JRRD Volume 41, Number 1, Pages 25–30
January/February 2004, Supplement 1
Journal of Rehabilitation Research & Development

Preconference Platform Session Abstracts

48 AUTONOMIC DYSREFLEXIA

Robert McAnelly, MD

Autonomic dysreflexia (AD) is a hypertensive emergency for persons with spinal cord injury (SCI) T6 or above, accompanied by pounding headache, bradycardia, profuse sweating, piloerection or goose bumps, cardiac arrhythmias including atrial fibrillation, flushing, blurred vision, visual field spots, nasal congestion, apprehension, and anxiety, but sometimes with minimal accompanying symptoms. The Consortium for Spinal Cord Medicine revised their 1997 Clinical Practice Guidelines for the Acute Management of Autonomic Dysreflexia, adding new sections on pediatrics, pregnancy, and sildenafil for their 2001 Guidelines. The guideline can be downloaded at www.pva.org. AD is commonly fueled by bladder or bowel irritation, and conservative measures are directed at these sources. Sympathetic inhibitory pathways from the baroreceptors to the major splanchnic outflow from T6 to L2 are lost with SCI T6 or above. Increased catecholamine release, resulting from stimulation below the level of the lesion, may be by neuronal reinnervation resulting from cord transection. In the rat model of SCI, sympathetic preganglionic neurons become innervated by spinal interneurons after losing cerebral excitation. Blocking nerve growth factor to prevent neuronal sprouting, blocks AD from developing in rats with transected spinal cords. For pharmaceutical treatment of AD, nifedipine is commonly used, and a review of the literature found no report of adverse events from nifedipine for AD Immediate-release nifedipine, whether chewed or swallowed whole, however, has caused occasional profound hypotension, myocardial infarction, and death in patients with essential hypertension, resulting in the call for a moratorium on its use. Known risk factors for nifedipine-induced death include congestive heart failure, coronary artery disease, advanced age, beta-blockers and grapefruit juice, but the reason some patients experience severe hypotension is not well understood. The manufacturer warns that immediate-release nifedipine "should not be used for the acute reduction of blood pressure." Nitrates are commonly used to treat AD acutely, and include nitroglycerin, isosorbide and sodium nitroprusside. However, the patient must be asked if they have used sildenafil within the last 24 hours, in which case nitrates are contraindicated. The ACE inhibitor captopril and central u-2 agonist clonidine are both well tolerated and effective in the acute treatment of AD.

49 ASSESSMENT AND MANAGEMENT OF PATIENTS WITH ACUTE SPINAL CORD INJURY

Marilyn Pires, RN, MS, CRRN-A, FAAN
Rancho Los Amigos National Rehabilitation Center, Downey, CA

Assessment and management of patients with acute spinal cord injury (SCI) requires specialized knowledge of the complex pathophysiology associated with injury to the spinal cord. Attention must be given to the basics of airway, breathing, and circulation; however, beyond that the nurse must anticipate how the acute injury will manifest itself within each body system. Obviously prevention of further injury is of primary importance and the nurse must understand and support the interventions for spinal stability. Knowledge of what neurologic impairment to expect by level of injury is necessary to monitor for possible progression or ascending injury. Knowledge of the manifestations of spinal shock and the skill to carry out supportive interventions needed to sustain the patient through this period. The signs and symptoms of spinal shock include flaccid paralysis, anesthesia below the level of injury,

hypotension due to vasodilation, bradycardia, paralytic ileus, bladder distention, and loss of thermal control. Respiratory complications are the major cause of morbidity and mortality during the acute phase of SCI. Vigilance in prophylactic respiratory care is imperative. While balancing all of these acute care issues, the nurse must also look toward supporting future rehabilitation goals such as maintaining skin integrity and establishing a functional bowel and bladder program that would prevent any complications that would compromise success in rehabilitation. Nurses in the acute setting see the patients and families in crisis and must be skilled in comforting them while not fostering unrealistic expectations.

50 SURGICAL MANAGEMENT OF PRESSURE ULCERS

Robert E. Montroy, MD, FACS

Despite the ever-present problem of wounds throughout the history of mankind, the surgical management of the pressure ulcers is a relatively new venture. In fact, the genesis and evolution of the surgical repair of these troublesome wounds has all occurred during my lifetime. The main reason for this was that these wounds usually occurred in patients with a poor prognosis—patients afflicted by a terminal, emaciating illness or a severe debilitation from injury or senility. The “bed sores” that afflicted these unfortunate victims were only a distraction from their main problem; they were dying. Until the advent of antimicrobials and other scientific advances in the second half of the 20th century, these wounds were managed by nurses and attendants who faithfully applied an array of potions or ointments that were limited only by one’s imagination. As surgeons during and after World War II began boldly to invade the formerly forbidden province of pressure ulcer surgery, basic surgical indications were established along with standard techniques involving local soft tissue flaps. Although the indications for surgery have not changed over the years, the development of a variety of new flaps and techniques have continue to evolve with the goal of eliminating the most common complication—recurrence.

51 POSTOPERATIVE MANAGEMENT OF MYOCUTANEOUS FLAPSURGERY IN PERSONS WITH SPINAL CORD INJURY

Marilyn Pires, RN, MS, CRRN-A, FAAN

Rancho Los Amigos National Rehabilitation Center, Downy, CA

Postoperative routines are aimed at preventing complications in persons with spinal cord injury who have undergone Myocutaneous Flap Surgery. Initial care on nursing unit includes assessment of vital signs, integrity of pumps and drains, condition of the dressing, intravenous fluids and site status, overall skin condition, breath sounds, bowel sounds, mental status, urinary/catheter output, and status of positioning devices (i.e., abduction pillow). The initial dressings remain intact for 24 hours until initially changed by the surgeon. Afterward, the dressings are changed by the nursing staff. When the surgical site is near the anus, the manual bowel evacuation program is not performed for up to 5 days because mechanical interference and contamination of the wound is possible. Turning of the patient is kept to a minimum for at least 2 weeks because excessive movement may cause wound dehiscence. The majority of patients are placed on an air-fluidized bed during the first postoperative weeks. Nurses must be aware of potential complications. Monitoring of pump and drainage is important to report more or less than expected drainage, which may indicate hemorrhage or hematoma. The surgical site should also be assessed for erythema and signs of infection. Respiratory care must be provided because of the possible complications of anesthesia and prolonged bed rest. Urinary management is aimed at preventing contamination and maceration of the surgical site. Progressive postoperative care and mobilization is initiated when all sutures are removed. It is an interdisciplinary process that progresses the patient to 6 hours of sitting tolerance. Patient/family education must be integrated throughout the postoperative period to prevent recurrence of pressure ulcers. Appropriate discharge planning and follow-up care will assist in identifying problems that may interfere with a successful outcome.

52 PHYSICAL THERAPY IN PRESSURE ULCER MANAGEMENT

Alicia McLelland, MPT, NCS

Physical therapy is involved in the management of pressure sores, from prevention to treatment. At Rancho Los Amigos National Rehabilitation Center, the physical therapist is an active member of the Pressure Ulcer Management Team. Prior to surgery, the physical therapist performs baseline evaluations of sensation, strength, range of motion, function, equipment use, and the patient's seating system using computerized pressure mapping. The therapist's assessment is then discussed with the surgeon and the other team members. Postoperatively, the patient is confined to bed for 4 weeks, then has 2 weeks out of bed on a prone gurney, and finally is allowed to sit, using a progressive program. During the period of bed rest, the physical therapist works with clients on maintaining upper-limb strength in bed using free weights and resistive bands. Clients continue strengthening using weight machines from the prone gurney. After 4 weeks, passive range of motion to the lower limbs is initiated. If suture closure is delayed, electrical stimulation is used to enhance wound healing. When the incision is completely healed, the client sits for one-half hour. Sitting time is increased by one-half hour every day or one-half hour every other day, if warranted. The physical therapist evaluates the client's equipment, including an optimal seating system, transfer status, and mobility. The physical therapist should look closely at the individual's activities of daily living, identify impairments or other factors that increase the risk for development of pressure sores, and educate clients on ways of decreasing these risks.

53 CLINICAL PRACTICE GUIDELINES FOR NEUROGENIC BOWEL MANAGEMENT IN ADULTS WITH SPINAL CORD INJURY

Marilyn Pires, RN, MS, CRRN-A, FAAN

Rancho Los Amigos National Rehabilitation Center, Downey, CA

Gastrointestinal and anorectal function are impaired as a result of spinal cord injury. The Consortium for Spinal Cord Medicine guidelines have recommended each of the following areas: assessment of the neurogenic bowel, management of the neurogenic bowel, managing complications of neurogenic bowel, surgical and nonsurgical therapies, and educational strategies for the neurogenic bowel. Pathophysiology of the neurogenic bowel is influenced by spinal shock and the remaining gastrocolic response, and affects colonic and rectal compliance and motility and alters anal sphincter function. Recommendations for assessment of the neurogenic bowel include assessment of impairment and disability, such as history of premorbid gastrointestinal conditions, medication use, satisfaction with present bowel program, and functional ability. Recommendations for designing a bowel program are aimed at providing predictable and effective elimination and reduce evacuation problems and gastrointestinal complaints. Chemical and mechanical rectal stimulation methods should be used as determined by the type of neurogenic dysfunction and the person's ability to carry out the methods. Nutritional considerations must also be individualized, because not everyone should be placed on a high-fiber diet. The bowel program initiated in the rehabilitation setting should be aimed at successfully managing the neurogenic bowel at home or in the community, considering the individual's functional status, availability of care assistance and the discharge environment. The bowel program should be monitored for effectiveness continuously and at least yearly. If there are problems with the bowel program, changes in the following areas should be considered: diet, fluid intake, level of activity, frequency of bowel care, position assistive/ techniques, types of rectal stimulation, and oral medications. Only one element should be changed at a time and should be maintained for at least three bowel cycles.

54 SEXUAL EXPRESSION IN SPINAL CORD INJURY

Linda R. Mona, PhD

Sexual expression among individuals with spinal cord injury (SCI) is a very important yet underdiscussed topic within rehabilitation settings. Typically, rehabilitation professionals educate individuals about sexuality and SCI in terms of sexual function and dysfunction with little attention paid to broader aspects of sexual expression. This presentation will address sexuality and SCI from a multilevel perspective reviewing critical components of sexuality-related changes following SCI including challenging new views of the sexual self, dating, and romance, and talking about disability within the context of a romantic relationships. The historical underpinnings of societal views of disability will be reviewed with hopes of better understanding the individual and social conceptualizations of sexuality and disability. Specific clinical approaches will be offered and practical suggestions made to address potential uncomfortable questions between patient and healthcare professionals.

55 MOTOR IMAGERY AND CORTICAL SENSORIMOTOR PLASTICITY

M. G. Lacourse

Neuromotor Rehabilitation Laboratory, Long Beach Department of Veterans Affairs Medical Center and Department of Kinesiology & Physical Education, California State University, Long Beach, CA

Sensory and motor disconnection from a traumatic spinal cord injury (SCI) can lead to brain reorganization that impedes or impairs motor rehabilitation (Turner et al., 2001; Roelke et al., 1997). Jackson et al. (2001) proposed a model emphasizing the role of motor imagery-based mental practice (MP) techniques for motor rehabilitation of patients with impairments such as SCI. Motor imagery (MI) is the type of mental simulation where a kinesthetic memory of a previous movement is recalled, giving rise to a conscious experience of reexecuting the movement. There is evidence that movement and MI are functionally equivalent processes (Jeannerod, 1994) and if performed repeatedly and systematically, MI can be used to mentally practice a motor task as a supplement or replacement to physical practice (Feltz & Landers, 1983). The findings from our studies using functional magnetic resonance imaging paradigms (fMRI) indicate that MP can produce large gains in motor behavior in healthy persons while inducing functional plasticity of cortical and subcortical sensorimotor structures, including the primary and secondary motor areas, basal ganglia, and cerebellum that is similar to physical practice-related plasticity. We are using these findings to design MP therapies that promote restoration and/or preservation of sensorimotor circuitry to counteract dysfunctional brain reorganization following SCI.

56 ALTERED HEPATOCYTE GENE EXPRESSION IN A RAT MODEL OF CHRONIC SPINAL CORD INJURY

Jack L. Segal, Gilberto Castaneda-Hernandez, Gabriel Guizar-Sahagun

Proyecto Camina A.C., Harbor-UCLA Medical Center, Torrance, CA; Mexico City, Mexico

Chronic spinal cord injury (SCI) in humans and animal models has been causally associated with myriad alterations in physiology and drug disposition. Limited numbers of studies conducted to date suggest that these changes may reflect the failure or a demodulation of the autonomic nervous system (ANS) that almost always accompanies significant injury. The pathobiology of SCI is almost always inimical to homeostasis, and it appears to have clinically significant impact on pharmacokinetics and pharmacodynamics. The underlying mechanisms, however, have not been elucidated, and our current level of understanding is only rudimentary. We measured messenger RNA (mRNA) levels in actively dividing rat hepatocytes using oligonucleotide arrays (Affymetrix, Inc.) containing probes for approximately 800 rat genes known to be involved in species-specific biotransformation of drugs and xenobiotics.

Five healthy, well-fed, age- and weight-matched animals, three subjected to a standardized contusive injury following laminectomy and two sham-operated controls, were studied. Animals subjected to SCI were sacrificed 2 weeks after injury when the SCI was deemed to be a chronic phase and compared to controls. Whole livers were harvested, immediately flash frozen in liquid nitrogen, and stored for less than 72 hours prior to gene expression analysis. RNA expression patterns for both groups were compared using only those changes that were reproducible across all comparisons, and significance was attributed to only those genes that showed consistent expression level changes of ≥ 1.5 fold between injured and sham-operated animals. A comparison of transcriptional profiles (mRNA abundance) within and between sham-operated animals and those exposed to long-standing SCI showed that gene expression was down-regulated among the SCI animals. The greatest and most easily discernible down-regulation was seen in the postinjury array abundance of mRNA for the enzyme glucose-6-phosphatase. Decreases in mRNA abundance and thus in the extent of gene expression appear to characterize and distinguish rats with chronic SCI from uninjured controls. In this small *n* study, the preponderant change demonstrated was that of gene down-regulation in experimentally injured animals, and the gene coding for glucose-6-phosphatase showed the greatest decrease in activity.

57 SHOULDER PRESERVING STRATEGIES FOR WHEELCHAIR PROPULSION

Sara Mulroy, PhD, PT; Craig Newsam, DPT; Philip Requejo, PhD

Rancho Los Amigos National Rehabilitation Center, Downey, CA

Loss of lower-limb function with spinal cord injury (SCI) places the demands of locomotion, transfers, and activities of daily living on the upper limbs, often resulting in debilitating shoulder pain. Conventional pushrim wheelchair propulsion (WCP) generates excessive stress on the shoulder. In paraplegic individuals, both superiorly directed shoulder forces and fatiguing levels of muscle activity increase the potential for subacromial impingement. With tetraplegia the capacity for manual WCP is diminished, necessitating both a further increase in muscle effort and use of alternative muscle substitutions. Despite slower propulsion speeds, tetraplegic subjects demonstrate a significant superior shoulder force, but lack the necessary muscular force to prevent humeral displacement. Strategies to decrease demands on the shoulder during WCP include optimizing the wheelchair configuration, strengthening exercises for key shoulder and scapular muscles, and using alternative propulsion systems. Moving the seat posteriorly reduces the superior shoulder forces by 15%. Increasing muscle strength of the rotator cuff, sternal pectoralis major, and serratus anterior should decrease the relative effort of WCP and protect against fatigue and subsequent impingement. A computer model of the upper limb during WCP is being developed to predict the conditions that minimize shoulder joint forces in alternative propulsion systems.

58 BLADDER MANAGEMENT FOR PATIENTS WITH SPINAL CORD INJURY/DISORDER

Marilyn Pires, RN, MS, CRRN-A, FAAN

Rancho Los Amigos National Rehabilitation Center, Downey, CA

Neurogenic bladder management is a source of great confusion for SCI providers as well as patients. There is generally a lack of understanding of appropriate urinary management goals for each type of neurogenic bladder. This confusion is compounded by usually strong parochial biases of the rehabilitation facilities toward one bladder management philosophy and condemnation of other management techniques. While there are strong belief systems about what management techniques are better than others, no research clearly identifies one best practice for the management of neurogenic bladder. It is important for patients and families to be presented with reasonable options, given the pros and cons of each management regimen, and be allowed to make decisions that match goals and preferences. Areas that need to be considered are functional ability, availability of caregivers, financial resources, personal behavioral traits, sexuality concerns, and lifestyle

issues. Assisting patients to make the most appropriate choice and giving them the tools and education to implement the regimen safely should be the focus of neurogenic bladder management programs.

59 LATEX ALLERGY

Lily C. Pien, MD

Section of Allergy and Immunology, Department of Pulmonary and Critical Care Medicine, The Cleveland Clinic Foundation, Cleveland, OH

Immunologic reactions to natural rubber latex (NRL) were first noted in the German medical literature in 1927; the symptoms of urticaria and laryngeal edema developed in a patient with placement of a rubber dental prosthesis. Slater and Gerber, in two separate articles, identify latex allergy as the cause of anaphylaxis in children with spina bifida in 1989. It is now more than a decade since latex allergy has been highlighted. The most common adverse reaction to latex glove exposure is irritant reactions, typically presenting with erythema, cracking, dryness, and chapping of the skin. Exposure to latex gloves produces this reaction without an immunologic mechanism. Delayed reactions or Gell and Coombs type 4 hypersensitivity reactions to latex glove require lymphocyte sensitization to chemical additives or accelerators, which are used in the manufacturing process. Latex exposure to mucosal surfaces causes IgE-mediated symptoms of burning, swelling, and itching. Exposure to mucosal surfaces can also be associated with systemic symptoms of hypotension, tachycardia, and bronchospasm. Even limited mucosal exposure to latex has caused anaphylaxis; generalized reactions have occurred with toy balloons, urinary catheters, condoms, dental surgery, and rectal procedures. The diagnosis of immediate latex allergy must begin with a thorough history. Allergen skin testing and serum testing can confirm many IgE-mediated reactions in humans. At this time in the United States, latex skin testing can be performed but not with a standardized FDA-approved latex reagent. The latex allergic individual must avoid natural rubber products; additional precautions are needed in the hospital. Medical management of a latex allergy is identical to the treatment of other IgE-mediated reactions. Removal of the allergen should occur first, followed by administration of antihistamines and corticosteroids, depending upon the location and severity of symptoms. Epinephrine may be needed if there is progression to systemic reactions of anaphylaxis. Pretreatment with antihistamines and steroids for the latex-allergic patient undergoing surgery has been tried but not well studied. The best preventive measure is still latex avoidance in the OR. There are a few reported trials of latex immunotherapy, and the treated individuals did show improvement of latex allergic symptoms, but this form of therapy is still investigational and not used conventionally.

60 BOWEL MANAGEMENT AFTER SPINAL CORD INJURY

Frederick Frost, MD

Although bowel problems rarely result in death or hospitalization after spinal cord injury (SCI), their impact on the fulfillment of social, vocational, and personal roles is significant. Persons with SCI rate bowel deficits as among the most disabling of conditions associated with their injuries, and bowel incontinence is a major determinant of the living setting after the patient leaves the hospital. Bowel dysfunction affects multiple domains in the life of a person with SCI, including nutrition, skin care, sexuality, and the need for personal assistance. Over the last 30 years, scientists have identified the normal mechanisms of bowel control and described their alteration after SCI. Management of the clinical problems of abnormal bowel motility and bowel emptying is based upon an understanding of these alterations in physiology. Since the 1940s, knowledge of simple strategies for completing bowel emptying have allowed many patients with SCI to reduce the medical morbidity and social/vocational handicap associated with bowel dysfunction. Despite this, many patients do not have adequate bowel routines, often as a result of social and environmental restrictions. All patients must be made aware of basic bowel emptying strategies and of the long-term importance of their implementation. In addition, patients and caregivers should be able to devise strategies to deal with minor setbacks in their bowel-emptying routine and to identify when serious problems occur that require medical attention.