Message from Chairman

Kenneth A Follett, MD, PhD
CNS 2000

is shaping up to be an outstanding meeting. Vince Traynelis, Doug Kondziolka, and the many individuals who have worked to organize the meeting have assembled an excellent group of speakers and topics. The Pain Section is pleased to contribute to this effort with two sessions we believe are especially relevant to the current practice of neurosurgery. Special symposia at these two sessions will focus on minimally-invasive and augmentative strategies for treating chronic pain.

On Tuesday, September 26, the Section on Pain will sponsor a symposium entitled “Minimally-invasive Procedures for Spinal Pain Syndromes.” This session is modeled after the highly successful practical course held last year. Drs. John Gorecki, Richard North, and Peter Gerszten will address three of the most popular current trends in minimally-invasive spinal procedures: epiduroscopy, facet denervation, and intradiscal thermal lesioning (IDET). The popularity of these procedures has been increasing in many pain management centers, but their specific indications and outcomes have not been well-established. These issues will be reviewed and discussed. Open papers to be presented following the mini-symposium will cover a wide variety of topics relevant to most neurosurgeons, including trigeminal neuralgia, vertebroplasty, control of acute postoperative pain in the lumbar spine surgery patient, spinal cord stimulation, and percutaneous cordotomy.

On Wednesday, September 27, members of the Pain Section will present “Trends in Intrathecal Polyanalgesia.” Intrathecal analgesic infusion therapy has become a common method of treating cancer pain and nonmalignant pain. Most practitioners who use this therapy have encountered patients who fail to achieve adequate pain relief with morphine, the only FDA-approved intrathecal analgesic medication. The off-label use of non-approved agents has become commonplace in an effort to help these individuals. Recently, physicians who manage patients with intrathecal analgesic delivery systems were surveyed to characterize current practices pertaining to the use of intrathecal analgesics. Three leaders in the field of intrathecal analgesia, Samuel Hassenbusch, Richard Penn, and Kim Burchiel, will review the results of this survey and discuss implications of the data for the use of non-approved intrathecal analgesic medications. Following this symposium, open paper presentations will provide additional information about intrathecal analgesic therapy. Among these subsequent presentations will be a comparison of trialing methods for intrathecal opioid therapy, outcomes of long-term intrathecal opioid therapy, and comparison of intrathecal analgesic therapy to surgical methods of pain management. Additional topics relevant to the neurosurgical treatment of pain, such as evaluation and treatment of craniofacial pain syndromes (including trigeminal and glossopharyngeal neuralgia) will also be presented.

On Tuesday, September 26, we will present the 2000 Ronald Tasker Award for excellence in pain-related research to Dr. James Leiphart. Dr. Leiphart will present the results of his research “Increased spinal cord alpha-2-adrenergic receptor binding in a rat model of neuropathic pain.” Given our rudimentary understanding of the pathophysiology of neuropathic pain and the fact that neuropathic pain syndromes are among the most common and most difficult pain problems to treat effectively, this research is timely and important.

continued on page 2
Mark you calendars! Members of the Joint Section on Pain will conduct the 5th Satellite Symposium on Neurosurgical Pain Therapies immediately preceding the 2001 AANS annual meeting in Toronto. This 2-day workshop, which is comprised of didactic sessions, open discussion, and hands-on training, provides a thorough, up-to-date review of interventional pain therapies of relevance to neurosurgeons. The symposium has been rated very highly by past participants. Look for more information in the upcoming issue of the AANS Bulletin and in your mail. Attendance will be limited to maximize opportunities for interaction between faculty and attendees, so plan on registering early to reserve your space.

The neurosurgical management of pain is changing. Ablative techniques, which constituted the only surgical options available for many years, are giving way to augmentative and minimally-invasive approaches. Neurosurgeons have had important roles in developing many of these therapies and should strive to remain at the forefront of research and clinical care. I encourage you to join us at CNS 2000 in San Antonio for an update in the latest that neurosurgery has to offer in the field of pain management.

Kenneth A. Follett MD, PhD
University of Iowa

I met Mary Ellen Marmaduke recently at a local Brain Awareness Week Event. Her remembrances of her father, Walter E. Dandy MD, and her life growing up with one of the most eminent figures in the history of our specialty were fascinating. She kindly agreed to write a chronological synopsis of her father’s pain-related neurosurgical career for the readership of the Pain Newsletter, her article is featured on page 3 of this issue.

Mary Ellen also kindly agreed to present some of her recollections at OHSU Neurological Surgery Grand Rounds in June 2000. Her presentation can be found in Acrobat format at http://www.ohsu.edu/som-neurosurgery/whatsnew/dandy.pdf

Kim J. Burchiel, MD, FACS
Oregon Health Sciences University

Editor’s Note

Mary Ellen, with her siblings, recently attended the Walter E. Dandy Visiting Lectureship, April 2000 at Johns Hopkins.

From left to right
Walter E. Dandy Jr., MD,
Kitty D. Gladstone,
Mary Ellen Marmaduke and
Margaret D. Gontrum

Colleagues:

An application, in Adobe Acrobat format, for membership in the Joint Section on Pain can be located at http://www.neurosurgery.org/pain/Painapp.PDF and on page 15 of this issue. We encourage you to forward this application to colleagues with interests in pain management.

The goals of the Section are to assure the highest quality of medical care for the management of patients with pain problems and to assure an appropriate socioeconomic and political climate conducive to the effective and efficient delivery of medical care to patients with pain problems.
Walter E. Dandy, M.D., 1886-1946

Mary Ellen Marmaduke, Health Education Consultant, Portland, OR

Trigeminal neuralgia was considered idiopathic until Walter Dandy discovered its cause in 1929. Dandy’s pioneering use of the cerebellopontine angle approach allowed him to discover that, in most cases, it is caused by pressure from an artery or, in rarer instances, an aneurysm or tumor, on the sensory root of the nerve. His professional career began in 1910, nine years before neurosurgery was declared a specialty, and spanned thirty-six years. During that time, he performed operations on brain tumors, cranial nerve lesions and injuries, vascular lesions in the brain, as well as surgery for spinal cord tumors and ruptured intervertebral discs.

Dandy was born in Sedalia, Missouri, in 1886. He was the only child of immigrant parents from England and Ireland. Walter’s father worked for the railroad. At the urging of one of Walter’s high school teachers, he continued his studies after high school at the University of Missouri. While there, he supplemented his scholarship by working in the laboratories of two Hopkins-trained Ph.D. biology professors. After getting to know him, they recommended he attend medical school at Johns Hopkins. Because of the advanced work he had completed at Missouri, he was admitted to Hopkins with 2nd year status in 1907.

In his years at Johns Hopkins School of Medicine, several fine professors influenced Dandy, the most significant of whom was Dr. William Halsted, Professor of Surgery. Halsted was known for his excellent surgical technique, including the extreme care he took to maintain antiseptic conditions in the operating room and his careful handling of tissue. Barnes Woodhall, MD, who later trained under Dandy from 1926-1937, described medical conditions at that time: “Medicine was not an attractive career; infection was everywhere and research was certainly of feeble status. . . . The in-hospital mortality for moderately severe infections was in the area of 75 percent.” Halsted’s fastidiousness had a strong impact on Dandy. Later, as a neurosurgeon, Dandy was rigorous in his efforts to maintain sterile conditions in the operating room. He often assigned an intern to oversee the sterilization of the instruments.

Halsted’s chief resident during Dandy’s years as a medical student was Harvey Cushing, who supervised the Hunterian Laboratory of Experimental Surgery. In 1910, the same year Dandy received his MD, he earned a Master’s degree for his study of a 21-day-old embryo at the Hunterian Laboratory. That embryo, which later became known as the “Dandy Embryo,” was the subject of Dandy’s first professional publication.

After graduating from medical school, Dandy became part of Halsted’s general surgery house staff, with assignment as a fellow to the Hunterian Laboratory. Cushing, whose interest was brain-related research and surgery, assigned Dandy the tasks of: 1. describing the circulation of blood to the pituitary 2. describing the nervous system of the pituitary Dandy published articles on those topics in 1911 and 1912. These early experiences shaped Dandy’s interest in neurological research and surgery.

After Cushing’s departure for Boston in 1912, Dandy was asked to determine the cause of internal hydrocephalus. Dandy and his colleague, pediatric resident Kenneth Blackfan, MD, proceeded to inject a dye into the ventricles of a dog, thus discovering where the cerebrospinal fluid originated, circulated, and was absorbed. With that knowledge, Dandy and Blackfan were able to induce hydrocephalus in laboratory animals by blocking the aqueduct of Sylvius. Dandy’s work on the cause of internal hydrocephalus has been characterized as “. . . what many medical historians believe to be the best piece of applied surgical research ever done through technical feats of surgery that none of the pathologic anatomists studying the problem could match. His combination of physiologic and anatomic studies was a masterpiece, bringing him instant fame even before he joined the house staff.” Dr. Halsted stated: “Dandy will never do anything equal to this again. Few men make more than one great contribution to medicine.”

In fact, however, Dandy went on to make other important contributions to the field.

Before 1918, Dandy had observed x-rays of a patient’s abdomen and noted the difference in the appearance of shadows that were cast by air and fluid. Imagining the effect of replacing cerebrospinal fluid in the ventricles with air, he conceived of ventriculography. In that procedure, a small amount of cerebrospinal fluid was withdrawn by syringe from a ventricle and replaced with air. Subsequent x-rays were able to show the lesions, which could not be determined by other means. “For the first time in the history of surgery, the neurosurgeon could now diagnose and localize brain tumors with considerable accuracy.”

In 1925, he reported on an innovative technique for total extirpation of acoustic tumors. The then-customary temporal approach, did not permit complete removal, and allowed for possible recurrence. Dandy performed this surgery using the cerebellopontine approach, which made possible the complete removal of the tumor and resulted in reduced blood loss. The approach was considered extremely dangerous by other surgeons because of the high level of surgical skill it required. Dandy’s goal in surgery was to cure, not palliate.

Dandy’s first operations which addressed pain directly were those reported for glossopharyngeal neuralgia in 1927 and trigeminal neuralgia in 1929. In both instances he used the cerebellopontine approach, although this procedure was generally believed to be too difficult for most surgeons. At that time, the approach for glossopharyngeal neuralgia had been through the neck. Dandy pre-
Management of Vasculitic Disorders

J. Patrick Johnson, MD, Comprehensive Spine Center, UCLA

The management of vasculitic disorders has been a difficult problem facing specialists in pain medicine, vascular surgery and neurosurgery for many years (6,7). The more common etiologies of various vasculitic disorders are presented on Table 1. Idiopathic Raynaud’s phenomenon is the most common etiology and represents the majority of clinically significant vasculitic pain syndromes. The remaining etiologies are relatively infrequent, and in fact, most are considered rare.

Raynaud’s phenomenon has a characteristic pattern of clinical presentation in the hands with cold sensitivity, a diagnostic triphasic color response of pallor, cyanosis and then rubor that occur in sequence. It is confined to the digits in most cases, occurs in women more commonly, and symptoms usually begin in the late teens. The symptoms are bilateral and symmetric, occur more commonly in the hands than the feet and rarely leads to ulceration or gangrene of the fingertips. Other vasculitic etiologies should be suspected when the presenting symptoms are not typical for Raynaud’s such as abrupt onset in an older person particularly in those greater than 50 years and have rapidly progressive symptoms. Other factors that make Raynaud’s phenomenon less likely are male gender, unilateral or asymmetric symptoms, and associated symptoms more compatible with other systemic diseases. Other etiologies of upper extremity pain syndromes can be related to thoracic outlet syndrome, shoulder-hand syndrome, previous cold injury, chronic traumatic injury as seen in jackhammer or other vibratory machine operators, climatic and seasonal variations, migraine headaches, menstrual cycle variations, and paraneoplastic syndromes.

The current treatment of Raynaud’s phenomenon and other vasculitic pain syndromes is generally avoidance of factors causing vasospasm that includes warm clothing with gloves (or mittens) and socks. Avoidance of external stress, smoking and vasoactive drugs such as amphetamines, ergotamines, and phenylephrine are useful. Sympathetic blocking agents are the mainstay of medical management with reserpine, guanethidine, alpha methyl dopa, and prazosin. Calcium channel blockers have also been effective and other vasodilators have been useful (2). Surgical treatment with thoracic or lumbar sympathectomy has been utilized in the past and likely has limited long-term usefulness. Sympathectomy initially results in a remarkable improvement that is generally followed by recurrence of symptoms in an unacceptable number of patients. Recurrence of symptoms to some degree is seen in at least 1/3 of patients and surgical treatment is generally not considered the first line of management (1,3,4,5). It is also considered that surgical sympathectomy does not prevent progression of vascular lesions.

New treatments with prostaglandin analogues have been promising, but the experience has been limited due to the need for parenteral administration (2). Future treatment will likely arise from current investigations into the basic mechanisms and pathways of vasospastic diseases. Neurotransmission at the nerve-vessel interface that may be mediated by prostaglandins, calcium metabolism or calcitonin peptides are the current directions of clinical and basic research efforts (2,7).

### Table 1. Vasculitis etiologies causing chronic pain syndrome

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<td>Raynaud’s phenomenon</td>
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<tr>
<td>Rheumatoid arthritis</td>
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<td>Systemic lupus erythematosis</td>
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<tr>
<td>Wegener’s granulomatosis</td>
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<td>Polyarteritis nodosa</td>
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<td>Behcet’s</td>
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<td>Henoch-Schonlein</td>
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<td>Immune complex disease</td>
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<td>Polymyalgia rheumatica</td>
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<td>Scleroderma (progressive systemic sclerosis)</td>
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Bibliography:

In his surgery for trigeminal neuralgia, Dandy again used the cerebellopontine approach although the temporal approach was the standard method at the time. In his surgery for glossopharyngeal neuralgia in 1927, he reported to a friend that “we cut the ninth nerve at the medulla and got a beautiful result. The patient’s attacks have entirely stopped. To my knowledge, this is the first time this procedure has been done.”

In a later article, it was reported that “The first accurate knowledge of the function of the glossopharyngeal nerve was obtained by Dandy when he divided the nerve intracranially.”

Dandy reported on two disc operations in the late 20’s, but did not pursue the subject at that time. In the late 30’s, Eustace Semmes, MD, a neurosurgeon from Memphis and a former classmate of Dandy’s at Missouri and Hopkins, reported some operations for the removal of intervertebral discs. After watching Semmes operate Dandy reported his operations were smooth and rapid. Dandy then refined the technique for own use. He completed 2000 disc operations before his death in 1946 and “did much to popularize the procedure.”

During his career, Dandy worked constantly to improve his technique. He modified instruments and developed a headlight for better visibility during surgery. He published 160 articles and 5 books. A collection of his articles was compiled by two of his former residents, Charles Troland, and Frank Otenasek and published in 1957. It has been estimated that in his later years, Dandy performed up to 1000 surgeries per year.

Dandy practiced neurosurgery until his death in 1946 at the age of 60. Those who knew Dandy well recognized his personal warmth and generosity. Those who observed him in the operating room commented on his focus, his intensity and volatility. He performed difficult procedures with speed and dexterity. One of Dandy’s successors at Johns Hopkins, Donlin Long, MD, put Dandy’s career in perspective when he wrote: “Cushing was the first neurosurgeon and established the field. Dandy was the first modern neurosurgeon, and his techniques are only now being supplanted through the use of magnification and technology.”

References
6. Park, Edwards, MD, Minute. Adopted by the Medical Board of the Johns Hopkins Hospital, May 6, 1946. p. 3.
10. Dandy, Walter E., MD, letter to Ralph Greene, Jacksonville, Florida, April 9, 1927. Dandy MSS.
The American Pain Society (APS) faces challenges on many fronts. Usually our progress is slow and steady, but now and again we take a giant step. Our current cooperative venture with the Joint Commission on Accreditation of Healthcare Organizations is a major leap forward. Thanks to the tireless work of some of our members, June Dahl, PhD, and Patricia Berry, PhD RN, among them, the Joint Commission has issued new standards expectations for pain assessment and treatment. These standards at last recognize the pressing need for organized pain management programs in hospitals and other types of healthcare organizations. They explicitly recognize pain as a condition that coexists with many diseases and injuries. As such, pain now requires explicit assessment and management. The new standards ensure that pain assessment and management will not muddle along indefinitely as optional features of patient care in the United States. Instead, pain control will become a formally acknowledged patient right and an organizational responsibility. The enormous change in organizational priorities and practice patterns that the new standards engender is entirely feasible and will succeed. The tools and knowledge that healthcare organizations need to meet the new standards are now, and long have been, available. Moreover, numerous evidence-based and consensus-driven pain management guidelines will facilitate the process of change. The standards will help healthcare organizations do what they have not done to date: integrate pain management into all patient care activities.

The new standards for pain assessment and management will appear in the 2000–2001 Joint Commission standards manual. To examine these standards in detail or to obtain a copy, go to the Joint Commission’s Web site at http://www.jcaho.org/standard/pm_mpfrm.html. The standards apply to ambulatory care facilities, behavioral healthcare facilities, healthcare networks, home care, hospitals, long-term care organizations, long-term care pharmacies, and managed behavioral healthcare organizations. In brief, the standards require that healthcare organizations comply with the following:

- Recognize the right of patients to appropriate assessment and management of pain.
- Screen for the existence and assess the nature and intensity of pain in all patients.
- Record the results of the assessment in a way that facilitates regular reassessment and follow-up.
- Determine and ensure staff competency in pain assessment and management, and address pain assessment and management in the orientation of all new staff.
- Establish policies and procedures that support the appropriate prescription or ordering of effective pain medications.
- Educate patients and their families about effective pain management.
- Address patient needs for symptom management in the discharge planning process.
- Maintain a pain control performance improvement plan.

On May 22, 2000, the Joint Commission and APS jointly held the first of two meetings designed to roll out the new standards. The first “Leadership Summit on Pain Management” took place in the Chicago area. Roughly 400 healthcare professionals and administrators attended this meeting. The objectives of the meeting were to:

- Showcase the leadership of the Joint Commission and APS in achieving effective pain management in American healthcare institutions.
- Disseminate information to accredited healthcare organizations on the new pain management standards.
- Educate healthcare professionals about pain management guidelines, organizational change strategies, and legal/ethical issues, and thereby improve assessment and treatment of pain in a wide range of healthcare settings.

Save These Dates!

CNS Annual Meeting  
23-28 September, 2000  
San Antonio, Texas

AANS Annual Meeting  
21–26 April, 2001  
Toronto, Ontario Canada

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Diagnostic Errors in Trigeminal Neuralgia

Anthony M. Kaufmann, Keith MacDougall and Genevieve Olsen

Background: We reviewed the incidence of diagnostic delays and errors experienced by patients with trigeminal neuralgia (TN).

Methods: The details of clinical history and management course were obtained for a consecutive series of 59 patients with classical TN referred for neurosurgical consultation between September 1997 and June 1999.

Results: Twenty-nine women and 30 men aged 33-87 presented with TN of 0.5–35 years duration (10 +/- 9 years). Pain onset was distinctly memorable in 80%, involving a single division in 85%, two divisions in 11%, and panhemifacial in 4%; extent subsequently increased in 30%. TN was correctly diagnosed only after consultation with 1-8 medical/dental professionals (3.2 +/- 1.4) 1 week to 12 years (1.4 +/- 2.4 years) following pain onset. Misdirected interventions were performed in 27% including dental surgical procedures (13), salivectomy (1), and temporomandibular joint splints (2), and long-term narcotic administration (1). Assessment at our cranial nerve disorder centre revealed that all patients had become dissatisfied with initially effective medical therapy and 37% had already undergone surgical interventions including microvascular decompression (MVD) (10), radiofrequency rhizotomies (10), alcohol blocks (5), nerve avulsions (3), and acupuncture (2). Following consultation, MVD was performed in 58%, and glycerol rhizotomies in 12% of patients; preliminary results were excellent or good in 32/34 and 7/7 respectively. The remaining 30% continued medical therapy.

Conclusions: Despite the classical clinical features of TN, patients often suffer the consequences of misdiagnoses. The majority of patients failing primary medical therapy benefit from surgical options at specialized centres.
Mechanical hyperalgesia following an L5 spinal nerve lesion in the rat is not dependent on input from injured nerve fibers

Allan J. Belzberg, Yongbo Li, Michael J. Dorsi and Richard A. Meyer

The role of injured and intact nerve fibers in mechanical hyperalgesia was evaluated in rats subjected to an L5 spinal nerve ligation-and-cut (“modified Chung lesion”). To assess the contribution of injured afferents, L5 dorsal rhizotomy was performed immediately prior, or seven days after modified Chung lesion. To study the role of adjacent intact spinal nerves, L4 dorsal rhizotomy was performed seven days after modified Chung lesion. Paw withdrawal threshold to mechanical stimuli was tested at three sites: L3, L4, and L5 dermatomes. We found that the modified Chung lesion produced a significant, lasting (greater than 20d) decrease of mechanical withdrawal threshold. L5 dorsal rhizotomy, by itself, produced transient decrease in mechanical withdrawal thresholds. L5 dorsal rhizotomy performed prior to, or seven days after, the modified Chung lesion did not prevent or resolve observed decrease in mechanical withdrawal thresholds. L4 dorsal rhizotomy performed seven days after the modified Chung lesion resulted in immediate reversal of mechanical withdrawal thresholds back to baseline values. The L5 and L4 dermatome test sites developed severe and lasting mechanical hyperalgesia. In contrast L3 testing site developed significantly less severe and shorter lasting mechanical hyperalgesia. These results suggest that, following L5 spinal nerve ligation-and-cut, mechanical hyperalgesia develops and persists independent of input from injured afferents. We propose that interactions between degenerating fibers of the injured spinal nerve and intact fibers of adjacent spinal nerves, rather than signals from injured nerve fibers, play a critical role for both initiation and maintenance of mechanical hyperalgesia.

Duration and Severity of Hyperalgesia After Nerve Root Section in Rat is Worse With Cut and Ligation Compared to Crush Injury

Rishi N. Sheth, Mary Pat Lancelotta, Richard A. Meyer, Allan J. Belzberg, and James N. Campbell

It is well known that peripheral nerve axotomy may induce hyperalgesia in animals. We sought to determine whether the technique used to induce axotomy influences the severity and duration of the hyperalgesic state in rats.

We crushed, cut/ligated, or isolated (sham) the L-5 spinal root. Behavioral tests for hyperalgesia to mechanical and cooling stimuli were compared among the three groups (eight rats in each) the experimenter were blinded. Both groups of lesioned rats but not the sham group showed hyperalgesia to cooling and mechanical stimuli. The “mechanical thresholds for the Crush group, was significantly lower than for the sham group (p<0.001) for the first 30 days after lesioning. At 40 days after lesioning, the mechanical threshold for the crush group was not different from control, but the cut/ligation was still significantly lower (p< 0.05). The duration of, paw Withdrawal to the cold stimulus was significantly longer in the cut/ligation group than in the group, and both were longer than in the sham group (p< 0.001). No recovery from cooling hyperalgesia was evident in either lesioned group at 40 days postlesion. The cut/ligation group had delayed recovery from mechanical hyperalgesia and more severe signs of cooling hyperalgesia. Impaired regeneration at the lesion site and/or neuroma formation at injury site in the cut/ligation group could explain the difference in behavior. Hyperalgesia from nerve lesion varies with the type of lesion both in severity and time to recovery.

A Randomized, Prospective, Blinded, Placebo-Controlled Trial of Epidural Analgesia Following Lumbar Discectomy

Todd S. Crawford, Patrick Tracy and Debra Schultz

Lumbar discectomy, primarily a pain procedure, has been modified and adapted to make patients’ postoperative recovery shorter and their satisfaction higher. Epidural analgesia is a mainstay of conservative therapy and its intraoperative use has been studied and used as an adjunct to surgery. We examined the effect of intraoperative epidural analgesia on pain and disability using a visual analog scale (VAS) and the Oswestry Disability Scale. Patients undergoing first time operations for radiculopathy due to herniated intervertebral discs were randomly administered morphine (4 mg), bupivacaine 0.25% (6 cc), solumedrol (80 mg), or placebo (saline). The medication was placed in the epidural space following standard lumbar discectomy. The VAS and Oswestry scores were recorded preoperatively and at 1 day, 1 week, 1 month, and 3 months postoperatively. A Kruskal-Wallis one-way analysis of variance was used for statistical analysis. Thirty patients were enrolled in the study. Demographics were similar in each group. There were no complications or adverse events. The mean preoperative VAS, and Oswestry scores were similar for all groups (7.9% and 49%, respectively). As a whole, there was a statistically significant improvement from pre, to postoperative scores at each time point. However, amongst groups, there was no statistically significant improvement at any timepoint. We failed to prove any benefit, for using intraoperative analgesia during routine lumbar discectomy.

Functional brain imaging and spinal cord stimulation: Localization of cortical activity using Magneto-encephalography (MEG)

Alon Y Mogilner, Ali R Rezai, Martin Zonenshayn, Urs Ribary and Rodolfo R. Llinas

Introduction: Epidural spinal cord stimulation (SCS) is a safe and effective therapy for chronic refractory neuropathic pain. The mechanism of action of SCS is still a subject of debate. Magnetoencephalography (MEG) is an accurate and reproducible technique for localizing spontaneous and evoked cortical activity. We utilized magnetoencephalography (MEG)
Selected Posters

Vascular Compression of the Trigeminal Nerve—Findings at MRI During Gamma Knife Radiosurgery: Implications for Etiology and Treatment

Ronald Brisman, Alexander G. Khandji, Steven R. Isaacson, Joseph Bargellini, Sherman A. Woodhous, Robertus B.M. Mooij and Scott Borzillary

Introduction: Blood vessel (BV) compression of the trigeminal nerve (V) is thought to be a common cause of trigeminal neuralgia (TN). High resolution MRIs done at gamma knife radiosurgery (GKRS) for TN allow analysis of the BV/V relationship.

Method: T1 axial 1mm thick volume acquisition MRIs were done through the area of V at its exit from the brainstem after injection of 15 ml gadolinium. The BV/V relationship bilaterally was evaluated: 0 (no close relationship), 1 (BV within 1 mm of V but not touching it), 2 (BV in contact with V).

Results: One-hundred and seventeen patients were studied. (See Tables 1-5). Twenty had multiple sclerosis (MS). In TN without MS, BV/V contact (score 2) occurred more often, 51% of 103 nerves, with TN than in nerves without TN, 37% of 91 nerves (p=.049). BV/V contact was much more likely to occur in TN without MS than in nerves with TN with MS (p <.0005). In TN without MS, males (p =.04) and age greater than 60 (p=.04) were independently associated with a greater chance of vessel contact or deformity.

Conclusion: BV compression of V is a cause of TN in many patients, but it is probably not the cause in many others, even in the absence of MS. Patients with BV/V scores of O and probably 1 may be less likely to benefit from microvascular decompression than patients with higher scores. GKRS is an effective treatment regardless of BV/V relationship.

Intrathecal Clonidine-Opiate Combinations for the Management of Neuropathic Pain

Zvi Israel, Larisa Jeffreys and Kim J. Burchiel

Introduction: Neuropathic pain is a notoriously difficult clinical problem to manage. Clonidine is an adrenergic agonist which, when administered Intrathecally, is believed to increase the antinociceptive threshold by activating descending noradrenergic pathways in the spinal cord, inhibiting nociceptive neuron firing in the substantia gelatinosa and by inhibiting spinal substance P release. It acts independently of and synergistically with morphine. We present our experience with 10 patients who had failed all other therapy for their neuropathic pain and in whom clonidine was administered intrathecally.

Methods: We prospectively followed 10 patients (5 males and 5 females; average age 65 years, range 46–77 years) with intractable neuropathic pain in whom clonidine was administered intrathecally via an indwelling pump. The etiologies of the neuropathic pain syndromes were variable. Seven patients received a morphine-clonidine mixture, two at the time of the original pump implant. Three patients received amhydromorphone-clonidine mixture. The opiate clonidine mixture was

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Severe Pain Confounds Neuropsychological Test Performance

Christopher J. Winfree, Eric Heyer, Ruchey Sharma, J. Mocco, Paul McCormick, Donald Quest, James McCurty III, Charles Riedel, Ronald Lazar, Yaakov Stern and E. Sander Connolly

There is little information on the effect of pain on neuropsychological test performance. We have undertaken this study to explore which tests are affected by pain, the magnitude of these changes, and other confounders of neuropsychological performance in a population of patients having spine surgery.

Twenty-four elderly English speaking Caucasian patients (age >60 years) were enrolled preoperatively in this IRB approved study. Pain scores using an 11-point Numeric Pain Intensity scale and performance on a neuropsychological battery (Controlled Oral Word Association, Rey Complex Figure, Trails A and B) were assessed at two times: before and 1 day after surgery. Scores were calculated using the standard algorithms and change scores were calculated by subtracting the baseline from follow-up scores. After surgery, performance on the Rey Complex Figure ($r = -0.577$, $P = 0.004$) and Trails Part A ($r = 0.527$, $P = 0.01$) declined with increasing postoperative pain scores. Women reported higher pain scores postoperatively than men ($P = 0.046$), and performed worse than men for change in performance on Trails Part A ($P = 0.027$). These data suggest that pain can influence performance on certain cognitive tests, and that some gender differences in these effects may occur. Interpretation of performance measures should take into account possible effects of pain, although our understanding of pain effects and ability to predict them in individual people, currently are quite limited.

Surgical Decompression for Chiari I Malformation: Classical vs. Atypical Presentation

Philip V Theodosopoulos, Marianne Ward, Charles Wilson, Neil Raskin and Nicholas Barbaro

Introduction: The Chiari I malformation is now readily diagnosed with magnetic resonance imaging (MRI). In patients with tussive headaches or other clear-cut signs of cervicomedullary compression, the role for surgical decompression is straightforward. Patients with Chiari I malformations may present with a wide variety of less specific symptoms, some of which may be considered incidental, making the decision to operate more challenging.

Methods: We reviewed all the Chiari I decompression procedures performed at our institution by two senior surgeons in the period 1991-1998. Surgical treatment included a wide foramen magnum decompression, C1 laminectomy, and duraplasty. We excluded patients with syringomyelia in order to avoid bias from syrinx-related symptoms. Eighteen procedures were performed on 17 patients. The average duration of the symptoms was 41 months and the average follow-up was 26 months.

Results: All patients had headache as a presenting symptom, including 61% with classic tussive headaches, 61% with headaches associated with straining, and 33% associated with exercise. Thirty-three percent of patients described sensory changes in the shoulders and hands. Eighty-nine percent had improvement of their symptoms postoperatively, while 39% had persistent headaches. Approximately two thirds of the patients who presented with tussive, straining, or exertional headaches were symptom-free after decompression. Only two thirds of patients presented with tussive headaches. Straining and exertional as well as sensory complaints are common presenting symptoms of a Chiari I malformation. Surgical decompression was equally effective in these varied presentations.

Conclusions: We recommend surgical decompression for Chiari I malformation even when patients present with certain atypical” symptoms.

Percutaneous Lumbar Facet Kryorhizotomy

Christian B. Bärlocher, Joachim K. Krauss and Rolf W. Seiler

Low back pain is one of the most common complaints experienced by our population and has become a major social and health problem. It is the most cause of activity limitation in people below the age of 45 years and one of the most frequent cause for hospitalization. The exact pathology of low back pain is difficult to diagnose. This may be in part related to the complex structure of the spine. One of the potential sources for low back pain are the facet joints, which can cause mechanical low back pain. Percutaneous radiofrequency facet denervation (Thermocoagulation) was introduced in clinical practice in the early 1970’s for treatment of lumbar facet syndrome. However, highly variable success rates were reported ranging between 21% and 99% among different series.

The aim of this prospective study was to assess clinical outcome of an new simple technique: percutaneous lumbar facet kryorhizotomy. Kryorhizotomies were performed in a total of 31 patients diagnosed with lumbar facet syndrome on the basis of controlled diagnostic blocks over a one year period. All 31 patients had a successful initial procedure and were either painfree or had less than 50% of the initial pain. There were no side effects. After a mean follow-up of one year 19 patients (61%) still had a good response. In 12 patients (39%) pain recurred. Recurrent pain was improved by a repeat kryorhizotomy in four patients (13%), and in six patients (19%) a stabilization of the involved segment was necessary. In all of them stabilization was successful. Based on this study patients diagnosed with lumbar facet syndrome on the basis of controlled diagnostic blocks benefit significantly from improvement of pain after percutaneous kryorhizotomy which has virtually no risk. The effect can be reinstated upon recurrence of pain, otherwise a stabilization of the involved segment can significantly reduce pain.

Please take the opportunity to promote upcoming Pain related books/jobs/meetings/topics of interest in issues of the Pain Newsletter.
Contact Shirley McCartney, PhD, Assistant Editor, Pain Section Newsletter at mccartns@ohsu.edu
to study somatosensory cortical activity in patients with implanted spinal cord stimulators. Methods: Three patients with refractory neuropathic pain were studied with MEG three months subsequent to the placement of epidural SCS systems. Two patients had refractory chronic regional pain syndromes, and one had arachnoiditis. Cerebral magnetic fields evoked by tactile stimulation of the affected extremity were recorded with a 148-channel whole-head MEG system. (MAGNES, Biomagnetic Technologies). Recordings were performed with the stimulators both on and off, and source activity was localized using a single dipole model. The sources were mapped onto high resolution MRI scans.

Results: All patients reported pain relief with SCS. In all patients, evoked responses mapped to the corresponding region of the primary somatosensory cortex. In one patient with allodynia, the sensory cortical source shifted with stimulation. No stimulus-induced artifacts were noted during recording.

Conclusions: This is the first study of MEG and SCS. MEG can reproducibly localize brain activity evoked by spinal cord stimulation. Preliminary results indicate that SCS may induce a rapid and reversible plasticity of the sensory cortex. Further studies will hopefully offer new insights into the mechanisms of action of SCS.

Outcomes of Surgical Decompression and/or Ganglionectomy of Second Cervical Root for Cervicogenic Headaches

Vasan S. Purighalla, Khang V. Nguyen and Joseph M. Phillips

There is limited information on the surgical treatment of cervicogenic headaches (CH). The objective of this study was to analyze the utility of diagnostic anesthetic block of the C-2 dorsal root ganglion and the outcomes of microsurgical decompression or ganglionectomy of the C-2 root and ganglion as a treatment for the CH.

One hundred and fifteen patients who showed improvement of their headaches with C-2 block at the Dartmouth-Hitchcock Medical Center during a 7-year period were analyzed retrospectively. One hundred fourteen sequential C-2 root and ganglion decompressions alone or combined with C-2 ganglionectomies were performed for the treatment of CH in 93 patients. Twenty-two patients improved permanently after the block alone and never required surgery. Preoperative factors and intraoperative findings were also evaluated with respect to outcome.

After a mean follow up of 20 months, 72 (77%) of 93 patients were improved after the first operation. Symptoms eventually recurred in 21 patients who initially only underwent decompression, and these patients underwent ganglionectomy as a second operation. Seventeen (18%) of these 21 patients improved. Twenty-one patients achieved lasting pain relief with the diagnostic C-2 block alone and never required surgery. All of these patients were noted to have degenerative arthropathies of the cervical spine and were older than 60 years of age.

The results suggest that microsurgical decompression of the C-2 root and ganglion has some utility in treating CH, but the...
Complication avoidance will be stressed.

Techniques of performing microsurgical dissections to understand the relevant anatomy in the different surgical procedures. Techniques of decompression in the management of trigeminal neuralgia, and other cranial nerve syndromes. Participants will be able to identify the indications for microvascular decompression, percutaneous rhizotomy and radiosurgery. Participants will acquire hands-on experience with percutaneous surgical procedures and will learn the specific applications of each for individual patient pathology. After this course, participants will be able to develop improved management skills for patients with trigeminal neuralgia refractory to medical management.

Learning Objective: Participants will be exposed to current strategies for the treatment of trigeminal neuralgia including diagnosis, medical management, and patient selection for specific surgical procedures with emphasis on percutaneous rhizotomy and radiosurgery. Participants will acquire hands-on experience with percutaneous surgical procedures and will learn the specific applications of each for individual patient pathology. After this course, participants will be able to develop improved management skills for patients with trigeminal neuralgia refractory to medical management.

1:00 pm - 5:00pm Afternoon Practical Course (PC15)
Microvascular Decompression for Trigeminal Neuralgia and Other Cranial Nerve Syndromes
Course Directors: Harry van Loveren, Hae Dong Jho
Faculty: Khaled M. Abdel Aziz, Michael R. Chicoine, Madgy El-Kalliny, Michael Link, Abhay Sanan, Mario Zuccarello, Sebastian Froelich, Walter C. Jean, Jeffrey T. Keller
Learning Objective: Upon completion of this course, participants will be able to identify the indications for microvascular decompression in the management of trigeminal neuralgia, hemifacial spasm, disabling positional vertigo, glossopharyngeal neuralgia and spasmodic torticollis. Participants will perform microsurgical dissections to understand the relevant anatomy in the different surgical procedures. Techniques of complication avoidance will be stressed.

SUNDAY, SEPTEMBER 24
8:00 am - 5:00 pm All Day Practical Course (PC24)
Neuroaugmentation for Pain Control
Course Director: Kenneth A. Follett
Faculty: Jaimie M. Henderson, Samuel J. Hassenbusch, Claudio Feler, Robert M. Levy, Richard Osenbach, Oren Sager, Joel L. Seres
Learning Objective: Upon completion of this course, participants will be able to explain the rationale for spinal cord stimulation, peripheral nerve stimulation, and spinal drug infusions for pain control; describe the patient selection process for neuroaugmentative pain control techniques; describe techniques for implantation and management of stimulation and infusion therapies; and describe complications, complication management, and outcomes of neuroaugmentative procedures for pain control.

MONDAY, SEPTEMBER 25
LUNCHEON SEMINARS M021/M021R
Ablative Surgery for Intractable Pain: What Works and Why Are We Not Utilizing These Procedures More Often?
Moderator: Giovanni Broggi
Faculty: Yucel Kanpolat, John P. Gorecki, Nicholas M. Barbaro, Alain C.J. de Lotbiniere, John J. Moossy
Learning Objective: This seminar will discuss different surgeries for the management of intractable pain. Participants will be able to review the roles of different ablative surgeries for the management of pain and identify which procedures are associated good outcomes for individual pain disorders.

TUESDAY, SEPTEMBER 26
LUNCHEON SEMINARS T31/T31R
Sympathetic vs. Neuropathic Pain: Differences in Pathophysiology and Treatment
Moderator: Richard K. Osenbach
Faculty: Richard K. Simpson, Jr., Samuel J. Hassenbusch, George T. Mandybur, Voichi Katayama, Kenneth A. Follett
Learning Objective: Participants will be able to differentiate the pathophysiology between these two conditions as well as the treatment options currently available with both the advantages and disadvantages of each.

Section on Pain I 2:00 pm - 5:30 pm
Minimally Invasive Procedures for Spinal Pain Syndromes
Learning Objectives: Participants will be able to describe minimally invasive procedures for pain syndromes. Participants will be able to list the advantages and disadvantages of each treatment modality. Participants will be able to discuss new developments in the field of treatment of pain.
Moderator: Jaimie M. Henderson
2:00 - 2:15 Epiduroscopy ......................... John P. Gorecki
2:15 - 2:30 Facet Denervation .................... Richard B. North
2:30 - 2:45 IDET/Intradiscal Therapy ....... Peter C. Gerszten
2:45 - 2:50 Discussion
2:50 - 3:30 Oral Posters
3:30 - 4:00 Refreshments with Exhibitors
4:00 - 5:30 Open Papers Moderator: Jaimie M. Henderson

Ronald Tasker Award
4:00 pm - 4:09 pm Increased Spinal Cord Alpha2-Adrenergic Receptor Binding in a Rat Model of Neuropathic Pain
James W. Leiphart, Cynthia Dills, Robert M. Lezy

WEDNESDAY, SEPTEMBER 27
LUNCHEON SEMINARS 76/W76R
Trigeminal Neuralgia: Treatment Options
Moderator: Kim J. Burchiel
Faculty: Jamal Taha, Amin Kassam, Andrew G. Shetter, Ronald Brisman
Learning Objective: This seminar will discuss the currently available treatment strategies for trigeminal neuralgia. Participants will be able to discuss the risks and the long-term efficacy of microvascular decompression, percutaneous rhizolysis procedures, and stereotactic radiosurgery.
formulated to deliver a starting dose of clonidine of between 50 and 62.5 g of clonidine per day. In patients already receiving intrathecal opiates, opiate dosage was decreased by 20% at the time of adding the clonidine. Patients without a preexisting intrathecal pump were screened with a preoperative trial of epidural opiate-clonidine mixture. Follow-up visits to the outpatient clinic were frequent and patients were screened for blood pressure changes, other side effects, and pain levels measured on a verbal analogue scale of 1 - 10. Dosage was changed as necessary.

Results: Maximum clonidine dosage reached was 110 g per day. Follow-up varied from 8 to 11 months; four patients are still receiving intrathecal clonidine. In the six patients in whom clonidine was discontinued, two reported lack of benefit or sustained relief, three had intolerable side effects and one pump was removed due to adverse effects included vomiting, fatigue, dizziness, and palpitations. In seven patients clonidine provided initial or sustained pain relief of up to 3 points on the verbal analog scale.

For postoperative nociceptive pain, intrathecal clonidine has been shown to have a short-lived analgesic effect, and can significantly prolong the duration of a local anesthetic block. One study could not demonstrate any additional anti-nociceptive effect of a clonidine-morphine mixture over morphine alone for postoperative pain. Coombs reported that continuous intrathecal clonidine in patients with reduced intrathecal narcotic doses could yield effective pain control; however, this therapy was complicated by hypotension.

Conclusions: The results in our small series suggest that intrathecal clonidine can be an effective adjunct to intrathecal opiates in patients with severe and intractable neuropathic pain, being most effective in those patients in whom the clonidine-opiate mixture is started together. These patients experience better analgesia, require lower doses of intrathecal opiates, and experience fewer side effects.

Chronic motor cortex stimulation for central neuropathic pain using neuronavigation with the Zeiss-MKM microscope and peroperative somatosensory evoked potentials: technical experience

Benoit Pirotte, Philippe Voordecker, Freddy Joffroy, Nicolas Massager, Marc Levievier and Jacques Brotchi

Introduction: Chronic motor cortex stimulation (MCS) is able to reduce refractory deafferentation pain, mainly central post-stroke pain (CP) or painful trigeminal neuropathy (TN). Patient selection and appropriate cortical targeting are crucial steps still on study. Different anatomical methods, often combined to peroperative somatosensory evoked potentials (peropSEP), are used to localise precentral gyrus and motor target.

Methods: We tested 8 patients (5 females / 3 males, mean age 51) suffering from refractory CP (n=6) or TN (n=2) assessed by multidisciplinary protocol (response to drugs, pain somatotopy, sensory/motor functions). We combined, under general anesthesia, frameless stereotactic magnetic-resonance-based (MR) (including functional magnetic resonance (fMR)) neuronavigation planning with the Zeiss-MKM microscope (NN) to epidural peropSEP by a small craniectomy. Target obtained by peropSEP was projected on anatomical NN.
significant recurrence rate of symptoms with decompression alone, makes C-2 ganglionectomy attractive as an initial procedure. Elderly patients with arthritis may obtain permanent relief with the block. The accepted diagnostic criteria and success of anesthetic blockade of C-2 should identify the subset of patients with CH predominantly mediated by the C-2 root or ganglion, which may favor surgical treatment.

Learning Objective: Attendees should be able to examine the outcomes of surgical decompression and/or ganglionectomy of second cervical root for cervicogenic headaches.

continued from page 6

- Publicize the urgent need for more aggressive and effective clinical and organizational responses to patients’ acute and chronic pain, and stimulate collaboration between executives and practitioners to address this need.

The program consisted primarily of didactic lectures and panel discussions on barriers to change in pain management, organizational change, the origin and nature of Joint Commission standards, and ethical issues related to pain management. It also included an informative and moving presentation by a patient with rheumatoid arthritis pain, with assistance from her husband. The patient recounted the onset and progression of her painful condition and the difficulties she had in finally finding effective pain management. This story is a classic and highly instructional example of pseudoaddiction.

Participants had an opportunity to comment and to query presenters. Some were concerned about whether a “top down” change could really work. Others contended that issues regarding addiction to pain medication were major and real barriers that the presenters, and the standards, were failing to recognize. Some worried that the new standards would contribute significantly to healthcare costs. A few voiced concern about insurance companies presenting barriers to the intended changes. A psychologist spoke up about the need to integrate cognitive behavioral factors into the issues that the standards raise.

In closing the meeting, I told the audience that we (APS and the Joint Commission) were well aware that they and their colleagues might see these requirements as an onus. In many settings, care providers do not think that pain management is a problem, and they feel ill prepared to undertake formal pain assessment and management. Nonetheless, the standards are an opportunity to make a lasting change in practice patterns that is of great humanitarian value. Moreover, the change will increase patient satisfaction and decrease costs in the long run. Complying with the new Joint Commission standards is not a matter of accommodating bureaucratic imposition; it is a chance to make the world a better place and to prevent future human suffering.

The new Joint Commission standards should concern all of us as APS members. Now, more than ever, healthcare professionals in a wide spectrum of care facilities need guidance and instruction about pain and its management. There is a role for all of us in meeting this need. Basic scientists can teach about the mechanisms of pain and interventions for pain. Nurses, physicians, and pharmacists can educate their peers about pain management. Psychologists should find some unprecedented opportunities to work with mental health professionals in behavioral healthcare organizations. We have an opportunity to create a climate of enthusiastic change, instead of grudging compliance, if we seize the moment and step forward to help.

Pain Section Awards

Ronald R. Tasker Young Investigator Award
$1,000 award sponsored by AANS, Inc. given for the best presentation by an investigator within 5 years of completion of residency training at the CNS Annual Meeting
2000 recipient James Leiphart

William H. Sweet Young Investigator Award
$1,000 award sponsored by Medtronic, Inc. given for the best presentation by an investigator within 5 years of completion of residency training at the AANS Annual Meeting.
2000 recipient Alon Y. Mogilner (presentation can be found reprinted on p8 of this issue)

NEUROSURGERY://ON-CALL - Pain Section
http://www.neurosurgery.org/pain/index.html
I. Biographical

Name: ____________________________________________________________________________________________

Birth Place: _______________________________________ Birth Date:____________________________________

Citizenship _______________________________________

Home Address: ____________________________________ Office Address: ________________________________

_________________________________________________ _____________________________________________

Fax:  _________________ Phone: _____________________ Fax: __________________  Phone: ________________

II. Category of Membership Requested:

☐ Active  ☐ Associate  ☐ Corresponding

III. Education

Premedical collegiate education (institutions/dates) _______________________________________________________

Final degree (institutions/dates) _______________________________________________________________________

Medical education (institutions/dates) __________________________________________________________________

Final degree (institutions/dates) _______________________________________________________________________

Internship or equivalent (institutions/dates) _____________________________________________________________

Residency or other graduate training (institutions/dates)___________________________________________________

Residency training institution _________________________________________________________________________

Completion (or expected completion) Date _____________________________________________________________

IV. Membership, Certification and Practice

Are you now certified by the American Board of Neurological Surgery?   ☐ Yes/Year ______   ☐ No

Are you certified in neurosurgery by another examining board?   ☐ Yes/Year ______   ☐ No

Are you a member of:

☐ American Medical Association

☐ Local or regional medical society    Name: _______________________________________________________

☐ State or provincial medical society Name: _______________________________________________________

☐ American Association of Neurological Surgeons

☐ Congress of Neurological Surgeons

☐ American Academy of Pain

☐ International Association for the Study of Pain

☐ American Pain Society

Medical Licensure State _______________________________ Dates ________________________________

Signature ______________________________________________ Date ________________________________

Please return completed application to:
Section on Pain
Membership Department
5550 Meadowbrook Drive
Rolling Meadows, IL  60008
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### Joint Section on Pain Newsletter

**Editor:** Kim J Burchiel, MD  
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