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Current Awareness Bulletin – Spinal Cord Injuries
March 2015

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1. Title: A narrative literature review to direct spinal cord injury patient education programming
Citation: Topics in Spinal Cord Injury Rehabilitation, 2015, vol./is. 21/1(49-60), 1082-0744;1945-5763 (2015)
Author(s): Van Wyk K., Backwell A., Townson A.
Language: English
Abstract: Purpose: To summarize the evidence on SCI-related education literature, while looking at potential barriers, solutions, benefits, and patient preferences regarding SCI patient education. Method: A literature review was conducted using 5 electronic databases. Quality appraisal instruments were designed to determine the methodological rigor of the quantitative and qualitative studies found. Selected articles were read in their entirety and themes were abstracted. Results: Fourteen articles met the inclusion criteria for this narrative literature review, all of which were based on research studies. Seven of these 14 were quantitative studies, 3 were qualitative studies, and 4 were mixed-methods studies. Conclusion: To improve SCI education during rehabilitation, programs should maximize the receptiveness of newly injured patients to SCI-related information, optimize the delivery of SCI education, increase the number of opportunities for learning, promote and support lifelong learning, and include patient and program evaluation. How these strategies are specifically implemented needs to be determined by program management in consultation with various stakeholders, whilst considering the unique characteristics of the rehabilitation facility.
Publication type: Journal: Article
Source: EMBASE
Full text: Available Topics in Spinal Cord Injury Rehabilitation at Topics in Spinal Cord Injury Rehabilitation
2. Title: Assessment of passive knee stiffness and viscosity in individuals with spinal cord injury using pendulum test.

Citation: Journal of Spinal Cord Medicine, March 2015, vol./is. 38/2(170-7), 1079-0268;1079-0268 (2015 Mar)

Author(s): Joghtaei M, Arab AM, Hashemi-Nasl H, Joghataei MT, Tokhi MO

Language: English

Abstract: Objective Stiffness and viscosity represent passive resistances to joint motion related with the structural properties of the joint tissue and of the musculotendinous complex. Both parameters can be affected in patients with spinal cord injury (SCI). The purpose of this study was to measure passive knee stiffness and viscosity in patients with SCI with paraplegia and healthy subjects using Wartenberg pendulum test. Design Non-experimental, cross-sectional, case-control design. Setting An outpatient physical therapy clinic, University of social welfare and Rehabilitation Science, Iran. Patients A sample of convenience sample of 30 subjects participated in the study. Subjects were categorized into two groups: individuals with paraplegic SCI (n = 15, age: 34.60 +/- 9.18 years) and 15 able-bodied individuals as control group (n = 15, age: 30.66 +/- 11.13 years). Interventions Not applicable. Main measures Passive pendulum test of Wartenberg was used to measure passive viscous-elastic parameters of the knee (stiffness, viscosity) in all subjects. Results Statistical analysis (independent t-test) revealed significant difference in the joint stiffness between healthy subjects and those with paraplegic SCI (P = 0.01). However, no significant difference was found in the viscosity between two groups (P = 0.17). Except for first peak flexion angle, all other displacement kinematic parameters exhibited no statistically significant difference between normal subjects and subjects with SCI. Conclusions Patients with SCI have significantly greater joint stiffness compared to able-bodied subjects.

Publication type: Journal Article

Source: MEDLINE

Full text: Available Salisbury EJournals at Journal of Spinal Cord Medicine

3. Title: Association between alendronate, serum alkaline phosphatase level, and heterotopic ossification in individuals with spinal cord injury.

Citation: Journal of Spinal Cord Medicine, March 2015, vol./is. 38/2(193-8), 1079-0268;1079-0268 (2015 Mar)

Author(s): Ploumis A, Donovan JM, Olorinde MO, Clark DM, Wu JC, Sohn DJ, O'Connor KC

Language: English

Abstract: Context/objective Only sparse evidence exists regarding the effectiveness of oral alendronate (ALN) in the prevention of heterotopic ossification (HO) in patients with spinal cord injury (SCI). The objective of this study is to investigate the protective effect of oral ALN intake on the appearance of HO in patients with SCI. Study design Retrospective database review. Setting A Spinal Cord Unit at a Rehabilitation Hospital. Participants Two hundred and ninety-nine patients with SCI during acute inpatient rehabilitation. Interventions Administration of oral ALN. Outcome measures The incidence of HO during rehabilitation was compared between patients with SCI receiving oral ALN (n = 125) and patients with SCI not receiving oral ALN (n = 174). The association between HO and/or ALN intake with HO risk factors and biochemical markers of bone metabolism were also explored. Results HO developed in 19 male patients (6.35%), however there was no significant difference in the incidence of HO in patients receiving oral ALN or not. The mean odds ratio of not developing versus developing HO given ALN exposure was 0.8. Significant correlation was found between abnormal serum alkaline phosphatase (ALP) levels and HO appearance (P < 0.001) as well as normal serum ALP and ALN intake (P < 0.05). Conclusion Even though there was no direct prevention of HO in patients with SCI by oral ALN intake, abnormal serum ALP was found more frequently in patients with HO development and without oral ALN intake. This evidence could suggest that ALN may play a role in preventing HO, especially in patients with acute SCI with increasing levels of serum ALP.

Publication type: Journal Article

Source: MEDLINE

Full text: Available Salisbury EJournals at Journal of Spinal Cord Medicine

4. Title: Bacteriology of pressure ulcers in individuals with spinal cord injury: What we know and what we should know.

Citation: Journal of Spinal Cord Medicine, March 2015, vol./is. 38/2(147-60), 1079-0268;1079-0268 (2015 Mar)

Author(s): Dana AN, Bauman WA

Language: English

Abstract: Individuals with spinal cord injury (SCI) are at increased risk for the development of pressure ulcers. These chronic wounds are debilitating and contribute to prolonged hospitalization and worse medical outcome. However, the species of bacteria and the role that specific species may play in delaying the healing of chronic pressure ulcers in
the SCI population has not been well characterized. This study will review the literature regarding what is known currently about the bacteriology of pressure ulcers in individuals with SCI. An electronic literature search of MEDLINE (1966 to February 2014) was performed. Eleven studies detailing bacterial cultures of pressure ulcers in the SCI population met inclusion criteria and were selected for review. Among these studies, bacterial cultures were often polymicrobial with both aerobic and anaerobic bacteria identified with culture techniques that varied significantly. The most common organisms identified in pressure ulcers were Staphylococcus aureus, Proteus mirabilis, Pseudomonas aeruginosa, and Enterococcus faecalis. In general, wounds were poorly characterized with minimal to no physical description and/or location provided. Our present understanding of factors that may alter the microbiome of pressure ulcers in individuals with SCI is quite rudimentary, at best. Well-designed studies are needed to assess appropriate wound culture technique, the impact of bacterial composition on wound healing, development of infection, and the optimum medical and surgical approaches to wound care.

**Publication type:** Journal Article  
**Source:** MEDLINE  
**Full text:** Available Salisbury EJournals at Journal of Spinal Cord Medicine

5. Title: Challenges for defining minimal clinically important difference (MCID) after spinal cord injury  
**Citation:** Spinal Cord, February 2015, vol./is. 53(2)(84-91), 1362-4393;1476-5624 (07 Feb 2015)  
**Language:** English  
**Abstract:** Study design: This is a review article. Objectives: This study discusses the following: (1) concepts and constraints for the determination of minimal clinically important difference (MCID), (2) the contrasts between MCID and minimal detectable difference (MDD), (3) MCID within the different domains of International Classification of Functioning, disability and health, (4) the roles of clinical investigators and clinical participants in defining MCID and (5) the implementation of MCID in acute versus chronic spinal cord injury (SCI) studies. Methods: The methods include narrative reviews of SCI outcomes, a 2-day meeting of the authors and statistical methods of analysis representing MDD. Results: The data from SCI study outcomes are dependent on many elements, including the following: the level and severity of SCI, the heterogeneity within each study cohort, the therapeutic target, the nature of the therapy, any confounding influences or comorbidities, the assessment times relative to the date of injury, the outcome measurement instrument and the clinical end-point threshold used to determine a treatment effect. Even if statistically significant differences can be established, this finding does not guarantee that the experimental therapeutic provides a person living with SCI an improved capacity for functional independence and/or an increased quality of life. The MDD statistical concept describes the smallest real change in the specified outcome, beyond measurement error, and it should not be confused with the minimum threshold for demonstrating a clinical benefit or MCID. Unfortunately, MCID and MDD are not uncomplicated estimations; nevertheless, any MCID should exceed the expected MDD plus any probable spontaneous recovery. Conclusion: Estimation of an MCID for SCI remains elusive. In the interim, if the target of a therapeutic is the injured spinal cord, it is most desirable that any improvement in neurological status be correlated with a functional (meaningful) benefit.

**Publication type:** Journal: Review  
**Source:** EMBASE  
**Full text:** Available Nature Publishing Group at Spinal Cord

6. Title: Chondroitinase gene therapy for spinal cord injury  
**Citation:** Neuromethods, 2015, vol./is. 93/(139-149), 0893-2336;1940-6045 (2015)  
**Author(s):** Hu J., Curinga G.M., Smith G.M.  
**Language:** English  
**Abstract:** Spinal cord injury (SCI) can lead to permanent paralysis below the level of injury. Environmental factors within the injured spinal cord have been shown to strongly participate in regenerative failure. Shortly after injury, the formation of a glial-fi broblastic scar develops at the injury site. Besides isolating the injury area and stabilizing infl ammation and cellular damage, the glial scar is also an important source of both the physical and molecular barriers affecting axonal regeneration. The responding reactive astrocytes are known to secrete a group of potent axonal growth-inhibitory matrix molecules known as chondroitin sulfate proteoglycans (CSPGs). The inhibitory nature of these CSPGs can be dramatically attenuated using the bacterial enzyme chondroitinase ABC. Since chondroitinase rapidly degrades, long-term studies require either (1) multiple injections of purifi ed protein, (2) expression of the chondroitinase transgene, or (3) biodegradable scaffold to release the protein slowly. Of these options, the latter two are preferred. We have developed an easy and rapid method of analyzing the bioactivity of
chondroitinase released by genetically altered cells or from a biodegradable platform.

**Publication type:** Book Series: Article  
**Source:** EMBASE

### 7. Title: Depression in spinal cord injury: Assessing the role of psychological resources.  
**Citation:** Rehabilitation Psychology, February 2015, vol./is. 60/1(67-80), 0090-5550;1939-1544 (2015 Feb)  
**Author(s):** Peter C, Muller R, Post MW, van Leeuwen CM, Werner CS, Geyh S, Swiss Spinal Cord Injury Cohort Study Group  
**Language:** English  
**Abstract:** PURPOSE: To test the spinal cord injury adjustment model (SCIAM) and to examine how psychological resources may influence depressive symptoms in persons with spinal cord injury (SCI). We expect that (a) higher general self-efficacy (GSE) and higher purpose in life (PIL) are associated with lower levels of depressive symptoms, and that (b) the effect of GSE and PIL on depressive symptoms is mediated by appraisals and coping strategies, as proposed by the SCIAM. METHOD: A nationwide cross-sectional survey (the Swiss Spinal Cord Injury Cohort Study) was conducted with individuals with SCI living in the Swiss community (N = 516). Structural equation modeling was used to test relationships between variables as specified in the SCIAM. RESULTS: Higher GSE (r = -.54) and PIL (r = -.62) were significantly associated with lower depressive symptoms. The initial model yielded poor model fit. However, the final modified model fitted well, with chi2(21) = 54.00, p < .01, RMSEA = .055 (90% CI [.038, .073]), CFI = .98, explaining 62.9% of the variance of depressive symptoms. PIL had a direct large effect and an indirect effect on depressive symptoms via appraisals and coping strategies. The influence of GSE on depressive symptoms was fully mediated by appraisals and coping strategies. CONCLUSIONS: Psychological resources of individuals with SCI can have a direct effect on depressive symptoms. The mediated pathways are present, but not exclusive in our data, yielding only partial support for the mechanism proposed by the SCIAM. (PsycINFO Database Record (c) 2015 APA, all rights reserved).

**Publication type:** Journal Article  
**Source:** MEDLINE

### 8. Title: Development, construction, and content validation of a questionnaire to test mobile shower commode usability  
**Citation:** Topics in Spinal Cord Injury Rehabilitation, 2015, vol./is. 21/1(77-86), 1082-0744;1945-5763 (2015)  
**Author(s):** Friesein E., Theodoros D., Russell T.  
**Language:** English  
**Abstract:** Background: Usability is an emerging domain of outcomes measurement in assistive technology provision. Currently, no questionnaires exist to test the usability of mobile shower commodes (MSCs) used by adults with spinal cord injury (SCI). Objective: To describe the development, construction, and initial content validation of an electronic questionnaire to test mobile shower commode usability for this population. Methods: The questionnaire was constructed using a mixed-methods approach in 5 phases: determining user preferences for the questionnaire’s format, developing an item bank of usability indicators from the literature and judgement of experts, constructing a preliminary questionnaire, assessing content validity with a panel of experts, and constructing the final questionnaire. Results: The electronic Mobile Shower Commode Assessment Tool Version 1.0 (eMAST 1.0) questionnaire tests MSC features and performance during activities identified using a mixed-methods approach and in consultation with users. It confirms that usability is complex and multidimensional. The final questionnaire contains 25 questions in 3 sections. The eMAST 1.0 demonstrates excellent content validity as determined by a small sample of expert clinicians. Conclusion: The eMAST 1.0 tests usability of MSCs from the perspective of adults with SCI and may be used to solicit feedback during MSC design, assessment, prescription, and ongoing use. Further studies assessing the eMAST’s psychometric properties, including studies with users of MSCs, are needed.

**Publication type:** Journal: Article  
**Source:** EMBASE  
**Full text:** Available Topics in Spinal Cord Injury Rehabilitation at Topics in Spinal Cord Injury Rehabilitation

**Citation:** Journal of Spinal Cord Medicine, March 2015, vol./is. 38/2(135-46), 1079-0268;1079-0268 (2015 Mar)  
**Author(s):** McGee MJ, Amundsen CL, Grill WM  
**Language:** English  
**Abstract:** Electrical stimulation for bladder control is an alternative to traditional methods of treating neurogenic lower urinary tract dysfunction (NLUTD) resulting from spinal cord injury (SCI). In this review, we systematically discuss the neurophysiology of bladder dysfunction following SCI and the applications of electrical stimulation for
Citation: Journal of Vocational Rehabilitation, 01 February 2015, vol./is. 42/1(85-96), 10522263
Author(s): Inge, Katherine J., Cimagi, Robert E., Revel, William G., Wehman, Paul H., Seward, Hannah E.
Language: English
Abstract: BACKGROUND: Employment for individuals with spinal cord injury (SCI) varies by demographic, educational, and preinjury occupational characteristics. Individuals with SCI also face a number of physical and structural barriers to returning to work postinjury. Vocational Rehabilitation (VR) services through the use of the federal and state vocational rehabilitation programs is one option for obtaining the needed supports that lead to successful competitive employment outcomes. OBJECTIVE: This information is for those individuals with SCI whose cases were closed by VR in one of the four case closure codes: Status 08, Status 28, Status 30, or Status 26. The intent of this research is to profile participation, services received, and outcomes achieved by individuals with SCI who were participants in State Vocational Rehabilitation programs. METHODS: Using the Federal Rehabilitation Services Administration's (RSA) 911-database, individuals with a primary physical disability of spinal cord injury who had their cases closed in Federal Fiscal Years 2011-2013 (n = 9,205) were selected to understand general demographic, education, SSI/SDI, and reasons for case closure information. More detailed analyses of data of services received, employment outcomes, and costs for individuals for whom an Individual Plan for Employment (IPE) also were completed. RESULTS: Nationally, state VR agencies reported closing 3,217 cases in FY 2011, 3,098 cases in FY 2012, and 2,890 cases in FY 2013 in the four case closure codes: Status 08, Status 28, Status 30, and Status 26. Status 26 closure represents those cases closed successfully. In this study, 991 individuals with SCI were closed in Status 26 during FY 2011, 972 in FY 2012, and 936 in FY 2013. The majority of cases closed successfully were for individuals who were white/Caucasian, and rates were slightly higher for individuals with an associate's degree or more. CONCLUSIONS: The findings in this study are consistent with previous findings on the demographic characteristics of individuals with SCI and return to work. More research is needed on the relationship between certain demographic characteristics and successful employment postinjury, the impact of rehabilitation technology services on successful case closures, the types of jobs that individuals with SCI obtain, and what makes state VR programs in some areas more successful than others.
Publication type: journal article
Source: CINAHL

11. Title: Heart rate response during underwater treadmill training in adults with incomplete spinal cord cord injury
Citation: Topics in Spinal Cord Injury Rehabilitation, 2015, vol./is. 21/1(40-48), 1082-0744;1945-5763 (2015)
Author(s): Stevens S., Morgan D.
Language: English
Abstract: Background: Walking on a submerged treadmill can improve mobility in persons displaying lower limb muscle weaknesses and balance deficits. Little is known, however, regarding the effect of water treadmill exercise on cardiac performance in persons with incomplete spinal cord injury (iSCI). Objective: To assess heart rate response during underwater treadmill training (UTT) in adults with iSCI. Methods: Seven males and 4 females with iSCI (age = 48 +/- 13 years; 5 +/- 8 years after injury) completed 8 weeks of UTT (3 sessions per week; 3 walks per session) incorporating individually determined walking speeds, personalized levels of body weight unloading, and gradual, alternating increases in speed and duration. Heart rate was monitored during the last 15 seconds of the final 2 minutes of each walk. Results: Over the course of 3 biweekly periods in which walking speed remained constant, heart rate fell by 7% (7 +/- 1 b * min<sup>-1</sup>; P < .001) in weeks 2 and 3, 14% (17 +/- 6 b * min<sup>-1</sup>; P < .001) in weeks 4 and 5, and 17% (21 +/- 11 b * min<sup>-1</sup>; P < .001) in weeks 6 and 7. Conclusion: In
12. Title: It's all of the above: Benefits of working for individuals with spinal cord injury
Citation: Topics in Spinal Cord Injury Rehabilitation, 2015, vol./is. 21/1(1-9), 1082-0744;1945-5763 (2015)
Author(s): Meade M., Reed K., Saunders L., Krause J.
Language: English
Abstract: Background: The majority of research on employment among persons with spinal cord injury (SCI) focuses on the employment rate at a given point in time to the exclusion of quality employment outcomes. Objective: To identify the employment outcomes of greatest importance as defined by those with SCI who have worked since injury. Methods: A qualitative approach was used with 6 focus groups at 2 sites (Minnesota and Georgia). Participants (N = 44) were a minimum of 10 years after injury and had been employed at some point after SCI. We identified participants through a 40-year longitudinal study of SCI and a community resource. A combination of homogeneous (race/ethnic minority group, female group) and heterogeneous groups were convened. A semi-structured interview format queried participants about personal, environmental, and policy-related factors that impacted obtaining, maintaining, and advancing in employment. Results: Seven overlapping themes were identified under the 2 broad categories of compensation and subjective well-being: (1) salary and what it can support, (2) health insurance and other fringe benefits, (3) promotions and recognition, (4) social connection and support, (5) job satisfaction and enjoyment from working, (6) making a difference and helping others, and (7) psychological and emotional health. Conclusion: The results indicate several common themes among persons with SCI who have successful employment histories, suggesting that the benefits of employment are multifaceted and go beyond monetary compensation.

13. Title: Lower extremity hemorrhage in patients with spinal cord injury receiving enoxaparin therapy.
Citation: Journal of Spinal Cord Medicine, March 2015, vol./is. 38/2(236-8), 1079-0268;1079-0268 (2015 Mar)
Author(s): Yeung V, Formal C
Language: English
Abstract: Low-molecular-weight heparin is commonly favored over unfractionated heparin because of its predictable pharmacokinetic and pharmacodynamic properties. However, full-dose enoxaparin can cause major soft tissue bleeding that may lead to compartment syndrome and even limb amputation. In patients with spinal cord injury, range of motion exercises should be carefully performed if on full-dose enoxaparin. This vulnerable patient population is particularly susceptible to aggressive stretching, which could lead to bleeding, and compartment syndrome. Providers should also monitor weight fluctuations in patients receiving full-dose enoxaparin. Changes in weight without proper dose adjustment can cause over or under treatment. Attention to both these issues can improve patient care.

14. Title: Lower-extremity muscle atrophy and fat infiltration after chronic spinal cord injury.
Citation: Journal of Musculoskeletal Neuronal Interactions, March 2015, vol./is. 15/1(32-41), 1108-7161;1108-7161 (2015 Mar)
Language: English
Abstract: BACKGROUND: Atrophy and fatty-infiltration of lower-extremity muscle after spinal cord injury (SCI) predisposes individuals to metabolic disease and related mortality.OBJECTIVES: To determine the magnitude of atrophy and fatty-infiltration of lower-extremity muscles and related factors in a group of individuals with chronic SCI and diverse impairment.METHODS: Muscle cross-sectional area and density were calculated from peripheral quantitative computed tomography scans of the 66% site of the calf of 70 participants with chronic SCI [50 male, mean age 49 (standard deviation 12) years, C2-T12, AIS A-D] and matched controls. Regression models for muscle
area and density were formed using 16 potential correlates selected a priori.RESULTS: Participants with motor-complete SCI had 32% lower muscle area, and 43% lower muscle density values relative to controls. Participants with motor-incomplete SCI had muscle area and density values that were both 14% lower than controls. Body mass (+), tetraplegia (+), motor function (+), spasticity (+), vigorous physical activity (+), wheelchair use (-), age (-), and waist circumference (-) were associated with muscle size and/or density in best-fit regression models.CONCLUSIONS: There are modifiable factors related to muscle size, body composition, and activity level that may offer therapeutic targets for preserving metabolic health after chronic SCI.

**Publication type:** Journal Article  
**Source:** MEDLINE

**15. Title:** Macrophages in spinal cord injury: Phenotypic and functional change from exposure to myelin debris  
**Citation:** GLIA, April 2015, vol./is. 63/4(635-651), 0894-1491;1098-1136 (01 Apr 2015)  
**Author(s):** Wang X., Cao K., Sun X., Chen Y., Duan Z., Sun L., Guo L., Bai P., Sun D., Fan J., He X., Young W., Ren Y.  
**Language:** English  
**Abstract:** Macrophage activation and persistent inflammation contribute to the pathological process of spinal cord injury (SCI). It was reported that M2 macrophages were induced at 3-7 days after SCI but M2 markers were reduced or eliminated after 1 week. By contrast, M1 macrophage response is rapidly induced and then maintained at injured spinal cord. However, factors that modulate macrophage phenotype and function are poorly understood. We developed a model to distinguish bone-marrow derived macrophages (BMDMs) from resident microglia and explored how BMDMs change their phenotype and functions in response to the lesion-related factors in injured spinal cord. Infiltrating BMDMs expressing higher Mac-2 and lower CX3CR1 migrate to the epicenter of injury, while microglia expressing lower Mac-2 but higher CX3CR1 distribute to the edges of lesion. Myelin debris at the lesion site switches BMDMs from M2 phenotype towards M1-like phenotype. Myelin debris activates ATP-binding cassette transporter A1 (ABCA1) for cholesterol efflux in response to myelin debris loading in vitro. However, this homeostatic mechanism in injured site is overwhelmed, leading to the development of foamy macrophages and lipid plaque in the lesion site. The persistence of these cells indicates a pro-inflammatory environment, associated with enhanced neurotoxicity and impaired wound healing. These foamy macrophages have poor capacity to phagocytose apoptotic neutrophils resulting in uningested neutrophils releasing their toxic contents and further tissue damage. In conclusion, these data demonstrate for the first time that myelin debris generated in injured spinal cord modulates macrophage activation. Lipid accumulation following macrophage phenotype switch contributes to SCI pathology. GLIA 2015;63:635-651 Main Points: Myelin debris generated in injured spinal cord switches macrophages from M2 phenotype towards M1-like phenotype. Myelin debris activates ATP-binding cassette transporter A1 (ABCA1) for cholesterol efflux in response to myelin debris loading in vitro. However, this homeostatic mechanism in injured site is overwhelmed, leading to the development of foamy macrophages and lipid plaque in the lesion site. The persistence of these cells indicates a pro-inflammatory environment, associated with enhanced neurotoxicity and impaired wound healing. These foamy macrophages have poor capacity to phagocytose apoptotic neutrophils resulting in uningested neutrophils releasing their toxic contents and further tissue damage. In conclusion, these data demonstrate for the first time that myelin debris generated in injured spinal cord modulates macrophage activation. Lipid accumulation following macrophage phenotype switch contributes to SCI pathology.  
**Publication type:** Journal: Article  
**Source:** EMBASE

**16. Title:** Neuromodulation by surface electrical stimulation of peripheral nerves for reduction of detrusor overactivity in patients with spinal cord injury: A pilot study.  
**Citation:** Journal of Spinal Cord Medicine, March 2015, vol./is. 38/2(207-13), 1079-0268;1079-0268 (2015 Mar)  
**Author(s):** Ojha R, George J, Chandy BR, Tharion G, Devasahayam SR  
**Language:** English  
**Abstract:** Objectives To demonstrate reduction in detrusor overactivity using surface electrical stimulation of posterior tibial nerve (PTN) or dorsal penile nerve (DPN) in patients with spinal cord injury (SCI). Design Patients with SCI with symptoms of urinary urgency/leaks, with cystometrogram (CMG) proven detrusor overactivity were recruited in this study. Ten persons with observable F-wave from tibial nerve were included in the PTN group. Five persons who had F-wave absent but preserved bulbocavernous reflex were included in the DPN group. Stimulation was given at 20 Hz, 10-40 mA for 20 minutes/session/day for 14 consecutive days. Detrusor overactivity was recorded using CMG on days 1 and 15. Settings Rehabilitation Institute, Department of Physical Medicine and Rehabilitation, Christian Medical College and Hospital, Vellore, TN, India. Participants Patients with SCI. Interventions Surface stimulation of peripheral nerves for reduction of detrusor overactivity. Outcome measures Qualitative analysis using voiding diary data and quantitative analysis using CMG data comparing pre- and post-intervention. Results P value obtained from voiding chart was 0.021 for PTN and 0.062 for DPN. P value obtained from CMG data was not significant in both groups. In one subject, treatment was extended to 4 weeks and further improvement in voiding diary was seen. Conclusions In this pilot study of 15 patients, voiding chart data showed statistically significant improvement following PTN stimulation and trend of improvement following DPN stimulation. However, the CMG data were not statistically significant in this sample population. Further studies with larger, appropriately...
17. Title: Neuromuscular electrical stimulation training increases intermuscular fascial length but not tendon cross-sectional area after spinal cord injury

Citation: Topics in Spinal Cord Injury Rehabilitation, 2015, vol./is. 21/1(87-92), 1082-0744;1945-5763 (2015)

Author(s): Gorgey A., Khalil R.

Language: English

Abstract: Objective: To determine the effects of 12 weeks of neuromuscular electrical stimulation (NMES) training with ankle weights on intermuscular fascial length and patellar tendon cross-sectional area in persons with spinal cord injury (SCI). Methods: This study was a pre-post intervention. Seven men with motor complete SCI were randomly assigned to a resistance training plus diet (RT + diet) group (n = 4) or a diet control group (n = 3). Participants in the RT + diet group were enrolled in a 12-week leg extension weight-lifting program via surface NMES of the knee extensor muscle group. The length of mid-thigh intermuscular fascia and the patellar tendon CSA were measured using MRI. Results: In the RT + diet group, a nonsignificant 8% increase in the CSA of the patellar tendon (P = .14) was noted. The length of the mid-thigh intermuscular fascia increased by 19% and 23% in the right (P = .029) and left (P = .015) legs, respectively, with no changes in the diet control group. Positive relationships were noted between skeletal muscle CSAs of the whole thigh (r = 0.77, P = .041) and knee extensors (r = 0.76, P = .048) and intermuscular fascial length. Conclusion: The preliminary results suggest that noncontractile connective tissue structures of the knee extensors respond differently to NMES training after SCI. Skeletal muscle hypertrophy is associated with an increase in the intermuscular fascial length.

Publication type: Journal: Article

Source: EMBASE

Full text: Available Topics in Spinal Cord Injury Rehabilitation at Topics in Spinal Cord Injury Rehabilitation

18. Title: Optical stimulation for restoration of motor function after spinal cord injury

Citation: Mayo Clinic Proceedings, February 2015, vol./is. 90/2(300-307), 0025-6196;1942-5546 (01 Feb 2015)

Author(s): Mallory G.W., Grahn P.J., Hachmann J.T., Lujan J.L., Lee K.H.

Language: English

Abstract: Spinal cord injury can be defined as a loss of communication between the brain and the body due to disrupted pathways within the spinal cord. Although many promising molecular strategies have emerged to reduce secondary injury and promote axonal regrowth, there is still no effective cure, and recovery of function remains limited. Functional electrical stimulation (FES) represents a strategy developed to restore motor function without the need for regenerating severed spinal pathways. Despite its technological success, however, FES has not been widely integrated into the lives of spinal cord injury survivors. In this review, we briefly discuss the limitations of existing FES technologies. Additionally, we discuss how optogenetics, a rapidly evolving technique used primarily to investigate select neuronal populations within the brain, may eventually be used to replace FES as a form of therapy for functional restoration after spinal cord injury.

Publication type: Journal: Conference Paper

Source: EMBASE

Full text: Available Mayo Clinic proceedings. Mayo Clinic at Mayo Clinic Proceedings

19. Title: Options for independent bladder management in patients with spinal cord injury and hand function prohibiting intermittent catheterization

Citation: Neurourology and Urodynamics, February 2015, vol./is. 34/2(167-176), 0733-2467;1520-6777 (01 Feb 2015)

Author(s): Sorokin I., De E.

Language: English

Abstract: Aims Choosing the appropriate bladder management strategy for the spinal cord injury patient with neurogenic bladder and hand function prohibitive of self catheterization (urethral or stomal) catheterization is complex and based on limited literature. We have catalogued the available data in this review. Methods A literature review was conducted on external sphincterotomy, suprapubic tube, ileal conduit, and ileovesicostomy between 1994 and 2012. Articles on neurogenic bladder focused primarily on spinal cord injury were included. Important aspects of each technique, patient selection, urologic events, and quality of life are described. Conclusion The
available literature consists primarily of level 3 data. Patient reported outcomes were rarely measured. External sphincterotomy is a good option for males who are candidates for an external catheter and who wish to avoid a complicated reconstruction - most will need re-operations for failure. Suprapubic tube is an option in both genders. Complaints usually involve urine leakage and urinary tract infection, which typically resolve with conservative measures. There is some evidence to support patient satisfaction. Ileal conduit is an option for all patients with quadriplegia, offering continuous drainage and absence of foreign material. Many providers and patients will choose more conservative options first. The ileovesicostomy is best applied to small bladders with severe overactivity. The "reversibility" of this procedure makes it attractive to those not interested in an ileal conduit and who have had complications from prolonged suprapubic tube placement. The authors conclude with recommendations for future research, most importantly more standard reporting of objective data. Neurourol. Urodynam. 34:167-176, 2015.

**Publication type:** Journal: Article  
**Source:** EMBASE

20. **Title:** Oxidative stress and antioxidative parameters in patients with spinal cord injury: Implications in the pathogenesis of disease  
**Citation:** Spinal Cord, January 2015, vol./is. 53/1(3-6), 1362-4393;1476-5624 (10 Jan 2015)  
**Author(s):** Fatima G., Sharma V.P., Das S.K., Mahdi A.A.  
**Language:** English  
**Abstract:** Study design: Oxygen-derived free radicals have been implicated in the pathogenesis of spinal cord injury (SCI) after trauma. Objective: In this review we will elucidate the importance of oxidative stress and antioxidants and its possible relationship with SCI. Methods: Literature analysis of oxidative stress, antioxidative parameters based on its implications in the pathogenesis along with devastating effect of oxidative stress parameters on SCI patients and its suggested proposed treatment by antioxidants have been performed. Results: SCI remains a major health problem despite advances in neurotechnology. Previous studies have reported oxidative stress in SCI patients, but the results were inconsistent. Furthermore, increased free radical levels are reported in SCI. Moreover, we have also mentioned in this review that oxidative stress is supposed to be increased in patients with SCI, which is related to the severity of SCI pain. Conclusion: Oxidative stress was commonly seen in SCI patients, which may provide useful information to augment the understanding of pathophysiology of SCI patients. However, complete understanding of the biochemical events occurring at a cellular level that influence oxidative damage is required to guide future therapeutic advances. Furthermore, supplementation of antioxidants may also be considered in these patients.  
**Publication type:** Journal: Review  
**Source:** EMBASE  
**Full text:** Available Nature Publishing Group at Spinal Cord

21. **Title:** Pharmacological therapy for acute spinal cord injury.  
**Citation:** Neurosurgery, March 2015, vol./is. 76 Suppl 1/(S71-83), 0148-396X;1524-4040 (2015 Mar)  
**Author(s):** Hurlbert RJ, Hadley MN, Walters BC, Aarabi B, Dhall SS, Gelb DE, Rozzelle CJ, Ryken TC, Theodore N  
**Language:** English  
**Abstract:** ABBREVIATIONS: ASIA, American Spinal Injury Association; MP, Methylprednisolone; NASCIS, National Acute Spinal Cord Injury Study; SCI, spinal cord injury.  
**Publication type:** Journal Article  
**Source:** MEDLINE  
**Full text:** Available Neurosurgery at Neurosurgery

22. **Title:** Predictors of the necessity for early tracheostomy in patients with acute cervical spinal cord injury: A 15-year experience  
**Citation:** American Journal of Surgery, February 2015, vol./is. 209/2(363-368), 0002-9610;1879-1883 (01 Feb 2015)  
**Author(s):** Jones T.S., Burlew C.C., Johnson J.L., Jones E., Kornblith L.Z., Biffl W.L., Stovall R.T., Pieracci F.M., Stahel P.F., Moore E.E.  
**Language:** English  
**Abstract:** Background The need for mechanical ventilation (MV) after spinal cord injury (SCI) is a risk factor for prolonged critical care. The "purpose" of this study was to identify the level of cervical SCI that requires MV, thereby defining candidates for tracheostomy. Methods Patients with cervical SCI over a 15-year period were reviewed. Results One hundred sixty-three patients sustained cervical SCI. Of 76 complete injuries, 91% required MV for greater than 48 hours. By injury level, MV incidence was 100% for C2-4, 91% for C5, 79% for C6, and 80% for C7. Only one quarter of patients with incomplete SCI required MV for greater than 48 hours; Glasgow Coma Score and Injury Severity Score were significantly worse compared with patients not requiring MV. Conclusions Factors influencing
the decision for tracheostomy in cervical SCI patients include the presence of a complete SCI, anatomic level of injury, Glasgow Coma Score, Injury Severity Score, and associated thoracic injury. Patients with complete cervical SCI often require prolonged MV. Conversely, the minority of incomplete SCI required MV; the need for tracheostomy was likely performed for associated injuries. Utilizing identified factors permits a thoughtful approach to tracheostomy in this patient population.

**Publication type:** Journal: Article  
**Source:** EMBASE

**23.** Title: Pre-procedural antibiotics for endoscopic urological procedures: Initial experience in individuals with spinal cord injury and asymptomatic bacteriuria.  
**Citation:** Journal of Spinal Cord Medicine, March 2015, vol./is. 38/2(187-92), 1079-0268;1079-0268 (2015 Mar)  
**Author(s):** Chong JT, Klausner AP, Petrosian A, Byrne MD, Moore JR, Goetz LL, Gater DR, Mayer Grob B  
**Language:** English  
**Abstract:** Objective The objective of this study was to compare the safety, efficacy, quality-of-life impact, and costs of a single dose or a longer course of pre-procedural antibiotics prior to elective endoscopic urological procedures in individuals with spinal cord injury and disorders (SCI/D) and asymptomatic bacteriuria. Design A prospective observational study. Setting Hunter Holmes McGuire Veterans Affairs Medical Center, Richmond, Virginia, USA. Participants Sixty persons with SCI/D and asymptomatic bacteriuria scheduled to undergo elective endoscopic urological procedures. Interventions A single pre-procedural dose of antibiotics vs. a 3-5-day course of pre-procedural antibiotics. Outcome measures Objective and subjective measures of health, costs, and quality of life. Results There were no significant differences in vital signs, leukocytosis, adverse events, and overall satisfaction in individuals who received short-course vs. long-course antibiotics. There was a significant decrease in antibiotic cost (33.1 +/- 47.6 vs. 3.6 +/- 6.1 US$, P = 0.01) for individuals in the short-course group. In addition, there was greater pre-procedural anxiety (18% vs. 0%, P < 0.05) for individuals who received long-course antibiotics. Conclusion SCI/D individuals with asymptomatic bacteriuria may be able to safely undergo most endoscopic urological procedures with a single dose of pre-procedural antibiotics. However, further research is required and even appropriate pre-procedural antibiotics may not prevent severe infections.  
**Publication type:** Journal Article  
**Source:** MEDLINE  
**Full text:** Available Salisbury Journals at Journal of Spinal Cord Medicine

**24.** Title: Role of endogenous neural stem cells in spinal cord injury and repair  
**Citation:** JAMA Neurology, February 2015, vol./is. 72/2(235-237), 2168-6149 (01 Feb 2015)  
**Author(s):** Stenudd M., Sabelstrom H., Frisen J.  
**Language:** English  
**Abstract:** Spinal cord injury is followed by glial scar formation, which has positive and negative effects on recovery from the lesion. More than half of the astrocytes in the glial scar are generated by ependymal cells, the neural stem cells in the spinal cord. We recently demonstrated that the neural stem cell-derived scar component has several beneficial functions, including restricting tissue damage and neural loss after spinal cord injury. This finding identifies endogenous neural stem cells as a potential therapeutic target for treatment of spinal cord injury.  
**Publication type:** Journal: Article  
**Source:** EMBASE

**25.** Title: Safety and efficacy of medically performed tongue piercing in people with tetraplegia for use with tongue-operated assistive technology  
**Citation:** Topics in Spinal Cord Injury Rehabilitation, 2015, vol./is. 21/1(61-76), 1082-0744;1945-5763 (2015)  
**Author(s):** Laumann A., Holbrook J., Minocha J., Rowles D., Nardone B., West D., Kim J., Bruce J., Roth E., Ghovanloo M.  
**Language:** English  
**Abstract:** Background: Individuals with high-level spinal cord injuries need effective ways to perform activities. Objectives: To develop and test a medically supervised tongue-piercing protocol and the wearing of a magnet-containing tongue barbell for use with the Tongue Drive System (TDS) in persons with tetraplegia. Methods: Volunteers with tetraplegia underwent initial screening sessions using a magnet glued on the tongue to activate and use the TDS. This was followed by tongue piercing, insertion of a standard barbell, a 4-week healing period, and an exchange of the standard barbell for a magnet-containing barbell. This was then used twice weekly for 6 to 8 weeks to perform computer tasks, drive a powered wheelchair, accomplish in-chair weight shifts, and dial a phone. Symptoms of intraoral dysfunction, change in tongue size following piercing, and subjective assessment of receiving
and wearing a magnet-containing tongue barbell and its usability with the TDS were evaluated. Results: Twenty-one volunteers underwent initial trial sessions. Thirteen had their tongues pierced. One individual's barbell dislodged during healing resulting in tongue-tract closure. Twelve had the barbell exchanged for a magnet-containing barbell. One subject withdrew for unrelated issues. Eleven completed the TDS testing sessions and were able to complete the assigned tasks. No serious adverse events occurred related to wearing or using a tongue barbell to operate the TDS. Conclusions: Using careful selection criteria and a medically supervised piercing protocol, no excess risk was associated with tongue piercing and wearing a tongue barbell in people with tetraplegia. Participants were able to operate the TDS.

**Publication type:** Journal: Article  
**Source:** EMBASE  
**Full text:** Available Topics in Spinal Cord Injury Rehabilitation at Topics in Spinal Cord Injury Rehabilitation

### 26. Title: Serum neurofilament light chain is a biomarker of human spinal cord injury severity and outcome

**Citation:** Journal of Neurology, Neurosurgery and Psychiatry, March 2015, vol./is. 86/3(273-279), 0022-3050;1468-330X (01 Mar 2015)  
**Language:** English  
**Abstract:** Background: Neurofilaments (Nf) are major structural proteins that occur exclusively in neurons. In spinal cord injury (SCI), the severity of disease is quantified by clinical measures that have limited sensitivity and reliability, and no blood-based biomarker has been established to further stratify the degree of injury. We aimed to examine a serum-based NfL immunoassay as predictor of the clinical outcome in SCI. Methods: Longitudinal measurement of serum NfL was performed in patients with central cord syndrome (CCS, n=4), motor-incomplete SCI (iSCI, n=10), motorcomplete SCI (cSCI, n=13) and healthy controls (HC, n=67), and correlated with clinical severity, neurological outcome, and neuroprotective effect of the drug minocycline. Results: Baseline NfL levels were higher in iSCI (21 pg/mL) and cSCI (70 pg/mL) than in HC (5 pg/mL; p=0.006 and p<0.001) and CCS (6 pg/mL; p=0.025 and p=0.010). Levels increased over time (p=0.001) and remained higher in cSCI versus iSCI (p=0.011) and than in CCS (p<0.001). NfL levels correlated with American Spinal Injury Association (ASIA) motor score at baseline (r=-0.53, p=0.004) and after 24 h (r=-0.69, p<0.001) and 3-12-month motor outcome (baseline NfL: r=-0.43, p=0.026 and 24 h NfL: r=-0.72, p=0.001). Minocycline treatment showed decreased NfL levels in the subgroup of cSCI patients. Conclusions: Serum NfL concentrations in SCI patients show a close correlation with acute severity and neurological outcome. Our data provide evidence that serum NfL is of prognostic value in SCI patients for the first time. Further, blood NfL levels may qualify as drug response markers in SCI.

**Publication type:** Journal: Article  
**Source:** EMBASE  
**Full text:** Available Highwire Press at Journal of neuroscience, neurosurgery, and psychiatry

### 27. Title: Short-latency inhibitory reflex responses to inspiratory loading of the scalene muscles are impaired in spinal cord injury

**Citation:** Experimental Physiology, February 2015, vol./is. 100/2(216-225), 0958-0670;1469-445X (01 Feb 2015)  
**Author(s):** Mcbain R.A., Hudson A.L., Gandevia S.C., Butler J.E.  
**Language:** English  
**Abstract:** New Findings: What is the central question of this study? The aim was to determine whether the reflex inhibition in the electromyographic activity of scalene muscles in response to inspiratory muscle loading is present in individuals with cervical spinal cord injury and to examine whether the intercostal muscle afferents are critical for genesis of the reflex. What is the main finding and its importance? The lack of reflex inhibition in response to inspiratory loading in individuals with complete cervical spinal cord injury suggests that the reflex critically requires input from intercostal afferents and/or an intact intersegmental neural network. In healthy individuals, transient loading of inspiratory muscles with a brief inspiratory occlusion produces a short-latency inhibitory response (IR) in the electromyographic activity of scalene muscles at ~40 ms, followed by an excitatory response (ER). It has been argued that this reflex plays a protective role in neuromuscular control of the inspiratory muscles and that it is coordinated by spinal segmental or supraspinal circuits. In this study, the reflex response to airway occlusion was recorded bilaterally from scalene muscles in 14 subjects and from the right costal diaphragm in seven subjects with spinal cord injury [SCI, C4-C6; American Spinal Injury Association (ASIA) Impairment Scale (AIS) A]. The incidence, latency and size of the reflex were compared with previously published data from able-bodied subjects. Only two subjects with SCI showed an IR, and six subjects had an ER. Latencies to the onset and peak of the IR and ER were 5-50 ms longer than in able-bodied subjects. However, when reflexes were identified, their size in individuals with SCI...

Langauge: English
was similar to that of control subjects. We conclude that afferents from the scalene muscles and diaphragm are insufficient in most subjects with SCI to evoke the usual inhibition to airway occlusion and that input from chest wall afferents below the spinal cord lesion may be important for genesis of the short-latency inhibition in the able-bodied subjects.

**Publication type:** Journal: Article  
**Source:** EMBASE

**28. Title:** Sitting Tai Chi improves the balance control and muscle strength of community-dwelling persons with spinal cord injuries: A pilot study  
**Citation:** Evidence-based Complementary and Alternative Medicine, January 2015, vol./is. 2015/2, 1741-427X;1741-4288 (21 Jan 2015)  
**Author(s):** Tsang W.W.N., Gao K.L., Chan K.M., Purves S., Macfarlane D.J., Fong S.S.M.  
**Language:** English  
**Abstract:** Objective. To investigate the effects of sitting Tai Chi on muscle strength, balance control, and quality of life (QOL) among survivors with spinal cord injuries (SCI). Methods. Eleven SCI survivors participated in the sitting Tai Chi training (90 minutes/session, 2 times/week for 12 weeks) and eight SCI survivors acted as controls. Dynamic sitting balance was evaluated using limits of stability test and a sequential weight shifting test in sitting. Handgrip strength was also tested using a hand-held dynamometer. QOL was measured using the World Health Organization's Quality of Life Scale. Results. Tai Chi practitioners achieved significant improvements in their reaction time (P = 0.042); maximum excursion (P = 0.016); and directional control (P = 0.025) in the limits of stability test after training. In the sequential weight shifting test, they significantly improved their total time to sequentially hit the 12 targets (P = 0.035). Significant improvement in handgrip strength was also found among the Tai Chi practitioners (P = 0.049). However, no significant within and between-group differences were found in the QOL outcomes (P > 0.05). Conclusions. Twelve weeks of sitting Tai Chi training could improve the dynamic sitting balance and handgrip strength, but not QOL, of the SCI survivors.  
**Publication type:** Journal: Article  
**Source:** EMBASE  
**Full text:** Available National Library of Medicine at Evidence-based Complementary and Alternative Medicine : eCAM

**29. Title:** Social skills: a resource for more social support, lower depression levels, higher quality of life, and participation in individuals with spinal cord injury?  
**Citation:** Archives of Physical Medicine & Rehabilitation, March 2015, vol./is. 96/3(447-55), 0003-9993;1532-821X (2015 Mar)  
**Author(s):** Muller R, Peter C, Cieza A, Post MW, Van Leeuwen CM, Werner CS, Geyh S, SwiSCI Study Group  
**Language:** English  
**Abstract:** OBJECTIVE: To examine the relevance of social skills and their different dimensions (ie, expressivity, sensitivity, control) in relation to social support, depression, participation, and quality of life (QOL) in individuals with spinal cord injury (SCI). DESIGN: Cross-sectional data collection within the Swiss Spinal Cord Injury Cohort. SETTING: Community-based. PARTICIPANTS: Individuals with SCI (N=503). INTERVENTIONS: Not applicable. MAIN OUTCOME MEASURES: Depression, participation, and QOL were measured using the Hospital Anxiety and Depression Scale, the Utrecht Scale for Evaluation of Rehabilitation-Participation, and 5 selected items of the World Health Organization Quality of Life Scale. The Social Skills Inventory and the Social Support Questionnaire were used to assess social skills (expressivity, sensitivity, control) and social support, respectively. RESULTS: Structural equation modeling was conducted. In model 1 (chi(2)=27.81; df=19; P =.087; root mean square error of approximation=.033; 90% confidence interval=.000-.052), social skills as a latent variable was related to social support (beta=.31; R(2)=.10), depression (beta=-.31; total R(2)=.42), and QOL (beta=.46; R(2)=.25). Social support partially mediated the effect of social skills on QOL (indirect effect: beta=.04; P =.02) but not on depression or participation. In model 2 (chi(2)=27.96; df=19; P =.084; root mean square error of approximation=.031; 90% confidence interval=.000-.053), the social skills dimension expressivity showed a path coefficient of beta=.20 to social support and beta=.18 to QOL. Sensitivity showed a negative path coefficient to QOL (beta=-.15) and control a path coefficient of beta=-.15 to depression and beta=.24 to QOL. CONCLUSIONS: Social skills are a resource related to more social support, lower depression scores, and higher QOL. Copyright &©x9; 2015 American Congress of Rehabilitation Medicine. Published by Elsevier Inc. All rights reserved.  
**Publication type:** Journal: Article  
**Source:** MEDLINE  
**Full text:** Available ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION at Archives of Physical Medicine and Rehabilitation
30. Title: Spinal cord injury causes chronic liver pathology in rats
Citation: Journal of Neurotrauma, February 2015, vol./is. 32/3(159-169), 0897-7151;1557-9042 (01 Feb 2015)
Author(s): Sauerbeck A.D., Laws J.L., Bandaru V.V.R., Popovich P.G., Haughey N.J., McTigue D.M.
Language: English
Abstract: Traumatic spinal cord injury (SCI) causes major disruption to peripheral organ innervation and regulation. Relatively little work has investigated these post-SCI systemic changes, however, despite considerable evidence that multiple organ system dysfunction contributes to chronic impairments in health. Because metabolic dysfunction is common after SCI and the liver is a pivotal site for metabolic homeostasis, we sought to determine if liver pathology occurs as a result of SCI in a rat spinal contusion model. Histologic evidence showed excess lipid accumulation in the liver for at least 21 days post-injury after cervical or midthoracic SCI. Lipidomic analysis revealed an acute increase in hepatic ceramides as well as chronically elevated lactosylceramide. Post-SCI hepatic changes also included increased proinflammatory gene expression, including interleukin (IL)-1alpha, IL-1beta, chemokine ligand-2, and tumor necrosis factor-alpha mRNA. These were coincident with increased CD68+ macrophages in the liver through 21 days post-injury. Serum alanine transaminase, used clinically to detect liver damage, was significantly increased at 21 days post-injury, suggesting that early metabolic and inflammatory damage preceded overt liver pathology. Surprisingly, liver inflammation was even detected after lumbar SCI. Collectively, these results suggest that SCI produces chronic liver injury with symptoms strikingly similar to those of nonalcoholic steatohepatitis (fatty liver disease). These clinically significant hepatic changes after SCI are known to contribute to systemic inflammation, cardiovascular disease, and metabolic syndrome, all of which are more prevalent in persons with SCI. Targeting acute and prolonged hepatic pathology may improve recovery and reduce long-term complications after SCI.
Publication type: Journal: Review
Source: EMBASE

31. Title: Teamwork approach to prevention and treatment of skin breakdown in spinal cord patients
Citation: CONTINUUM Lifelong Learning in Neurology, February 2015, vol./is. 21/(206-210), 1080-2371;1538-6899 (13 Feb 2015)
Author(s): Ponce De Leon M.
Language: English
Abstract: Pressure ulcers, which are localized injuries to skin and underlying tissue resulting from prolonged pressure, are a significant complication among patients with spinal cord injury. They threaten patients’ quality of life, prolong stays at health care facilities, and pose a burden on the overall health care system through increased costs. Familiarity with the risk factors for developing pressure ulcers and the methods used to treat them is paramount to decreasing their occurrence and lessening the negative impact from both a human and economic standpoint.
Publication type: Journal: Article
Source: EMBASE

32. Title: The neuropathological foundations for the restorative neurology of spinal cord injury
Citation: Clinical Neurology and Neurosurgery, February 2015, vol./is. 129/S1(S1-57), 0303-8467;1872-6968 (February 2015)
Author(s): Kakulas B.A., Kaelan C.
Language: English
Abstract: An appreciation of the neuropathology of human spinal cord injury (SCI) is a basic requirement for all concerned with the medical treatment of patients with SCI as well as for the many neuroscientists devoted to finding a cure. An understanding of the neuropathology of SCI is a necessary guide to those concerned at all levels of treatment, whether they are doctors or other health professionals. The underlying changes in the spinal cord are especially relevant to the restorative neurology (RN) of SCI. The new discipline of RN seeks to enhance the function of residual spinal cord elements which have survived the injury and so improve the patient's rehabilitative status. This is in contrast to the conventional approach in rehabilitation which works around the clinical neurological deficiencies. Following the injury a series of changes take place in the spinal cord and surrounding tissues which continue to evolve throughout the life of the patient. In flexion and extension injuries resulting from motor vehicle trauma, diving and sporting accidents the spinal cord is compressed and disrupted but usually with some continuity remaining in the white matter columns. The brunt of the injury is usually centrally placed where there is bleeding into the disrupted grey matter involving one two segments, usually cervical. The loss of central grey matter is nowhere near as important as is the tearing apart of the white matter tracts in determining the patient's clinical...
state. The central grey matter supplies one two overlapping segmental myotomes and sensory fields. In contrast loss of continuity in the long white matter tracts is catastrophic because all functions below the level of injury are affected, autonomic or voluntary either by paralysis or anaesthesia, usually both. It is important to determine the exact nature of the injury in every patient as a preliminary to treatment by RN. This assessment is both clinical and neurophysiological with special attention given to any part of the long white matter tracts which may have escaped the initial injury. It is these residual nerve fibres which provide the opportunity to improve the patient’s neurological state by being re-activated, modulated and enhanced by stimulation or by other RN methods. The conversion of a clinically complete SCI patient to being incomplete and ambulant is a tremendous improvement in the patient’s status. It is the purpose of this article to provide the reader with the essential neuropathology of SCI as a beginning point in planning treatment whether it is medical or ancillary, as well as to inform the neuroscientist about the condition being addressed in his or her research.

**Publication type:** Journal: Article

**Source:** EMBASE

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**33. Title:** The role of the serotonergic system in locomotor recovery after spinal cord injury

**Citation:** Frontiers in Neural Circuits, February 2015, vol./is. 8/FEB, 1662-5110 (09 Feb 2015)

**Author(s):** Ghosh M., Pearse D.D.

**Language:** English

**Abstract:** Serotonin (5-HT), a monoamine neurotransmitter synthesized in various populations of brainstem neurons, plays an important role in modulating the activity of spinal networks involved in vertebrate locomotion. Following spinal cord injury (SCI) there is a disruption of descending serotonergic projections to spinal motor areas, which results in a subsequent depletion in 5-HT, the dysregulation of 5-HT transporters as well as the elevated expression, super-sensitivity and/or constitutive auto-activation of specific 5-HT receptors. These changes in the serotonergic system can produce varying degrees of locomotor dysfunction through to paralysis. To date, various approaches targeting the different components of the serotonergic system have been employed to restore limb coordination and improve locomotor function in experimental models of SCI. These strategies have included pharmacological modulation of serotonergic receptors, through the administration of specific 5-HT receptor agonists, or by elevating the 5-HT precursor 5-hydroxytryptophan, which produces a global activation of all classes of 5-HT receptors. Stimulation of these receptors leads to the activation of the locomotor central pattern generator (CPG) below the site of injury to facilitate or improve the quality and frequency of movements, particularly when used in concert with the activation of other monoaminergic systems or coupled with electrical stimulation. Another approach has been to employ cell therapeutics to replace the loss of descending serotonergic input to the CPG, either through transplanted fetal brainstem 5-HT neurons at the site of injury that can supply 5-HT to below the level of the lesion or by other cell types to provide a substrate at the injury site for encouraging serotonergic axon regrowth across the lesion to the caudal spinal cord for restoring locomotion.

**Publication type:** Journal: Review

**Source:** EMBASE

**Full text:** Available Frontiers in Neural Circuits at Frontiers in Neural Circuits

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**34. Title:** Urodynamic patterns after traumatic spinal cord injury.

**Citation:** Journal of Spinal Cord Medicine, March 2015, vol./is. 38/2(128-33), 1079-0268;1079-0268 (2015 Mar)

**Author(s):** Agrawal M, Joshi M

**Language:** English

**Abstract:** Objectives To study the correlation between neurological level of spinal injury and bladder functions as detected by urodynamic study. Study design Analytical study. Setting and participants Seventy individuals with traumatic spinal cord injury (SCI) admitted to the Department of Physical Medicine and Rehabilitation, S.M.S. Medical College and Hospital, Jaipur. Detailed clinical, neurological evaluation as per American Spinal Injury Association Classification and radiological assessment were done along with clinical examination of bladder and urodynamic study. Results Out of 65 patients with suprasacral injuries, 53 (81.5%) demonstrated hyperreflexia with or without detrusor sphincter dyssynergia, 6 (9.2%) detrusor areflexia, and 6 (9.2%) had normal bladders, 41 (59.4%) low compliance (<20 ml/cmH2O), and 47 (72.30%) had high detrusor leak point pressures (>40 cmH2O). Of the five patients with sacral injuries, one (20%) showed detrusor hyperreflexia, four (80%) detrusor areflexia, and one (20%) had low bladder compliance; all five (100%) had high detrusor leak point pressures. Conclusions The correlation between somatic neurologic findings, spinal imaging studies, and urodynamic findings in patients with SCI is not exact. Therefore, bladder management should not completely rely only on clinical bladder evaluation or neurological examination alone, but should always include urodynamic studies.

**Publication type:** Journal Article
35. Title: Vocational rehabilitation in spinal cord injury: What vocational service activities are associated with employment program outcome?
Citation: Topics in Spinal Cord Injury Rehabilitation, 2015, vol./is. 21/1(31-39), 1082-0744;1945-5763 (2015)
Author(s): Ottomanelli L., Barnett S., Goetz L., Toscano R.
Language: English
Abstract: Background: Designing effective vocational programs for persons with spinal cord injury (SCI) is essential for improving return to work outcome following injury. The relationship between specific vocational services and positive employment outcome has not been empirically studied. Objective: To examine the association of specific vocational service activities as predictors of employment. Method: Secondary analysis of a randomized, controlled trial of evidence-based supported employment (EBSE) with 12-month follow-up data among 81 Veteran participants with SCI. Results: Primary activities recorded were vocational counseling (23.9%) and vocational case management (23.8%). As expected, job development and employment supports were the most time-consuming activities per appointment. Though the amount of time spent in weekly appointments did not differ by employment outcome, participants obtaining competitive employment averaged significantly more individual activities per appointment. Further, for these participants, job development or placement and employment follow-along or supports were more likely to occur and vocational counseling was less likely to occur. Community-based employment services, including job development or placement and employment follow-along or supports as part of a supported employment model, were associated with competitive employment outcomes. Office-based vocational counseling services, which are common to general models of vocational rehabilitation, were associated with a lack of employment. Conclusions: Vocational services that actively engage Veterans with SCI in job seeking and acquisition and that provide on-the-job support are more likely to lead to employment than general vocational counseling that involves only job preparation.

Publication type: Journal: Article
Source: EMBASE
Full text: Available Topics in Spinal Cord Injury Rehabilitation at Topics in Spinal Cord Injury Rehabilitation

36. Title: What would brain-computer interface users want: opinions and priorities of potential users with spinal cord injury.
Citation: Archives of Physical Medicine & Rehabilitation, March 2015, vol./is. 96/3 Suppl(S38-S45.e5), 0003-9993;1532-821X (2015 Mar)
Author(s): Huggins JE, Moinuddin AA, Chiodo AE, Wren PA
Language: English
Abstract: OBJECTIVES: To identify perceptions among people with spinal cord injury (SCI) of the priorities for brain-computer interface (BCI) applications and design features along with the time investment and risk acceptable to obtain a BCI. DESIGN: Survey. SETTING: Research registry participants surveyed via telephone and BCI usage study participants surveyed in person before BCI use. PARTICIPANTS: Convenience sample of people with SCI (N=40), consisting of persons from the registry (n=30) and from the BCI study (n=10). Participants were classified as those with low function (n=24) and those with high function (n=16). INTERVENTIONS: Not applicable. MAIN OUTCOME MEASURES: Descriptive statistics of functional independence, living situations and support structures, ratings of importance of different task and design features, and acceptable levels of performance, risk, and time investment. RESULTS: BCIs were of interest to 96% of the low-function group. Emergency communication was the top priority task (ranked in the top 2 by 43%). The most important design features were "functions the BCI provides" and "simplicity of BCI setup." Desired performance was 90% accuracy, with standby mode errors no more than once every 4 hours and speeds of more than 20 letters per minute. Dry electrodes were preferred over gel or implanted electrodes (P<.05). Median acceptable setup time was 10 to 20 minutes, satisfying 65% of participants. CONCLUSIONS: People with low functional independence resulting from SCI have a strong interest in BCIs. Advances in speed and setup time will be required for BCIs to meet the desired performance. Creating BCI functions appropriate to the needs of those with SCI will be of ultimate importance for BCI acceptance with this population. Copyright © 2015 American Congress of Rehabilitation Medicine. Published by Elsevier Inc. All rights reserved.
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