



CL-01

INVESTIGATING THE IMPACT OF PRE-AMPUTATION OCCUPATIONAL STATUS ON THE REHABILITATION AND QUALITY OF LIFE OF UPPER LIMB AMPUTEES EXPERIENCING PHANTOM LIMB PAIN

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Hypothesis: Does Pre-Amputation Occupational Status affect upper limb prosthetic use and phantom pain?

Methods: Cross-sectional study. Occupational Status measured by Hollingshead Index. Classified into 2 groups by scores-“upper occupational status” or “lower occupational status.” Prosthetic use-hours/week. All amputations WSIB. 7 subjects were from tertiary trauma center. Prosthetic Evaluation Questionnaire (PEQ), Visual Analogue Scale (VAS), & Beck Depression Inventory-2 (BDI-2) were administered.

Demographics:

Age	38 (26-51)
Sex	14% Female (1/7)
Marital Status	57% married (4/7)
Post Secondary Education	43 % (3/7)
Transradial	86% (6/7)
Transhumeral	14% (1/7)
<1 year amputation	28% (2/7)
Low occupational status	72% (5/7)
High occupational status	28% (2/7)

Results:

Prosthetic Use #hrs/week	34.9
Prosthetic satisfaction (0-10)	5.3
Pain experience (0-10):	
Phantom Pain	1.9
Limb Pain	2.1
Beck Depression	30.4
*>31 severe	
Return to work	28% (2/7)
- Myoelectric	43% (3/7)
- Body-Powered	43% (3/7)

Conclusions:

1. Upper limb amputees with phantom limb pain low rates of prosthetic use.
2. Main problem prosthetic use: appearance & low sense well being.
3. High rate of moderate depression.
4. Despite funding WSIB only 29% (2/7) returned to work.
5. Level of occupational status not variable for return to work.

M. E. S. H: *phantom limb pain, employment, and upper limb amputee.*



CL-02

THE EFFECTS OF MASSAGE THERAPY ON THE PHYSICAL, PSYCHOLOGICAL AND SOCIAL WELL BEING OF MULTIPLE SCLEROSIS

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Hypothesis: Evaluate effect of massage on physical, psychological and social well being adult multiple sclerosis (MS).

Methods: Retrospective cohort study comparing Quality of Life (QOL) scores before and after massage therapy. QOL measured Functional Assessment of Multiple Sclerosis (FAMS).

101 MS (71 women, 30 men) age 25-80years receiving massage MS clinic between Oct 2001-Feb 2005. All 1-hour Swedish massage 1x/week for 6-8 weeks, by massage students (Kikkawa International Complementary Therapies School). Pre and post massage FAMS compared using Wilcoxon Sign Rank test in SPSS.

Results:

1. Massage improve mobility in MS (p=0.035)
2. Massage reduce family & social well being (p=0.010)
3. Benefits of massage:
 - Alleviates fatigue (p=0.001)
 - Decreases pain (p=0.027)
4. Women reduced family & social well being (p=0.009)
5. Men improved mobility after massage (p=0.002)
 - Sample divided by age:
 - 53 and under (N=49)
 - 53 and over (N=52)
6. Patients older than 53 (N=52) improved mobility (p=. 0001) but reduced family and social well being (p=0.017)

Conclusions: MS massage influenced gender & age. Massage beneficial men over 53 years-improved physical and mobility related social well being. Women over 53 years massage detrimental family support & related social well being.

M. E. S. H: *multiple sclerosis, massage, quality of life, and program evaluation.*



CL-03

SELF ESTEEM AND BOWEL MANAGEMENT IN ADULT SPINA BIFIDA

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Hypothesis: To examine the relationship between self esteem and the use of either the Shandling enema continence catheter (SECC) or percutaneous cecostomy (PC) for management fecal incontinence in 10 adult spina bifida (20-23 years).

Methods:

(Observational cross sectional study.)

Exclusion criteria: severe cognitive impairment.

Self-esteem assessed Rosenberg Self Esteem Scale.

2 study groups (n=5 per group) SECC or PC.

SPSS statistical analysis relation between self-esteem and 2 management systems. T-test compare RSE of two techniques. $P < 0.05$ statistical significant.

Qualitative methods analyze nonrated questions by coding & identifying emerging themes.

Results:

	Shandling Enema (N=5)	Percutaneous Cecostomy (N=5)
Age	21-23 years	20-21 years
Male	3	2
Female	2	3
Wheelchair	5	5
High School	3	3
College	2	2
Years using device	16	6.4
Mean RSE score	24.6	28.6

* $P=0.036$ (significant)

Qualitative analysis:

Percutaneous cecostomy had fewer accidents, shorter bowel routine and more independence.

Conclusion:

1. PC higher level of self-esteem than SECC.
2. Main advantage PC is: easier to use, cleaner, less time and more degree of independence.
3. PC more invasive and needs annual maintenance.
4. Further research should explore other methods of managing fecal incontinence in spina bifida.

M. E. S. H: *Spinal dysraphism, self-concept & fecal incontinence*



CL-04

RECOGNIZING AND REDUCING CORONARY ARTERY DISEASE IN PERSONS WITH SPINAL CORD INJURY

Paul Winston, MD, Cathy Craven, MD

Objective: To identify the multiple risk factors for coronary artery disease (CAD) in persons with Spinal Cord Injury (SCI), and to develop a clinical guideline and screening tool for physicians with the goal of preventing adverse outcomes.

Method: A literature review to identify risk factors for CAD in SCI. Consultation of specialists in cardiac rehabilitation and endocrinology for expert opinion for management.

Results: Cardiovascular events are the leading cause of death for the SCI patient post the rehabilitation phase. Silent, asymptomatic CAD is very common and may be missed. Persons with SCI have multiple risk factors for CAD and are at high risk for developing the metabolic syndrome. The lack of innervation of the heart and muscle tissue may lead to adverse outcomes that are not recognized by clinicians. Risk factors include impaired cardiovascular innervation, immobilization, obesity, adiposity, poor diet, low physical activity, hyperinsulinemia and dyslipidemia. Due to the medical complexities of SCI, many of these risks may not be properly assessed by routine methods of testing. A simple screening guideline and worksheet for the clinician is proposed to aid in early detection and prevention strategies.



CL-05

IMMOBILIZED TENDONS, THEY ATROPHY, OF COURSE!...OR DO THEY?

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Objective: To assess the effects of 2 months of unloading of the lower limbs on Achilles tendon dimensions.

Methods: 24 healthy female volunteers underwent bed rest with the head down 6 degrees for a duration of 60 days. They were divided in groups consisting of exercise (E) control (C) or leucin-rich diet (L) (each n=8). An experienced ultrasonographer (PA) assessed both Achilles tendons of all subjects before entering and at the conclusion of the study. Surface ultrasound probes recorded AP and lateral dimensions 2 and 4 cm from the calcaneal insertion. The average reconstituted volumes of both tendons were compared between the beginning and the end of bed rest with two-sided paired t-tests.

Results: All tendons combined, the average tendon volume between 2 and 4 cm increased from $1.81\text{mm}^3 \pm 1\text{sem}$ (0.05mm^3) to $1.98\text{mm}^3 \pm 0.05\text{mm}^3$ after 60 days of bed rest, $p < 0.05$. In all three groups, the tendon volume increased by 10%, 7% and 11% for the E, C and L groups respectively, the difference reaching statistical significance in the nutrition group only.

Conclusion: Many musculoskeletal structures will atrophy when inactive. In this respect the measured increase in tendon volume is peculiar. This result correlates with results obtained in other experimental models. The reason for the increase may be the altered tenocyte metabolism toward a remodeling process involving collagenolysis. The strength of the larger tendon is likely not increased and may even be decreased. The larger tendon size may mislead the rehabilitation clinician in the evaluation of the readiness of a tendon to return to activity.



CL-08

SURVEY OF THE SNAPPING HIP SYNDROME IN ELITE BALLET DANCERS

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Objective: To determine the prevalence, frequency, impact and causative movements of snapping hip syndrome among elite ballet dancers.

Design: Cross-Sectional Prevalence Study.

Methods: A 34-item questionnaire created to delineate the syndrome was distributed to 87 unselected elite level ballet dancers. All are members of either the National Ballet of Canada or the National Ballet School and are age 16 years and older. Out of a total population of 123 dancers, 92 surveys were distributed in person to the dancers who were present on one day at each institution. 95% were returned. Outcome measures include: Presence of a snap, frequency, pain on visual analogue scale, timing of pain, ability to reproduce voluntarily, disability, causative movements.

Results: Almost all of the dancers (91%) dancers reported snapping hip of which most (80%) were bilateral. More than half (58%) had pain associated with the snap though infrequently. Nearly two thirds of the dancers can voluntarily snap their hip, and will attempt to snap on purpose, mainly to free hip. Only a small percentage of dancers had taken time off dancing due to snapping hip. Three commonly performed specific dance movements caused the snapping in the large majority of dancers.

Conclusions: Snapping hip syndrome is extremely common among ballet dancers. It is largely an asymptomatic bilateral event in most dancers, with minimal pain and disability reported in this population.

Key Words: dancing, hip injuries, tendons, questionnaires.



CL-09

ULTRASOUND AND PHYSICAL EXAMINATION OF THE SNAPPING HIP SYNDROME IN ELITE BALLET DANCERS

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Objective: To determine the cause of snapping hip syndrome in ballet dancers and test the usefulness of physical examination techniques and real-time ultrasound in making the diagnosis.

Study Design: Diagnostic Case Series.

Methods: Participants: 26 elite ballet dancers with 50 self-reported snapping hips selected from a group of 87 dancers who had completed our snapping hip survey. Each dancer reported they could voluntarily reproduce the snap. Three physical examination techniques recommended in the literature were performed then the dancer voluntarily reproduced the snap. Ultrasound examinations of all hips were performed anteriorly and laterally. Outcome measures: Audible or palpable snap felt by examiner with each technique. Snapping identifiable on ultrasound.

Results: Voluntary reproduction by the dancer produced a snap in 46 hips, in contrast to 12 hips with the recommended maneuvers. Inter-rater reliability for the recommended maneuvers was poor, but consistent for the voluntarily produced snap. Ultrasound diagnosed a snapping iliopsoas tendon in 59% of the hips and the iliotibial band in 4%. A snap was felt by the radiologist through the transducer but not visualized in an additional 17%. Pain was an uncommon feature during the examinations.

Conclusions: Iliopsoas snapping hip is very common in ballet dancers. Dancer reproduction of the snap was far more useful than recommended examination techniques. Ultrasound was very useful in visualizing iliopsoas snapping hip. Iliotibial band snapping was evident by physical examination and ultrasound. The snapping was largely asymptomatic.

Key Words: dancing; hip injuries; tendons; ultrasonic diagnosis.

Funding Source: \$600 Budget provided by the Resident Research Fund by the Division of Psychiatry at the University of Toronto.



CL-10

ORTHOSTATIC HYPOTENSION AND PAIN IN ACUTE CERVICAL SPINAL CORD INJURY

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A positive relation between autonomic disturbance and pain in individuals with cervical spinal cord injury (SCI) is suggested by the recent literature. We examined the association of orthostatic hypotension (OH) and acute pain report in three individuals with acute traumatic cervical SCI. OH was defined by a decrease in systolic blood pressure of 20 mmHg with head-of-bed elevation to 60 degrees and a comprehensive pain measure consisting of standard numerical rating scales was administered to evaluate neuropathic and nociceptive pain perception on Day 7 and Day 14 following acute SCI admission.

The two individuals with incomplete cervical injuries (C2 ASIA C, C4 ASIA C) demonstrated mild OH only within the first week following SCI. In the individual with complete C6 ASIA A injury, OH persisted for one month following acute injury and pain was moderately severe for both nociceptive and neuropathic (dysesthetic only) symptoms. Neuropathic pain was moderately intense for thermal, dysesthetic and paroxysmal properties in the individual with C4 ASIA C injury. By contrast, pain was minimal or absent, regardless of type, in the C2 ASIA C injury.

Three individuals with acute cervical SCI injuries and neurological deficit presented with pain symptoms of varying type (neuropathic, nociceptive) and properties. Complete SCI and persistent OH was accompanied by severe and multiple pain symptoms. Further studies will determine which pain types and properties at acute SCI are associated with central autonomic disturbance such as OH to better understand the association of internal regulation of pain, and to more precisely direct treatment and rehabilitation efforts. (Supported by Rick Hansen Man in Motion Foundation)



CL-11

SHOULD WHEELCHAIR SKILLS TRAINING BE OFFERED TO LONG-STANDING WHEELCHAIR USERS? A HYPOTHETICAL CASE REPORT

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In this report, we present a hypothetical case of a wheelchair-related fall and review the evidence for wheelchair skills training. Two weeks after a routine follow-up in Spinal Cord Injury Clinic, a 52-year-old female with a 5-year history of T8 complete paraplegia, sustained a comminuted right distal tibia/fibular fracture, as a result of a tip and fall accident from her wheelchair. Following this injury, during a subjective appraisal of her wheelchair skill capabilities, she described her skills as only being “fair” and being unable to perform a wheelie. On review of the wheelchair skills training literature, the use of formal wheelchair skills training programs to improve the performance of first-time wheelchair users and experienced community wheelchair users is clearly supported. This case suggests that wheelchair skills should be routinely inquired about, and preferably observed, as a routine part of the functional ADL history, even in long-standing wheelchair users. When a wheelchair user’s current skill level seems less than appropriate, formal training should be offered.



CL-12

DO HERBAL AGENTS PROVIDE PAIN RELIEF? A RANDOMIZED CONTROLLED PILOT STUDY

Gordon Ko, MD

Objective: To test that topical O24 essential oils are superior to placebo in fibromyalgia (FMS) patients.

Design: Double blind, randomized placebo-controlled study (RCT).

Setting: Physiatry outpatient clinics.

Participants: 153 subjects meeting the American College of Rheumatology criteria for FMS.

Intervention: Treatment period of one month with use of topical O24 essential oils or placebo (peppermint oil which was identical in smell and consistency). Oils were applied into tender areas four times per day. Topical O24 consists of a proprietary blend of seven essential oils (aloe vera, camphor, eucalyptus, lemon, orange, peppermint, rosemary). One bottle contains 30 ounces (120 full sprays).

Main outcome measures: Primary end points: Pain visual analogue scale (VAS) ratings and diary, Fibromyalgia Impact Questionnaire (FIQ), Jamar grip strength, Pressure algometry measurements of tender point pain threshold and number of tender points. Secondary end points: Seven point Lanier rating (from 1 markedly worse to 7 markedly better) of treatment and tolerability of the oils.

Results: In the 133 participants (65 active, 68 placebo) with complete data, the active (over placebo) demonstrated improvements in the VAS night pain ($p=.018$), Jamar grip strength ($p<.001$), number of tender points ($p<.001$) and average tender point pain threshold ($p<.001$), and the Lanier scale ($p=.001$) rated 5.6 as mildly to moderately effective. No significant differences were noted with the FIQ or VAS activity pain scores. 43 participants (19 placebo and 24 active) complained of smell sensitivity. Only 1 active and 1 placebo participant complained of skin irritation.

Conclusion: This pilot RCT suggests that FMS patients may be effectively and safely managed for pain with topical O24. This would need to be confirmed with larger and longer randomized controlled trials. Topical O24 essential oils may have a clinically important effect in chronic pain syndrome.

Key words: Fibromyalgia Topical Herbals Rehabilitation Alternative Medicine



CL-14

CARDIOVASCULAR CONTROL AND POST-EXERCISE HYPOTENSION FOLLOWING ARM CYCLING EXERCISE IN SUBJECTS WITH SPINAL CORD INJURY

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Objective: Spinal cord injured (SCI) individuals are prone to unstable blood pressure control. We aimed to examine post-exercise hypotension (PEH) in individuals with SCI.

Methods: Individuals with chronic cervical (n=19; 18 male; aged 39±2 years) and thoracic (n=8, 5 male; aged 32±3 years) SCI were studied. Subjects underwent graded arm cycling with continuous ECG and breath-by-breath oxygen uptake monitoring until peak oxygen uptake was attained. Before and after exercising we measured heart rate and blood pressures. Motor and sensory function was determined by ASIA score in all subjects, and autonomic function by sympathetic skin responses (SSR; n=16).

Results: Resting blood pressures and heart rates were lower in cervical than thoracic SCI (mean arterial pressure [MAP]: cervical 77±2 and thoracic 93±3 mmHg; p<0.001). Heart rate responses to exercise were greater in thoracic SCI (159±4 versus 105±4 bpm; p<0.001). There were no significant ECG abnormalities in any subject. MAP increased following exercise in thoracic SCI (+8±4mmHg) and decreased in cervical SCI (-9±2mmHg), p<0.001. After exercise there was a marked transient decrease in blood pressure in cervical (MAP 67±3 mmHg) but not thoracic SCI (MAP 102±3mmHg), p<0.001. There were significant correlations between the maximal heart rate response to exercise, the blood pressure immediately after exercise, and the integrity of SSR.

Conclusions: Cardiovascular responses to exercise were abnormal and transient PEH was common in subjects with cervical, but not thoracic SCI. This may be related, at least in part, to the loss of descending sympathetic nervous control of the heart and vasculature following high SCI.

This work was supported by a grant from the Rick Hansen Man In Motion Research Foundation.



CL-15

HIGH PREVALENCE OF MALNUTRITION FOLLOWING STROKE: ARE THE ESTIMATES VALID?

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Objective: Malnutrition among patients hospitalized following stroke is common and has been associated with poor outcomes. Therefore, it is important to identify correctly those who are undernourished so that appropriate interventions can be initiated. While a wide variety of methods are used to identify malnutrition, there is no gold standard for its assessment. Furthermore, the underlying limitation of many commonly used nutrition indicators is their inability to differentiate between nutritional status and the metabolic consequences of disease. The purpose of this study was to survey the published literature to identify studies in which the nutritional status of patients was assessed during hospitalization following stroke and to determine the consistency and validity of the methods used for assessment.

Methods: Using results from a recent systematic review, eight studies were identified. Six studies evaluated nutritional status upon admission to hospital, one conducted the assessment at the point of transfer to a rehabilitation unit, and the timing of assessment was not stated in the remaining study.

Results: The reported frequency of malnutrition ranged from 9-62%. Only one study used an assessment tool that had been previously validated, although not among patients who had experienced stroke. While similar nutritional indicators, such as serum albumin and weight, were used as part of the assessment procedure in the remainder of the studies, there was poor consistency between studies with respect to both the number of abnormal indicators and the cut-off points used for the identification of malnutrition.

Conclusions: The wide range of estimates describing the prevalence of malnutrition may be explained in part, by the heterogeneity of nutritional assessment techniques. These findings indicate the need to develop a valid and reliable nutrition assessment tool appropriate for use in the stroke population.

This research was funded by a grant from the Heart and Stroke Foundation of Ontario.



CL-16

FOCAL DYSTONIA IN A MUSICIAN: AN EXERCISE APPROACH TO SUCCESSFUL MANAGEMENT

P.J. Potter, MD

A 70 year old, piper was seen in musician's clinic for complaints of incoordination of the left long finger. He described a 20 year history of focal dystonia in which the long finger would remain fixed to the chanter of the Great Highland Bagpipe and could not be extended either individually or in with the index finger. Covering the corresponding sound hole with tape and thereby eliminating the need for sustained precise placement of the finger resulted in resolution of the symptom. Other musical instruments such as piano could be played without dystonia occurring. In this scenario, botulinum toxin is a commonly recommended but not affordable approach. In consideration of, whether botulinum injection would be effective, it was hypothesized that a temporary effect mimicking botulinum could be achieved by fatiguing the muscles in question. This was achieved by performing enough focused resistance exercise required to produce adequate fatigue and then playing. The expectation was that there would be temporary improvement. The result has been the ability to play up to 60 minutes. To quote the patients measure of outcome "This is the first time in 20 years I have been able to play using all 8 fingers and I thank you for helping me across the river from the state of depression and despair to the state of hope and contentment." From a physician's perspective what was possibly a test for efficacy of injection treatment became an effective therapeutic intervention.



CL-17

THE PHYSICS BEHIND PRESSURE ASSOCIATED SYMPTOMS RESULTANT FROM PERFORMANCE ON A DOUBLE REED INSTRUMENT

P.J. Potter, MD

Within a clinic devoted to medical problems of performing artists it is not uncommon to be presented with impairments which, are common to use of a musical instrument but do not occur otherwise. In the playing of the Great Highland Bagpipe, a constant flow of air is sustained between compression by the left arm and blowing. The effect of repetitive and sustained blowing to maintain a constant pressure of 1 psi and physical effort approaching 3 mets, renders some musicians unable to play due to sequelae which can include headaches, vertigo, back pain and inability to adequately blow. Airflow, when optimized is approximately 30 liters per minute. Sequelae vary according to physiologic status of the symptomatic areas especially in the presence of other impairments which may range from palatal insufficiency to spodylolisthesis (vasalva effect).



CL-18

FOCAL DYSTONIA IN A MUSICIAN'S HAND: EXERCISE VERSUS BOTULINUM TOXIN

P.J. Potter, KS Sequeira

A 73 year old musician presented with an 18 month history of onset of hand pain secondary to generalized osteoarthritis accompanied by the tendency for the left index and ring finger to curl, much like writer's cramp after approximately 10 minutes of musical performance on the Great Highland Bagpipe. Hand pain responded partially to NSAIDS. Finger dystonia was only present during performance with symptoms of curling not apparent during any other activity. We initiated a protocol of muscle fatigue by resistance exercise which initial success however with the daily approach required the pain due osteoarthritis became a limiting factor in utilizing the performing the exercises to fatigue. A series of approaches to resistance exercises were unsuccessfully tolerated. As an adjunct to the exercises and retraining, under emg guidance, botulinum toxin was therefore injected flexor digitorum profundus and flexor digitorum sublimis. The musician has found that with the reduction in tone joint pain decreased allowing for a successful combination approach of botulinum toxin, exercise of the affected muscle groups to fatigue followed by retraining. Greater than 30 minutes continuous performance is now easily met.



CL-19

ASSESSING AND PREDICTING SUCCESSFUL TUBE PLACEMENT OUTCOMES IN ALS PATIENTS

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Background: A significant problem for ALS patients is maintaining adequate nutrition in the face of dysarthria, oromotor weakness, reduced upper extremity function and significant fatigue. Although bulbar patients are clearly at risk of malnutrition due to dysphagia, we have found that nonbulbar patients are at similar risk. Many patients opt for feeding tube placement to augment and eventually replace oral feeding. Despite promoting early tube placements while patients are in ‘better’ health, they often delay these decisions which increases patient risk.

Objectives: To determine at which point the risks outweigh the benefits of tube placement by reviewing outcomes against parameters of respiratory function, nutritional status and speech and swallowing deterioration.

Methods: A retrospective review of all consecutive feeding tube placements in an ALS outpatient clinic between January 2000 and 2005 was performed. Data was obtained from medical records describing respiratory function, nutritional status, and speech and swallowing function at time of tube placement.

Results: A statistically significant association ($p = 0.0058$) between nutritional status (% change in usual body weight UBW) and successful tube placement outcomes i.e., > 1 month survival post tube placement was found. The odds of a successful outcome in the subjects who were $\geq 74\%$ UBW were about 11 times as likely than the odds of a successful outcome in subjects with $< 74\%$ UBW. No association was found between variables of respiratory status (FVC) ($p = 1.000$), speech ($p = 0.4243$) and swallowing ($p = 0.4943$) (ALS Severity Score (ALSS)) outcomes. The number of deteriorated variables present per patient was not associated with success of outcomes.

Discussion/Conclusions: The only variable of statistical significance was that of nutritional deterioration, i.e., reduction in usual body weight below 74%. Trends in data indicate a 100% success rate for outcomes occurred with ALSSS for Speech and Swallowing greater than 7. These scores correspond to mild impairments, supporting early tube placement well before dysphagia impacts total oral intake. No association was found between tube placement outcomes and variables of respiratory, speech and swallowing function.

Funding Source: William G. Fraser Rehabilitation Research Award 2004.



CL-20

HOPE AND SPIRITUALITY IN STROKE REHABILITATION

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Objective: To examine the relationships between spirituality, hope and stroke rehabilitation.

Methods: We recruited rehabilitation inpatients post-stroke with a minimal score of 5/7 on the CIHI Functional Independence Measure [FIM] Comprehension and Expression sub-scales. After patients completed an informed consent, a study assistant administered the Spiritual Well-Being Scale (SWB), the Herth Hope Index (HH), the Stroke Impact Scale (SIS), and the Barthel Index at baseline and after discharge from the rehabilitation unit. Possible SWB scores range from 20 to 120 and HH scores range from 12 to 48 with higher scores indicating greater spirituality or hope. Both SIS and Barthel have maximum scores of 100 with greater scores indicating less disability.

Results: 35 subjects completed the initial assessment and 25 patients (16 M: 9F) completed the follow-up. Mean (s.d.) scores at baseline were SIS 57.6 (12.74), Barthel 70.0 (20.26), SWB 85.6 (14.18), and HH 38.7 (4.16). Mean stroke improvement was SIS +16.8 and Barthel +17.4. SWB and HH scores were significantly correlated ($r=-0.73$, $p< 0.0001$). Baseline SWB and HH were not significantly associated with subsequent change in the SIS and/or Barthel scores. HH at baseline and change in SIS were inversely correlated ($r=-0.34$) but the relationship was not significant ($p=0.097$). Change in HH was also correlated with change in SIS ($r=0.364$) but the relationship was not significant ($p=0.074$).

Conclusion: Our study revealed a significant correlation between spiritual well-being and hope in post-stroke patients as measured by the SWS and HH. Because of the large number of subjects who did not complete the study, the study was underpowered. We were not able to identify a significant correlation between baseline spiritual well-being or hope and subsequent stroke recovery as measured by changes in the SIS or Barthel scores. However, there were some interesting interrelationship trends worth pursuing in future studies.



CL-21

CAN CLINICAL IMAGING PREDICT THE ABILITY OF A HUMAN ACHILLES TENDON TO SUSTAIN TENSILE FORCE?

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Objective: To assess the value of clinical imaging in evaluating human Achilles tendon strength in a cross-sectional study.

Methods: 102 Achilles tendons from 51 consecutive autopsies (27 male, 24 female, mean age 66 years) were assessed. Anterior-posterior (AP) diameter on ultrasound and MRI (mm), cross-sectional area (CSA) on MRI (mm²) and T1 optical density were measured for each tendon. The bone mineral density (BMD) of the whole calcaneus (gm/cm²) was recorded. The tendons were mechanically tested to determine peak load (N) at failure.

Results: Mean AP diameter on ultrasound and MRI was 6.9 ± 1.4 mm and 7.0 ± 1.2 mm respectively. Mean CSA on MRI was $79.8 \pm \text{mm}^2$ and mean BMD was 0.69 ± 0.18 gm/cm². AP diameter was larger with increased height ($p < 0.05$). CSA and BMD decreased in females and subjects of lower weight and height (all $p < 0.05$). BMD decreased with age ($p < 0.05$). 58% of tendons ruptured in their midsubstance with a mean peak load of 4722 ± 990 N. For these tendons, there was no significant relationship between any of the subject descriptors or outcome measures and the peak tendon load (all $p > 0.05$).

Conclusion: Based on this study, current clinical imaging cannot accurately predict a tendon's ability to return to activities.

This study was supported by the Workplace Safety and Insurance Board of Ontario.



CL-22

IMPLANTATION AND FOLLOW-UP OF INTRATHECAL BACLOFEN PUMP: TEN YEARS OF EXPERIENCE OF A SINGLE URBAN MEDICAL CENTER

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Long-term continuous intrathecal baclofen infusion via an implantable pump (ITB) is a treatment option used to manage intractable spasticity. In this single-center retrospective review (1996-2006), we are reporting on the experience of the tertiary medical center with two neurosurgeons responsible for pump implantations and revisions. During this period, 312 individuals were referred to the center as possible pump candidates. 141 individuals were tested with intrathecal baclofen. In 10 years, a total of 43 new baclofen pump patients were implanted, not including 9 pumps adopted from the children's program in British Columbia or patients who moved from other provinces. During this time there were 16 pump replacements due to low battery, and 12 catheter revisions. We would like to acknowledge that Medtronic made continuous recommendations to our program for surgical implant techniques and provided us with new product revisions. Presently, our pump program is managing a total of 41 pumps: including spinal cord injury (39%) followed by multiple sclerosis (34%), cerebral palsy (12%) and others (15%). The median age at implantation was 41 years (range 19 to 60). Twenty-two (54%) recipients were male, and nineteen (46%) were female. Eight new pump candidates are waiting to be implanted. During 165 recipient-years of pump operation, 8 treatment-associated adverse events occurred: 7 from withdrawal and 1 from an overdose. There were a total of 16 device-related complications/revisions: 80% were catheter related. There were 4 cases with postoperative infections. In two of these cases the pump had to be removed. Numerous issues with pump and catheter positioning during implantation were addressed by Medtronic's latest recommendations. There were six deaths unrelated to ITB. With 10 years of pump experience and data collecting, we may assist in establishing a patient selection criteria and treatment goals, improving patient follow-up, and monitoring adverse events.



CL-24

ECONOMIC BURDEN OF PAIN DUE TO MULTIPLE SCLEROSIS IN CANADA

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Objectives: Multiple Sclerosis (MS) is a chronic disease affecting 100 to 240/100,000 in Canada. It is often associated with severe pain, the prevalence of which ranges from 10%-80% (average~50%). Pain impacts negatively on patient wellbeing, as well as costs to patients and the healthcare system. We determined the prevalence and societal burden, of pain due to MS in Canadian patients.

Methods: After approval from an independent ethics review board, patients were recruited through the MS society and from individual participating hospitals. Epidemiologic and costing data over the previous six months were collected from 297 patients by telephone interviews. Mean total cost per patient was calculated.

The burden was extrapolated to the Canadian population using national demographics and prevalence rates. Trends were analyzed, using Spearman's Rho, for relationships between cost, Expanded Disability Status Scale (EDSS) levels and pain severity.

Results: The average age was 49 (± 11) years, with 77% females; average age at diagnosis of MS was 37 \pm 10 years. The prevalence of pain due to MS was 71% (211/297). The mean severity level was 6.8 as measured by the BS-11 scale with a median of 4.5. While no relationship was observed between either the clinical form of MS or EDSS level with the number of patients reporting pain, a significant positive trend was observed between total cost and EDSS levels (Rho=0.170, p=0.014) and pain severity measured by the BS-11 scale (Rho=0.291, p=0.0001). The mean estimated total (direct and indirect) cost per patient experiencing pain was \$3,198 \pm \$5,965 over the 6-month period. The projected six-month burden for Canada was \$65,034,679.

Conclusions: The burden of pain due to MS in Canada is high to both patients and society. Cost increases with EDSS level and pain severity.

Funding Sources: Bayer Inc.



CL-25

PAIN PERCEPTION IN MANUAL WHEELCHAIR USERS

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Objective: To determine whether perception of shoulder pain is different in adults who began using a wheelchair as a child (CHO) than in adults who began wheeling as an adult (ADO), using multidimensional pain measures.

Methods: Sixteen subjects (8 from each group) performed 5 selected activities that have reported to elicit shoulder pain (wheel up ramp, wheel 10 min, pick up object overhead, transfer in to car and transfer wheelchair into car).

Four questionnaires were administered: The Brief Pain Inventory, the Wheelchair Users Shoulder Pain Index, the Pain Catastrophizing Scale, and the Pain Anxiety Symptom Scale. The nonverbal facial analysis used Ekman and Friesen's Facial Action Coding System (FACS).

The subject selected an activity at random, performed the activity, and reported the pain experienced during the activity using a numerical rating scale. The subject's face and body were video taped during the activity for FACS analysis.

Results: When the time sampled facial activity is combined across the 5 activities, there was a significant difference between ADO and CHO participants ($t = 2.10$, $df = 14$, $p = .05$), with mean facial activity for ADO ($X = 139.19$) greater than CHO ($X = 63.69$). It is noted that there was substantial within group variability. For the Pain Anxiety and Pain Catastrophizing measures, there was no difference between the two groups. The ADO had a negative correlation of self report pain to FACS ($-.287$) while the CHO had a positive correlation ($.345$).

Conclusion: The results indicate that there is a significant difference in pain experienced between the ADO and the CHO groups. Further research is needed to explore the reason why the difference. Do the CHO wheel differently? Is there joint remodeling that occurs early in childhood development in response to increased shoulder stresses?

Funding: British Columbia Medical Services Foundation administered by the Vancouver Foundation.



CL-26

FALL RISKS AND PREVENTION IN THE INPATIENT REHABILITATION UNIT IN SASKATOON

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Objectives: To study the characteristics of falls in our inpatient rehabilitation population, assess the frequency and nature of injuries, identify risk factors predictive of falls, and to extrapolate fall preventive strategies.

Methods: In this retrospective cohort study, all patients admitted to the Saskatoon City Hospital (SCH) rehabilitation unit (24 bed inpatient unit) from January 2001 to June 2005 were examined. During this time, 995 patients were admitted. Incident reports were completed on patients who experienced a fall and resultant injuries documented. A database for falls was developed and a fall prevention program was implemented in December 2002.

Results:

- 162 patients (16%) experienced a total of 234 falls.
- 45% of falls were in patients who had fallen before (repeat fallers).
- The prevalence of falls was 20% among stroke patients, 15% in spinal cord injury (SCI) patients and 10% in brain injured patients.
- 81% occurred in the patients' rooms or bathrooms, especially at the toilet.
- Peak times of falls were between 0800-1200 and 1600-2000.
- There was a reduction in bathroom falls by 45.4% after adapting the fall prevention program.



CL-27

WHEELCHAIR-RELATED THUMB INJURY OF MULTIFACTORIAL ETIOLOGY: A CASE REPORT

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We present a previously unreported type of wheelchair injury that illustrates the interrelated importance of adherence to accessibility guidelines, of good wheelchair prescription and of proper wheelchair training.

The patient was a 56-year-old male with bilateral transtibial amputations secondary to peripheral vascular disease and diabetes. While using a hospital-owned wheelchair to descend a long 5.6° slope in an underground tunnel connecting the rehabilitation centre to a neighboring acute-care facility, the patient had difficulty slowing the wheelchair to negotiate a turn. After sustaining burns on the palmar aspects of the thumbs due to friction against the metal handrims, he shifted his thumbs onto the treaded tires. This pulled his right thumb between the brake and the tire of wheelchair. The resulting laceration and small chip fracture of the dorsal aspect of the thumb metacarpal required immobilization.

We view this as an injury that could have been prevented if the ramp slope had not exceeded the recommended upper limits, if the brakes had been retractable, if the patient had been wearing gloves and/or if the patient had used appropriate procedures for descending long, steep inclines. This case has several implications for the wheelchair-delivery system.



CL-28

THE EXPERIENCE OF LIVING WITH STROKE: A QUALITATIVE META-SYNTHESIS

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The effects of stroke on the stroke survivor are profound and cannot be adequately understood from a single approach or point of view. Use of qualitative study, in addition to quantitative research, provides a comprehensive picture of the consequences of stroke grounded in the experience of stroke survivors. This expanded understanding of stroke is essential in the development of stroke interventions and services relevant to the individual stroke survivor. The present study represents an attempt to provide a meta-synthesis of qualitative studies exploring the experience of living with stroke.

Method: A literature search was conducted to identify qualitative studies focused on the experience of living with stroke. Themes and supporting interpretations from each study were compiled and reviewed independently by two research assistants in order to identify recurring themes across studies.

Results: From 7 qualitative studies, 5 recurring themes were identified as follows: 1) Change, Transition and Transformation 2) Loss 3) Uncertainty 4) Social Isolation 5) Resiliency, Adaptation and Hope. All themes appeared to interact to a degree while two, transition and loss, are echoed throughout.

Conclusion: The present analysis suggests that stroke represents a sudden transition for the survivor and a sense of loss is dominant. However, with the encouragement and comfort of supportive social relationships, stroke survivors may move forward through adaptation toward recovery. Meta-synthesis of qualitative research is needed to promote the inclusion of what we know about patient preferences and values in evidence-based practice.



CL-29

**DIFFERENCES BETWEEN POST-STROKE DRIVERS AND NON-DRIVERS:
MEDICAL ATTRIBUTES, SOCIAL FACTORS AND TRANSPORTATION
CONSEQUENCES**

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Introduction: Longitudinal data following the stroke patient after a formal driving evaluation is limited (Fisk et al 1997, Legh-Smith et al 1986). More specifically, issues related to the safety of post-stroke drivers who maintain the ability to drive as well as the implications of losing the ability to drive for post-stroke patients have not been thoroughly explored (Legh-Smith et al 1986).

Objective: (1) To compare demographical factors, medical attributes and transportation habits between post-stroke drivers and non-drivers who underwent a formal driving assessment (2) To determine the social implications of not driving for the post-stroke non-driver.

METHOD:

Design: A retrospective cohort study. 232 stroke patients were notified by mail and subsequently by telephone. Structured telephone interviews identified demographic, medical and transportation habits in post-stroke drivers and non-drivers.

Setting: Ministry approved driving assessment program located in a regional tertiary care centre, The Rehabilitation Centre (Ottawa, Canada).

Participants: 106 subjects, all who underwent a formal driving assessment at The Rehabilitation Centre in 1995-2003, were studied. Participants were living in the Ottawa-Gatineau region (Figure 1).



Results:

- Post-stroke drivers were significantly younger (62.7 years vs. 69.2 years, $p=0.0164$), more likely to be married (69% vs. 57%), employed (56% vs. 86%), and own residential property (86% vs. 72%) than non-drivers (Table 1).
- They also had less medical co-morbidity (Modified Steinberg Score; 3.69 vs. 5.03, $p=0.0058$), relied less on the use of walking aids (36% vs. 56%) and displayed fewer problems with balance (33% vs. 39%) and falls (17% vs. 22%) (Table 1).
- The majority of drivers (64%) reported driving at least five days a week with 36% of drivers reporting self-imposed restrictions such as not driving in inclement weather and not during night-time and/or rush-hour (Table 2).
- Non-drivers relied more on the use of taxis (50% vs. 33%), public transport (72% vs. 41%) and family/friends (97% vs. 76%) (Table 2).

Discussion:

- Self-imposed driving restrictions are likely a result of conscientious decisions made by these individuals to increase their driving safety.
- Disproportionate number of respondents were drivers likely due to the fact that successful candidates were more likely to participate and be more prevalent at time of survey due to their younger age and health status.

Conclusions: Post-stroke drivers are younger and healthier than their non-driving counterparts and self-restrict their driving. Non-drivers rely more on community support for their transportation needs.

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CL-30

PSYCHOSOMATIC COMPLICATIONS IN SPINAL CORD INJURY WITHOUT RADIOGRAPHIC COMPLICATIONS: A CASE STUDY

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Background: This case report describes the application of an intentional, strategic-behavioural protocol designed to overcome severe psychological distress and involuntary paralysis superimposed on spinal cord injury without radiographic abnormality in a young male with psychosomatic symptom complications and psychological complications.

Method: A structured, interdisciplinary, intentional strategy of step-wise mobility expectations within a graduated, behavioural protocol was employed over a seven-day period following inpatient admission. The protocol involved application of specific behavioural principles, strategic communication, self-management coping training, and structured reinforcement within a tailored rehabilitation format and standard care pathway for SCI rehabilitation.

Results: Full mobility including normal gait was achieved in four-day period of intensive rehabilitation. The individual engaged fully in the intervention, despite emotional lability. Challenges to mobility were met with dramatic improvement at each rehab session and he was discharged home after one week from acute care with a normal neurologic examination, normal mobility and reduction of emotional lability. Normal neurologic status was maintained at six-week and six-month follow-up examinations.

Conclusion: This case emphasizes the effectiveness of interdisciplinary collaboration for incorporating behavioural, medical and psychological interventions, and outlines the complexity of somatic presentation in SCI. A structured, behaviourally-driven interdisciplinary rehabilitation intervention tailored to an individual presenting with minimal organic SCI findings was successful in realization of expected mobility recovery. Early identification and management of psychological vulnerabilities for somatic overlay within a structured rehabilitation protocol eliminated potential for iatrogenic effects. Caution in attributing presentation of neurological deficit solely to psychogenic factors is also emphasized by this case.



CL-31

RED BLOOD CELL MASS CHANGES IN WOMEN EXPOSED TO 60 DAYS OF BED REST

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Objective: To prospectively quantify indicators of red blood cell (RBC) mass in women pre-, during, and post- long-duration bed rest.

Methods: 24 healthy women underwent 60 days of uninterrupted bed rest as part of the Women International Space Simulation for Exploration 2005 study coordinated by the European Space Agency. A strict protocol of -6 degrees of head-down tilt was followed. Women were randomized to three intervention groups: exercise, nutrition, or control. Blood work, including CBC, differential, and reticulocyte count was performed at the baseline, twice during bed rest, and four times following remobilization to 180 days. Total blood work drawn was 701 ml. Menstruation diaries were recorded.

Results: Hemoglobin (Hb) was reduced from the baseline of 130.1 ± 8.1 g/L to 116.5 ± 8.6 ($p < 0.001$) on day 6 after remobilization. Hb remained significantly lower than baseline until 90 days after bed rest. Hematocrit (Ht) was significantly reduced from the baseline of $38.4 \pm 2.2\%$ to $34.5 \pm 2.5\%$ during remobilization ($p < 0.001$). Hb and Ht were highly correlated $R = 0.95$, $p < 0.001$. There were no differences between intervention groups.

Conclusions: RBC mass significantly decreased after 60 days of bed rest. Recovery of RBC mass to baseline took 90 days after 60 days of bed rest. This study was performed to simulate the weightless environment of space, and provides a timeline for recovery of RBC mass in astronauts suffering from space flight anemia. This model is also generalizable on Earth to people with decreased mobility or with prolonged critical illness who are anemic during rehabilitation.

Funding by the Canadian Space Agency.



CL-32

PRELIMINARY ASSESSMENT OF THE MEASUREMENT PROPERTIES OF THE FICSIT-3 BALANCE MEASURE AMONG HOSPITALIZED ELDERLY PATIENTS

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Objective: The Frailty and Injuries Cooperative Studies of Intervention Techniques balance measure (FICSIT-3) is a performance-based static balance measure used to test a person's ability to maintain balance in parallel, semi-tandem, and tandem standing. The overall goal of this preliminary study is to assess the measurement properties of the FICSIT-3 in a sample of hospitalized elderly individuals.

Design: Cross-sectional study. The FICSIT-3 and Timed Up and Go Test (TUG) were assessed during subjects' hospital stay by a trained physiotherapist and a research assistant, the latter with no prior training.

Setting: Acute medical unit of a university-affiliated tertiary care hospital.

Participants: Consecutive sample of 51 hospitalized older adults (mean age 84 ±4 years).

Main Outcome Measures: Interrater reliability, correlation with the TUG, sensitivity, specificity, and likelihood ratios were calculated for the FICSIT-3.

Results: Two-way ANOVA intraclass correlation coefficients calculated to determine interrater reliability was 0.96 (95% confidence interval, CI, 0.93-0.98). Hypothesized correlations with the TUG were observed with regards to magnitude and direction of the relationship (Pearson's product moment correlation, $r=-0.342$, $p<0.05$). A cut-off point of 1.5 on the FICSIT-3 maximized the diagnostic sensitivity and specificity for mobility disability (64% and 76% respectively), which was defined as a TUG time greater than 30 seconds. Likelihood ratios for a positive result (FICSIT-3 score ≥ 2) and for a negative result (FICSIT-3 score ≤ 1.5) were 2.67 and 0.47 respectively.

Conclusions: The FICSIT-3 balance measure is a simple and easy to administer performance-based measure that provides reliable and valid data when assessing standing balance in hospitalized older adults. The FICSIT-3 is a potentially important clinical and research tool to assess the balance of older inpatients as they transition back to the community.



CL-33

EFFECTS OF THERMOFLOW CERAMIC-IMPREGNATED GARMENTS ON PATIENTS WITH FIBROMYALGIA SYNDROME: A RANDOMIZED, PLACEBO CONTROLLED PILOT STUDY

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Objectives: To review the literature on CAM [Complementary Alternative Medicine] pain management in fibromyalgia [FMS] and to report on effective treatment with thermoflow garments.

Methods: Following a literature review of MEDLINE and EMBASE for published randomized controlled trials on CAM therapies for FMS pain treatment, a double-blinded placebo controlled trial was carried out in outpatient clinics on 31 subjects meeting the American College of Rheumatology criteria for FMS using Thermoflow garments for a treatment period of one month. Main outcome measures were pain visual analog scale (VAS) ratings, a diary, the Fibromyalgia Impact Questionnaire (FIQ), Jamar grip strength, pressure algometry measurements of tender point [TeP] pain threshold, and seven-point Lanier scale rating of treatment.

Results: In the 31 participants with complete data, improvements were noted in the VAS pain rating [$P=0.05$], average TeP pain threshold [$P<0.003$] and the Lanier scale [$P<0.0001$] with Thermoflow garments over the placebo. No statistical improvement was noted with the FIQ score, number of active TePs, total algometry score, Jamar grip strength.

Conclusion: This pilot randomized controlled trial provides some statistical evidence that Thermoflow garments can improve some aspects of pain in FMS. This would need to be confirmed with larger and longer randomized controlled trials. The ceramic-impregnated Thermoflow garments appear to have a clinically important effect in FMS.

KEY WORDS: fibromyalgia, far infrared therapy, chronic pain syndrome, trigger point, low back pain, alternative medicine.



CL-34

CHARACTERISTICS OF AUTONOMIC DYSREFLEXIA IN 296 VIBROSTIMULATION TRIALS IN MEN WITH SPINAL CORD INJURY

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Objective: To study the characteristics of autonomic dysreflexia (AD) provoked by ejaculation induced by penile vibrostimulation (PVS) in 144 men with various levels and completeness of spinal cord injury (SCI).

Methods: A retrospective chart review analyzed 296 VS trials for incidence of AD, defined by increase of SBP of ≥ 20 mmHg, and data was analyzed using increasing BP criteria (≥ 30 mmHg, or ≥ 40 mmHg) and severity of symptoms (symptomatic or silent). AD was examined in relation to level and completeness of SCI, presence or absence of ejaculation, and use of prophylactic antihypertensive Prazosin prior to VS.

Results: AD occurred in 65.9% of the 296 VS procedures, and was more common in higher lesions. This trend continued with increasing BP criteria. AD was twice as likely to occur in those procedures where ejaculation was provoked despite consistent application of VS. The majority of AD procedures were classified as silent (62.6%). There was no significant difference between the cervical (62.1%) and T1-6 (60.0%) levels of injury in the incidence of silent AD, regardless of BP rise. Silent AD (but not overall AD incidence) was seen significantly more frequently in men with complete (69.8%) versus incomplete (52.6%) cervical lesions. Prazosin made no significant difference in maximal BP whether typical or silent AD occurred.

Conclusion: Iatrogenic AD occurs in the majority of men undergoing PVS. Symptoms of AD are highly variable and may be silent despite significantly raised BP. PVS should be performed initially under supervision and patients should be informed of the potential risk of developing AD. Due to the variable findings, further research is needed to determine whether assessment of the descending autonomic pathways in addition to ASIA score can better evaluate the risk of typical and silent AD during clinic PVS or private home ejaculation.



CL-35

MUSCULOSKELETAL EXAMINATION SKILLS TUTORIAL AS A TOOL TO IMPROVE MEDICAL STUDENT COMPETENCE AND CONFIDENCE IN PERFORMING PHYSICAL EXAMINATIONS

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One of the core medical expert competencies taught in medical school curriculums is the physical examination of the musculoskeletal (MSK) system. Anecdotally, many undergraduate medical students still lack confidence in their MSK examination skills at the end of undergraduate training.

Objective: To determine whether MSK physical examinations tutorials improve students' subjective confidence and their objective performance in the Objective Standardized Clinical Encounter (OSCE) examination.

Methods: The University of British Columbia Division of Physical Medicine and Rehabilitation offered a MSK examination skills tutorial to second year medical students on a voluntary, first-come, first-served basis. Two tutorial sessions took place over two days, and each session contained 5 stations. Each station had an assigned tutor and focused on a separate region of the body. The content of each station was based on existing curriculum objectives. The students rotated through each station in groups of 4. A post-tutorial survey asked each student to rate on a 5-point scale whether the tutorial increased their confidence level in performing MSK examinations. The students' overall year-end OSCE scores and MSK OSCE sub-scores were analyzed and compared.

Results: From a class of 126 students, 35 participants were accepted into the tutorial and 29 were waitlisted due to lack of capacity. Thirty-three participants completed the post-tutorial survey. All students who completed the survey felt the tutorial helped them feel more confident in their MSK physical examination abilities (Mean 4.4, Median 4). The students who participated performed significantly better on their MSK OSCE station than those who were on the waitlist ($p = 0.010$). There were no group differences on any other OSCE station scores in the year-end examination.

Conclusion: The MSK tutorials not only increased the students' confidence in performing MSK exams, but also significantly improved their objective performance on MSK OSCE in an examination setting.



CL-36

GENDER-BASED MODELS TO PREDICT DISCHARGE DESTINATION FOLLOWING INPATIENT STROKE REHABILITATION

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Abstract: Studies have shown that women and men are not discharged home at the same rate following inpatient stroke rehabilitation. We attempted to identify factors that predict discharge destination following inpatient stroke rehabilitation, on the basis of gender. Using retrospective data from 272 stroke patients, logistic regression models were built for men and women. Standardized co-efficients were expressed as odds ratios (OR) with 95% confidence intervals (CI). Women discharged home were younger (OR 1.13; 95% CI; 1.06 to 1.21), scored higher on FIM at admission to rehabilitation (OR 0.93; CI 0.89 to 0.96), were living with a spouse prior to stroke (OR 0.09; CI 0.03 to 0.32) and were not diabetic (OR 5.38; 95% CI 1.45 to 19.96). For men, factors associated with discharge home were: living with a spouse prior to the event (OR 0.10; CI 0.03 to 0.34) and higher admission FIM scores (OR 0.94; CI 0.91 to 0.96). Models predicting discharge destination differed by gender. Further investigation indicating reasons for differences of discharge destination based on gender is required.

Funded by the Parkwood Foundation and the Canadian Stroke Network.



CL-37

INTERIM RESULTS OF A LONG TERM OPEN LABEL STUDY OF SATIVEX, A CANNABIS BASED MEDICINE, IN CENTRAL NEUROPATHIC PAIN DUE TO BRACHIAL PLEXUS AVULSION, FOLLOWING A RANDOMISED CONTROLLED STUDY

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Objective: To assess the long-term tolerability and efficacy of Sativex in relieving neuropathic pain (NP) due to brachial plexus avulsion injury (BPAI).

Methods: The long term tolerability and efficacy of Sativex, a whole plant Cannabis Based Medicine (CBM) containing Δ -9 tetrahydrocannabinol (THC) and cannabidiol (CBD), was investigated in BPAI patients with NP who had previously enrolled in a double-blind, crossover study. Each 100 μ L oromucosal spray of Sativex delivered 2.7mg THC and 2.5mg CBD, and was compared with placebo and a CBM delivering 2.7mg THC only (THC-CBM). During the initial study there were three crossover periods of 2 weeks when blinded medication was self-titrated; all existing analgesics were continued. At the end of the crossover study, patients could elect to receive Sativex within a long-term open-label extension study.

Results: Forty-five patients completed the double-blind crossover study. Improvement in NP assessed using an 11-point numerical rating scale (NRS) was observed for both the Sativex ($p < 0.005$), and THC-CBM ($p < 0.002$) treatment periods when compared with placebo, as previously reported¹.

Thirty-seven patients (82%) elected to enter the extension study. The mean duration of treatment at study end was 519 days. Eighteen patients had over 2 years of treatment. The mean number of sprays per day during week 4 and in the last 6 days of treatment were 6.18 and 4.58 respectively. Twenty patients withdrew, however only one for adverse events and three for lack of efficacy. The baseline NRS score for NP reduced from 6.39 (crossover study baseline) to 4.13 (extension study week 52), for those patients with data available. 94% of patients who completed the study reported they still derived benefit from the study medication.

¹*Berman J et al. Efficacy of two cannabis based medicinal extracts for relief of central neuropathic pain from brachial plexus avulsion: results of a randomised controlled trial. Pain 2004; 112: 299-306*

Conclusions: A significant proportion of BPAI patients derived benefit from a stable dose of Sativex for over two years without troublesome side effects.



CL-38

THE LONDON STROKE REHABILITATION DATA BASE PROJECT: IMPACT OF STROKE SEVERITY, AGE, GENDER AND TIME TO REHABILITATION

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A large database of stroke rehabilitation patients admitted to London Hospitals has been compiled from 1986-2003 with information on 2,113 stroke rehabilitation patients. Databases, particularly retrospective chart reviews, are endangered by new privacy laws, but lend themselves well to reviewing factors which influence the final outcomes following stroke rehabilitation. **Hemorrhagic** stroke rehab patients, when compared to ischemic stroke patients, took longer to enter into rehabilitation and were more susceptible to developing medical complications. **Severe stroke** patients were more impaired and older, yet they showed similar overall FIM gains as less severe stroke patients in rehabilitation; however, their absolute level of improvement was lower and they took twice as long to achieve similar gains. **Young stroke patients** suffered a variety of unique **social problems** not seen with older stroke victims, including an extraordinary high divorce/separation rate following the stroke, issues of young children, having parents as caregivers, and surprisingly low return to work rates. **Elderly patients** with similar neurological damage, i.e., weakness of the limbs on one side, often performed more poorly than younger stroke patients and this difference appeared to be accounted for by **decreased balance**. A **model** was developed for **predicting** which stroke rehab patients were likely to be **able to return to their own home**. **Women** were less likely to be discharged home and those that were discharged home were younger, scored higher on FIM on admission to rehab, were living with a spouse prior to the stroke and were not diabetic. For **men**, factors associated with discharge home were living with a spouse prior to the event and higher admission FIM scores. Stroke patients **admitted later** to rehab had greater length of stay, lower admission and discharge FIM scores and lower FIM efficiency scores.

Funded by the New St. Joseph's Foundation, London.



CL-39

BUILDING THE FOUNDATIONAL BASIS FOR INTEGRATING EVIDENCE INTO PRACTICE: THE STROKE REHABILITATION EVIDENCE-BASED REVIEW (SREBR)

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The SREBR provides the most comprehensive and current review of the stroke rehabilitation research literature available anywhere in the world. The SREBR utilizes a well-validated methodology that includes, an extensive literature search, data extraction and analysis, study quality assessment using the PEDro scale and development of levels of evidence, with the focus on RCTs. The 7th edition of the SREBR was completed in June 2005 with the 8th edition due in December 2005. The SREBR has its own very active and free website www.ebrsr.com. The 8th edition of the SREBR has reviewed in detail well over 900 studies of which 604 are randomized controlled trials. The SREBR has been remarkably successful with over 30 peer-reviewed articles or monographs and 120 abstracts and presentations. The SREBR has formed the basis for a number of knowledge translation projects including SCORE (a nation-wide multi-centered project), StrokEngine (bilingual lay-version of the SREBR) and elements of other educational programs such as the REPS (Ontario) program. The SREBR has helped to identify the most compelling research questions in stroke rehabilitation and build upon current published work with innovative projects such as the integration of the animal and clinical research in stroke rehabilitation. It has provided background material for a number of provincial and national committees attempting to standardize various elements of stroke rehabilitation care. Moreover, the SREBR has provided much of the basis for an MOHLTC funded project to look at various models of rehabilitation care. Finally, the SREBR has served as the template for evidence-based reviews into the rehabilitation of acquired brain injuries, spinal cord injuries, amputees and low vision.

This project has been supported by the Canadian Stroke Network, the Heart and Stroke Foundation of Ontario and Toronto Rehabilitation Institute.



CL-40

A RANDOMIZED CONTROLLED TRIAL OF SATIVEX, A CANNABIS BASED MEDICINE (CBM), IN SPASTICITY IN PATIENTS WITH MULTIPLE SCLEROSIS, FOLLOWED BY AN OPEN-LABEL EXTENSION

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Objective: To assess the efficacy and tolerability of Cannabis Based Medicine (CBM) compared with placebo, in relieving spasticity due to Multiple Sclerosis (MS).

Methods: The efficacy and tolerability of Sativex, a whole plant CBM containing Δ -9 tetrahydrocannabinol (THC) and cannabidiol (CBD), was investigated in a randomised, double-blind parallel group study of 189 patients with spasticity due to MS. CBM was administered as an oromucosal spray, each 100 μ L spray delivering 2.7mg THC and 2.5mg CBD. Patients were allowed to self-titrate their dosage and remained on all their antispasticity medications throughout the study. Upon completion of this 6-week study, patients could participate in a long term open label extension (OLE) study.

Results: 124 patients received Sativex and 65 received placebo in the double-blind parallel group study. Significant improvement in spasticity was observed on an 11-point numerical rating scale (NRS) (-0.52 compared with placebo $p=0.048$). 146 patients (77% of those eligible) then entered the OLE. Median follow-up in OLE was 305 days (min 1, max 801). In the acute study, the baseline NRS score for spasticity was 5.57 and spasticity scores reduced to 3.83 at week 52 in the OLE, for those patients with data available. The mean number of sprays taken at week 4 and in the last 6 days of treatment in OLE were 7.29 and 6.34 respectively. Only 23 (16%) patients withdrew due to adverse events.

Conclusions: Sativex is efficacious and well tolerated in the treatment of spasticity due to MS. A significant proportion of patients derive benefit for long periods without troublesome side effects and without tolerance developing.



CL-42

MAGNETIC RESONANCE FIELD DISTORTION ARTIFACT MASQUERADING AS A LARGE CYST IN A TRANSTIBIAL RESIDUAL LIMB: A CASE STUDY

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Introduction: We report a case in which a sizeable low signal field distortion artifact (due to surgical clips) seen on a non-enhanced magnetic resonance image (MRI) led us to misinterpret the severity of a painful, draining cyst in the residual limb of a person with a remote (>20 year) traumatic transtibial amputation.

Case: This 40-year-old male was an otherwise healthy and active prosthesis user. He had a past history of ingrown hairs and recurrent, pustular skin lesions on the residual limb. For the lesion being reported, he was treated with antibiotics and referred to orthopaedics with the recommendation of incision and drainage of the presumed lesion. When he underwent surgical revision, which included the removal of a fibular exostosis, there was no evidence of a large cyst and cultures from the surgical site were negative.

Conclusion: This case illustrates the importance of understanding the significant distorting effects of even small metal components on MR images so as not to over-interpret the severity of presenting clinical signs and symptoms.

Funding: None.



CL-43

TRENDS IN PHYSICAL REHABILITATION OUTREACH SERVICES

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Objectives: Evaluate clinical service characteristics of a physical rehabilitation outreach clinic.

Methods: The Terry Fox Mobile Clinic provided multidisciplinary physical rehabilitation outreach services for adults with disabilities in Eastern and North Eastern Ontario, Canada (on-site visits by rehabilitation specialists). A retrospective analysis was performed on service-related factors and patient information (every clinical encounter between 1983 and 2002). Records were analyzed for 4816 clients with physical disabilities from Eastern and North Eastern Ontario. Measures included patient data (age, residence, diagnosis, inpatient/outpatient), clinic data (type, location, totals), team data (clinical disciplines), and assistive device utilization. The last 15 years of data were used for analysis.

Results: Over 15 years, 4816 clients (1032 clinic days, 1.46 patient-contact ratio) were seen by the outreach team. Single discipline days were the best “number of clinic days” predictor. Following 1999, the 35-64 age group became predominate (instead of over-65). Most patients lived in their own residence. Stroke, amputations, neck and back pain, and cerebral palsy accounted for 53% of patient diagnoses. Wheelchairs and orthoses were the highest ranked assistive device consultations/prescriptions (total=6304). Physicians were involved with the majority of patient contacts. Most clinic activity occurred at sites within 100 km driving distance. Sites over 200 km away had the lowest correlation with the number of clinic days.

Conclusions: The fifteen years of physical rehabilitation outreach service data is valuable for planning new outreach programs, benchmarking existing services, and telerehabilitation comparisons. Multidisciplinary physical rehabilitation can make a positive contribution to healthcare that extends beyond direct patient contact time.



CL-44

SCIRE: THE SPINAL CORD INJURY REHABILITATION EVIDENCE-BASED REVIEW

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Objective: To develop an evidence-based review of the rehabilitation interventions for spinal cord injury (SCI) based on rigorous standardized methods of appraisal. Specific objectives are 1) to identify priority areas in SCI rehabilitation for which research evidence is strong and should be transferred rapidly and effectively to improve SCI care and 2) to identify areas where evidence for effectiveness is lacking and more research is required.

Design: Systematic review.

Participants/Methods: All relevant articles including prospective, retrospective, experimental and non-experimental designs were identified through key word searches in MEDLINE, CINAHL, PSYCHInfo and Cochrane Library databases from the years 1980-2005. Review articles, meta-analyses and systematic reviews were reviewed to ensure comprehensiveness. The methodological quality of the interventional studies was evaluated by 2 independent reviewers. The Physiotherapy Evidence Database Scale and Downs and Black checklist were used to evaluate the studies. Relevant data were extracted from each paper and the findings grouped by topic and summarized based on levels of evidence.

Results: 6,273 papers were identified initially and 587 of these have been identified for extraction to date. Topic areas with the largest number of papers include upper and lower extremity function, cardiovascular function, bladder management and non-traumatic SCI.

Conclusion: An information gap separates many scientists involved in SCI rehabilitation research from the stakeholders who would benefit from that knowledge. The SCIRE project aims to close that gap and make knowledge translation a reality for consumers, health care professionals and medical administrators. The findings will be made available in peer-reviewed journal articles, CDs and through the internet.

Support: This project is supported by the Rick Hansen Man in Motion Foundation Research Fund and the Ontario Neurotrauma Foundation.



CL-46

ABANDON THE ASHWORTH? CONSIDER THE ALTERNATIVES

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Objective: The objective of this study was to determine the intersession reliability of three lower extremity spasticity measures: the Modified Ashworth Scale (MAS) (Bohannon & Smith, 1987), pendulum test (PEND) and dynamometer ramp-and-hold (RH) test amongst patients with chronic spinal cord injury (SCI).

Methods: Twenty subjects, 18 - 80 years old with SCI (C5 to T10 ASIA A–D), >12 months post injury, on constant spasticity medication consented to participate. A single assessor performed the three spasticity measures at five consecutive sessions one week apart. An assessor, twice per session, used the MAS to quantify spasticity about the knee and ankle joints. The PEND test data was used to quantify knee spasticity. The RH test data was used to quantify ankle spasticity. Ten repetitions of the PEND and RH were performed per limb at each session. PEND test data was reduced to measures of relaxation index (Bajd and Vodovnik, 1984), logarithmic decrement and damping ratio (Rao, 1986). The RH test (controlled ankle dorsiflexion impulse with a peak angular velocity of 250 deg/sec) was reduced to peak moment, energy, and range-of-motion. Intraclass correlation coefficients (ICC's) were calculated to determine the test-retest reliability using combined limb session mean data for each variable.

Results: The test-retest reliability was equivalent or better than plantar flexor MAS at the ankle using energy (RH), and than quadriceps MAS at the knee using the logarithmic decrement and damping ratio (PEND).

Joint	Variable	ICC
Ankle (RH)	peak moment	0.1778
	energy	0.6123
	range-of-motion	0.2388
	MAS (plantarflexor)	0.7113
	MAS (dorsiflexor)	-0.1635
Knee (PEND)	R2n (relaxation index)	-0.0149
	δ (logarithmic decrement)	0.7848
	ζ (damping ratio)	0.7756
	MAS (hamstrings)	0.3725
	MAS (quadriceps)	0.7134

Discussion: The PEND and RH tests may be more appealing to clinicians/researchers than the MAS given their equivalent reliability and potentially greater resolution, responsiveness and face validity.

Funding: This research has been generously funded by a grant from the Ontario Ministry of Health and Long-Term Care (Toronto Rehab, Best Practices Initiative).



CL-47

A MULTI-CENTER OPEN LABEL STUDY OF BOTULINUM TOXIN TYPE A (BoNT/A) TREATMENT OF FOCAL UPPER LIMB POST-STROKE SPASTICITY: HEALTH UTILITY AND QUALITY OF LIFE ASSESSMENT

Martin K. Childers, Richard L. Barron, Rina K. Patel, Catherine C. Turkel

In this multi-center, open-label, repeated dose study, we examined the effect of repeated intramuscular administration of Botulinum toxin type A (BoNT/A) on health utility and quality of life in stroke patients treated for focal upper limb spasticity. All stroke patients (n=279; mean age 58.2±13.2 years; 53.2% male) from 35 North-American stroke research centers received up to 5 intramuscular BoNTA (100-600U) injections to the wrist, finger, and elbow flexors. The main outcomes measured included SIP-SA (0=no dysfunction to 100=maximum dysfunction) and EQ-5D visual analogue score (VAS; 0=worst imaginable health and 100= best imaginable health). Measurements were taken at baseline, and weeks 6, 12, 24, 30, 36, and 48 after first intervention. Of all patients enrolled, 49.1% received 5 treatments over 54 weeks, where the remainder (50.9%) received 1 to 4 treatments. The average time since stroke onset was 5.0 years, with onset of spasticity observed 4.4 years after stroke. Mean SIP-SA score was 41.5 at baseline (9 domain scores and 2 dimension scores). Specifically, the physical dimension averaged 49.2, psychosocial dimension averaged 32.4, and body care and movement domain averaged 54.9. Over the course of the treatment, improvements were observed in all 9 domains and both dimensions, with a range of 1 to 7 points from baseline. Similarly, significant improvements were observed in the mean utility VAS EQ-5D over the course of the study, where baseline score of 66.4 improved to 67.4, 69.3, 69.9, 72.3, 72, and 72.6 at weeks 6, 12, 24, 30, 36, and 48 respectively (p<0.001). In conclusion, the results from this large, open-label study clearly demonstrate progressive improvements in quality of life with repeated treatments of BoNT/A. Indeed, these findings are consistent with other studies which demonstrate improved and sustainable patient outcomes with repeated BoNT/A treatments. It should be noted that the results of the present study should be regarded in the context of a lack of a control group.

Funding for this research was provided by Allergan Inc.



CL-48

COMPARISON BETWEEN CEREBRAL PALSY PATIENTS TREATED WITH BOTULINUM TOXIN TYPE A (BoNT/A) AND PROPENSITY SCORE-MATCHED CONTROLS: A COST OF CARE ANALYSIS

Michael Dickson, Chris Kozma, Rich Barron, L. Andrew Koman

The total cost of care for cerebral palsy patients treated with BoNT/A was compared to a cohort of cerebral palsy patients not treated with BoTN/A, in a retrospective pre-post assessment. From 24 sample months during a seven year period (1995-2001), the cost of services, procedures performed, and diagnoses from the paid claims for South Carolina Medicaid recipients were extracted. The relationship between these factors and BoTN/A treatment was analysed via conditional logistic regression. Following 1:6 matching, a total of 406 patients were analysed (58 cases and 348 controls). Of the factors examined, regression analysis demonstrated that only cerebral palsy diagnosis (diplegia, hemiplegia, quadriplegia) was significantly related to BoTN/A treatment. Conversely, cost was not significantly related to BoTN/A treatment. In conclusion, BoTN/A treatment did not add to the total cost of care for patients with cerebral palsy.

This study was funded by Allergan, Inc.



CL-49

REPEATED DOSES OF BOTULINUM TOXIN TYPE A (BoNT/A) FOR THE TREATMENT OF POST-STROKE FOCAL UPPER LIMB SPASTICITY: ASSESSMENTS OF RESOURCE UTILIZATION, CAREGIVER BURDEN, AND PRODUCTIVITY

Elie Elovic, R.L. Barron, J. Lui, C.C. Turkel

We examined the functional utility of repeated intramuscular administration of Botulinum toxin type A (BoNT/A) on quality of life in patients with post-stroke focal upper limb spasticity, as measured in indices of resource utilization, caregiver burden, and productivity. In this multi-center (35 North American stroke research centers), open label study, effects on burden of illness were measured using the Spasticity Impact Questionnaire (SIQ). The SIQ was administered at baseline, and weeks 6, 12, 24, 30, 36, and 48 post-BoNT/A treatments. Patients received no more than 5 treatment cycles of BoNT/A over the one year study duration. Of the patients enrolled (n=279; mean age 58.2±13.2 years; 53.8% male; 82.1% Caucasian), 226 patients completed the 12-month-long study. The average time since stroke onset was 5.0 years, with onset of spasticity observed by 4.4 years post-stroke. SIQ analyses revealed statistically significant reductions in days per month (average of 1.1-1.9 days) that friends/family members had to take off work for caregiving purposes. Similarly, there were statistically significant reductions in hours per week (mean range 4.9-8.8 hours per week) of assistance required from friends/family members, following BoNT/A treatment. Finally, there were significant reductions in the number of days per month (1.5-3) that upper limb function interfered with daily activities. Overall, the greatest percentage of patients reported improvements (versus no change or worsening) in accomplishing more work, in requiring less adaptation/changes to perform work, and in working with less care or accuracy. Indeed, our results suggest that BoNTA treatment for post-stroke focal upper limb spasticity may improve health utility and quality of life, as measured via productivity, resource utilization, and caregiver burden.

Funding for this research provided by Allergan Inc.



CL-50

NEUTRALIZING ANTIBODY FORMATION WITH INTRAMUSCULAR OF BOTULINUM TOXIN TYPE A (BoNT/A) IN THE TREATMENT OF NEUROMUSCULAR DISORDER PATIENTS

Stuart A.Yablon, S. Daggett, MF. Brin

In this open label study, we assessed the rate of neutralizing antibody formation following intramuscular injection of Botulinum toxin type A (BoNT/A; BOTOX®, Allergan, Inc), in BoNT/A-naïve patients. Serum samples were collected from patients (cervical dystonia, chronic headache, post-stroke spasticity) in six clinical trials, where the presence of neutralizing antibodies to BoNT/A was assessed via the mouse protection assay (MPA). Samples were collected at baseline, prior to each BoNT/A injection, and at study exit. Patients received the following regimen of BoNT/A injections: CD patients (n=326) received 1-15 injections (mean of 187.3U/treatment; range of 20-500U; maximum total exposure per patient of 4115U); chronic headache patients (n=356) received 3 injections (mean: 157U; range: 75-260U; max exposure: 780U); post-stroke spasticity (n=247) received 1-4 injections (mean: 241U; range: 100-360U; max exposure: 960U). Of the 94.7% of patients with analyzable samples, MPA was negative for 99% of them. 0.5% of patients (n=4) had inconclusive results, and 0.5% of patients (n=4) were positive. Of the 4 positives, 3 were CD patients (patient 1: one injection of 300U; patient 2: six injections of 100-150U, totaling 750U; patient 3: eight treatments of 100-400U, totaling 2300U). The remaining positive MPA was from a post-stroke spasticity patient, who received one treatment of 200U. However, only the post-stroke spasticity patient failed to demonstrate clinical improvement after BoNT/A treatment. In conclusion, there is a very low incidence of neutralizing antibody formation in neuromuscular disorder patients receiving repeat therapeutic BoNT/A intramuscular injections.



CL-51

ASSESSMENT OF SAFETY AND EFFICACY OF MULTIPLE BOTULINUM TOXIN TYPE A (BoNT/A) INJECTIONS FOR POST-STROKE FOCAL UPPER LIMB SPASTICITY: A ONE YEAR-LONG MULTICENTER, OPEN-LABEL TRIAL

Elie Elovic, A. Brashear, D. Kaelin, R. McIntosh, J. Liu, C. Turkel

In this report, we evaluate the long-term safety and efficacy of repeated doses of Botulinum toxin type A (BoNT/A) in the treatment of focal upper limb post-stroke spasticity. All patients with upper limb poststroke spasticity (n=279; 35 North American stroke research centers; open-label study) received up to 5 intramuscular BoNT/A injections (dose per treatment: 200 U to 400 U) administered to the wrist, finger, and elbow flexors, with at least 12 weeks between treatments (physician discretion). Main outcome measures were: adverse events (overall and by each treatment cycle); muscle tone (5-point Ashworth Scale); functional disability (4-point Disability Assessment Scale, DAS). DAS measures disability in 4 domains: hygiene, dressing, limb posture, and pain. At baseline, one domain was selected as the principal therapeutic intervention target (PTIT). During the year-long study, 22.6% of patients did not report a single adverse event. Only 6.5% of patients reported treatment-related adverse events, and no serious treatment-related adverse events were reported. Muscle tone was markedly improved from baseline at week 6, and was sustained throughout the 12 month-long study. Similarly, functional disability was improved: At least 50% of patients achieved a 1-point or greater improvement in their PTIT at all evaluations throughout the course of the study. To conclude, repeated treatment with BoNT/A clearly and safely improves upper limb post-stroke spasticity without any reported tachyphylaxis. The very low occurrence of adverse events in this 12 month-long study strongly suggests that BoNT/A represents a significant advantage over many oral anti-spasticity medications, which are notably associated with a high incidence of undesired systemic side effects.

This research was sponsored by Allergan Inc.



CL-52

RICK HANSEN SPINAL CORD INJURY REGISTRY (RHSCIR): A CANADIAN INITIATIVE

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Objective: RHSCIR was developed to: promote excellence in clinical practice; facilitate the translation of therapeutic interventions for SCI; and foster enhanced quality of life for people living with SCI.

Design: A prospective cohort of incident cases of traumatic SCI (ASIA A, B, C, D and cauda equina injuries).

Participants/Methods: Following a review of international SCI databases, a model was developed to collect data at hospital sites and then transfer, store and analyze data at a national centre. A detailed privacy and security framework has been developed to protect the information. All individuals with SCI are eligible to participate. Every reasonable attempt is made to provide translation for individuals who are unable to speak or understand English. Consenting participants will be followed in acute and rehabilitation settings and then in the community at 1, 2, 5 and every 5 years post injury. RHSCIR was launched in June 2004 and is currently rolling out to 13 sites in Canada.

Results: Preliminary results on a sample of registry participants (n=52) enrolled between July to December 2004 indicate the demographic profile of Canadians with SCI is similar to the United States. The average age was 42.0 ± 20.4 and 81% were male. Cervical injuries (56%) were more common than thoraco-lumbo-sacral injuries (44%) with the former having more incomplete injuries and the latter having more complete injuries. 48% of participants had a complete injury (ASIA A) and 52% had an incomplete injury. Transport was the most common cause of injury (44%), followed by falls (33%), sports (15%) and other (8%).

Conclusion: RHSCIR will assist in understanding the epidemiology of SCI in Canada, validate new and existing therapies and offer consumers opportunities to partake in research and shape future service delivery.

Support: Rick Hansen Man In Motion Foundation, Ontario Neurotrauma Foundation, Newfoundland and Labrador Neurotrauma Foundation.



CL-53

A RANDOMIZED DOUBLE-BLINDED CROSSOVER STUDY ASSESSING THE EFFECT OF CANNABINOIDS ON SPASTICITY IN SPINAL CORD INJURED PERSONS: A PILOT STUDY

Dr. Daryl Perry, Dr. Tony Szturm, Archana Arun, T. Olafson, Dr. Alan Casey, Dr. Karen Ethans

Introduction

- There are reports of SCI patients experiencing beneficial effects on spasticity from smoking marijuana.
- Oral formulations may be a more appropriate dosing method for d-9-THC and cannabinoids.

Objective

- To conduct a pilot project of a double-blinded crossover trial assessing the efficacy of nabilone on spasticity in persons with SCI.

Methods

- Six subjects were randomized to receive either nabilone (1 mg PO BID) or placebo during the first two-week period of the study, with the option to increase the dosage of their treatment (to 2 mg PO BID) for another two weeks.
- After a two-week washout period, patients were crossed over to the opposite treatment group during which the same dose titration option was maintained.
- Outcome measures assessed at two-week intervals included: the Ashworth scale, the Penn Spasm Frequency Scale (PSFS), a visual analog scale (VAS) for spasticity, and a review for adverse reactions from the medication. The Wartenberg Pendulum Test with a MiniBird six degree-of-freedom DC magnetic motion sensor from Ascension Technology (18x8x8 mm) accelerometer was assessed at four-week intervals.

Results

- All six subjects completed the placebo phase of the trial.
- Four subjects did not complete the study (66%) because of the side effects they experienced while taking nabilone (1 mg PO BID).
- The two subjects who completed the study demonstrated an increased mean velocity of leg drop, increased natural frequency of leg oscillation, increased angular displacement with a decreased damping ratio on at least one of their legs after the nabilone phase when using the Wartenburg Pendulum Test outcome measure.
- The Ashworth scale, PSFS and VAS for spasticity did not demonstrate consistent findings in these two subjects.

Conclusions:

- Cannabinoids may have an effect on spasticity.
- A larger, potentially multi-centre study is recommended.
- A lower starting dose of nabilone is recommended.
- The Wartenburg Pendulum Test with data collection through a mini-Bird® accelerometer is recommended as an objective outcome measurement tool for future studies.

**The study drug and an unrestricted educational grant was provided by Valeant Canada for this study.*



CL-54

NEW EVIDENCE IN THE EFFECT OF AGE ON THE RATE OF RECOVERY OF INPATIENT REHABILITATION OF TBI PATIENTS

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**Toronto Rehabilitation Institute*

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Background: Previous studies have indicated that age is a negative long term predictor of outcome following a Traumatic Brain Injury (TBI) causing many service providers to limit their treatment of elders. Early recovery periods have not been adequately explored.

Hypothesis: Older TBI patients admitted to an inpatient rehabilitation service make similar gains to younger patients during rehabilitation admission.

Method: 140 TBI patients admitted to an ABI service were divided into those less than 45 years and those over 55 years (80 vs 60 respectively). All patients underwent multidisciplinary therapy averaging 3 hours per day including PT, OT, SLP and SW support. FIM was used to assess function, motor and cognitive ability in patients at admission and discharge, as well as to measure rate of recovery. Mann-Whitney U tests and ANOVA were used to compare admission and discharge scores.

Results: The average age of the younger group was 30 ± 7.8 and the older group was 69 ± 8.4 . There were no differences in time to get to rehabilitation ($p=0.383$) or admission FIM scores between the older vs. younger population ($p=0.707$). FIM changes during rehabilitation between younger TBI patients and older TBI patients were 74.26 and 64.33 respectively ($p=0.160$).

Conclusion: This study supports the hypothesis that age does not significantly influence the rate of recovery in Traumatic Brain Injured patients who are admitted to an ABI rehabilitation service. This finding is interesting in light of previous findings that indicate that age is a poor predictor of longer term TBI outcomes. Theories explaining this finding are explored.



CL-55

COMPARISON OF BRAIN INJURY REHABILITATION OUTCOMES USING A TRADITIONAL VS. FUNCTIONALLY BASED PROGRAM: A PRELIMINARY ANALYSIS

Won Hyung A. Ryu, Hon BSc (Toronto Rehabilitation Institute, Toronto, Ontario), Nora Cullen, BSc, MD, MSc, FRCPC.

Objective: To study and compare the outcomes of a rehabilitation program where Acquired Brain Injury (ABI) patients of a range of etiologies are treated by functional need rather than diagnosis.

Design: Prospective case-controlled study.

Setting: ABI rehabilitation program.

Participants: 116 ABI patients (mean age 49.89 ± 17.18) admitted prior to the inception of the Functionally Based Streaming Program in January 2002 were used as the control group to evaluate the functional outcome of 94 patients (mean age 48.63 ± 19.65) who were admitted after full implementation of the streaming program by January 2003. The patients were introduced into Neurocognitive (NC) and Neurophysical (NP) streams.

Interventions: Not applicable.

Main Outcome Measures: Functional Independence Measure (FIM).

Results: Age, Glasgow Coma Scale scores and admission FIM scores were found to be comparable between the control group and the patients who were admitted into either the NC or NP streams ($p = 0.622$, $p = 0.170$, $p = 0.207$ respectively). However, patients treated based on their functional need through the streamed rehabilitation program had a significantly higher discharge FIM scores than the control group ($p = 0.005$) along with a higher delta value that approached significance ($p = 0.051$).

Conclusions: This preliminary analysis supports the hypothesis that streaming ABI patients into specialized NC and NP rehabilitation programs based on their functional need results in improved rehabilitation outcome.

Key Words: Brain Injury; Rehabilitation; Treatment Outcome



BS-01

PHARMACOLOGICAL EVALUATION OF BOTOX[®], DYSPORT[®] AND MYOBLOC[®] IN ANIMAL MODELS OF EFFICACY AND SAFETY

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Objective: In vivo pharmacological assessment of commercial preparations of Botulinum neurotoxin serotype A (BoNT/A – BOTOX[®], Dysport[®]) and Botulinum neurotoxin serotype B (BoNT/B – Myobloc[®]).

Methods: Three pre-clinical in vivo models were used to study the intramuscular (i.m.) actions of these various preparations. Pharmacological efficacy and potency were measured using the mouse Digit Abduction Score (DAS) assay, investigating the effects of transient, dose-dependent myorelaxation on the mouse hindlimb digit abduction (“startle”, “toe spread”) behavioral reflex in response to hindlimb elevation (tail-lift). Safety via the route of administration was assessed using the mouse i.m.-LD₅₀, with a Safety Margin derived from the i.m.-LD₅₀/DAS ED₅₀ ratio. Finally, migration of toxin from the muscle of injection was assessed using the mouse DAS/muscle atrophy assay, evaluating the threshold dose yielding ipsilateral quadriceps atrophy two (2) weeks following an intra-gastrocnemius injection, with toxin migration indexed as the Therapeutic Margin (TM, previously described as the Diffusion Margin). Two commercially available preparations of BoNT/A were BOTOX[®] (Allergan) and Dysport[®] (Ipsen). The sole commercially available preparation of BoNT/B was Myobloc[®] (Elan).

Results: The DAS rank order of potency (ED₅₀, units/kg) was BOTOX[®] > Dysport[®] ≥ Myobloc[®]. A similar result was obtained for the rank order of the calculated Safety Margins (BOTOX[®] > Dysport[®] ≥ Myobloc[®]). The rank order for intermuscular migration (TM, most → least) was Myobloc[®] > Dysport[®] > BOTOX[®].

Conclusion: While Botulinum toxins are potent, clinically efficacious muscle relaxants, the present results clearly differentiate these preparations in terms of in vivo potency and safety, supporting the concept that these different products are not interchangeable.

This work was funded by Allergan.



BS-02

PERIPHERAL PLASTICITY FOLLOWING SPINAL CORD INJURY AS A POSSIBLE CAUSE OF AUTONOMIC DYSREFLEXIA IN ANIMAL MODELS AND MAN

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Objective: Abnormal cardiovascular control following spinal cord injury (SCI) is well documented in animal models and humans, and has been attributed in part to injury-induced plasticity within the central nervous system. These studies assess the contribution of plasticity in sensory and sympathetic ganglia to autonomic dysreflexia (AD) following spinal cord injury (SCI) in rats and humans.

Methods: Adult Wistar rats received a complete transection at the third thoracic segment (T3): survival times were one, two, or four weeks following SCI. On the last day of the experiment, AD was examined in conscious rats by recording arterial pressure and heart rate during balloon distension of the colon. This stimulus resembles some of the stimuli, such as colon impaction, contraction, or irritation, which initiate AD clinically. Pressor responses to colon distension were also examined in a group of uninjured rats. After assessment of AD, rats were killed with an anesthetic overdose and transcardially perfused. Dorsal root ganglia (DRGs) and thoracolumbar paravertebral sympathetic ganglia rostral and caudal to SCI, as well as stellate and pelvic ganglia, were harvested. Immunohistochemical analysis was performed to characterize changes in intra-ganglionic axon density, as well as catecholamine and neuropeptide receptor expression following SCI. Human DRG specimens were selected and subjected to similar immunohistochemical characterization as rat DRGs.

Results: Tyrosine hydroxylase (TH) –expressing sympathetic axons invaded the rat DRG within two weeks following SCI. These axons infiltrated the DRG from its distal pole, the point at which the grey ramus joins the spinal nerve. TH-positive bouton-like structures apposed substance P-containing (small-diameter nociceptive) DRG neurons. We also found that substance P-containing (potentially sympathetic sudomotor) axons sprouted within the paravertebral sympathetic chain following SCI.

Conclusion: Peripheral sympathetic sprouting following SCI may form a novel anatomical substrate for AD.

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RR-04

RANDOMIZED CONTROLLED TRIAL OF POST SURGICAL ELECTRICAL STIMULATION TO PROMOTE NERVE REGENERATION IN PATIENTS WITH CARPAL TUNNEL SYNDROME

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Background: Electrical stimulation of peripheral nerves after crush injury and axotomy augments axonal regeneration in adult laboratory animals. The clinical applicability of this intervention has never been investigated in human subjects. The aim of this study was to test the effect of electrical stimulation on axonal regeneration after carpal tunnel decompression surgery in patients with carpal tunnel syndrome.

Methods: In a randomized controlled trial, we investigated the effect of 1-hour continuous 20Hz electrical stimulation following decompression surgery on axonal regeneration of the median nerve, compared to a control group that underwent decompression surgery only. Subjects were followed for a year at regular intervals. Motor unit number estimation (MUNE) was used to quantify the axonal regeneration. Additionally, sensory and motor nerve conduction studies, Purdue Pegboard Test, Semmes Weinstein Monofilaments, and Levine's Self-Assessment Questionnaire were used to assess functional recovery.

Results: The stimulation group had significant axonal regeneration 6-8 months after the procedure when the MUNE increased to 290±140 (Mean±SD) from 150±62 at baseline ($p<0.05$). In comparison, MUNE did not significantly improve in the control group ($p>0.2$). Sensory nerve conduction values significantly improved in the stimulation group earlier after treatment than the controls. Terminal motor latency significantly accelerated in the stimulation group but not the control group ($p>0.1$). Other outcome measures showed a significant improvement in both groups.

Conclusion: One-hour of continuous 20 Hz electrical stimulation of the median nerve following decompression surgery significantly augmented axonal regeneration. The procedure was feasible and was well tolerated by the subjects.



RE-03

EXERCISE PRESCRIPTION DURING PREGNANCY

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During pregnancy, many women seek advice regarding continuing their exercise routine or how to start an exercise program. While exercise is generally considered safe, there are potential concerns that exercise diverts blood away from the baby, and that impaired thermoregulation during exercise may have teratogenic potential. Despite these concerns, research has shown no adverse fetal effects in regards to gestation length, birth weight, Apgar scores, uterine growth restriction, or long term neurodevelopmental potential. Clear maternal benefits have been demonstrated in those women who continue to exercise including shorter labours with less obstetrical interventions, less back pain, improved control of gestational diabetes, and less psychosocial stress and postpartum depression. New guidelines have incorporated much of this research to provide evidence based support of exercise programs. Physiatrists prescribe exercise for a variety of conditions and therefore need to be up to date regarding current literature and guidelines when counseling their pregnant patients.



SR-03

CAN TOPICAL ANESTHETIC REDUCE THE DISCOMFORT ASSOCIATED WITH INTERVENTIONAL ZYGAPOPHYSIAL JOINT BLOCK/INJECTIONS?

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Objective: to determine the effectiveness of a topical local anesthetic cream (5% liposomal lidocaine) in reducing the pain associated with interventional spinal zygapophysial joint block/injection.

Study Design: double-blind randomized controlled trial.

Methods: after providing informed consent, 39 pairs of injections (36 medial branch sensory blocks; 3 zygapophysial joint intra-articular) were performed on 20 patients with bilateral mechanical spine pain. Thirty minutes prior to injection, a standardized quantity of topical agent was applied over the injection area under occlusive dressing. On one side, the active agent cream was used (5% liposomal lidocaine) and on the contralateral side, a placebo cream with identical characteristic was used. The treatment sides were randomized and both the patient and the physician performing injections and recording the pain responses were blinded. With each injection, the patient provided a numerical pain rating (NRS; 0-10) immediately following each phase of the injection procedure [superficial (skin to subcutaneous fat); deep (subcutaneous fat to spine) and overall].

Results: injection associated pain was significantly less during the superficial phase on the side of the local anesthetic versus the placebo cream (NRS = 3.0 vs. 4.2; $p = .002$). No significant differences were found during the deep phase or for the injection overall.

Conclusions: Five percent liposomal lidocaine cream significantly reduces the pain associated with the superficial phase of zygapophysial joint block/injection but does not change the pain associated with the deep phase or injection procedure pain overall. Its usefulness for this application is questionable.

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MSE-02

THE USE OF BOTULINUM-A TOXIN FOR THE TREATMENT OF NEUROGENIC BLADDER

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Although it was first investigated as a potential agent of chemical warfare, today, the application of botulinum toxin has expanded to treat dystonias, dysphonias, spasticity, cosmetic issues, migraines, and hyperhidrosis, among other conditions. Its role as a means to treat neurogenic conditions of the bladder will be examined in this paper. While intermittent self-catheterization and baclofen remain the cornerstones in the management of the neurogenic bladder, most of the oral therapies now used have been targeted to the peripheral nervous system. However, these drugs often cause undesired systemic side effects. If medical management fails, surgical intervention in the form of sphincterotomies or rhizotomies may be used as alternatives, although they too carry certain risks. Botulinum toxin type A has been studied as a therapeutic modality using injections into either the detrusor muscle or the external urethral sphincter. The toxin produces a local chemodenervation of muscle by blocking acetylcholine release at the neuromuscular junction. As a result, the muscle is rendered incapable of contracting and will thus be weakened and relaxed. For patients with detrusor-sphincter-dyssynergia, injections into the external urethral sphincter provide a nonsurgical sphincterotomy that is reversible. Compared against placebo, Botox therapy shows significant decreases in post-void residual volumes as well as in mean urethral pressures. When compared with medications, Botox treatment seems to be superior, showing more of a decrease in frequency of daily incontinence, maximum pressure of uninhibited bladder contraction, as well demonstrating more of an increase in maximum bladder capacity during bladder contractions. As it is temporary measure, patients may entertain a trial of botulinum toxin to see whether or not they would benefit from future surgical intervention. The ability of this treatment to improve quality of life for patients with neurogenic bladders makes it a worthwhile treatment modality.