UNIVERSITY OF WASHINGTON SCHOOL OF MEDICINE

SPINAL CORD INJURY Update

Department of Rehabilitation Medicine Volume 13, Issue 1 • Winter 2004

SCI Statistics from the Model Systems

As one of the 16 Model Spinal Cord Injury (SCI) Care Systems funded by the U.S. Department of Education, the Northwest Regional Spinal Cord Injury System (NWRSCIS) at the University of Washington collects medical and other data on people with SCI, starting at the time of injury and continuing with periodic follow-up questionnaires over 25 years. If you are part of this follow-up study, you may be wondering what we do with all that information.

Since the early 1970s, SCI centers such as ours have been sending SCI patient data to the National Spinal Cord Injury Statistical Center (NSCISC; *www.spinalcord.uab.edu*; 205-934-3330) in order to monitor trends in injury (such as cause, severity, age, etc.) and evaluate the effectiveness of services and treatments. Over the years, this information has contributed to the improvement of SCI care around the nation and the world.[1]

As of November 2003, the National SCI Database contained information on 22,599 patients, 1,028 of whom came from our center here at the University of Washington. The following information is drawn from the NSCISC's *SCI Facts and Figures at a Glance* (December 2003) and the *2003 Annual Report for the Model SCI Systems*.

Age at Injury

The average age at the time of injury has increased nationally, from 28.7 years before 1979 to 37.8 years since 2000, reflecting a corresponding increase in the average age of the U.S. population. The occurrence of SCI is highest in the 16-30 age group, which accounts for more injuries than all other age groups combined.

Etiology (Cause of Injury)

Motor vehicle accidents (MVAs) have been the leading cause of injury nationally for the last 30 years (see Figure 1), but the percentage of injuries due to MVAs has declined gradually, from 47% before 1979 to 40.2% in 1999. Injuries

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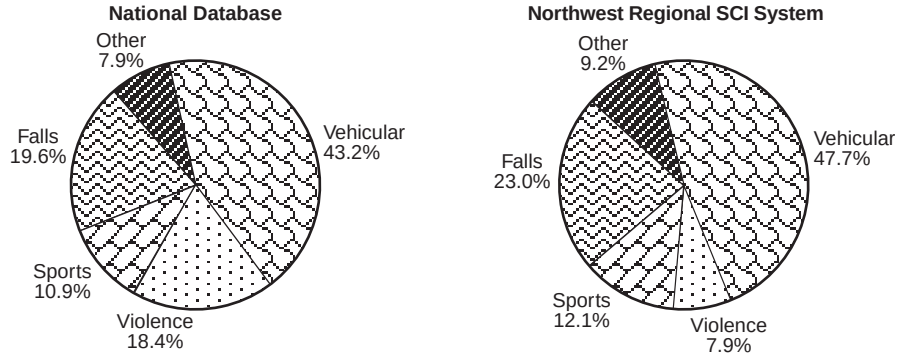

Figure 1. Etiology (Cause) of SCI since 1973.

INSIDE

Treating SCI Pain with Relaxation and Hypnosis: A UW Study

Chronic pain is a serious, debilitating problem for many persons with spinal cord injury. It can interfere significantly with daily life and is often unresponsive to conventional pain treatments. Mark Jensen, PhD, professor in the Department of Rehabilitation Medicine at the University of Washington and an expert in the field of pain and disability, is conducting a five-year study, funded by the National Institutes of Health, to test the effectiveness of two different relaxation treatments for SCI pain.

"We really want to expand the treatment options for persons with SCI-related pain because we know the treatments we have available now are not

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SCI Statistics

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from falls—the second most frequent cause—has increased steadily from 14.3% to 23.2% during this same time. Injuries from violence (mostly gunshot wounds) also increased, temporarily taking second place in the mid-1990s, and have subsequently declined. Sports injuries decreased from 14.3% to 7.0% between 1973-99, partly due to better prevention measures.

Etiology varies significantly by age. For example, in the 16-30 age group, falls are responsible for 10.7% of injuries and violence accounts for 22.8%. Among 46-60-year-olds, however, 36.8% of injuries are due to falls and only 8.8% to violence.

Gender and Race

Nationally, 81.3% of all injuries occur among males (78.2% in the NWRSCIS). While most injuries overall occur among whites, the percentage has decreased steadily: in 1973-77, 76.8% of persons injured were white; in 1992, 62.8% were white. This partly reflects trends in the U.S. population, but there also have been changes in the race-specific rates of occurrence.

Occupational Status

The impact of SCI on employment is striking. At time of injury, 63.8% of patients were employed, while 15.3% were students and 16.7% were unemployed. One year post-injury, however, only 13.8% were employed (15.6% among persons with paraplegia, 13.0% among those with tetraplegia) . This gradually increased to 43% (paraplegia 46.1%; tetraplegia 41.7%) by year 25, but never achieved pre-injury levels.

Neurologic Level and Completeness of Injury

The majority of patients in the database had cervical lesions (50.9%), 34.7% had thoracic, and 10.8% had lumbo-sacral lesions. The most common lesion levels were C5 (14.7%), C4 (13.6%), C6 (11%) and T12 (6.9%).

The percent of patients with incomplete injuries increased from 45.9% in 1973-79 to 55.8% in 2000-03, partly due to the introduction of high dose methylprednisolone as standard therapy within hours after injury. Incomplete injuries declined briefly between 1991-94, due to a corresponding increase in SCIs caused by gunshot wounds, which are usually complete.

Level and severity of injury varies according to etiology. For example, most (88.1%) injuries from sports accidents, but only 29.1% from violence, result in tetraplegia. Incomplete tetraplegia is the most common injury for all etiologies—except for acts of violence, which most often result in complete paraplegia.

Length of Hospital Stay

The average length of stay (LOS) in the hospital following injury has decreased significantly in the last 30 years (see Table 1) as medical care has improved and insurance coverage has become more stringent. This decrease is seen in both acute and rehabilitation LOS.

Table 1. Average Number of Days in the Hospital Following Injury

Year	National			NWRSCIS		
	Acute	Rehab	Total	Acute	Rehab	Total
1974	25	115	**140**	26	181	**207**
1990	18	65	**83**	26	66	**92**
2000	18	46	**64**	15	46	**61**

Average acute and rehab LOS were longer for persons with tetraplegia than those with paraplegia. This difference is small for acute LOS but substantial for rehab LOS. Likewise, neurologically complete injuries usually resulted in longer acute and rehab LOS.

Model SCI System Research Studies

The Model SCI Care Systems also receive funding to conduct individual and multi-center research projects, and these have played a major role in raising the standard of SCI care and advancing new treatments in the past 30 years.[2]

Research studies in the 1970s emphasized acute care and survival immediately after injury and contributed to significant improvements in traumatic SCI care. In the 1980s research efforts focused on prevention and treatment of common medical complications, such as pressure ulcers and urinary tract infections, and on more rigorous research designs and clinical trials. In recent years, innovative studies have evaluated new drugs and biotechnical developments. (For information about studies conducted by the NWRSCIS, see the Summer 2003 issue of the *SCI Update* newsletter, online at *http://depts.washington.edu/rehab/sci/updates/03sum_research_update.html*.)

For More Information

Find out more about the 16 Model SCI Systems by visiting the Model SCI System Gateway at *www.ncddr.org/rpp/hf/hfdw/mscis/* or by calling the National Center for the Dissemination of Disability Research at 800-266-1832.

References

1. Tate D and Forchheimer M. Contributions from the Model Systems Programs to Spinal Cord Injury Research *J Spinal Cord Med* 2002;25:316-330).

2. Ditunno JF, Apple DF, Burns AS, et al. A View of the Future Model Spinal Cord Injury System Through the Prism of Past Achievements and Current Challenges. *J Spinal Cord Med* 2003;26:110-115.

Spinal Cord Injury Update is supported by grant H133N000003 from the National Institute of Disability and Rehabilitation Research (NIDRR), U.S. Department of Education, Office of Special Education and Rehabilitative Services (OSERS), to the Northwest Regional Spinal Cord Injury System, one of 16 model SCI care systems nationwide. **Project Director:** Diana D. Cardenas, MD, MHA; **Project Co-Director:** Charles Bombardier, PhD.

To add your name to the mailing list or to request alternative formats, contact the editor, Cynthia Salzman, at the University of Washington Department of Rehabilitation Medicine, Box 356490, Seattle WA 98195-6490; 206-685-3999; *csalzman@u.washington.edu*.

Northwest Regional SCI System Web site: *http://depts.washington.edu/rehab/sci*

SCI Pain and Relaxation

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very effective," Jensen said. "Medications are not always helpful and often have adverse or intolerable side effects."

"In contrast, hypnosis and relaxation techniques are a way to get pain relief that has only positive side effects, such as improved sleep, lowered blood pressure and decreased anxiety."

The two treatments under investigation in this study both contain hypnosis and relaxation training components. One focuses on direct verbal suggestions for relaxation; the other uses biofeedback-assisted relaxation. "Patients report they feel better after both treatments, and each has been shown to be effective for chronic pain in other populations," Jensen said.

Jensen explains the effect of deep relaxation by comparing the brain to a television set: "You can only listen to one or two channels at a time. Yet there are potentially thousands of channels of information available to our brains. We can't process all the possible input that our brains receive. In a deeply relaxed state, the mind simply has more control over how we process information. People can learn to filter out unpleasant pain sensations, and we think relaxation helps to facilitate this."

"Also, it's hard to hurt so much when you're deeply relaxed," he added.

Jensen and his colleagues are recruiting up to 134 participants who have SCI at any level and who experience bothersome chronic pain. Participants can have neuropathic pain—caused by abnormal processing of sensory input due to damage to the nervous system—or musculoskeletal pain—due to overuse of non-paralyzed muscles, as in wheelchair propulsion. Most people with SCI have a combination of both types of pain, says Jensen. "One of our research questions is whether these treatments are effective for different kinds and combinations of pain."

Participation involves an initial interview; a physical exam by the study physician (Dr. Diana Cardenas); a two-month "baseline" period (before beginning treatment) of daily pain ratings; random assignment to one of two relaxation treatment groups; 10 free one-hour relaxation training sessions over a two- to four-week period; and monthly follow-up phone interviews for one year after treatment. Participants will receive free parking, free treatment sessions with a research psychologist (which normally costs $120 per session), and compensation for follow-up interviews.

Participants in the study so far report significant benefit from the relaxation training, Jensen says. Because relaxation is something people can learn to do for themselves, it can give them a sense of control over pain. Many participants have been surprised at the effectiveness of the techniques—for some, this was the first time in years they felt pain-free. Some said the procedures eliminated their pain; others that it helped make their pain more tolerable. A number of participants commented that it was a good way to decrease anxiety and get through tough times. It also improved sleep for many.

"These techniques don't relieve pain for everybody, but some people get significant pain relief and most report at least a little," Jensen noted. Furthermore, "relaxation is a good stress-management skill." Finally, many research participants like knowing they are contributing to research that will help others in the future.

For more information about participating in this study, contact Amy Hoffman, 206-616-9058 or 800-377-9707; *painstudy@u.washington.edu* (confidentiality of information sent via email cannot be guaranteed).

Sybil Bailey (right) is a participant in the research study "Relaxation and Hypnotic Treatment of Persons with Spinal Cord Injury-Related Pain." She is seen here during a training session with Joyce Engel-Knowles, PhD (left), associate professor in the Department of Rehabilitation Medicine and one of the study investigators.

SCI-Related Publications by UW Faculty: Year Three

A sampling of work published in the third year of the Northwest Regional SCI System's five-year grant cycle.

JOURNAL ARTICLES

Brodke DS, Anderson PA, **Newell DW**, Grady MS, **Chapman JR.** Comparison of anterior and posterior approaches in cervical spinal cord injuries. *J Spinal Disord Tech.* 2003; 16(3):229-235.

Burns SP, Rivara FP, Johansen JM, Thompson DC. Rehabilitation of traumatic injuries: use of the Delphi method to identify topics for evidence-based review. *Am J Phys Med Rehabil.* 2003; 82(5):410-414.

Cardenas DD, Turner JA, Warms CA, Marshall HM. Classification of chronic pain associated with spinal cord injuries. *Arch Phys Med Rehabil* 2002; 83(12):1708-1714.

Ehde DM, Jensen MP, Engel JM, Turner JA, Hoffman AJ, Cardenas DD. Chronic pain secondary to disability: A review. *Clin J Pain.* 2003 Jan- Feb;19(1):3 – 17.

Guihan M, **Goldstein B**, Smith BM, Schwartz A, Manheim LM. SCI health care provider attitudes about pressure ulcer management. *J Spinal Cord Med.* 2003 Summer;26(2):129-34.

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The SCI Forum is an evening presentation and discussion series on topics of interest to persons with spinal cord injury and their friends and family members, held monthly at the University of Washington Medical Center during the fall, winter and spring.

Artists with SCI: Personal Stories

June 10, 2003—Seattle native Brom Wikstrom decided at an early age that he wanted to be an artist like his father. Brom studied art in college and worked as a commercial artist. When he was 21 and living in New Orleans, he dove into the Mississippi River and broke his neck. After a lengthy hospital stay in New Orleans and the UW Medical Center, Brom moved back into his parents' Seattle home and started painting by holding a brush in his mouth. Today, Brom is a professional mouth painter who exhibits and travels internationally.

Brom's return to art after his injury began as a volunteer, teaching art to patients at Children's Hospital in Seattle. He received a grant to teach for a year and organize an exhibit of the children's art. This led to his involvement in the disability arts movement and VSA arts (1300 Connecticut Ave. NW, Suite 700, Washington, D.C., 20036; 800-933-8721; *www.vsarts.org/*). He participated in the first VSA arts festival in Washington, DC, in 1979 and has continued a close association with them ever since.

In 1980, Brom applied for membership in the Association of Mouth and Foot Painting Artists (AMFPA, 2070 Peach Tree Industrial Court, Atlanta, GA 30341; 770-986-7764; *www.amfpa.com*), an international organization that exhibits and sells the work of its member artists around the world. AMFPA has high professional standards, and Brom was turned down the first time he applied. Undeterred, he kept working and perfecting his technique. "Eventually I was accepted as a student, and after several more years became a full member," he said. Brom and his wife travel widely for this organization, which has conventions in different international locations every three years and more frequent regional meetings. Brom has done artist residencies in the public schools and finds tremendous satisfaction bringing arts opportunities to children.

Success has taken a toll, however. After years of holding a brush in his mouth for many hours a day, every day, he has recently developed temporomandibular joint (TMJ) problems. "I can't paint 12-14 hours a day anymore," he said. "I may have to alter my style." For more information about Brom's life and work, visit his Web site at *www.bromwikstrom.com/*.

Charlene Curtiss is a dancer. She is also a person who uses a wheelchair due to an incomplete T12 injury from a gymnastics accident she had when she was a teenager. "I got involved in wheelchair sports, and that led me to dance," she said. Charlene now has her own dance company, Light Motion (1520 32nd Avenue S, Seattle, WA 98144; 206-328-0818; *cacurtiss@msn.com*), and performs and teaches internationally. She calls her form of dance "integrated" because it combines dancers in wheelchairs with "stand-up" dancers.

"There are about a dozen professional integrated dance companies in the U.S. today," she said, "and another dozen internationally." There is a refreshing amount of variation and experimentation among these companies, from ballet and jazz to physical theatre. Some dancers use motorized wheelchairs, some manual, and some disabled performers dance lying on the floor. One company uses a trapeze.

Charlene choreographs most of her company's performance pieces. She organizes and choreographs community-based groups all over the U.S. and has conducted artist residences in schools.

Like Brom, Garreth Schuh yearned to be an artist as a youth, but was discouraged by parents and others on the grounds that it wasn't practical. He compromised by going into architecture, "but it never really scratched that (artistic) itch," he said. After his injury 12 years ago, he decided to revisit his creative urges and enrolled in painting and drawing technique classes.

His earliest themes were dark. "When I first started I was consumed with disability and loss, and that's what informed my subjects," he said. Gradually that need diminished, and he began expanding his subjects and methods, working with color and large canvasses, and exploring abstract ideas as well as cityscape themes.

Garreth admits that the marketing side of his art has been a struggle: "It's a full-time job getting your work out there." But as he gains more recognition and receives commissions, it has become more and more gratifying. More recently he has begun showing in juried exhibits and fairs, including a VSA arts of Washington "No Boundaries" touring exhibit. Like many artists, he struggles to balance his desire to devote more time to painting with the need to accept paid work—in his case, lucrative architectural commissions.

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When I first started painting after my injury, I was consumed by disability and loss, and that's what informed my subjects.

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A month before his injury, artist Bruce Hanson, a.k.a. "projectorguy," completed a fine arts graduate degree program and was actively engaged in creating large-scale public art projects, including a "gorilla" style projection on the side of the newly remodeled Bellevue Art Museum (BAM) just before it opened. "That makes me the first artist to show there," he quipped. In response, BAM commissioned him to do a projection piece for the ceiling of the portico: a video showing an enormous eye, blinking and looking around, the pupil filled with a video of visitors wandering around a museum. He wanted to stimulate visitors to rethink their notions of "who is looking

at whom," he said. "An interesting idea, especially for an art museum."

Bruce's C6 incomplete injury hasn't derailed his artistic career. Working with video has enabled him to continue working in the same medium as before his injury. This would have been difficult had he been a painter (as he originally intended when he started graduate school) because he has lost function in his right hand.

Bruce's approach tends toward the confrontational—he enjoys surprising people and forcing them to think about things in new ways. Recently he was invited to participate in the Boston Cyberarts Festival, where he projected images of wounds onto the torsos of passersby. "I wanted to push the boundaries of personal space," he said. "I appropriated (images of) wounds from crucifixion paintings, surgical procedures and violence." The Festival took place during the bombing in Iraq, adding a degree of intensity and relevance to Bruce's work, which garnered praise by a *Boston Globe* critic. Examples of Bruce's work can be seen on his Web site, *www.projectorguy.com*.

"Artists with disabilities are really making a difference in the world," Charlene Curtiss remarked in closing. "If something here tonight has intrigued you, we encourage you to get involved."

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Videos: Life After SCI

October 14, 2003—In a departure from our usual speaker and discussion format, we passed around the popcorn, dimmed the lights, and screened several videos dealing with life after SCI. Here are some of our favorites. (For more information, including ratings and comments by audience members, go to our Web site at *http://depts.washington.edu/rehab/sci/video.html*.)

Moment By Moment: The Healing Journey of Molly Hale (2002)

After being told by her doctors that she would never be able to move again from the shoulders down, Molly Hale embarked on her own intensive program of healing techniques and gradually recovered her abilities beyond all medical expectations. (To obtain a copy, go to *www.aquariusproductions.com* or call 888-440-2963.)

The Toughest Break: Christopher Reeve on Spinal Cord Injury (1997)

Hosted and narrated by Christopher Reeve, this documentary records the personal experiences of several individuals with cervical SCI, from the emergency room through rehabilitation, discharge, and adjusting to life with SCI. This film also showcases many new cutting-edge technologies to enhance mobility and presents research conducted by some of the world's leading scientists. (To obtain a copy, go to: *www.films.com* or call 1-800-257-5126.)

Spinal Impact (2000)

This video explores promising scientific breakthroughs in the treatment of SCI, including nerve regeneration, electrical stimulation devices, and the importance of aggressive care at the time of injury. Includes case studies of persons with spinal cord injuries and different degrees of paralysis. (Shown on the The Learning Channel. To obtain a copy, go to *www.films.com* or call 1-800-257-5126.)

ITB Therapy for the Management of Severe Spasticity (1996)

A product education and promotion video of the intrathecal baclofen pump (ITB) as a treatment option for severe spasticity. Includes before and after video clips of individuals who have undergone the treatment. (To obtain a copy, contact Tara Beer, Patient Services Consultant, Activa & ITB Therapies, Medtronic Neurological, 800-638-7621 ext. 95977.)

Working Together: Computers and People with Mobility Impairments (2000)

An informational video from the University of Washington's DO-IT (Disabilities, Opportunities, Internetworking and Technology) program highlighting several computing tools that have been used effectively by individuals with mobility impairments. (To obtain a copy, go to *www.washington.edu/doit/* or call 888-972-DOIT.

Skin Care: Preventing Pressure Ulcers (1998)

Provides education on skin inspection, correct pressure relief techniques, daily range-of-motion exercises, nutrition, hydration and the importance of maintaining overall health to prevent pressure ulcers. (To obtain a copy, go to *www.pva.org/member/pdf/pubs_mem_cat03.pdf*)

Accidents Stink (2000)

Detailed information on and demonstrations of bowel management for individuals with spinal cord injury, produced at the Seattle Veterans Administration Hospital and directed by Dr. Steve Steins. An excellent training resource for new attendants. (To obtain a copy, contact Concepts in Confidence at 1-800-822-4050.)

Many of the videos shown at this SCI Forum are available for viewing in the Patient Education Library on 8 North at UWMC. Contact Debra Glazer (dglaze@u.washington.edu; 206-685-3880) for information.

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To learn about upcoming SCI Forums, consult our Web site at ***http://depts.washington.edu/rehab/sci/forum.html****, or contact Cynthia Salzman (Email: csalzman@u.washington.edu; Phone: 206-685-3999) and ask to be added to the SCI Forum mailing list.*

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SCI Forum Reports

Due to space limitations, we cannot publish all SCI Forum reports in the print version of this newsletter. More SCI Forum reports are published on our Web site at:

http://depts.washington.edu/rehab/sci/forum_reports.html.

The articles previewed below were selected from a recent screening of the National Library of Medicine database for articles on spinal cord injury. In the judgment of the editors, they include potentially useful information on the diagnosis or management of spinal cord injury. You may obtain copies of the complete articles through your local medical library or from UW Health Sciences Library Document Delivery Service (call 206-543-3436 for fee schedule).

COMPLICATIONS

■Acupuncture as a promising treatment for below-level central neuropathic pain: a retrospective study.

In a retrospective chart review of 36 inpatients with SCI and below-level central neuropathic pain (diffuse pain characterized by generalized burning) of between 2-week and 15-year duration who received an electroacupuncture protocol for pain, 26 patients showed improvement after treatment. Pain ratings were assessed using an 11-point visual analog scale before the first acupuncture treatment and compared to ratings at discharge. Type of injury, level of injury, and duration of below-level central neuropathic pain was not correlated with improvement. However, patients with burning pain that was bilateral, symmetric, and constant were the most likely to improve. Patients experienced noticeable benefits quickly (usually by the third treatment) and had no adverse effects.
Rapson LM, Wells N, Pepper J, et al.
J Spinal Cord Med. 2003 Spring;26(1):21-6

■Healthy body mass index values often underestimate body fat in men with spinal cord injury.

Body mass index (BMI) (kg / m(2)) and dual-energy x-ray absorptiometry measures of total and regional lean tissue mass and fat mass were measured in 19 men with traumatic SCI and 19 age-, height-, and weight-matched able-bodied controls. Although the groups had similar BMIs, total lean tissue mass was 8.9kg lower, total fat mass was 7.1kg greater, and body fat percentage was 9.4% greater in the SCI group. Regional measures showed a similar pattern. Many patients with SCI do not appear to be obese yet carry large amounts of fat tissue. A healthy BMI may mask excessive adiposity in people with SCI.
Jones LM, Legge M, Goulding A.
Arch Phys Med Rehabil. 2003 Jul;84(7):1068-71

■Prevention of venous thromboembolism in the rehabilitation phase after spinal cord injury: prophylaxis with low-dose heparin or enoxaparin.

In a prospective, nonrandomized, multicenter study, 119 subjects received either low-dose unfractionated heparin (UFH) or enoxaparin for prophylaxis against venous thromboembolism (VTE) during the rehabilitation phase after SCI. After 2 weeks of acute-phase prophylaxis, patients without objective evidence of VTE entered the rehabilitation phase and received up to 6 additional weeks of thromboprophylaxis with either UFH 5,000 U every 8 hours or enoxaparin 40 mg once daily. Repeat bilateral lower extremity duplex ultrasonography found new VTE in 13 of 60 UFH versus 5 of 59 enoxaparin patients (21.7% vs. 8.5%). While both interventions were safe, enoxaparin appeared more effective than heparin in the prevention of thromboembolic complications during rehabilitation after SCI.
Merli G
J Trauma. 2003 Jun;54(6):1111-5.

■Prevalence of vitamin B_{12} deficiency in spinal cord injury

Fasting blood samples were obtained at annual evaluation for serum B_{12}, folic acid, methylmalonic acid (MMA), and homocysteine in 106 adult men with SCI or SCD seen at a regional Veterans Affairs SCI Service. Vitamin B_{12} deficiency was found in 5.7% of subjects by subnormal serum B_{12} level and in 19% by supranormal serum MMA level. Most (67%) had symptoms suggestive of B_{12} deficiency. Vitamin B_{12} deficiency was most commonly associated with middle age (40-59 years); complete or near-complete injury; long duration of SCI; and tetraplegia. Given the possible risk of irreversible neuropsychiatric deficits, low cost of screening, and high efficacy of high-dose B_{12} replacement, screening and early treatment of B_{12} deficiency is recommended.
Petchkrua W, Burns SP, Stiens SA, et al.
Arch Phys Med Rehabil. 2003 Nov;84(11):1675-79

■Do spinal cord injuries adversely affect serum lipoprotein profiles?

Sixty persons with SCI (46 men; 14 women; mean age, 28.1 years) were matched for age and sex with 28 non-injured controls. Serum low-density lipoprotein cholesterol level was significantly higher in subjects with SCI than in controls and serum high-density lipoprotein cholesterol level was lower. Apolipoprotein A-I level was significantly lower in the SCI group compared with controls and apolipoprotein B level was significantly higher. Results show that serum lipoprotein level should not be ignored for the follow-up of the patients with SCI.
Ozgurtas T, Alaca R, Gulec M, et al.
Mil Med. 2003 Jul;168(7):545-7.

GENITOURINARY

■A protocol of electroejaculation and systematic assisted reproductive technology achieved high efficiency and efficacy for pregnancy for anejaculatory men with spinal cord injury.

Ten men with traumatic SCI (9 with paraplegia; 1 with tetraplegia; mean years since injury 11; mean age 33) underwent assisted reproductive technology for infertility. One couple achieved pregnancy after the second cycle of electroejaculation and intrauterine insemination. Seven couples underwent 8 cycles of intracytoplasmic sperm injection (ICSI): 4 with fresh electroejaculates; 2 with cryopreserved samples; and 2 with cryopreserved samples with added pentoxifylline. Seven (88%) clinical pregnancies occurred, one from ICSI with cryopreserved sperm from vasal aspiration. Fertilization and pregnancy rates from ICSI cycles using sperm from men with SCI were comparable to men without SCI. The cumulative successful pregnancy rate per couple was 80% (8 / 10).
Shieh JY, Chen SU, Wang YH, et al.
Arch Phys Med Rehabil. 2003 Apr;84(4):535-40

A 7-year follow-up of sacral anterior root stimulation for bladder control in patients with a spinal cord injury: quality of life and users' experiences.
Thirty-seven patients with complete SCI who had sacral anterior root stimulation (SARS) implanted between 1987 and 2000 responded to a questionnaire about complications, technical failures and personal experiences. Respondents reported decreased infection rate (68%), improved social life (54%), and complete daytime (54%) and nighttime (70%) continence. SARS is effective and safe for neurogenic bladder management in patients with complete SCI and seems to reduce the effects of urinary-disorder-specific quality of life (QoL) aspects and to increase QoL in general.
Vastenholt JM, Snoek GJ, Buschman HP, et al.
Spinal Cord. 2003 Jul;41(7):397-402

Effect of controlled-release oxybutynin on neurogenic bladder function in spinal cord injury.
A 12-week, prospective, open-label dose-titration study of extended-release oxybutynin enrolled 10 subjects with complete and incomplete SCI who had urodynamically defined detrusor hyperreflexia. Following a 7-day washout period, subjects were evaluated via video-urodynamic study and treatment was initiated at a dosage of 10 mg per day. Dosage was increased in weekly intervals to a maximum of 30 mg per day. Micturation frequency diaries and urodynamics were completed at baseline and repeated at week 12. Tolerability information was collected at each follow-up visit. Participants reported decreased urinary frequency and fewer incontinence episodes with oxybutynin therapy following titration to 30 mg per day. All subjects chose a final effective dosage of greater than 10 mg, with 4 taking the maximum of 30 mg per day. Mean cystometric bladder capacity increased from 274 mL to 380 mL. Onset of clinical efficacy occurs within 1 week, and daily dosages up to 30 mg are well tolerated.
O'Leary M, Erickson JR, Smith CP, et al.
J Spinal Cord Med. 2003 Summer;26(2):159-62.

REHABILITATION CARE

Satisfaction with upper-extremity surgery in individuals with tetraplegia.
Sixty-seven individuals with SCI between C4 and C8 responded to a mailed survey measuring satisfaction with upper-extremity reconstructive surgery to improve function. Procedures included tendon transfers for elbow extension, wrist extension, hand grasp, and pinch or hand grasp neuroprosthesis. Participants were generally satisfied with the results of their upper-extremity surgery (70%) and reported a positive impact on their lives (77%), improvements in activities of daily living (68%), improved independence (66%), improvement in occupation (69%), and improved appearance or neutral (71%). They also reported that postoperative therapy was beneficial (86%).
Wuolle KS, Bryden AM, Peckham PH, et al.
Arch Phys Med Rehabil. 2003 Aug;84(8):1145-9.

Effects of a wheelchair ergometer training programme on spinal cord-injured persons.
Seven males with T6-L5 SCI (ages 21-55, time since injury 1-30 years) performed 45 minutes of wheelchair ergometry three times per week, for 6 weeks. Training resulted in significant improvements in maximal tolerated power, peak oxygen consumption and oxygen pulse. Heart rate and ventilation were significantly lower while VO2 was unchanged. Between the first and the last training session, the total physical work was improved by 24.7%, whereas heart rate was unchanged. An individualized interval-training program using a wheelchair ergometer can significantly improve fitness level and endurance capacity.
Bougenot MP, Tordi N, Betik AC, et al.
Spinal Cord. 2003 Aug;41(8):451-6.

Wheelchair configuration and postural alignment in persons with spinal cord injury.
Fourteen subjects with motor-complete C6-T10 SCI sat in 3 manual wheelchairs: standard setup E&J Premier (S1), standard setup Quickie Breezy (S2), and test configuration Quickie TNT (T) with posterior seat inclination and a low backrest set perpendicular to the floor. Shoulder and neck alignment and pelvic tilt were determined from sagittal plane digital photographs at rest and with maximal vertical reach. At rest, T produced less shoulder protraction, less head-forward position, and greater vertical reach above the seat plane than either conventional configuration. The wheelchair with a positive seat slope (14º), acute inside backrest angle, and relatively low backrest (meeting the lowest ribs) produces more vertical postural alignment and greater reach ability versus the standard factory setup wheelchairs, and may be associated with reduced neck and shoulder pain in this population.
Hastings JD, Fanucchi ER, Burns SP.
Arch Phys Med Rehabil. 2003 Apr;84(4):528-34

The short-term effect of hippotherapy on spasticity in patients with spinal cord injury.
Thirty-two patients with SCI between C4 and T12; ASIA A-D; ages 16-72; time since injury 1-60 months; and various degrees of spasticity received repeated sessions (range: 5-24; mean 11) of 25-30 minutes of Hippotherapy-K treatment (therapeutic horseback riding). Spasticity testing of the lower extremities before and immediately after each session found that Hippotherapy significantly reduced spasticity of the lower extremities. Of the 351 sessions performed, 327 (93%) led to lower Ashworth scores immediately after treatment. Highest improvements were observed in subjects with very high spasticity. There was no significant difference in improvement between subjects with paraplegia versus tetraplegia.
Lechner HE, Feldhaus S, Gudmundsen L, et al.
Spinal Cord. 2003 Sep;41(9):502-5.

OTHER

Catastrophic spine injuries in American football, 1977-2001.
This study describes 25 years (1977-2001) of catastrophic neck injuries, including incidence, cause, and variables that have either increased or decreased these injuries. National data from all organized football programs (public school, college, professional, and youth) found 223 permanent cervical injuries during this time period. Rule changes regarding allowed techniques of the game; teaching and enforcing the correct techniques; equipment standards; and improved medical care both on and off the playing field have led to a 270% reduction in permanent SCI from a peak of 20 per year between 1971-75 to 7.2 per year during the past 10 years. Recommendations are given for reducing catastrophic cervical spine injury in football.
Cantu RC, Mueller FO.
Neurosurgery. 2003 Aug;53(2):358-62; discussion 362-3.

Recent SCI Publications by UW Faculty (continued from page 3)

Hastings JD, Fanucchi ER, **Burns SP**. Wheelchair configuration and postural alignment in persons with spinal cord injury. *Arch Phys Med Rehabil* 2003; 84(4):528-534.

Hyman GS, **Cardenas DD.** Upper extremity deep venous thrombosis associated with peripherally inserted central catheters in acute spinal cord injury: A Report of 2 Cases. *Arch Phys Med Rehabil.* 2002; 83(9):1313-1316.

Komar JC, **James J, Little JW**. Scheuermann's kyphosis following cervical spinal cord injury. *J Spinal Cord Med* 2003; 26(1):92-94.

Marshall G, **Little JW**. Deep tendon reflexes: a study of quantitative methods. *J Spinal Cord Med*, 2002; 25:94-99.

Petchkrua W, Little JW, Burns SP, Stiens SA, James JJ. Vitamin B12 deficiency in spinal cord injury: a retrospective study. *J Spinal Cord Med* 2003; 26(2):116-121.

Cardenas DD, Warms CA, Turner JA, Marshall H, Brooke MM, Loeser JD. Efficacy of amitriptyline for relief of pain in spinal cord injury: Results of a randomized controlled trial. *Pain* Apr 96(3):365-373, 2002.

Turner JA, Jensen MP, Warms CA, Cardenas DD. Blinding effectiveness and association of pretreatment expectations with pain improvement in a double-blind randomized controlled trial. *Pain.* 2002; 99:91-99.

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James J, Cardenas DD. Spinal Cord Injury. In: *Handbook of Physical Medicine and Rehabilitation*, 2nd Edition. Garrison SJ (Ed). Lippincott, Williams & Wilkins, Philadelphia, PA. 2003:270-95.

Little JW. Post-traumatic syringomyelia. In: Lin VW, ed, *Spinal Cord Medicine: Principles and Practice*. New York: Demos Medical Publishing, 2003:501-507

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Catheter Study

Dr. Diana Cardenas is seeking individuals with SCI and frequent urinary tract infections (UTIs) for a research study investigating the effects of a new hydrophilic catheter system on the number and/or severity of UTIs. Participants who complete the study will be paid $150. For more information, contact Helen Ramil at 206-685-3906 or *ramil@u.washington.edu*.

Also published online at http://depts.washington.edu/rehab/sci/update.html

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