Identify the impact of delays to referral and admission on a cohort of newly injured UK SCI individuals.
- Identify the impact of avoidable complications sustained prior to admission.
- Clearly identify benchmarks in the SCI acute care to rehabilitation pathway.

Material and Methods

UK based survey of medical records. Participants were a convenience sample of 74 TSCI and NTSCI patients aged 18+ and admitted for their first episode of SCI rehabilitation.

Results

Longer times to admission were not associated with prolonged SCIC acute or rehabilitation LOS but were associated with shorter acute LOS in those admitted without complications. Delays in referral to SCIC were associated with further delays in admission as well as avoidable complications on admission. Those who were admitted with complications had significantly longer acute and rehabilitation LOS.

Conclusions

These unpublished findings confirm reduced acute LOS following delayed admission to an SCIC suggesting that, for many, these delays purely mean that the acute period of care is completed at the referring hospital. However the relationship between delays in referral and avoidable pressure sores on admission highlights the need for early admission to an SCIC or early liaison between acute hospitals and SCIC. The impact of avoidable pressure sores on overall LOS suggest that pressure sores sustained prior to admission to an SCIC will have a longstanding impact which will have ramifications not only for the individual and the SCIC service but also on other SCI individuals awaiting admission to the SCIC. Strong clinical and financial arguments will be discussed for early admission to an SCIC as well as the need for outreach services to support referring hospital teams in the management of the newly injured SCI individual.

Minimal clinically important difference (MCID) of the Spinal Cord Independence Measure (SCIM III). An anchor-based study

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Introduction and Objective

The SCIM is a scale that was developed specifically for people with spinal cord injury (SCI) to evaluate their performance in daily activities. Statistically significant changes of the SCIM have been used by several groups to examine the efficacy of treatments in clinical trials. However, there is growing recognition that the traditional statistical methods that are used to evaluate treatment efficacy are limited in at least 2 respects. First, the tests provide no information on the variability of response to a treatment within a sample. Second, whether a treatment effect exists statistically is irrelevant to its clinical significance. The existence of a treatment effect has no bearing on its size, importance, or clinical significance. Issues regarding the clinical significance of a treatment are germane to the benefits that are derived from it, its potency, its impact on patients, and its ability to make a difference in peoples' lives. Purpose: to study the MCID of the SCIM III based on an anchor based approach.

Patients and Method

Prospective study of 58 patients (M 39/ F 19 , mean age 48.6; mean distance from the lesion 5.5 months, level: C 24, T 24, L10; AIS impairment : A16, B 5, C 7, D 30) to the first rehabilitation hospitalization after spinal cord injury. At the time of discharge, patients were asked to report if they experienced any change in their independence in activities of daily life according to the Global Rating of Change (GRC) questionnaire. They were also evaluated with the Spinal Cord Independence Measure. For the total SCIM score, as well as for the 4 subscores domain, we assessed the mean change in score which is associated with small, moderate, and large changes in the corresponding GRC.

Results

The MCID for Self-Care domain varied from 2 to 15 depending on the level and completeness of the lesion. The MCID for Respiration and Sphincter Management domain from 6 to 20. For the Mobility "room and toilet" domain it varied from 2 to 4.5 and for Mobility "indoors and outdoors" from 2.5 to 8. finally the MCID for the total SCIM varied from 11 to 55.

Conclusions

In the present study we set (to our knowledge for the first time) the MCID of the SCIM III in a cohort of SCI patients in the subacute phase. Clinicians and researchers can gauge the functional potential of each patient, based on his neurological status, and the outset of rehabilitation. At the end of rehabilitation, it is possible to determine whether a patient realized his potential and experienced true improvement with little or substantial impact on his daily life. Furthermore, clinical significance might influence the statistical significance of improvements in performance in a clinical trial and can be used to examine the results of a trial by comparing the proportion of treatment and control groups who experienced changes and calculating the number needed to treat.

Validation of the Italian version of the spinal cord independence measure (SCIM III) self- reported

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Introduction

The Spinal Cord Independence Measure Version III (SCIM III) is a rating scale of the independence of patients with spinal cord injury (SCI) in the performance of activities of daily living (ADL). Designed specifically for patients with SCI, it is enjoying increasing success and is becoming the most popular instrument for assessing the ADL of SCI patients. Recently a Self Reported version of the SCIM III (SCIM SR) has been created. SCIM SR has the advantage of saving time for operators and to allow an assessment of ADL in patients not hospitalized. The aim of this study was to validate the Italian version of the SCIM SR.

Patients and Methods

We studied 116 patients (M / F 80/36; mean age 45.7 ± 17.7 , mean distance from the injury 5.7 ± 2.7 ; Level: C 50, T 43, L 23; AIS impairment: A 33, B 16, C 13, D 54) at the first hospitalization for rehabilitation after SCI. At the time of discharge, the patients were assessed with SCIM III by the rehabilitation team and self-assessed their independence in ADL via SCIM SR. Statistics: Spearman correlation to assess the agreement between the values expressed by the team and those assessed by the patients. Student's T test for paired data to assess any differences between evaluations.

Results

The Spearman correlation showed a moderate to good agreement between the data of the SCIM III and those of SCIM SR ($r = 0.918$ for self care, of 0.681 for respiration and sphincter management, of 0.905 for mobility, and of 0.918 for the total score). The Student's T test showed that the rehabilitation team has assigned higher scores than those self-assessed by the patients, especially with regard to the respiration and sphincters management items (28.72 vs. 22.53, $p < 0.001$) and the total score (61.1 vs. 54.7, $p < 0.001$).

Conclusions

The results support the validity of the Italian version of the SCIM-SR. The self-report version can facilitate longer-term evaluations of the level of independence of people with spinal cord injury.

11:35 - 13:05

Oral Session 15: Physical Capacity/Fitness Thursday AM
Auditorium

Training for a handcycling mountain time trial: pilot study on the benefits for fitness

LJM Valent¹; K Postma²; L van Vliet³; D Gobets⁴; S de Groot³

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Introduction and Aims

To study the effects of a training period, prior to a handcycling mountain time trial (20 km, 1000 Hm+), on physical capacity and to monitor possible adverse effects due to training or the time trial.

Material and Methods

47 Persons, predominantly with a spinal cord injury, were medically approved to participate in the mountain time trial. All were former patients participating in teams of eight Dutch rehabilitation centers. Laboratory peak graded exercise tests were performed in 6 out of 8 rehabilitation centers at the start (T1) and after 3 months semi-controlled training (T2) just prior to the time trial. Outcome measures were peak oxygen uptake (VO₂peak) and peak power output (POpeak). Body mass and waist circumference were determined and participants had to fill out a questionnaire about upper-extremity pain. Two weeks after the race the participants had to fill out a questionnaire about their recovery.

Results

VO₂peak improved on average 12% from 2.11 ± 0.60 L/min to 2.30 ± 0.59 L/min ($n=28$, $p=0.007$) and POpeak improved on average 21% from 120 ± 44 W to $141 \text{ W} \pm 48$ ($n=31$, $p<0.001$). Body mass decreased from 76.9 ± 12.5 kg to 75.9 ± 13.0 kg ($n=33$, $p=0.034$). No change in waist circumference was found ($n=23$). Participants with relatively large improvements ($> 15\%$) in POpeak were those with a significantly lower POpeak at T1 and who were less hampered by injuries. All participants finished the time trial. Two weeks after the time trial 34 out of 40 reported complete recovery; 4 still had to recover from minor to moderate upper-extremity (shoulder) complaints; 2 had serious chronic complaints, which were already present before the time trial.

Conclusion(s)

A large improvement in fitness is seen after the training period especially in those with a low physical capacity. A key factor for success in training for such an event is preventing overload (injuries) and, therefore, we advise an optimal ergonomic handcycling set-up, custom-made training protocols and to monitor the training with a diary.

Gains in bone strength after 6 months of FES-Row-Training: preliminary findings of a randomized control trial in men with motor complete SCI

LR Morse¹; CO Tan²; JA Taylor²; R Gupta³; E Garshick⁴; A Lazzari⁴; A Doherty⁵; SX Vaughn⁵; RA Battaglino⁶
¹PMR, Spaulding Rehabilitation Hospital, Charlestown, MA, USA; ²PMR, Spaulding Rehabilitation Hospital, Boston, USA; ³Radiology, MGH, Boston, USA; ⁴Boston VA, Boston, USA; ⁵SRH, Boston, USA; ⁶The Forsyth Institute, Boston, USA

Background

SCI results in rapid, severe osteoporosis and an increased risk of lower extremity fractures. Despite the medical complications associated with these fractures, there is no standard of care to prevent osteoporotic fractures following SCI. Functional Electrical Stimulation (FES) assisted-rowing is a promising intervention to improve bone health in SCI due to its ability to generate a muscular contraction in conjunction with mechanical loading of the lower extremity long bones. Combination therapy consisting of FES-rowing plus Zoledronic Acid may be a superior treatment via inhibition of bone resorption and stimulation of new bone formation.

Methods

We studied participants enrolled in a randomized clinical trial comparing FES-rowing alone to FES-rowing plus zoledronic acid to improve bone health in SCI. Participants were eligible if they were 18 years of age or older, had motor complete SCI, were not actively using bisphosphonates, and had no current lower extremity fracture. 12 participants were enrolled between August, 2001 and February, 2013 and completed baseline and 6 month testing. Plasma samples were stored at -800C until batch analysis. 25 OH vitamin D was quantified by ELISA assay. Volumetric CT scans at the distal femur were performed for finite element analysis. A 10 mm section of the distal femur was segmented from the surrounding tissue by thresholding followed by region growing. Stiffness was determined by recording the sum of the reaction forces of all elements and dividing it by the displacement ($k=F/x$).

Results

4 subjects in the FES-rowing arm and 7 in the FES-rowing plus zoledronic acid arm were studied at baseline and after 6 months of row-training. When considering the all participants (n=11), we detected a 15.6% increase in axial stiffness and a 42.8% increase in maximal load in response to rowing. Changes in femur stiffness and maximal load were positively associated with total rowing work performed and baseline vitamin D level. Additionally, there was a positive association between injury duration and change in distal femur axial stiffness. Participants in the FES-rowing plus zoledronic acid arm experienced a trend toward less improvement in axial stiffness (p=0.19) and maximal load, (p=0.17).

Conclusion

These findings demonstrate bone regeneration in response to FES-rowing that is dose dependent. Baseline 25OH Vitamin D levels may be an important determinant of the osteogenic response to FES-rowing. Our findings suggest gains at 6 months are greater in the FES-rowing arm than FES-rowing plus zoledronic acid but additional information is needed to confirm this and to determine if this trend persists at the 1 year time-point. FES-row training has therapeutic potential to improve bone quality, and perhaps reduce fracture risk, at the most common fracture site following SCI.

Validation of a home-based exercise protocol for spinal cord injured persons developed on android operating system

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¹Department of Rehabilitation Medicine, Physical Medicine and Rehabilitation Institute, UDINE, Italy; ²Department of Mathematics and Computer Science, University of Udine, Udine, Italy

Introduction and Aims

Ageing of people with spinal cord injury (SCI) induce a progressive reduction on performance, with an increased risk of rehospitalization and a reduced quality of life. It is therefore of great importance to promote physical activity programs adapted to SCI population, developed in the long term, accompanying the person throughout life with the aim of ensuring the maintenance of muscular parameters and cardio-vascular performance. We studied a home-based behavioural intervention adapted to SCI persons realized on a smartphone application (Fisiofriend), with the goal of increasing through visual and acoustic stimuli, which also have the characteristics of a game / competition, the involvement in the program. We tested the effectiveness through the evaluation of neuromuscular strength's parameter of the upper limb and aerobic performance.

Material and Methods

14 SCI male subjects performed the same home-based program, 7 with Fisiofriend (SCI1 age 43.43 ± 10.11 , BMI 24.23) and 7 with exercise paper instructions (SCI2 age 46.00 ± 17.33 years, BMI 24.64). The home-based protocol consists of upper limbs muscles exercises (stretching and strength). Considering the neurological level every subjects could choose the favourite exercise inside a group of similar exercises. Fisiofriend allows the monitoring of: 1. the proper exercise execution through the audio feedback of the accelerometer inserted in the smartphone and positioned on the wrist of the subject; 2. the heart rate (Hr) during exercise through a Hr monitor Zephyr HXM BT interfaced with smartphone (blue-tooth system). The application included a description as well as an audio-video of the exercises. The intensity of the program was adjusted, on the parameters obtained at the stress test, by Hr monitoring. The program provides at the end of the session the acquisition of a score with the aim to improve the performance.

Results

Outcomes parameters included physical fitness (aerobic/muscular). In particular we tested 1) biceps an triceps brachii strength and endurance parameters at the isokinetic dynamometer (Biodex System 4); 2) O₂ maximal consumption at crankergometer stress test detected with respiratory gases analyser (VO2000, Medgraphics) at the beginning of the home-based program (t1) and after 2 months (t2). In SCI1, we found an increase in torque of triceps brachii and an amelioration of endurance parameters, a significantly greater workload (in Watts) at the stress test (SCI1 25% increase t2 vs t1; SCI2 no change) and an increase of VO₂peak (SCI1 19% t2 vs t1; SCI2 8% t2 vs t1).

Conclusions

We believe that the gain on fitness parameter we evidenced in the group who exercised with Fisiofriend (SCI1) could be clinically significant, confirming that a home-based physical adapted program realized in interactive mode can find the compliance of people with SCI in chronic phase changing the behavioural regarding physical activity and contrasting the decay in performance.

Imaginary exercises in people living with SCI evoke pain and dysesthesia with a strong somatotopic concordance

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¹Faculty of Health Sciences, Curtin University and Royal Perth Hospital, Perth, Australia; ²Private practice, Sydney, Australia; ³School of Physiotherapy and Exercise Sciences, Curtin University, Perth, Australia

Introduction and Aims

There is little consensus on the management of central neuropathic pain and dysesthesia following spinal cord injury (SCI). In the long term the chronic pain can impact on the quality of life and in some cases more than motor impairment. Various rehabilitation protocols have considered manipulating the primary motor or sensory processing to control the pain. Virtual and imaginary exercises are emerging as new interventions, however the efficacy of these interventions is not definitive and variations in exercises treatments can both increase or decrease symptoms. It is unclear if any imaginary exercises of the lower limbs may induce pain or dysesthesia or if the responses are highly related to the specific imaginary movement. Therefore the aim of this study was to determine whether individual participant characteristics, or the type of imaginary exercises performed, could alter pain levels or dysesthesia during imaginary exercises.

Material and Methods

Twenty participants living with SCI (14 with pain, 11 Complete 10 Tetraplegia) trialled six imaginary exercises with spoken audio cues presented in a block randomised order. 30 s duration imaginary exercises included were left and right single joint (ankle or knee) and imagined walking with and without actual arm movements. Symptoms were recorded on a body chart with VAS scoring of intensity and verbal descriptors, and a Brief Pain Inventory score. Descriptive data, frequency and intensity were compared using Mann Whitney U and Kruskal-Wallis. Likelihood ratios (Chi Sq test) were determined from these results. Alpha was set at 0.05.

Results

All exercises had a similar frequency of response (approximately 40%). Lesion level, completeness, history of symptoms did not predict the type of response ($p < .05$). The description of the symptoms however was always in the context of pain memory (symptoms previously experienced). Individuals who reported no history of pain, never reported changes in symptoms as painful. If positive they reported dysesthesia or strange sensations. There was a 4.2 fold (95% CI 2.3 to 7.7) greater chance of increased pain and dysesthesia symptoms (compared to a decreased or no change) for all imagined exercises, suggesting that attenuation of neuropathic pain is unlikely to occur with imagining exercise alone. There was also a 38.7 fold (95% CI 2.5 to 600) greater chance of the response occurring in the same limb to which the imagined exercise was targeted (as opposed to the contralateral limb), suggesting a consistent somatotopic correlation between imagined movement and sensory responses. Incorporating actual arm movements with lower limb imaginary movements had no systematic effect.

Conclusions

Our observation that pain perception with imaginary exercises is reported by people with a somatotopic correlated pain memory. Demographic factors did not systematically relate to increased sensations during lower limb imaginary exercises. We suggest key historical factors define the response to imaginary exercises and future research needs to incorporate these findings with somatosensory feedback using virtual exercises to investigate the underlying cortical mechanisms.

Analysis of handbike use in the Swiss spinal cord injury population

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¹Swiss Paraplegic Research, Nottwil, Switzerland; ²Swiss Paraplegic Association, Nottwil, Switzerland

Introduction and Aims

The handbike is an appropriate and effective device for outdoor mobility, sports and exercise for persons with spinal cord injury (SCI). Even though several studies have shown the benefits of handcycling, not much is known about the handbike use in the SCI population. This knowledge would show whether there is scope for increased handbike use in the SCI population. The aim of this study was to investigate handbike use in Switzerland and to evaluate factors that may facilitate or restrain handcycling.

Material and Methods

In a cross-sectional and population-based survey as part of the Swiss Spinal Cord Injury (SwiSCI) Cohort Study, we identified handbike users, studied factors associated with handbike use, and examined reasons for not using a handbike. Included were persons 16 years or older, who were diagnosed with traumatic or non-traumatic SCI, and who were permanently residing in Switzerland. Data were collected between 2011 and 2013 by self-report. Basic descriptive statistics as well as multivariable logistic regression analysis were used to evaluate associations of handbike use with socio-demographic and socio-economic factors as well as SCI characteristics.

Results

From the 1549 people that participated in the study were 22.6% handbike user (350 subjects). The probability of handbike use was highest in persons with the following characteristics: being male, having a complete paraplegic lesion, speaking German (vs. French/Italian) and having a middle net income. Handbike use declined with age, but was not associated with education or cause of injury. 23% of the handbike users were cycling less than once a month; 31% 1 to 3 times per month; 40% 1 to 6 times per week; and 6% daily. The most frequently mentioned reasons for not using a handbike were "no interest" (26%), "cannot use the handbike due to disability" (20%), "I do not know the handbike" (19%) and "too expensive" (14%).

Conclusions

Our results have shown that a substantial proportion of persons with SCI living in Switzerland routinely use the handbike. However, there is still potential to promote the handbike further as a healthy way of spending the leisure time with friends, to train for increasing the physical capacities or for competition, or also to use the handbike as a mode of mobility in daily life. Future activities that aim to further promote handcycling should emphasize its use for leisure activities and its health benefits and should reduce financial barriers for using a handbike. Promotion campaigns to raise awareness of the benefits of hand bike use should particularly focus on the female population as well as the French- and Italian-speaking part of Switzerland.

Eat less and gain weight? -- changes of resting energy expenditure and body composition during the first six months after spinal cord injury

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¹Ernährungsberatung, Swiss Paraplegic Centre, Nottwil, Switzerland; ²Swiss Paraplegic Centre, Nottwil, Switzerland

Introduction and Aim

Overweight in spinal cord injury (SCI) shows a prevalence of up to 60%, which leads to severe secondary complications within this population. In order to prevent from such complications it seems important to sensitize patients with SCI. However, for this purpose the knowledge of longitudinal data about changes in resting energy expenditure (REE) and body composition after SCI are necessary, but still lacking to date. Thus, the aim of the present study was to fill this gap and to compare body mass, body composition and REE during the first six months after traumatic SCI.

Material and Methods

In 23 men and 2 women (age: 38.7±3.2 years; BMI: 24.3±3.2kg/m²) with traumatic SCI (lesion level C5-Th12; AIS A to C) body mass, REE and body composition were determined 2, 6, 10, 14 and 26 weeks after the occurrence of SCI. REE was measured by means of indirect calorimetry whereas body composition was determined based on a bioimpedance analysis. A one way analysis of variance (ANOVA) was used to detect significant differences between measurements at the different time points. Where a significant main effect was found, a Bonferoni post-hoc test was used to locate the significant differences. Values were considered to be significantly different if $p < 0.05$. Data were presented as mean±standard deviation.

Results

Compared to the baseline measurement at week 2 (1603±258kcal/d) REE was significantly decreased after 6 (1425±262kcal/d), 10 (1401±222kcal/d), 14 (1407±216 kcal/d) and 26 weeks (1400±245 kcal/d). Body mass was 76.9±13.2kg at week 2, 71.6±12.4kg at week 6, 71.3±13.0kg at week 10, 73.0±12.8kg and 72.9±12.8kg after weeks 14 and 26. These changes did not reach statistical significance. Further, no significant changes comparing measurements at weeks 2 to 26 concerning fat mass (15.9±6.6kg; 13.8±5.8kg; 12.8±6.3kg; 12.8±6.0kg and 14.3±6.1kg) and lean body mass (61.7±9.4kg; 57.6±9.4kg; 58.1±9.3kg, 59.0±10.1kg and 58.7.3±610.5kg) were found.

Conclusions

Six weeks after traumatic spinal cord injury REE revealed a significant decrease of more than 10%. This change is of high clinical relevance and requests some dietary adaptations during the first rehabilitation process in patients with SCI, namely an adequate individual adaptation of caloric intake. Although no significant changes were found concerning body mass and composition, from a clinical point of view our results point towards a loss of fat and muscle mass during the first 10 weeks after SCI followed by a slight gain in body mass again after 14 weeks. Based on our findings, the determination of REE, body mass and composition on a regular base can be recommended to sensitize patients with SCI and their therapists, allow fast dietary adaptations and consequently prevent overweight and its concomitant secondary complications.

11:35 - 13:05

Workshop 10: New measurement techniques to improve the clinical care of individuals with SCI

Thursday AM

Brussels Room

New measurement techniques to improve the clinical care of individuals with SCI

Chair: David Tulsy, United States of America

New committees and interest in defining common data elements that can be used across SCI research and practice

S Charlifue, United States of America

New PRO measurement techniques

D Tulsy, United States of America

Several ways to measure bladder and bowel functioning in individuals with SCI

D Tate, United States of America

Development of the SCI-FI2 measurement system

A Jette, United States of America

11:35 - 13:05

Workshop 11: The world health organization's (WHO) international perspectives on spinal cord injury (IPSCI) report: implications Thursday AM

Paris Room

11:35

The World Health Organization's (WHO) International Perspectives on Spinal Cord Injury (IPSCI) report: Implications

S Charlifue¹; A Officer²; M Brinkhof²; A Burns³; E Weerts⁴; P Maximilian von Groote²

¹USA; ²Switzerland; ³Canada; ⁴Belgium

SCI Epidemiology, a global perspective

Martin Brinkhof, Switzerland

Meeting health care and rehabilitation needs after SCI in high- and low-resource settings: a global perspective

Anthony Burns, Canada

Systems of care. Providing optimal care and follow up in worldwide settings. Perspectives from an international non-governmental development organization -- Handicap International

Eric Weerts, Belgium

Implementing WHO health reports. Bridging the gap from recommendation to evidence informed policy and practice

Per Maximilian von Groote, Switzerland

11:35 - 13:05

Oral Session 16 (Free Communication: General health issues) Thursday AM
Berlin/Cop Room

The efficacy and tolerability of intravesical oxybutynin and oral fesoterodine: a retrospective cohort study in the adult spina bifida population

K Dewulf¹; M Tutolo²; F Van Der Aa¹

¹University Hospitals Leuven, Leuven, Belgium; ²Ospedale San Raffaele, Milan, Italy

Introduction and Aim

Oral anticholinergic drugs are the first line therapy for neurogenic bladder. In our spina bifida population, intravesical oxybutynin is often used since childhood. Previous studies assessed the role of the intravesical use of the aforementioned drug in the treatment of pediatric spina bifida patients. However in literature, there is no evidence of their use in the adult population. The aim of our study was to compare the efficacy, tolerability and patient preference of an oral anticholinergic drug, fesoterodine, to intravesical oxybutynin in adult spina bifida patients.

Materials and Methods

This cohort study included 31 spina bifida patients treated for neurogenic bladder in a single tertiary referral center between 2013 and 2014. All patients were older than 18 and had complete demographic and follow up data. No additional anticholinergic therapies were used but fesoterodine. First we assessed the efficacy and tolerability of intravesical oxybutynin and, after a washout period, we evaluated the same outcomes with fesoterodine. Primary outcomes were: changing in maximum detrusor pressure (MaxDP), compliance, detrusor leak point pressure (DLPP), cystometric bladder capacity (CBC) and vesico-ureteral reflux (VUR) at urodynamic investigation. Secondary outcomes were the rate of absolute urinary continence (dry versus not dry), socially dryness, satisfaction and side effects. Socially dryness was defined as continent or using 1 pad per day. Satisfaction was defined as a positive response to the question: 'Are you satisfied with this treatment?'. Side effects were rated as mild, moderate or severe. Chi-square test, paired sample T-test and Wilcoxon signed-rank test were used to compare the aforementioned outcomes between the two groups.

Results

Mean follow up was 6.75 months (range 1-10). No statistically significant differences were found in terms of MaxDP, DLPP, CBC and VUR between the two groups (all $p > 0.05$). The only significant difference was found in median compliance: 17.5 mL/cmH₂O (IQR 9-28) with oxybutynin and 16 mL/cmH₂O (IQR 10-32.5) with fesoterodine ($p=0.046$). When analyzing the secondary outcomes, the two groups resulted to have comparable results in the rate of absolute continence, socially dryness, satisfaction and side effects (all $p > 0.05$). Most patients, satisfied with fesoterodine, value the comfort of oral medication.

Conclusions

This study shows a statistically significant difference of compliance between the two treatments with a moderate improved compliance with fesoterodine. However, this difference has no important clinical implications. Tolerability and satisfaction are good with both treatments. There were less side effects with intravesical oxybutynin, although this difference is not statistically significant. Patients who were satisfied with fesoterodine, preferred oral medication for its comfort in use.

BiPAP is often better tolerated and a more effective therapy than CPAP for tetraplegic patients with obstructive sleep apnea

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Introduction and Aims

Patients with spinal cord injury (SCI) have a high prevalence of obstructive sleep apnea (OSA). For severe sleep apnea continuous positive airway pressure (CPAP) is the first line treatment. In our experience tetraplegic patients (TP) often have problems tolerating CPAP pressures without sufficient effect on the apnea/hypopnea index (AHI). Bi-level positive airway pressure (BiPAP) at the same inspiratory pressure is well tolerated and an effective therapy for OSA in TP.

Materials and Methods

All our SCI inpatients are screened for OSA with polygraphy. Lung function tests and capillary blood gas testing is used to exclude nocturnal hypercapnia due to alveolar hypoventilation. When diagnosed with OSA, CPAP is started. If CPAP fails to treat OSA successfully with pressures up to 8 centimeters of water (cmH₂O), treatment is switched to low pressure BiPAP (inspiratory pressure ≥ 8 cmH₂O, expiratory pressure 4 cmH₂O). Treatment is evaluated by anamnesis and polygraphy.

Results

With CPAP pressures ≥ 8 cmH₂O patients report dyspnea and difficulties with breathing out. In most cases polygraphic evaluation during CPAP shows an asynchronous breathing pattern with partly central apneas instead of obstructive apneas, probably due to a lack of active expiration capacity, necessary to breathe out properly. Polygraphic evaluation of BiPAP therapy with inspiratory pressures ≥ 8 cmH₂O, expiratory pressure 4 cmH₂O shows in most cases a synchronous breathing pattern and clinically relevant reduction of AHI.

Conclusion(s)

In our overall experience for TP low pressure BiPAP therapy is more effective and better tolerated than CPAP therapy.

Is there a role for extra corporal pump trial in indication and goal setting for intrathecal baclofen therapy?

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Introduction and Aims

Intrathecal Baclofen Therapy (ITB) is considered for patients with spinal cord injury who have disabling spasticity. Before implanting a drug delivery device in a patient a test with ITB is necessary to ascertain its effect. This can be done either by intrathecal bolus injections of baclofen or by continuous infusion using an extra-corporal drug pump (ECDP). In our centre bolus injection test is used when improvement of quality of life and reducing care giver burden is goal of ITB. In wheelchair dependent patients in whom improvement in functionality is the main goal and in all patients with remaining standing and walking function ECDP testing is used. The aim of this study is to review the results of this procedure and to determine its role in indication and goal setting procedure.

Material and Methods

Cohort of patients who underwent a trial with ECDP before considering ITB is included in the study. Before the trial all underwent spasticity and functionality assessment including their expected goals. The spasticity was assessed using Perceived Resistance to Passive Movements, spasm frequency scale and clonus score. The functionality was tested using Timed Transfer and if possible Timed Up & Go, and 10 metre walk test. For goal setting Canadian Occupational Performance Measure was used. The oral medication was unchanged. Neurosurgeon in the team placed an intrathecal catheter and the patient was then transferred to the rehabilitation centre where the ECDP was attached and the infusion was started. The dosage was periodically increased until the desired effect is seen. After that the effect of continuous medication on spasticity and foremost on functionality was assessed. Side effects were also recorded.

Results

Total 33 patients underwent trial with ECDP between 2008 and 2013. In 14 patients ECDP was without complications, spasticity was reduced, their functionality improved and they got definite ITB. In 5 patients there were mild complications (headache and CSF leakage), spasticity was reduced and functionality improved and they got definite ITB. In 5 patients spasticity was reduced but they had serious headache and CSF leakage for which the ECDP trial was stopped. They got definite ITB after bolus trial. Two patients got infection which was treated by antibiotics; one got definite ITB after bolus trial. In 7 patients spasticity was reduced but no functional gain was recorded, there were no complications and definite ITB was not started.

Conclusion

This is the first major case series presenting results of ECDP trials. In patients for whom functional improvement is an important goal, ECDP trial could be considered to evaluate if the expected functional improvement with ITB is realistic. In addition, this procedure also gives patients the opportunity to experience effect of ITB before proceeding with a definitive implant ("informed consent"). However, CSF leakage and headache can have a negative effect on functional assessment and infection is a major complication of this procedure. Fine tuning of indication & further research with ECDP is needed.

Health care utilization in persons with traumatic spinal cord injury: the importance of multi-morbidity and the impact on patient-reported outcomes

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Introduction and Aims

Health care utilization (HCU) for persons with spinal cord injury (SCI) living in the community is influenced by factors such as age, type of SCI and health conditions. To date, the inter-relationships among secondary complications and comorbidities that drive HCU and impact patient outcomes are not known. The aim of this study was to determine the association between multiple health conditions and HCU and their impact on health status.

Materials and Methods

The SCI Community Survey assessed community-living and patient outcomes in 1137 participants with traumatic SCI. HCU was assessed using 7-items from the Canadian Community Health-Survey. Data on personal factors (e.g. age), injury (e.g. type of SCI), health conditions (presence/absence of 30 conditions) and health status [Short Form-12 (SF-12)] was collected. Participants were grouped using the HCU responses; (Group 1-did not receive needed care and/or rehospitalized; Group 2-received needed care and rehospitalized; and Group 3-received needed care and not rehospitalized). Multivariable analysis was conducted to determine the effect of multiple health conditions and HCU on SF-12 mental component score (MCS) and physical component score (PCS).

Results

The HCU Group 1 (n=292) had the greatest number of health conditions (15.14 ± 3.86) and Group 3 (n=650) had the least (12.00 ± 4.16) ($p < 0.05$). Participants who were in the HCU Group 1 and 2, had an average MCS that was 5.6 and 2.0 points lower compared to Group 1 ($p < 0.01$) (range 13.4-73.8). Similar trends were observed for SF-12 PCS. The presence of each health condition was associated with a 0.7 point decrease in the MCS and PCS ($p < 0.001$).

Conclusions

The presence of multiple health conditions and HCU are inter-related and negatively impact health status. Future work will develop a screening tool to identify persons at risk of inappropriate HCU (e.g. rehospitalization) due to multi-morbidity to help optimize health status and reduce costs.

General health perception of persons with spinal cord injury during the first five years after the onset of injury

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Introduction and Aims

To improve the health care for persons with a spinal cord injury it is important for clinicians and policy makers to gain understanding in the general health perception among persons with spinal cord injury. To our knowledge little is known about the general health perception in persons with spinal cord injury and moreover little is known about the general health perception in a long term follow-up after spinal cord injury. To describe the general health perception in persons with spinal cord injury from the start of active inpatient rehabilitation to 5 years after discharge from the rehabilitation centre and to examine the influences of persons- and lesion characteristics and secondary health conditions.

Material and Methods

Design: longitudinal cohort study. Data from 225 persons with spinal cord injury from eight specialized rehabilitation centres in the Netherlands were analysed. Six measurements were performed, from start of active inpatient rehabilitation to 5 years after discharge. General health perception was measured by using the domain "general health" from the MOS 36-Item Short Form Health Survey. Person characteristics, lesion characteristics and secondary health conditions were analysed as possible determinants of general health perception.

Results

The general health score significantly increased from start of active inpatient rehabilitation (54.1) to 3 months later (61.9) and increased further until discharge (63.0). The general health score decreased slightly after discharge until 5 years after discharge (60.7). Having a non-traumatic injury (Beta:-0.225), 2 or more secondary health conditions (Beta:-0.224), pressure sores (Beta:-0.184) and hypotension (Beta:-0.187) were determinants negatively associated with the general health score at 5 years after discharge.

Conclusion(s)

The general health perception of persons with spinal cord injury increased directly after start of inpatient rehabilitation, a slight decrease after discharge from rehabilitation centre was found. Having a traumatic cause of injury and having a low number of secondary health conditions were positively associated with general health perception at 5 years after discharge.

Prevalence and related factors of pressure ulcers among chronic spinal cord injury wheelchair users in northern Thailand

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Introduction and Aims

The pressure ulcer (PU) has a negative impact on quality of life. From our previous survey in 2003, 20 % of our chronic spinal cord injury (SCI) patients had never had a PU and 22.5% had PU/PUs at the time of the survey. Since then we have improved our PU prevention program e.g. providing a proper cushion and stressing protective behaviors. Therefore, we conducted a study to report prevalence and factors associated with PUs in chronic SCI wheelchair users in Northern Thailand and to compare current prevalence with previous data.

Material and Methods

Chronic SCI wheelchair users (duration post injury more than a year) were recruited from January to December 2013. Demographic and pressure ulcer questionnaires as well as EQ-5D and Health state VAS were used. Descriptive analysis was done and factors related to PUs were analyzed using multivariable logistic regression models.

Results

Of all 146 participants, 24.7% had current PU/PUs, 28.1% reported PU/PUs in the past and 47.3% had never had a PU since the onset of SCI. PUs at ischium were more common in those with current PUs than those with healed PUs (36.1% v 26.8%). The demographic data including age, sex, duration post injury, severity of SCI, educational level and economic sufficiency of those with and those without current PU/PUs showed no statistically significant difference. From multivariate analysis, having mild anxiety and depression (from EQ-5D) is the only factor significantly related with current PUs ($p=.017$).

Conclusions

The prevalence of pressure ulcers among chronic spinal cord injured wheelchair users at the time of study was 24.7%, nearly the same as our previous report. However, there were significantly more patients who had never had a pressure ulcer since injury. Mild anxiety and depression was significantly related with pressure ulcer.

Bacterial load of conditioned pressure sores is not a predictor for early flap failure in spinal cord injury

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Introduction and Aims

Pressure sores impose a major lifetime medical problem to patients with high-grade spinal cord injury (SCI). For patients with stage 3-4 pressure sores, in many instances plastic surgery is the only remaining treatment option. Flap failure rates are usually stated around 30% and predictors for flap failure are sparse. Hence, identification of predictors for flap failures is needed.

Material and Methods

We prospectively enrolled 38 SCI patients with stage 3-4 pressure sores scheduled for plastic surgery. Preoperative wound swabs, intraoperative tissue samples and postoperative drainage liquids were microbiologically analyzed. In multivariable logistic regression analyses, bacterial loads of deep tissue cultures of intraoperative samples as well as other clinical variables were analyzed with respect to the prediction of flap failures.

Results

The flap failure rate was 27.5%. The bacterial load of deep tissue cultures was not predictive for flap failure; neither was the colonization with a specific bacterial strain. We observed a considerable fluctuation of microbiological environment from initial swabs cultures, intraoperative samples and postoperative drainage fluids. Antibiotrophylaxis was sufficient in only 77.5% of deep tissue cultures and 50% of drainage fluids. Insufficient antibiotrophylaxis was associated with a higher risk of flap failures (OR 5.2, CI 1.1-25.4).

Conclusions

After inpatient wound conditioning, bacterial load analysis of intraoperative wound tissue cultures is ineffective in order to predict flap failure rates in SCI patients with stage 3-4 pressure ulcers after flap surgery. Instead, insufficient antibiotrophylaxis might be a factor contributing to flap failure.

14:40 - 16:10

Oral Session 17 (Free Communication: Basic Science/Clinical Trials) Thursday PM
Auditorium

Survival of neural stem/progenitor cells is promoted when cells are loaded in artificial microfibers in mouse complete spinal cord injury model

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Purpose

Transplant of neural stem/progenitor cells (NS/PCs) is now considered to be a promising treatment for spinal cord injury (SCI). In most of the previous studies, however, NS/PCs transplantation was performed for incomplete sub-acute SCI animal models. In cases of chronic injury or severe injury, cavities or gaps formed within the spinal cord make it difficult to fill these defects only with cellular transplant. Therefore, any scaffold is required to fill that defect in parallel with the NS/PCs transplantation. In the present study, we sought to determine the effectiveness of a novel artificial microfiber made of bio-absorbable material (collagen and alginate gel) as a candidate for the scaffold to treat complete SCI.

Method

NS/PCs derived from striatum of fetal transgenic mice encoding CAG-ffLuc (Venus fused to firefly luciferase) were used in this study. These NS/PCs were loaded into the artificial microfiber, and their viability and differentiation potential were evaluated in vitro. In addition, a bundle of these NS/PCs-laden microfibers was transplanted into the injured spinal cord with 3 mm defect in Th9-10 level, immediately after the transection. Survival of the grafted cells was evaluated using bioluminescence-imaging system. Motor function of the lower limbs was assessed in each mouse using BMS (Basso Mouse Scale) score. Histological evaluation was performed 6 weeks after the transplantation.

Result

In vitro, the loaded NS/PCs within the microfibers proliferated well in normal NS/PCs medium and differentiated into the neural and glial lineages in the differentiation medium. In vivo, the grafted NS/PCs within the microfibers showed good survival rate at least for 6 weeks after the transplantation. Survival of the transplants was confirmed in histology as well. At the rostral and caudal areas of transplanted microfiber, transplanted cells migrated into the host spinal cord, and differentiated into the neural and glial cells.

Conclusion

We achieved to make connection between stumps of transected spinal cord with novel NS/PCs-laden microfibers, in treating mouse transected SCI model. Cellular survival was promoted compared to the traditional injection method. This material is possible tool for NS/PC transplantation therapy for complete SCI.

The neuroprotective effects of co-ultraPEALut in a mouse model of spinal cord injury

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Introduction

Traumatic injuries to the spinal cord frequently cause permanent neurological disabilities and yet there is no effective therapeutic option to improve functional recovery. Spinal cord injury (SCI) is well-known to induce the formation of reactive astrocytes and the infiltration of immune cells in the area of the lesion site, but whether SCI also induces the production of new neurons in vivo remains controversial. Neurogenesis has been described in various regions of the central nervous system. Significant spontaneous neuroplasticity occurs over the weeks and months following brain or spinal cord trauma leading to some functional recovery. Moreover, studies have shown that spinal neurogenesis occurs to a limited extent after SCI, but that it could be stimulated by experimental intervention. In that regard, in a recent study, we have demonstrated that treatment with a new composite, a formulation including palmitoylethanolamide (PEA) and the antioxidant compound luteolin (Lut), subjected to an ultramicrosonication process, co-ultraPEALut, significantly reduced inflammatory secondary damage associated with SCI. Thus, the aim of this study was to investigate the neuroprotective effect of co-ultraPEALut in the injury-induced neurogenesis in a mouse model of SCI.

Materials and Methods

SCI was induced in mice through spinal cord compression by the application of vascular clips (force of 24 g) to the dura via a four-level T5 to T8 laminectomy. The animals were sacrificed and the spinal cord were collected.

Results

Chronic exogenous administration of co-ultraPEALut increased bromodeoxyuridine (BrdU) and doublecortin immunoreactive cells in the spinal cord of SCI subjected mice. This neuronal development was correlated with synaptic plasticity, identified using the Golgi impregnation method to quantify dendritic spines in spinal cord. In addition, co-ultraPEALut treatment also increased the expression of different neurotrophic factors such as brain-derived neurotrophic factor (BDNF), glial cell-derived neurotrophic factor (GDNF), nerve growth factor (NGF) and neurotrophin-3 (NT-3).

Conclusion

The results indicate that co-ultraPEALut could have a role on birth, survival, and differentiation of new neurons and maturation of spines in the spinal cord and could be a therapeutic target in traumatic diseases.

A new co-ultramicronized composite including palmitoylethanolamide and luteolin prevents neuroinflammation associated to spinal cord injury

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Introduction

It has recently been demonstrated that palmitoylethanolamide (PEA), an endogenous lipid amide belonging to the N-acyl ethanolamine family, exerts neuroprotection in central nervous system (CNS) pathologies. In recent studies, we have demonstrated that treatment with PEA significantly reduced inflammatory secondary events associated with spinal cord injury (SCI). Since oxidative stress is considered to play an important role in neuroinflammatory disorders, in the present work we studied a new composite, a formulation including PEA and the antioxidant compound luteolin (Lut), subjected to an ultramicronization process, co-ultraPEALut. We investigated the effect of co-ultraPEALut (in the respective fixed doses of 10:1 in mass) in both an ex vivo organotypic spinal cord culture model and an in vivo model of SCI.

Material and Methods

For the organotypic cultures, spinal cords were prepared from mice at postnatal day 6 and were cut into transverse slices of 400 μ m thickness. After 7 days of culturing, the slices were mechanically injured and the co-ultraPEALut was applied at different concentrations (0.00009, 0.0009 and 0.009 g/l) 1 hour before damage. For in vivo studies, SCI was induced in mice through spinal cord compression by the application of vascular clips at four-level T5 to T8 laminectomy, and co-ultraPEALut (1 mg/kg ip) was administered at 1 and 6 hours after SCI. At 24 hours after SCI, mice were sacrificed and the spinal cords were collected for further evaluation. Additional animals were treated similarly and sacrificed 10 days after SCI.

Results

Pretreatment with co-ultraPEALut significantly reduced cyclooxygenase-2 (COX-2) and inducible nitric oxide synthase (iNOS) expression in a concentration-dependent manner, restored neuronal nitric oxide synthase (nNOS) expression at all three tested concentrations, and protected cells by cell death (MTT assay) in spinal cord organotypic cultures. Moreover, we demonstrated in vivo that co-ultraPEALut 1 mg/kg reduced the severity of trauma induced by compression and improved the motor activity evaluated at 10 days post-injury.

Conclusion

The present study demonstrates that the protective effect of PEA on SCI-associated neuroinflammation could be improved by co-ultramicronization with Lut possibly due to its antioxidant properties.

Investigation of the effect of cryopreservation on the character of iPSC cell-derived neural stem cells for spinal cord injury

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Introduction

Recently, we have reported the effectiveness of human iPSC cell-derived neural stem cells (iPSC-NSCs) for spinal cord injury (SCI) in adult mice. However, before the clinical trial, there are still several hurdles, one of which is to investigate whether cryopreservation affects the viability and proliferation of iPSC-NSCs. The purpose of this study is to determine the effect of cryopreservation on the characters of human iPSC-NSCs *in vitro* and to determine the effectiveness of transplantation of cryopreserved iPSC-NSCs for SCI mice.

Method and Results

201B7 iPSC-NSCs, which were considered safe clone-derived iPSC-NSCs, were used in the present study. Neurospheres of these cells were divided into two groups. One was a non-frozen (NF) group and the other was a frozen and thawed (FT) group. In FT group, neurospheres were frozen in cellbanker3® by the slow-freezing method on 3 day *in vitro* after the last passage (div) or 10 div. First, we evaluated the viability of the cells that were frozen on 3 and 10 div immediately after thawing. The survival rate of freezing on 3 div was 20.3%, which was significantly higher than 11.9% of freezing on 10 div. Therefore, we determined that we used neurospheres frozen on 3 div. Then, we evaluated the cell viability, proliferation and differentiation ability of the following four groups: NF group on 3 div (NF3) and 6 div (NF6); FT group immediately (FT0) and on 3 days (FT3) after thawing. The cell viability of NF6, FT0 and FT3 were 211%, 20.3% and 92.4% respectively compared to that of NF3. This finding suggested that cryopreservation decreased the cell viability and that additional 3 day-culture *in vitro* after thawing increased the cell number of iPSC-NSC to more than 90% of that before freezing. Differentiation assay revealed that iPSC-NSCs of both NF and FT groups differentiated into Tuj-1 positive neurons and GFAP positive astrocytes but not CNPase positive oligodendrocytes. There was no significant difference in differentiation efficiencies among them. Principal component analysis and hierarchical clustering revealed that the gene expression profile of FT0 was similar to NF3, and that there was a difference in gene expression profile between FT3 and NF3. This finding indicated that 3 day-culture after thawing would significantly influence various genetic expressions of iPSC-NSCs. *In vivo*, contusive SCI was induced at the Th10 level in NOD/SCID mice, and iPSC-NSCs of NF3, FT0 and FT3 were transplanted into the injured spinal cord 9 days after injury. Behavioral analysis was performed until 12 weeks after SCI. The transplanted group showed better functional recovery, compared to the control group and there was no difference in motor function among NF3, FT0 and FT3.

Conclusion

In conclusions, cryopreservation of iPSC-NSCs decreased the cell viability and additional 3 days culture *in vitro* after thawing was needed for the number of iPSC-NSCs to recover to that before freezing. Furthermore, cryopreservation did not influence their differentiation and therapeutic potentials for SCI.

Combined cell therapy for complete chronic Spinal Cord Injury (cSCI) patients. Response after one year of treatment

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Introduction

In previous publication (Cytotherapy 2006; 8:202-209 and Spinal Cord, 2009; 47:499-503) we described an experimental strategy with the combination of three different cell types: Bone Marrow Mesenchymal Stromal Cells (BM MSC), Effector Cells (EC) and in vitro differentiated adult neural progenitor cells (NPC) (BEN therapy). In this experiment we replaced BM MSC with adipose Mesenchymal Stromal Cells (aMSC) in the hope of improving on the time and quality of the previously reported BEN outcome. We name this new experimental therapeutic approach as MED (Mesenchymal Stromal Cells, Effector Cells, Differentiated Stem Cells). The preliminary MED outcomes are reported in this abstract.

Methods

Following Maimonides University ethical committee approval 4 cervical ASIA A and 1 cervical ASIA B chronic SCI patients received MED therapy. The patients were received after a range of 3 to 8 years of having the accident. They were followed for 6 to 12 months only. Adipose tissue was obtained by patient's lipectomy and dissociated with collagenase 4 in a GMP facility. The aMSC were isolated by their attachment property and cultured for a week. Half of the aMSC were harvested and injected intra arterially (IA) in an infusion into the lesion via a feeding artery. The following week the patient underwent a peripheral mononuclear cell aphaeresis (Ospira). Effector Cells against CNS proteins from the Buffy Coat were activated, expanded and negatively selected using Clinimacs equipment. Half of EC were infused in the patient by intravenous access. The second half was co cultured for 24 hrs with the second aliquot of aMSC which in turn differentiated into Neural Progenitor Cells (NPC). The NPC were implanted by intra arterial (IA) access. The patients subsequently underwent an intensive program of physical therapy. The outcomes were evaluated clinically and with electrophysiological tests after 3, 6 and 12 months of MED & intensive Rehabilitation.

Results

Five patients exhibited a degree of progressive improvements in their clinical condition that corresponded to function of muscles innervated by motor nerves originating from between 3 to 10 spinal cord segments below the lesion. Three of the patients were able to stand up and take small steps with upper limb support from two assistants. Prior to receiving MED therapy no Surface Electromyography activity or sensory evoked potential could be registered below two levels of the original spinal cord lesion level in any of the ASIA A patients. The post intervention general wave shape morphology, intensity, amplitude and transmission speed values seem to coincide with the clinical findings of perceived motor improvement and occurred prior to the observed functional recovery. No patient exhibited clinical symptoms or signs of complications or neurological deterioration.

Conclusion

the reported results are a proof of concept that MED therapy is safe for chronic SCI patients and might have the potential for clinical improvement. A phase 1-2 prospective trial with independent international assessment is in progress. results will be reported at ISCo

Pharmacological prophylaxis for deep vein thrombosis in acute spinal cord injury: Indian perspective

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Introduction

Amongst hospitalized patients, those with Acute Spinal Cord Injury (ASCI) have one of the highest incidences of Deep Vein Thrombosis (DVT). Pulmonary embolism due to DVT is the leading causes of preventable in-hospital mortality throughout the world. The risk of DVT is highest in the first three months following SCI (80% in first two weeks) and declines after three months. Thromboprophylaxis using Low Molecular Weight Heparin (LMWH) is generally the standard of care globally. However this is not routinely practiced in India supposedly due to a low incidence. Critics however ascribe this to under reporting. There is no prospective randomized study in Indian patients documenting the incidence of DVT and the role of pharmacological prophylaxis. Study design: Prospective randomized single blind study. Aims: To find out the incidence of deep vein thrombosis (DVT) in Indian acute spinal cord injury (ASCI) subjects with and without pharmacological prophylaxis.

Methods

Seventy four ASCI subjects were randomly divided into 2 groups with 37 subjects each: Group I received no antithrombotic prophylaxis and only physical measures like compression stockings were employed for prophylaxis whereas Group II received antithrombotic prophylaxis with low molecular weight heparin (LMWH) along with physical measures as in group I. DVT was monitored through daily clinical assessment and doppler venous ultrasonography at two weeks.

Result

Out of 37 subjects in each group, 8 (21.6%) developed DVT in group I and 2 (5.4%) in group II. The difference was significant (P value = 0.041). 6 out of 8 subjects who developed DVT in group I were asymptomatic. There was no incidence of significant DVT related complications including pulmonary embolism in any of the subjects.

Conclusion

There is significant incidence of DVT in Indian subjects with ASCI but definitely less than what has been reported in western literature. Pharmacological prophylaxis (LMWH in this study) significantly (P=0.041) decreases the incidence of DVT in subjects with ASCI. Since there was no difference in the incidence of symptomatic DVT or related complications, a larger study would be required to conclude definitely on the role of pharmacological prophylaxis in the Indian population. Till such time it may be safer to use pharmacological prophylaxis in all Indian ASCI patients.

Screening for deep vein thrombosis with duplex ultrasound and D-dimer in spinal cord injured patients at shortly after injury

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Introduction

Deep vein thrombosis (DVT) is considered as one of devastating complications for Spinal Cord Injured (SCI) patients. The incidence of DVT in SCI patients is higher than in other injuries and we should provide the patients as preventive and therapeutic measures in the acute phase following the injury. However, exact timing of appearance of DVT has not unraveled yet. We prospectively investigated the timing of pathogenesis of DVT for traumatic SCI patients by ultrasound procedure and D-dimer test in the acute phase after SCI.

Material and Methods

In this study, all of traumatic SCI patients were prospectively surveyed who were admitted in our hospital and underwent the surgeries within a day after the injury from November 2012 to June 2013. We determined neurological status at admission, DVT in the lower extremities by compressive duplex ultrasonography and D-dimer level on the day of admission, Day 1,3,7,14,28 postoperatively.

Results

29 SCI patients were analyzed. 24 of 29 patients were admitted on the day of injury. Average age was 63.5. Cervical SCI have seen in 19 patients. As neurologic status at admission, 9 patients were in AIS A, 2 in B, 8 in C and 10 patients were in D. Neurological level of injury of 11 patients was at C3 and C4, 8 patients were at C5 to C8 and other were at thoracic and lumbar lesion. DVT was detected in 12 patients by ultrasound procedure that localized in distal from popliteal vein in all cases. DVT positive group contained 7 tetraplegia, 5 paraplegia and 7 in AIS A. 3 of 12 patients demonstrated DVT in 3 days after injury and median date of detection was 7.5+-2.2 days (SE). Average level of D-dimer at the detection of DVT was 4.6+-11.8 microg/ml. Mann-Whitney U test found no significance of D-dimer level between DVT positive and negative groups on all days we evaluated.

Conclusions

SCI patients face a heightened risk of DVT since the acute phase after injury. Ultrasonography was efficacious procedure to detect DVT easily and quickly but D-dimer had no advantage over ultrasonography. Screening with ultrasonography in the acute phase after SCI will provide us the appropriate timing of treatment for SCI patients.

Cutaneous nociceptive afferent central projections plasticity matches nociceptive hyperreflexia/dysautonomia after rodent spinal cord injury

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Introduction and Aims

The cutaneous trunci muscle (CTM) spinal reflex results from stimulation of segmental dorsal cutaneous nerves (DCNs) and demonstrates neurophysiological plasticity after unilateral T10 hemisection spinal cord injury (SCI). DCN stimulation also generates a depressor blood pressure response in normal animals but can generate dysautonomia after severe bilateral C7 crush SCI. The goal of this work was to relate anatomical plasticity in DCN afferent central projections with plasticity in the physiological responses evoked by activation of these afferents after SCI.

Material and Methods

The central projection patterns of A and C fibers in DCNs were analyzed after thoracic hemisection injury or cervical crush injury. Retrograde axonal tracers, cholera toxin subunit B (CTB) for myelinated A fibers or isolectin B4 (IB4) for non-peptidergic, unmyelinated C fibers, were injected into bilateral T7 and T13 DCNs, one tracer on one side and one on the other. Immunohistochemistry was performed on serial sections of the spinal cord at T7 and T13 to measure the projection fields of labeled A and C fibers.

Results

Following cervical crush injury, a spectrum of blood pressure responses are seen, ranging from mild dysautonomia to the frank pressor response of autonomic dysreflexia, with rostral DCN stimulation generating greater pathology than caudal DCN stimulation. In these animals, there is sprouting of the central projections of C fibers at both T7 and T13 much more so than A fibers. Following unilateral thoracic hemisection injury, we record predominantly nociceptive hyperreflexia to DCN stimulation both at A delta strength stimulation as well as to combined A delta and C fiber strength stimulation, both above and below the hemisection, and both on the injured and uninjured sides of the spinal cord. In these animals, there is sprouting of the central projections of both A and C fibers at both T7 and T13 with some A fibers now invading C fiber territory in lamina II.

Conclusions

It seems plasticity in central projections of cutaneous nociceptive afferents matches the nociceptive hyperreflexia and dysautonomia seen after spinal cord injury.

14:40 - 16:10

Oral Session 18 (Free Communication: Spine Surgery) Thursday PM
Brussels Room

Pattern of cerebrospinal fluid phosphorylated neurofilament subunit NF-H (pNF-H) is predictive for evolution of secondary lesions in SCI

SM Lencean¹; Andrei Stefan lencean²

¹Neurosurgery, GrT Popa UMPh Iasi, Iasi, Romania; ²Neurosurgery, N Oblu Emergency Hospital, Iasi, Romania

Introduction and Aims

The objective of this study was to measure the phosphorylated neurofilament subunit NF-H (pNF-H) in cerebro-spinal fluid of patients with spinal cord injury and to determine the correlation between the pNF-H levels and the severity of the injury.

Materials and Methods

The study included 15 subjects with acute traumatic spinal cord injury : eight patients with complete spinal cord injury (SCI) and seven patients with incomplete SCI. All patients were classified according to the American Spinal Injury Association impairment scale (ASIA) and all patients underwent surgery during the first 24 hours (decompression, stabilization). We measured daily the heavy phosphorylated neurofilament subunit (pNF-H) concentration by sandwich ELISA test in CSF in all patients and we correlated the values of pNF-H with the clinical evolution.

Results

For all patients with SCI pNF-H was detectable in CSF samples and the values were different in the cases of complete SCI toward the cases of incomplete SCI and the cerebro-spinal pNF-H level was more elevated in cases of complete SCI. The level of CSF pNF-H was of ten till hundred times higher in complete SCI than the level of CSF pNF-H in cases with incomplete SCI, where the level of this biomarker was close to normal. The patients with a favorable neurological evolution after treatment had a specific pattern of daily values of NFP-H: a sudden increase up to a maximum value then a progressive decrease until normal. The maximum values were different in each case, from 10 times up to 170 times higher than the normal.

Conclusion

The phosphorylated form of the high-molecular-weight neurofilament subunit NF-H (pNF-H) in cerebro-spinal fluid is a specific biomarker for spinal cord injury and it can distinguish the severity of SCI. pNF-H is a predictive biomarker because of its values pattern can show the reducing or stopping of the secondary lesion and the favorable result.

Keywords

Biomarker, cerebro-spinal fluid, phosphorylated neurofilament subunit NF-H, spinal cord injury

Practice patterns of steroid administration for acute SCI: A Canadian perspective

CS Rivers¹; RJ Hurlbert²; H Ahn³; CS Bailey⁴; SD Christie⁵; MG Fehlings³; BK Kwon⁶; AG Linassi⁷; J Chen¹; M Dvorak⁶; [VK Noonan](#)¹; RHSCIR Network¹

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Introduction

High-dose steroid administration to treat acute spinal cord injury (SCI) is controversial. The NASCIS-II dosing protocol received widespread acceptance until further independent analyses produced discrepant conclusions. Subsequently the Canadian Spine Society recommended steroid use in SCI to be considered a treatment option rather than a standard. Our aim was to examine a Canadian database of SCI patients looking for patient/physician/hospital factors influencing steroid administration.

Methods

SCI patients with complete records from the Rick Hansen Spinal Cord Injury Registry (RHSCIR) prospectively recruited from 27 Canadian institutions between 2004-2013 were analysed. Patient demographics/injury/neurological variables and steroid administration were analyzed.

Results

Among the 1243 with steroid data, only 144 (12%) received steroids for acute SCI; there was no association with patient/injury variables excepting a higher proportion of cervical (72v62%, $p=0.0322$) and less severe injuries (mean ISS 24v27, $p=0.0079$) were treated with steroids. While steroids were administered by 61% ($n=11$) of acute-care sites, 50% of patients receiving steroids were treated at one of four institutions, and 38% had steroids initiated at a community hospital prior to arrival at a RHSCIR institution. Steroid administration frequency peaked in the first recorded year (2004; 42%), and dropped to a steady rate for each subsequent year (mean 10.6 range 6-14%). Mean time from admission-to-discharge neurologic examination was 97.6h (median=88h; range 1-488h). There was no significant difference in change in total admission-to-discharge motor/sensory scores (adjusted for AIS) relating to steroid administration.

Conclusion

Steroid administration for acute SCI in Canada is uncommon, falling in use over time but remains in steady active use at a number of centres. Our results fail to show any relationship between the administration of this drug and patient/injury-related factors. Instead steroid use appears to be more highly associated with physician and institutional preference. These results may provide an opportunity to develop Canadian best-practice guidelines.

Reliability of the spine adverse events severity system for traumatic sci (saves-sci)

RA Glennie; J Batke; V Noonan; JT Street

Combined Neurosurgical and Orthopedic Spine Progra, Vancouver General Hospital, Vancouver, Canada

Background

Documenting adverse events (AE) in traumatic spinal cord injury (TSCI) patients is essential for developing care guidelines, allocating resources and developing meaningful multicenter collaboration. A modified version of Spine Adverse Events Severity System (SAVES) is introduced to specifically collect AE data in TSCI (SAVES--SCI). The SAVES-SCI consists of four AE categories; intra-operative, pre- or post-surgical, consequences secondary to SCI and other. We have previously demonstrated the validity of SAVES SCI, when compared with ICD-10 coding of AE's. The purpose of this study was to determine the inter-rater and intra-rater reliability of the SAVES--SCI in a TSCI population among physicians, nurses, allied health care providers and research staff.

Methods

Five physicians and five clinicians/ research personnel applied the SAVES--SCI to ten cases reflective of typical TSCI scenarios. A binary grading scheme was used for the severity of an adverse event with 0 having no impact on outcome or length of stay and 1 having an impact. Inter- rater reliability was determined using both Fleiss's and Conger's kappa and intra- rater reliability was determined by calculating a simple kappa and a two-way random effect of the intra-class correlation coefficient (ICC).

Results

10 intra-operative, 19 pre- or post-surgical, 6 consequences secondary to SCI and 2 other adverse events were evaluated in the simulated patient cases. Intra- and inter-relater reliability was highest ($\kappa > 0.8$, $p < 0.001$) for identifying and grading allergic reactions, dural tears, deep vein thrombosis (DVTs), pneumonia, mood disturbance, and renal calculi. Reliability was generally lower ($\kappa < 0.4$, $p < 0.001$) for identifying and grading massive intra-operative blood loss, early neurologic deterioration, post operative neuropathic pain due to hardware, and identifying those patients requiring tracheostomy post-operatively.

Discussion

Agreement in identifying and grading adverse events using SAVES-SCI was generally high or moderate for all groups. Identifying AE with low intra and inter-rater reliability should be the target of future educational efforts.

Regional differences in acute phase management of tSCI in the Netherlands: consequences for outcome?

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Introduction and Aims

In the Netherlands, patients with traumatic spinal cord injury (tSCI) are referred to one of the eleven level 1 trauma centers. There are indications that acute phase management differs among these trauma centers which might have significant influence on outcome and complication rates. In this study a survey was performed to evaluate the regional differences in acute phase management and investigate differences in length of stay and complication rates.

Methods

All eleven level 1 trauma centers received a questionnaire as part of a national survey. A multicentre prospective observational cohort evaluation was performed in three centers. Complication rates (pulmonary origin and pressure sores) and length of stay were analyzed.

Results

Large regional differences in acute phase management and protocols were found. Four centers had strict tSCI protocols consisting of early decompressive surgery, treatment of neurological shock and/or administration of methylprednisolone, whilst the other centers were less comprehensive and strict in their acute phase treatment. Significant differences in incidence of pressure sores were found between three centers. Frequency of pulmonary complications and length of stay were not significantly different between the three centers. The centers in which outcome and complication rates were evaluated had relatively similar acute phase treatment protocols.

Conclusion

In level 1 trauma centers in the Netherlands there are large regional differences in acute phase management of tSCI. There are significant differences in complication rates between level 1 trauma centers. Further evaluation is needed to assess the relation between acute phase management and complication rates.

Comparison surgical outcomes in thoracolumbar fractures operated with posterior constructs having varying fixation length with anterior fusion

A Nanda¹; HS Kim²; ES Moon²

¹Spine Services, Indian Spinal Injuries Centre, New Delhi, India; ²Gangnam Severance Hospital, Seoul, South Korea

Introduction and Aims

Surgical treatment in the case of thoracolumbar burst fractures is very controversial. Posterior instrumentation is most frequently used, however, the number of levels to be instrumented still remains a matter of debate. The aim of the study is to investigate the number of levels of fixation which are required to give a stable fixation without fusing any extra level.

Materials and Methods

A total of 94 patients who had a single burst fracture between T11 and L2 were selected and were managed using posterior instrumentation with anterior fusion when necessary. They were divided into three groups as follows; Group I (n = 28) included patients who were operated by intermediate segment fixation, Group II (n = 32) included patients operated by long segment fixation, and Group III (n = 34) included those operated by intermediate segment fixation with a pair of additional screws in the fractured vertebra. The mean follow-up period was twenty one months. The outcomes were analyzed in terms of kyphosis angle (KA), regional kyphosis angle (RA), sagittal index (SI), anterior height compression rate, Frankel classification, and Oswestry Disability Index questionnaire.

Results

In Groups II and III, the correction values of KA, RA, and SI were much better than in Group I. At the final follow up, the correction values of KA (6.3 and 12.1, respectively) and SI (6.2 and 12.0, respectively) were in Groups II and III found to be better in the latter.

Conclusion

The intermediate segment fixation with an additional pair of screws at the fracture level vertebra gives results that are comparable or even better than long segment fixation and gives an advantage of preserving an extra mobile segment.

Spondylotic myelopathy: rehabilitation outcomes after surgical intervention or without it

A Catz; E Aidinoff; S Kartoon; V Bluvshstein

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Introduction and Aims

The evidence for the superiority of either surgery or conservative treatment in mild or severe thoracic or cervical spondylotic myelopathy (TSM or CSM) is weak. There is insufficient evidence to determine whether specific activities or minor trauma are a risk factor for neurological deterioration in spondylitic myelopathy (SM).

Furthermore, studies comparing treatment results in SM do not consider the devastating nature of complications that may appear immediately after surgery, or the indolent nature of the neurological deterioration, which may or may not appear following conservative treatment. To contribute to the evidence on the roles of surgical or conservative treatment in SM, we compared neurological and functional outcomes of SM patients who underwent rehabilitation, after surgical decompressive intervention and without it.

Materials and Methods

Neurological outcomes, reflected by the American Spinal Injury Association Motor Scores (AMS), and functional outcomes reflected by scores on the Spinal Cord Independence Measure, third version (SCIM III) were compared, at admission to rehabilitation, at discharge from rehabilitation, and after the three-year follow-up, between two patient groups: 14 CSM and 13 TSM patients who had undergone decompressive spinal surgery within one month before admission, and 10 CSM and 8 TSM patients who underwent only rehabilitation.

Results

At admission to rehabilitation AMS and SCIM III scores did not differ significantly between the two groups. Following rehabilitation both sets of scores improved significantly in both groups ($p < 0.001$), by 12.8 and 13 AMS and by 26 and 22 SCIM III points). At the three-year follow-up, both AMS and SCIM III scores deteriorated in both groups. At the follow-up SCIM III value remained higher than at admission ($p < 0.001$) and AMS value did not differ significantly from that at admission ($p > 0.08$). At all time points, AMS and SCIM III values did not differ significantly between the two groups ($p > 0.08$). The findings were similar when examined separately for TSM or CSM.

Conclusions

We failed to demonstrate a significant effect of decompressive surgery for TSM or CSM on the neurological and functional outcome during or after rehabilitation. Pre-surgery AMS and SCIM III scores, however, are still required to assess the overall effect of surgical treatment in SM and to separate this effect from that of rehabilitation in patients who undergo both.

Rapid incremental closed traction reduction of cervical dislocations in spinal cord injury patients: success rate and neurological outcomes

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Introduction and Aims

Contrary to the aims of the procedure, rapid incremental closed traction reduction (RICTR) of cervical dislocations in awake patients with spinal cord injury could lead to transient and sometimes permanent neurological deficits. The main aims of the study were:

- To perform a systematic review to evaluate the success rate and neurological outcomes of rapid incremental closed traction reduction of cervical dislocations with spinal cord injury.
- To conduct a clinical audit to determine the success rate and neurological outcomes of rapid incremental closed traction reduction of cervical dislocations with SCI in the National Spinal Injuries Centre -- UK.

Materials and Methods

Two combined methods were used as a framework for this study; (a) systematic review and, (b) clinical audit. Explicit eligibility criteria, search strategy, search terms, critical appraisal, narrative and subgroup analysis were used to perform the systematic review. Cervical dislocation patients with SCI, who had attempted RICTR between June 2006 and June 2013 in the NSIC, were included in the audit. Evaluation of the outcomes of rapid incremental closed traction reduction of cervical dislocations is presented with analysis of the available quantitative data.

Results

Thirteen studies were included in the systematic review and sixteen patients were included in the clinical audit. Rapid incremental closed traction reduction of cervical dislocations with spinal cord injury has an overall success rate of 70 % with a 2.4 % risk of transient neurological deficit and 0.6 % risk of permanent neurological deficit.

Conclusion

Rapid incremental closed traction reduction of cervical dislocations with spinal cord injury is a relatively safe and successful procedure which, if successfully done within 4 hours of injury, could well open the door for complete recovery for some spinal cord injured patients.

Spasticity, dynamic and static standing training in individuals with spinal cord injury

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¹ICORD, Vancouver, Canada; ²Orthopaedics, University of British Columbia, Vancouver, Canada

Introduction and Aim

Spasticity is a common consequence of upper motor neuron (UMN) lesions including spinal cord injury (SCI). Supported standing conditions have been used for spasticity management in individuals with SCI. The objective of this study was to evaluate how the effects of static and dynamic standing trainings (moving around on Segway) were different on spasticity in individuals with SCI.

Materials and Method

Ten individuals with chronic SCI who experienced spasticity were participated in this cross-over study. Each participant participated in either twenty minute static or dynamic standing (on the Segway) training in two different training days. The trainings were done at least one week apart. The Visual Analogue Scale (VAS), Modified Ashworth Scale (MAS), and Electromyography (EMG) were used to assess the effects of standing trainings on spasticity. EMG was measured during the passive movement of the joints while the clinician was assessing the MAS score. The muscles of interest were gastrocnemius, rectus femoris and biceps femoris. The measurements were done before, immediately after and 1 hour later of each training session.

Results

Two-way ANOVA analysis showed a significant difference ($P < 0.05$) for gastrocnemius muscle EMG (ankle movement) through the time (before, after, and one hour later). The applied post-hoc test revealed a significant difference ($P < 0.05$) between before and one hour later gastrocnemius muscle EMG (ankle movement) for dynamic standing training. Two standing trainings were significantly different ($P < 0.05$) for biceps femoris muscle during the knee movement. The MAS knee extension (biceps femoris muscle) was significantly decreased ($P < 0.05$) during the time (before, after, and one hour later) for dynamic standing training. There was no significant difference for the other outcome measures.

Conclusion

Dynamic standing training revealed more promising results versus the static standing training for spasticity reduction measured by three different outcome measures including self-assessment (VAS), clinical (MAS), and electrophysiologic (EMG) measures. All the tested muscle groups except the rectus femoris measured EMG showed a remained decreasing trend after dynamic standing training for all spasticity outcome measurements used in the study.

14:40 - 16:10

**Workshop 12: Pregnancy following spinal cord injury Thursday PM
Paris Room**

Pregnancy following spinal cord injury

Chair: A Krassioukov, Canada

Lactation following pregnancy with spinal cord injury: role for
autonomic nervous system

Andrei Krassioukov, Canada

Autonomic Dysreflexia during pregnancy and labor in women with
SCI

Jean-Gabriel Prévinaire, France

Sexual health and fertility

Stacy Elliott, Canada

Urinary Tract Problems during and after Pregnancy in SCI:

Marije Vos-van der Hulst, The Netherlands

Canadian consensus on pregnancy following SCI

Shea Hocaloski (RN), Canada

Pregnancy and SCI: personal experience

Marie-Helene Warrens, Belgium

14:40 - 16:10

Workshop 13: Improving quality of life for people with spinal cord injury and their families: a comparison of different approaches to peer mentoring Thursday PM
Berlin/Cop Room

Improving quality of life for people with spinal cord injury and their families: a comparison of different approaches to peer mentoring

L Robinson¹; J Dekkers²; P Nabarro¹; K Schultes³

¹United Kingdom; ²Netherlands; ³Germany

Quality standards (needed) for effective peer support

Jos Dekkers, The Netherlands

"Someone who understands": Peer Support for Family Members

Polly Nabarro, United Kingdom

Creating opportunities: Space and time for peer support

Kevin Schultes, Germany



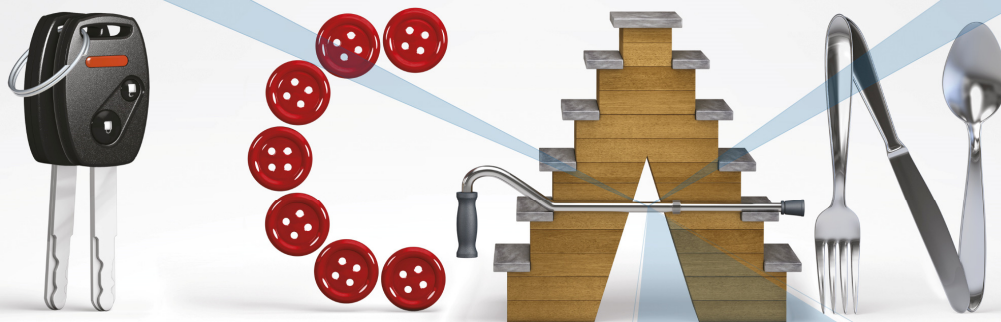
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1. Azouvi P, Mane M, Thiebaut JB, Denys P, Remy-Neris O, Bussel B. Intrathecal baclofen administration for control of severe spinal spasticity: functional improvement and long-term follow-up. Arch Phys Med Rehabil. 1996;77(1):35-39

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