



spinal cord injury

UPDATE

Department of Rehabilitation Medicine

Volume 19 Issue 1 • Spring 2010

INSIDE:

- Recent SCI Publications by UW Faculty..... 3
- New Exercise Study Seeks Participants 3
- SCI Forum Report: Aging with a Spinal Cord Injury..... 4
- Literature review: 14 abstracts on SCI topics 6

UW Medicine
SCHOOL OF MEDICINE

Maintaining Oral Health after SCI

We all want to keep our teeth healthy, but this can be hard to do if you have a spinal cord injury.

- Surveys show that dental care is one of the most difficult health care services for people with SCI to access.
- Dental facilities, offices, exam rooms and exam chairs may not be accessible to someone using a wheelchair.
- Most dental professionals have limited experience and training in caring for people with SCI, and may not understand their special health needs and concerns.
- Many of the medications people with SCI regularly take can make them more vulnerable to dental problems.
- For people with tetraplegia (quadriplegia), lack of arm or hand function can make it difficult or impossible to brush and floss without assistance.

- Caregivers need to be properly trained by dental professionals in how to care for another person's teeth.

Why is oral health so important after SCI?

The condition of a person's teeth and gums can affect overall health in important ways, according to Bart Johnson, DDS, of Seattle Special Care Dentistry, a practice specializing in dental care for individuals with special medical and physical needs.

"Inadequate dental care can cause a build-up of bacteria in your mouth and cause chronically inflamed gums, both of which can weaken the immune system and put you at risk for other health problems, such as cardiac disease" or poor healing. Since a person with SCI is already vulnerable to a host of secondary conditions, maintaining good oral health is especially important.

Accessibility issues

Many dental facilities and offices are not wheelchair accessible. The standard dental treatment room is too small for a wheelchair, and patients usually have to transfer into the exam chair. If they cannot transfer by themselves, they will need assistance; yet most dental professionals

have not had training in safe wheelchair transfer techniques.

"We see a fair number of SCI patients because usually other offices are not big enough or accessible," Johnson says. He and his partner, Amy Winston, DDS, designed their office "from scratch" with special needs patients in mind. Located in a new building near University Village, their expansive office has wide doorways, a push-button automatic front door, large exam rooms and personnel trained in proper transfer techniques. Even so, in most cases, patients can remain in their wheelchairs for treatment.

CONTINUED ON PAGE 2



Special care dentist Amy Winston (left) and dental assistant Rob Coghill (right), of Seattle Special Care Dentistry, talk with a patient in a wheelchair. Their practice specializes in caring for people with disabilities and complex medical conditions.

Maintaining Oral Health after SCI

CONTINUED FROM PAGE 1

“You can drive a wheelchair into our big room, lean back, and we can swing all the equipment over,” Johnson says. “If a lot of treatment is necessary, we can use our Hoyer lift to transfer a patient into the dental chair.” They also have a special x-ray machine for full-mouth images that swings into place so the patient can stay in his or her wheelchair.

Insurance coverage can be another hurdle for people with SCI. “Many patients with disabilities are DSHS funded, but a lot of dentists do not accept DSHS patients because their reimbursement rate is so low,” Johnson says. While Seattle Special Care Dentistry is committed to serving medically complex DSHS patients, they lose money every time they do.

Medical issues

Many dentists are not familiar with the unique medical needs of patients with spinal cord injury. In one study, 90% of the dental professionals surveyed did not know the term autonomic dysreflexia. “Because we know that autonomic dysreflexia can be an issue, we keep the patient monitored and keep the blood pressure cuff on,” Winston says. “Most people can feel it coming on, so they tell us and we can stop the procedure or use medications as necessary.”

Some common SCI-related medications can take a toll on a person’s oral health. “Chronic pain and spasticity medications often cause dry mouth,” Johnson explains. “Saliva helps neutralize bacteria, so when saliva is reduced from these medications, decay is rampant.”

Johnson and his team look out for this and spend extra time training the patient in proper cleaning technique. They may devise simple solutions when self-brushing is difficult, such as sticking a toothbrush in a tennis ball or using straps and Velcro.

They also encourage patients to bring their caregivers to the visit for training in how to properly care for someone else’s teeth. For patients with a high risk of decay, they will prescribe a fluoride tray to strengthen the teeth.

In order to provide the best care, a dentist must get a very careful medical history and know all the medications you are taking. Your dentist must understand your functional abilities and other medical concerns that might affect the dental visit, such as spasticity or the need to do pressure reliefs.

A dentist also needs to be willing to write appeals to insurance companies explaining why extra visits may be necessary for more

frequent cleanings or other necessary services. “This takes extra time,” says Johnson. “We are able to spend the time necessary and do longer appointments.”

How often should someone with SCI get dental care? “This varies by the individual,” Winston says. “If someone hasn’t been to a dentist for a while, we may start with visits every three months and see how they do.”

Since many of their patients come from far away, they often choose to stay a couple of days in Seattle and get all their care done. “Major work can get done in one or two longer appointments,” Winston explains, “and maintenance can be done back in their local communities.”

For long procedures, their practice is set up to do conscious sedation—a combination of muscle relaxants and narcotics given intravenously—which makes it much more comfortable for the patient and allows the dentist to get more work done. If general anesthesia is required, they have an anesthesiologist available two days a week.

Johnson and Winston were faculty with the University of Washington until 2007. They opened Seattle Special Care Dentistry in January of the following year. About 80% of their practice is made up of medically complex or special needs patients.

Johnson provides continuing education for the dental community in caring for medically complex patients and frequently consults with local dentists about special needs cases. The practice is also a training facility for Swedish Medical Center Dental Residents.

For more information about Seattle Special Care Dentistry, call 206-524-1600 or visit www.seattlespecialcaredentistry.com.

Finding a dentist

It is important to find a dentist who not only has an accessible office, but is willing to work with you and your individual needs. Special needs dentists have expressed an interest in working with this population. When shopping around for a dentist, “ask if they have had extra training in hospital dentistry or caring for special needs patients,” Johnson suggests. “You can look on their Web sites and check their resumes. Hospital dentistry requires extra training after dental school.”

For more information about special care dentistry, contact the Special Care Dentistry Association: www.scdonline.org; 312-527-6764; scda@scdaonline.org.

Reference

Sullivan AL, Morgan C, Bailey J. Dental professionals’ knowledge about treatment of patients with spinal cord injury. *Spec Care Dentist*. 2009 May-June;29(3):117-22.

❖ ❖ ❖

Many dentists are not familiar with the unique medical needs of SCI patients. One survey of dentists found that 90% hadn’t heard of autonomic dysreflexia.

❖ ❖ ❖



Photo credit: UW School of Dentistry.

Recent SCI-Related Publications by UW Faculty

A selection of articles published in the last year. Names of UW faculty are in boldface.

- Bates-Jensen BM, Guihan M, Garber SL, Chin AS, **Burns SP**. Characteristics of recurrent pressure ulcers in veterans with spinal cord injury. *J Spinal Cord Med*. 2009;32(1):34-42.
- Cardenas DD, **Hoffman JM**. Hydrophilic catheters versus noncoated catheters for reducing the incidence of urinary tract infections: a randomized controlled trial. *Arch Phys Med Rehabil* 2009;90:1668-71.
- Evans CT, **Burns SP**, Chin A, Weaver FM, Hershow RC. Predictors and outcomes of antibiotic adequacy for bloodstream infections in veterans with spinal cord injury. *Arch Phys Med Rehabil*. 2009 Aug;90(8):1364-70.
- Evans CT, Hershow RC, Chin A, Foulis PR, **Burns SP**, Weaver FM. Bloodstream infections and setting of onset in persons with spinal cord injury and disorder. *Spinal Cord*. 2009 Aug;47(8):610-5.
- Guihan M, Garber SL, **Bombardier CH**, **Goldstein B**, Holmes SA, Cao L. Predictors of Pressure Ulcer Recurrence in Veterans with Spinal Cord Injury. *J Spinal Cord Med*. 2009 31,551-559.
- Massa L, **Hoffman JM**, Cardenas DD. Validity, Accuracy, and Predictive Value of Urinary Tract Infection Signs and Symptoms in Individuals with Spinal Cord Injury on Intermittent Catheterization. *J Spinal Cord Med*. 2009;32(5):568-73.
- Molton IR**, **Jensen MP**, Nielson W, Cardenas D, **Ehde DM**. A preliminary evaluation of the motivational model of pain self-management in persons with spinal cord injury related pain. *Journal of Pain*. 2008;9, 606-612.
- Molton IR**, **Stoelb BL**, **Jensen MP**, **Ehde DM**, **Raichle KA**, Cardenas DD. Psychosocial factors and adjustment to chronic pain in spinal cord injury: Replication and cross-validation. *Journal of Rehabilitation Research and Development*. 2009;46(1):31-42.
- Jensen MP**, Barber J, Romano JM, Hanley MA, **Raichle KA**, **Molton IR**, **Engel JM**, Osborne TL., **Stoelb BL**, Cardenas DD, & **Patterson DR**. Effects of self-hypnosis training and EMG biofeedback relaxation training on chronic pain in persons with spinal cord injury. *International Journal of Clinical and Experimental Hypnosis*. 2009 Jul;57(3):239-68.
- Kalpakjian CZ, **Bombardier CH**, **Schomer K**, **Brown PA**, **Johnson, KL**. (2009). Measuring Depression in Persons with Spinal Cord Injury: A Systematic Review. *Journal of Spinal Cord Medicine*. 2009;32(1):6-24.
- Kalpakjian CZ, Toussaint LL, Albright KJ, **Bombardier CH**, Krause JK, Tate DG. Patient health Questionnaire-9 in spinal cord injury: an examination of factor structure as related to gender. *Journal of Spinal Cord Medicine*. 2009;32(2):147-56
- Krogh K, Perikash I, **Stiens SA**, Biering-Sørensen F. International bowel function basic spinal cord injury data set. *Spinal Cord*. 2009 Mar;47(3):230-4 and International bowel function extended spinal cord injury data set. *Spinal Cord*. 2009 Mar;47(3):235-41
- Moritz CT**, **Perlmutter SI**, **Fetz EE**. Direct control of paralysed muscles by cortical neurons. *Nature*. 2008 Dec 4;456(7222):639-42.
- Sellers DL, Maris DO, **Horner PJ**. Postinjury niches induce temporal shifts in progenitor fates to direct lesion repair after spinal cord injury. *J Neurosci*. 2009 May 20;29(20):6722-33.
- Stoelb BL**, **Tackett MJ**, **Jensen MP**. (2009). Hypnotic analgesia for combat-related spinal cord injury pain: A case study. *American Journal of Clinical Hypnosis*, 51, 273-280.
- Svircev JN**, Wallbom AS. False-negative triple-phase bone scans in spinal cord injury to detect clinically suspect heterotopic ossification: a case series. *J Spinal Cord Med*. 2008;31(2):194-6.
- Weaver FM, **Burns SP**, Evans CT, Rapacki LM, **Goldstein B**, **Hammond MC**. Provider perspectives on soldiers with new spinal cord injuries returning from Iraq and Afghanistan. *Arch Phys Med Rehabil*. 2009 Mar;90(3):517-21.

Exercise and Mood Study at the University of Washington

Exercise has been shown to be an effective treatment for improving mood in the general population. In people with MS or SCI, exercise has been shown to result in improvements in mood, quality of life, strength, cardio-respiratory fitness, pain, and fatigue. However, the effect of exercise on improving mood in people aging with MS or SCI has not yet been studied. This study will evaluate the effect of exercise as an alternative method of improving mood in people with MS or SCI who are 45 years of age or older.

All study participants will be asked to complete phone interviews with research staff four times over the course of the study. Participants will be assigned to one of two approaches to physical activity treatment. People assigned to the Treatment A group will participate in a phone call with a study counselor to design a home exercise program based on his or her needs

and abilities, and will receive 6-8 follow-up phone sessions. The Treatment B group will participate in an educational phone session with the study counselor, to discuss reasons to exercise and examples of exercise tailored to their disability. All participants will also be asked to wear a device called an accelerometer to measure physical activity for three one-week periods. All study participants will receive up to \$120 for their time and phone expenses. All participant information will remain confidential.

If you or someone you know is 45 years of age or over, has MS or SCI, and has been feeling the need to improve his or her mood, this study may be of interest to you. **You are welcome to contact us at any time for further information at 206-221-5641 or 866-928-2114 (toll-free).**

forum report

The SCI Forum is an evening presentation and discussion series on topics of interest to persons with spinal cord injury and their family members, friends, caregivers and health care providers, held monthly at the University of Washington Medical Center. To learn about upcoming SCI Forums, read reports of past forums, or view forum videos, consult our Web site at <http://sci.washington.edu/inf/forum>. Contact Cynthia Salzman (email: csalzman@u.washington.edu; phone: 206-685-3999) if you wish to be added to the SCI Forum mailing list.

Aging with a Spinal Cord Injury

By Rina Reyes, MD

Medical Director, UW Medicine SCI Rehabilitation Program and Assistant Professor, UW Department of Rehabilitation Medicine. Presented at the SCI Forum on June 9, 2009, at the UW Medical Center.

People with SCI are living longer than ever, and as they age, they are more likely to develop the same kinds of health problems that plague the rest of the aging population. However, individuals with SCI have a higher likelihood of being diagnosed with the following conditions:

- cholesterol disorders
- diabetes
- overweight/obesity
- infections, primarily pneumonia, urinary tract infections and complications from pressure sores
- bladder cancer

This forum discusses how aging affects your health risks and what you can do about it.

Cardiovascular System

Cholesterol disorders, diabetes and overweight are more common in the SCI population and can lead to coronary artery disease (CAD). Exercise can improve these conditions, and the American College of Sports Medicine (ACSM) recommends that people with SCI exercise three to five times per week for 20 to 60 minutes of moderate-intensity exercise per session.

You can estimate your exercise intensity—how hard you are working—using the Borg Rate of Perceived Exertion Scale (learn more at www.cdc.gov/physicalactivity/everyone/measuring/exertion.html).

Individuals with SCI can get exercise in a variety of ways, including arm crank ergometry, wheelchair propulsion, swimming, wheelchair sports, walking with devices, seated aerobics and electrical stimulation. Whatever exercise you choose, it is important to take precautions to reduce the risk of injury:

- Cushion surfaces to make sure you don't get skin breakdown from transferring to or from equipment.
- For strength exercises, vary which muscle groups you exercise in a ses-

sion, and don't overdue the number of repetitions or amount of resistance.

- Use correct positioning to avoid falls or fractures.
- If possible, work with fitness professionals who are trained to work with individuals with disabilities, such as a ACSM/NCPAD-certified inclusive fitness trainer (CIFT). Go to the NCPAD (National Center on Physical Activity and Disability) Web site for information: www.ncpad.org.

Your doctor should monitor you yearly for blood pressure, cholesterol profiles, glucose tolerance or serum blood sugars, diet and weight, tobacco use, activity level, alcohol use and medications that might contribute to cardiovascular risk.

Musculoskeletal System

Individuals with SCI have an increased risk for shoulder problems, early degenerative arthritis and osteoporosis.

- **Upper limb pain** (shoulder, arm, wrist, hand) can develop from overuse due to transfers; wheelchair pushing; pressure releases; activities that require sustained arm positions above-shoulder level; and crutch walking in individuals with incomplete SCI.

What to do: Use proper positioning and body mechanics. Get an individualized exercise program from your rehab physician to balance the shoulder. See *Preservation of Upper Limb Function Following Spinal Cord Injury: A Clinical Practice Guideline for Health-care Professionals*, Consortium on Spinal Cord Medicine (PVA, 2005). For a copy, contact the PVA: 800-555-9140; info@pva.org; www.pva.org.

- **Bone loss and osteoporosis** begins immediately after injury and continues for at least 12 months. Women with SCI are at increased risk as they age because of post-menopause hormonal changes. Osteoporosis increases your

risk for fractures, and this risk continues to increase with time after SCI. Scientists believe that osteoporosis related to SCI is different from that seen with aging and hormonal changes in women.

What to do: There are still no treatments proven to be effective at preventing the onset or progression of osteoporosis in the SCI population. Reduce caffeine, tobacco and alcohol use. Consume enough calcium and vitamin D as recommended by your provider. See the SCI Forum, "Osteoporosis in SCI" (<http://sci.washington.edu/inf/forum/reports/osteoporosis.asp>).

Respiratory System

Everyone loses a little respiratory function over time due to decreased lung elasticity and decreased number of *alveoli* (small air spaces in the lungs) and reduced *vital capacity* (ability to take a deep breath). Individuals at all levels of SCI are at risk because paralysis of the abdominal muscles reduces the ability to cough well and expel secretions.

Respiratory disorders after SCI:

- Ventilatory failure from reduced ability to take deep breaths.
- Pneumonia, due to poor secretion management or *atelectasis* (lungs can't inflate fully). The death rate from pneumonia is much higher in the SCI population (15%) than the general population (2.7%).
- Sleep disordered breathing or *sleep apnea*, which is more common in SCI and can have dangerous consequences: daytime sleepiness (which can cause motor vehicle crashes); cardiovascular complications (high blood pressure and arrhythmias); problems with wound healing; and even death.

What to do:

- Learn a variety of ways to manage your secretions (manually assisted cough techniques or special equipment).

- Get vaccinated for flu and pneumonia.
- Quit smoking!
- See a pulmonary specialist if you have unexplained shortness of breath, rapid breathing, daytime drowsiness, fluctuating alertness, more dramatic changes in breathing with sitting versus laying, and declining ability to take deep breaths.

Gastrointestinal System

Normal effects of aging include decline in motility of colon and rectum, decreased acid secretion, and increased water absorption from colon, all of which can cause or worsen constipation.

What to do: If constipation, distention or incontinence start to increase with age, follow these guidelines:

- Maintain a daily or every-other-day bowel program.
- Avoid chronic laxative use.
- Include adequate fluids and fiber in your diet.
- Keep as active as possible.
- Consider a colostomy if incontinence or constipation becomes excessive.

Even though there is no increased risk for colorectal cancer after SCI, early warning symptoms may go undetected due to lack of sensation. Follow the screening schedule recommended for the general public.

Urinary System

Changes that occur with normal aging:

- Less storage capacity, so bladder doesn't hold as much urine.
- In women, weakening of the urethral opening, which can cause incontinence.
- Increase in involuntary bladder contractions, the "overactive bladder."
- Increased residual bladder volumes after voiding (urinating).
- Progressive decline in kidney function after the age of 40 or 50.
- Increased risk for urinary tract infections (UTIs) after age 60.

If you have used an indwelling or Foley catheter for many years, you have a slightly increased risk for bladder cancer, particularly if you smoke. There is no increased risk for prostate cancer.

What to do:

- Watch for changing symptoms of UTIs. For example, your primary symptoms may be confusion and lethargy rather than the typical urinary changes.

- Get regular cystoscopy (small tube with a camera through the urethra into the bladder) to screen for bladder cancer if you have used an indwelling Foley catheter for more than eight years.
- Evaluate bladder program annually. An increase in UTIs may signal a need to change your method of catheterization. Only rarely should antibiotics be used preventively for infections.
- Avoid overfilling of leg bag that might cause distention of the bladder and transmit urine back up to the kidneys.
- Women should use the smallest possible catheter size and try to avoid increasing the size of the catheter.
- Yearly upper urinary tract screening for stones and upper tract deterioration, including ultrasound or CT scan of the kidney and lab tests to assess kidney function.

Nervous System

There is normally a decrease in strength, reaction time, vibratory sensation, fine motor function, agility, reflexes, and balance as we age. Individuals with SCI are also at risk for certain nerve entrapment problems, such as carpal tunnel syndrome. Carpal tunnel syndrome can be treated with relative rest, since it's usually impossible to completely stop using the limb. Splinting or surgery may be recommended.

Neurological changes can also occur from a syrinx or syringomyelia (a cyst that forms at the site of your injury). Symptoms include new loss of feeling or change in motor strength in areas where you typically have normal strength and sensation, new onset of autonomic dysreflexia, or changes in blood pressure and spasticity control. Notify your medical provider if you notice these changes.

Skin

Aging makes the skin more vulnerable to pressure sores because:

- Skin becomes thinner and loses elasticity with age, making it more vulnerable to shear forces that lead to blisters and skin breakdown.
- Decreased circulation reduces blood flow to skin.
- Decreased mobility reduces the opportunity to redistribute blood flow to the weight-bearing areas of the body.

What to do:

- Good nutrition is critical both for pre-

venting pressure sores and for healing if a sore is already present. See the SCI Forum on Nutrition Guidelines for Individuals with SCI, <http://sci.washington.edu/inf/forums/reports/nutrition.asp>.

- Keep skin dry and follow good hygiene.
- Don't smoke! It reduces blood flow.

Changing equipment needs

You may need to change equipment as you age due to:

- Increased risk for falls, even for those using a wheelchair.
- Loss of strength and endurance.
- Changes in weight.
- Skin changes
- Upper limb problems that might affect your ability to perform pressure releases or transfers safely.

Manual wheelchair users may need to start using power mobility or power assist wheels to preserve upper extremity function. Likewise, those who are ambulatory may need to use a wheelchair. Other equipment, including bathroom ADL equipment, seating systems, cushions and mattresses, also should be assessed.

Your health care team

If you have an SCI, your health care team should ideally include a rehab provider who is familiar with SCI. However, rehab physicians cannot possibly keep up with the volume of primary care literature, so regular visits to your primary care provider are advised as well. You may also need a urologist or neurological or orthopedic surgeon, depending on what problems arise. For individuals with higher injury levels affecting their respiratory function, a pulmonary physician may be required. The rehab provider is usually in the best position to coordinate all this care and to provide the team with recommendations related to your SCI.

Read the full text of this forum report or watch the video on our Web site at http://sci.washington.edu/inf/forums/reports/aging_6.09.asp.

In the next issue: "Social and Psychological Factors Associated with Aging with SCI," by UW rehab psychologist Ivan Molton, PhD.

literature review

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).

BLADDER MANAGEMENT

■ Urethral versus suprapubic catheter: choosing the best bladder management for male spinal cord injury patients with indwelling catheters.

This review compared urological complications in SCI patients managed with indwelling urethral catheter (UC) to those with suprapubic tube (SPT). Of 179 SCI patients, 133 used UC and 46 used SPT. There was no significant difference between the two catheter groups in number of urinary tract infections, bladder stones, renal calculi and cancer. Each method had its own specific complications: erosion in the UC group and urethral leak, leakage from the SPT and SPT revision in the SPT group. Urethral and scrotal complications may be higher with UC, but complications from SPT may offset benefits from SPT. Overall, bladder management for patients with chronic indwelling catheters should be selected on the basis of long-term comfort for the patient.

Katsumi HK, Kalisvaart JF, Ronningen LD, Hovey RM.
Spinal Cord. 2009 Oct; 13. [Epub ahead of print]

■ Long-term effects of repeated intradetrusor botulinum neurotoxin A injections on detrusor function in patients with neurogenic bladder dysfunction.

This study included 27 patients who had neurogenic detrusor (bladder) overactivity due to SCI and received at least five botulinum neurotoxin A (BoNT-A) treatments. After the first BoNT-A treatment, bladder capacity, reflex volume, continence status and detrusor compliance were significantly improved and maximum detrusor pressure (P(detmax)) was significantly reduced. Incontinence rate (seven patients) and the number of patients with an elevated P(detmax) (five patients) were slightly increased after the final BoNT-A treatment, compared to results after the first treatment. The long-term success rate was 74%. Every fourth patient needed a major surgical intervention. BoNT-A may lead to impaired detrusor contraction strength, which could influence future treatment options.

Pannek J, Göcking K, Bersch U.
BJU Int. 2009 Nov; 104(9):1246-50.

■ Cranberry is not effective for the prevention or treatment of urinary tract infections in individuals with spinal cord injury.

This review identified five studies (four randomized clinical control trials, three using cranberry tablets and one using cranberry juice) that evaluated the effectiveness of cranberry products for the prevention or treatment of urinary tract infections (UTIs) in the SCI population. Three studies reported no statistically significant effect of cranberry tablets on urinary pH, urinary bacterial count, urinary white blood cell (WBC) count, urinary bacterial or episodes of symptomatic UTIs. A fourth study showed that cranberry juice intake significantly reduced biofilm load compared with baseline. A final study reported fewer UTIs during the period with cranberry extract tablets vs placebo. Limited evidence from clinical trials suggests that cranberry, in juice or supplement form, does not seem to be effective in preventing or treating UTIs in the SCI population. More rigorous research is needed.

Opperman EA.
Spinal Cord. 2009 Nov 24. [Epub ahead of print.]

PHRENIC NERVE STIMULATION

■ Phrenic nerve stimulation in patients with spinal cord injury.

Phrenic nerve pacing (PNP) is a clinically useful technique that replaces mechanical ventilation in individuals who cannot breathe independently due to SCI. This review article discusses patient evaluation, equipment, methods of implementation, clinical outcomes, and the complications and side effects of PNP. Despite considerable technical development and clinical success, current PNP systems have significant limitations.

Even in patients with intact phrenic nerve function, PNP is successful in achieving full-time support in only 50% of patients. A novel method of pacing is under development which involves stimulating spinal cord tracts that synapse with the inspiratory motoneuron pools. This technique results in combined activation of the intercostal muscles and diaphragm in concert and holds promise to provide a more physiologic and effective method of PNP.

Dimarco AF.

Respir Physiol Neurobiol. 2009 Sep 26. [Epub ahead of print]

PHYSICAL ACTIVITY

■ Effects of hand cycle training on physical capacity in individuals with tetraplegia: a clinical trial.

Twenty-two individuals with motor incomplete C5–C8 tetraplegia (at least 2 years postinjury) participated in a structured hand cycle interval training program of 24 sessions, 35–45 minutes each, for 8–12 weeks. Training was conducted at home or in a rehabilitation center. After an average of 19 sessions, significant improvements were found in peak power output, peak oxygen uptake and mechanical efficiency as reflected by a decrease in submaximal oxygen uptake. Common health complications, such as urinary tract infections, bowel problems, and pressure sores, led to dropout and nonadherence. There was no participant-reported shoulder-arm pain or discomfort.

Valent LJ, Dallmeijer AJ, Houdijk H, et al.
Phys Ther. 2009 Oct; 89(10):1051-60.

■ Glucose tolerance and physical activity level in people with spinal cord injury.

Twenty-five people (5 women, 20 men) with SCI (11 with tetraplegia, 14 with paraplegia) and no known coronary heart disease, stroke or diabetes were recruited for this cross-sectional observational study. Participants underwent an oral glucose tolerance test and completed the physical activity scale for individuals with physical disabilities. Nine participants had disordered glycemia (6 tetra; 3 para) and the remaining participants had normal glucose tolerance. As a group, participants with normal glucose tolerance spent significantly more time engaged in physical activity, including outdoor household activities, housework and non-exercise-related mobility tasks. Physical activity and age, but not lesion level, were related to glucose concentration.

Raymond J, Harmer AR, Temesi J, van Kemenade C.
Spinal Cord. 2010 Jan 5. [Epub ahead of print]

PAIN

■ Chronic neuropathic pain management in spinal cord injury patients. What is the efficacy of pharmacological treatments with a general mode of administration (oral, transdermal, intravenous)?

This review analyzed and classified pain studies in SCI into four levels of quality of evidence (1 to 4) and three grades of recommendations (A, B, C). The evidence showed that pregabalin is effective for neuropathic pain in SCI (grade A). Gabapentin has a lower level of evidence in SCI pain (grade B), but both drugs can be used as first line therapy and are safe to use. Tricyclic antidepressants (TCAs) can also be a first line drug (grade B for SCI pain associated with depression, grade A for other neuropathic pain conditions), especially in patients with both pain and depression. Tramadol, alone or in combination with antiepileptic drugs, can be used if the pain has a predominant non-neuropathic component. If these treatments fail, strong opioids can be used as second/third line (grade B in SCI, grade A in other types of neuropathic pain). Lamotrigine may also be used at this stage, particularly in patients with

CONTINUED ON NEXT PAGE

CONTINUED FROM PAGE 6

incomplete SCI associated with allodynia (grade B). For difficult central pain, cannabinoids may be used on the basis of positive results in other central pain conditions (e.g. multiple sclerosis). To date few clinical trials have been specifically devoted to this topic. Large scale studies and trials comparing several active drugs are needed.

Attal N, Mazaltarine G, Perrouin-Verbe B, Albert T.
Ann Phys Rehabil Med. 2009 Mar;52(2):124-41.

SPASTICITY

■ Effect of whole-body vibration on quadriceps spasticity in individuals with spastic hypertonia due to spinal cord injury.

Sixteen individuals with SCI and quadriceps (thigh muscle) spasticity had their spasticity measured by gravity-provoked stretch (Pendulum Test) before and after 12 sessions of 3 day/week whole-body vibration (WBV). Quadriceps spasticity was significantly reduced for at least eight days after the program. Improvements were similar whether or not a subject had been using antispastic medications. Vibration may be a useful addition to training in those with spasticity. Future studies should compare the antispastic effects of vibration to antispastic medications.

Ness LL, Field-Fote EC.
Restor Neurol Neurosci. 2009;27(6):621-31.

HYPOTENSION

■ Cognitive performance in hypotensive persons with spinal cord injury.

Individuals with SCI, especially those with tetraplegia, often have hypotension (low blood pressure). Twenty individuals with chronic SCI (2-39 years) participated in this study, 13 with tetraplegia and 7 with paraplegia. Hypotension was defined as having a mean 24-hour systolic blood pressure (SBP) below 110 mmHg for males and 100 mmHg for females at least 50% of the time. Most of the individuals (82%) in the hypotensive group had tetraplegia. Memory was significantly impaired and there was a trend toward slowed attention and processing speed in the hypotensive compared to the normal group. These findings are similar to effects of hypotension in the non-SCI population.

Jegade AB, Rosado-Rivera D, Bauman WA, et al.
Clin Auton Res. 2009 Oct 16. [Epub ahead of print]

PRESSURE SORES

■ Botulinum toxin type A in the healing of a chronic buttock ulcer in a patient with spastic paraplegia after spinal cord injury.

A 27-year-old man with paraplegia following SCI had developed recurrent severe muscular spasms, particularly in the buttock region. The patient had a grade IV pressure ulcer in the left gluteal region. Several treatments were administered without success, and all efforts at healing the ulcer by topical medication were hampered by recurrent spasms in the area of the ulcer. The left gluteus maximus muscle was treated with 2 infiltrations of 660 IU botulinum toxin type A. This allowed better care of the pressure ulcer, which healed by 6 months after the initial infiltration.

Intiso D, Basciani M.
J Rehabil Med. 2009 Nov;41(13):1100-2.

■ Promote pressure ulcer healing in individuals with spinal cord injury using an individualized cyclic pressure-relief protocol.

Forty-four individuals with SCI, aged 18-79 years, with a Stage II or III pressure ulcer (PrU), were randomly assigned to the control or treatment group. Those in the treatment group used wheelchairs equipped with an individually adjusted automated seat that provided cyclic pressure relief, and those in the control group used a standard wheelchair. All subjects sat in wheelchairs for at least 4 hours per day for 30 days. Wound characteristics were assessed using the Pressure Ulcer Scale for Healing (PUSH) tool and wound dimensions recorded with digital

photographs twice a week. At the end of 30 days, both groups demonstrated a general trend of healing. However, the treatment group took significantly less time to achieve 30% healing and had greater improvement of the wound area compared with the control group. Individualized cyclic pressure relief may have substantial benefits in speeding up the healing process in wheelchair users with existing PrUs while maintaining their mobility.

Makhsous M, Lin F, Knaus E, et al.
Adv Skin Wound Care. 2009 Nov;22(11):514-21.

HETEROTOPIC OSSIFICATION (ABNORMAL BONE GROWTH)

■ A systematic review of the therapeutic interventions for heterotopic ossification after spinal cord injury.

Thirteen studies, divided into prevention or treatment of heterotopic ossification (HO) after SCI, were included in this review. Nonsteroidal anti-inflammatory drugs (NSAIDs), warfarin, and pulse low-intensity electromagnetic field (PLIMF) therapy were reviewed as preventive measures. Bisphosphonates, radiotherapy and excision were reviewed as treatments. Pharmacological treatments of HO after SCI had the highest level of research evidence supporting their use. Of these, NSAIDs showed greatest efficacy in the prevention of HO when administered early after an SCI, whereas bisphosphonates had the strongest evidence once HO had developed. Of the non-pharmacological interventions, PLIMF had the best evidence; however, more research is needed to fully understand its role.

Teasell RW, Mehta S, Aubut JL, et al.
Spinal Cord. 2010 Jan 5. [Epub ahead of print]

■ Impact of late surgical intervention on heterotopic ossification of the hip after traumatic neurological injury.

Heterotopic ossification (HO) occurs in 16% to 53% of individuals with SCI. HO can limit range of movement, and the hip is the most frequently affected site. Total joint ankylosis (fixation) occurs in 5% to 16% of affected hips. This was a study of patients who developed HO of the hip after injury and required surgery to improve their range of movement. Of the 143 patients (183 hips) in the study, 65 (35.5%) had SCI and 118 (64.5%) had TBI. In all, 70 hips had ankylosis. Twenty-five fractures of the femoral neck occurred during surgery, all in patients with ankylosed hips. The loss of the range of movement before ankylosis is a more important factor than the maturity of the HO in deciding the timing of surgery. Early surgical intervention minimizes the development of intra-articular pathology, osteoporosis and the resultant complications without increasing the risk of recurrence of HO.

Genet F, Marmorat JL, Lautridou C, et al.
J Bone Joint Surg Br. 2009 Nov;91(11):1493-8.

ASSISTIVE TECHNOLOGY

■ Evaluation of the tongue drive system by individuals with high-level spinal cord injury.

Tongue Drive System (TDS) is a tongue operated, unobtrusive, minimally invasive, wireless assistive technology (AT), which can enable people with severe disabilities to control different devices using their tongue motion. TDS can translate specific tongue movements into user-defined commands by detecting the position of a small permanent magnetic tracer attached to the user's tongue. The prototype was built on a wireless headphone and interfaced to a laptop and a commercial powered wheelchair. The eTDS performance was evaluated by eight subjects with high level (C3-C5) SCI at the Shepherd Center in Atlanta, GA. All the subjects could successfully perform common tasks related to computer access, such as controlling a mouse cursor or playing a computer game, as well as complex wheelchair navigation tasks, such as driving through an obstacle course.

Huo X, Cheng C, Ghovanloo M.
Conf Proc IEEE Eng Med Biol Soc. 2009;1:555-8.

Spinal Cord Injury Update is supported by grant H133N060033 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 14 model SCI care systems nationwide. Project Director: Charles Bombardier, PhD.

Editorial Board of Advisors: Charles Bombardier, PhD; Stephen Burns, MD; Michael K. Copass, MD; Chris Garbaccio; Barry Goldstein, MD, PhD; Jeanne Hoffman, PhD; Cathy Warms, PhD, ARNP, CRRN.

To add your name to the mailing list, 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.

Visit our Web site:
<http://sci.washington.edu>

Keep up-to-date on SCI topics by watching our videos

Our monthly SCI Forum presentations on different topics related to living with SCI are often videotaped and posted on our Web site. Watch them streaming on your computer, anytime. Go to http://sci.washington.edu/info/forums/forum_videos.asp.

We continue to add new videos to our Web site on a regular basis. Have you seen these videos?

- Management of Urinary Problems Caused by Spinal Cord Injury
- Aging with a Spinal Cord Injury
- Stem Cells and Regeneration of the Spinal Cord: Practical Barriers and New Cell Technologies
- Conversations About... Living with Spinal Cord Injury
- Personal Caregivers
- Osteoporosis in Spinal Cord Injury
- Autonomic Dysreflexia
- Using Hypnosis for Spinal Cord Injury Pain Management
- Universal Fitness
- Home Adaptations and Modifications after Spinal Cord Injury

Read the newsletter online at <http://sci.washington.edu/info/newsletters>



61-8238

ADDRESS SERVICE REQUESTED

Spinal Cord Injury Update
Spring 2010 • Volume 19, Number 1
UNIVERSITY OF WASHINGTON
Rehabilitation Medicine, Box 356490
Seattle, Washington 98195-6490

Nonprofit Org.
US Postage
PAID
Seattle WA
Permit 62