



NEUROSURGERY

NEWS

THE OFFICIAL NEWSMAGAZINE OF THE CONGRESS OF NEUROLOGICAL SURGEONS

President's Message

Vincent C. Traynelis, M.D.
President, CNS



The Congress of Neurological Surgeons exists for the purpose of promoting the public welfare through the advancement of neurosurgery by a commitment to excellence in education and by dedication to research and scientific knowledge. Commitment to Excellence—these three words should define the essence of all our endeavors: private, public, personal, and professional. A commitment to excellence provides focus not only on long-term goals, but also on the day-to-day journey toward them. The quest for excellence demands a tremendous investment of energy, perseverance, integrity, and resilience. Men and women are gifted with the inherent ability to err, and thus every step is not sure, every decision not correct. The fruits of this gift are harvested when a mistake or misjudgment is recognized and corrected, and these inevitable slips educate and strengthen us in our pursuit of excellence. The accomplishment of the CNS Educational Mission is made possible by the many members committed to excellence. These member volunteers contribute countless hours of personal time to help fulfill the educational mission of the CNS. Many volunteer assignments rotate on a yearly basis. This complicates the process, but with the mentorship of experienced volunteers, an ability to rapidly learn from minor missteps, and a commitment to excellence, these volunteer members have enabled the CNS to fulfill its educational mission in an outstanding manner. Although I cannot list every volunteer, I thank each person who has contributed to the CNS in the past, as well as those presently working on behalf of the organization. Their energies are funneled into numerous standing and ad hoc committees through which the activities of the CNS are directed and implemented. While each contribution is critical to the success of the organization, I would like to acknowledge those committees directly involved with our educational mission.

The CNS Publications Committee, chaired by David Adelson, promotes the goals of the CNS by providing educational information for members in written and electronic form. Foremost is our monthly scientific journal, *NEUROSURGERY*, which disseminates the latest information on our specialty in particular and neuroscience in general. This publication has evolved, grown, and flourished under the careful and creative eye of Michael L. J. Apuzzo. It has enjoyed the highest neurosurgical citation impact factor for years and is truly the premier journal of its type in the world. *Clinical Neurosurgery*, the product of the major speakers at our

annual meeting, is directed and edited by Guy McKhann. This publication provides a ready and written reference of important and timely neurosurgical information. The Publications Committee directs and coordinates the publication of other CNS texts on a regular basis. Ali Rezai and Joel MacDonald direct the CNS Web site (<http://www.neurosurgeon.org/>) redesign. This revamped Web site is user friendly and serves as the central source of information concerning the CNS and its educational offerings. Information regarding the journal *NEUROSURGERY*, the Annual Meeting, SANS Wired, and other educational presentations are available on the CNS Web site. This newsletter, *Neurosurgery News*, edited by Greg Thompson and Karin Muraszko, also serves to educate CNS members. Both the Web site and *Neurosurgery News* freely disseminate information from the Joint Sections. Additionally, *Neurosurgery News* provides important periodic updates on pertinent socioeconomic issues that appear in the Washington Committee Report and other special articles.

SANS (Self Assessment in Neurosurgery) is produced under the auspices of the Publication Committee. *SANS Wired 2004*, the latest version of this remarkable educational tool, presents an opportunity to earn CME credits online and obtain new and current neurosurgical information in an easy to use Web-based digital format. It is the product of hours of work by many individuals who were drawn from the Joint Sections to provide subspecialty input. Tony Asher, *SANS Wired* Editor, provided great vision and direction while orchestrating the efforts of the many contributors. *SANS Wired* will play an important role in the Maintenance of Certification process as directed by the American Board on Neurological Surgery.

The Annual Meeting of the Congress of Neurological Surgeons is always a spectacular event, and with Nelson Oyesiku and Chris Wolfla serving as the Chairs of the Annual Meeting and Scientific Program Committees, respectively, 2004 will be no exception. The

meeting is structured to allow time for recognized authorities to address topics in the area of their expertise, while also allowing for presentation of new research via the abstract submission and selection process. Although the CNS Annual Meeting attracts a great number of registrants, it is a relaxed event in which the speakers are always available after their presentations to clarify points or answer questions. This personal approach to education is an exceedingly important component of the meeting. The Annual Meeting provides education for an overwhelming number of non-North American neurosurgeons. Our international colleagues have contributed to the meeting as speakers and teachers as well, and this year will be no exception. I am particularly pleased to announce that the 2004 Annual Meeting will be a joint endeavor with the Società Italiana di Neurochirurgia.

The International Committee oversees the educational offerings outside of North America. There are almost 600 international members, and countless others have attended the Annual Meeting, subscribe to *NEUROSURGERY*, and participate in other educational programs of the CNS. Gail Rosseau has been involved in international neurosurgical education for many years and as the newly appointed Chair of the International Committee, Dr. Rosseau is the ideal colleague to inject energy and enthusiasm into this important component of our mission. The International Committee interacts with many other societies outside of North America, including the World Federation of Neurosurgical Societies (WFNS). The Committee is also an active participant in the Foundation for International Education in Neurological Surgery (FIENS) and Volunteers for International Neurosurgical Education (VINE). The CNS also actively sponsors and supports other international educational societies around the world.

Finally, the CNS takes great pride in its longstanding Fellowship program, and the organization is committed to continued strong support of this effort. Paul Camarata is the Chair of the Fellowship Committee, which offers financial support for extra training in clinical,

Continued on page 2

INSIDE THIS ISSUE

Spine and Peripheral Nerves Section	2
Cerebrovascular Section	9
CSNS News	14

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JOINT SECTION ON DISORDERS OF THE SPINE AND PERIPHERAL NERVES

Practice Guidelines

The AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves, under the direction of Dr. Mark Hadley and Dr. Beverly Walters, has completed an evidence-based review of literature pertaining to the treatment of cervical spine trauma and spinal cord injury. This work represents a monumental effort of many prominent experts in spinal surgery and embraces twenty-two clinical questions ranging from immobilization in the field, to the role of Methylprednisolone after acute spinal cord injury. The evidence took two years to compile and analyze.

The end result, *Practice Guidelines in the Treatment of Cervical Spine and Spinal Cord Injury*, was published under separate cover as a supplement to the March 2002 issue of the journal *NEUROSURGERY*. This publication has become the reference manual for all clinicians involved in treating cervical spine injuries from the paramedics in the field, to the rehabilitation specialists involved in long-term follow-up.

We are continuing to publish a synopsis of each of the recommendations in this and subsequent editions of *Neurosurgery News*. The following is an excerpt from Chapter 5 of 22.

Radiographic Assessment of the Cervical Spine in Symptomatic Trauma Patients

Recommendations

Standards:

A three view cervical spine series (AP, lateral, and odontoid views) is recommended for radiographic evaluation of the cervical spine in patients who are symptomatic following traumatic injury. This should be supplemented with computed tomography to further

define areas that are suspicious or not well visualized on the plain cervical x-rays.

Guidelines:

There is insufficient evidence to support treatment guidelines.

Options:

It is recommended that cervical spine immobilization in awake patients with neck pain or tenderness and normal cervical spine x-rays (including supplemental CT as necessary) be discontinued following either:

- Normal and adequate dynamic flexion/extension radiographs; or
- Normal MRI study obtained within 48 hours of injury.

Cervical spine immobilization of obtunded patients with normal cervical spine x-rays (including supplemental CT as necessary) may be discontinued:

- Following dynamic flexion/extension studies performed under fluoroscopic guidance; or
- Following a normal MRI study obtained within 48 hours of injury; or
- At the discretion of the treating physician.

Rationale

Trauma patients who are symptomatic, that is, complain of neck pain, have cervical spine tenderness, or have symptoms or signs of a neurological deficit associated with the cervical spine, and trauma patients who cannot be assessed for symptoms or signs (those who are unconscious, uncooperative or incoherent, intoxicated, or who have associated traumatic injuries that distract from their assessment) require radiographic study of the cervical spine prior to the discontinuation of cervical

spine immobilization. Many authors have proposed strategies and imaging techniques to accomplish x-ray clearance of the cervical spine after trauma, particularly in the symptomatic or the obtunded patient. One, three, and five view static cervical spine x-rays, computed tomography (CT), magnetic resonance imaging (MRI), bone scans, flexion/extension radiographs, dynamic fluoroscopy with or without somatosensory evoked potential monitoring, and other studies have all been described as useful for the determination of spinal injury and potential spinal instability following traumatic injury. The purpose of this review is to determine the optimal radiographic assessment strategy necessary and sufficient to exclude a significant cervical spine injury in the symptomatic trauma patient.

Summary

In summary, no single radiographic study can adequately rule out cervical spinal injury in all symptomatic patients. A three-view spine cervical spine series supplemented with CT through areas difficult to visualize and “suspicious” areas will detect the vast majority of spinal injuries. This combination of studies represents the minimum required for clearance of the cervical spine in the symptomatic patient. The negative predictive value of this combination of studies is reported to be between 99% and 100% in several Class II and III evidence studies.

In the awake patient, dynamic flexion/extension views (with at least 30° excursion in each direction) are safe and effective for detecting the majority of “occult” cervical spine injuries not identified on plain x-rays. The negative predictive value of a normal three view series and flexion/extension views exceeds 99%. Patients who are unable to cooperate with active flexion/extension radiographs due to pain or muscle spasm may be maintained in a cervical collar until they are able to cooperate, or may be studied with MRI. A negative MRI within the first 48 hours of injury in addition to normal radiographs and supplemental CT appear to be sufficient for the clearance of the cervical spine. The significance of a positive MR study is currently unclear. It is suggested

Continued on page 3

President's Message

Continued from page 1

educational, and other areas important to the field of neurological surgery. Information for those interested can be obtained from the CNS Web site or by contacting Dr. Camarata.

This brief overview highlights the educational efforts of the CNS, but in no way is it meant to be all-inclusive, as there are many other educational offerings supported by the CNS. Numerous

members, each committed to excellence, fuel the educational mission of the CNS. Over the years, I have been blessed to work with countless such individuals and as the CNS President, I continue to be inspired by them. As I begin my presidential journey, I, too, am committed to excellence. Through unwavering support and encouraging the realization of new ideas among our hundreds of volunteers, my overall goal is to work toward increased organizational efficiency and the creation of enhanced educational products. Initia-

tives that help and benefit each one of our members and neurosurgery as a whole are at the heart of the CNS leadership. For over 50 years, the philosophy of the CNS maintains that through volunteerism, nothing is out of reach. Together, we will face the changes and economic challenges in our specialty. Together, the CNS volunteers will continue to offer their expertise, time, vision, and masterful leadership to give rise to new ideas and innovative solutions. We are committed to excellence in 2004. □

Joint Section of Disorders of the Spine and Peripheral Nerves

Continued from page 2

that cervical immobilization be continued in these patients until delayed flexion/extension views can be obtained.

In the obtunded patient with a normal three-view x-ray series and appropriate CT of the cervical spine, the incidence of significant spine injury is less than 1%. Based upon mechanism of injury and clinical judgment, the cervical spine in selected patients may be considered cleared without further study. In the remainder of cases, flexion/extension performed under fluoroscopic visualization appears to be safe and effective for ruling out significant ligamentous injury, with a reported negative predictive value of over 99%. Because the incidence of occult injury diagnosed with dynamic flexion/extension fluoroscopy in the setting of normal plain cervical spine x-rays and CT images is low, it is probably most efficient for these procedures to be performed by staff in the department of radiology, although variances in local experience should be respected. MRI represents another option for clearance of the spine in this patient population, and a negative MRI within 48 hours of injury appears to effectively eliminate the likelihood of a significant ligamentous injury. However, MRI evaluation will result in a large number of false positive examinations, and the consequences of prolonged unnecessary immobilization in the obtunded patient are not insignificant.

Annual Meeting – San Diego, California

The AANS/CNS Section on Disorders of the Spine and Peripheral Nerves will hold its 20th annual meeting in San Diego, California at the beautiful Marriott Hotel and Marina from March 17–20. Make your reservations now!

Coding Corner

Gregory J. Przybylski, M.D.

CPT 2004 Coding Changes for Spinal Surgery

Current Procedural Terminology (CPT) remains the standard for describing physician services in a numerical format. In order to maintain a contemporary coding system, the CPT Editorial Panel meets quarterly to review requests for new and revised codes. However, the current coding set does not always include procedures that have been per-

formed for many years. For CPT 2004, several new codes for spinal surgery and spinal/nerve injections were added to describe long-standing procedures that were not adequately considered by the prior nomenclature.

Although standard anterolateral and posterior approaches to the thoracolumbar spine have been included in CPT, there has been significant difficulty in describing the less commonly

used lateral extracavitary approach to the thoracolumbar spine. Prior editions of CPT included sections for anterolateral thoracotomy and lumbotomy approaches as well as posterior laminectomy, costotransversectomy, and transpedicular approaches. However, these code sets failed to describe the unique aspects of the lateral extracavitary approach (i.e. lateral rachiotomy) popularized by Dr. Sanford Larson. The coordinated efforts of the Joint Section's

Coding Committee with the CNS CPT Advisor Dr. Pat Jacob led to the development of a set of arthrodesis and decompression procedures performed through a lateral extracavitary approach. In addition, multidisciplinary efforts of several specialty societies resulted in several minor new and revised codes in the areas of shunting, pain management, and nerve injections.

Continued on page 4

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Joint Section of Disorders of the Spine and Peripheral Nerves

Continued from page 3

This coding update will review the new and revised 2004 CPT codes pertinent to the spinal neurosurgeon's practice.

Lateral Extracavitary Approach to Spine Surgery

Although less commonly performed than anterolateral and posterior approaches, the lateral extracavitary approach is an important technique in a spine surgeon's armamentarium. However, the approach classifications available in CPT were limited to anterior and posterior approaches alone. In order to parallel the arthrodesis and decompression codes that use these more common approaches, a series of six codes were developed to describe similar procedures using the lateral extracavitary approach. An interbody arthrodesis performed in the thoracic (22532) or lumbar (22533) spine includes the minimal discectomy needed for the arthrodesis, whereas each additional level is coded 22534. If the thoracolumbar junction is crossed, then a single primary arthrodesis code is chosen, whereas the remaining levels are described with the additional level codes. Similarly, a decompression involving a partial or complete vertebrectomy is described in the thoracic (63101) and lumbar (63102) spine, with each additional level coded as 63103. If both arthrodesis and decompression codes are performed in the same operative setting, the lesser valued arthrodesis codes would be subject to the multiple procedural rule and thus would be appended with the -51 modifier. In contrast, the additional level codes are never appended with the -51 modifier as these are only valued for the intraoperative physician work performed. Furthermore, posterior arthrodesis, posterior decompression, spinal instrumentation, and bone graft harvest performed during the same operative session would be reported separately with the appropriate codes.

Syrinx Shunts

Although shunts are commonly used to decompress a spinal cord syrinx into a variety of locations, coding nomenclature included the subarachnoid space and peritoneal cavity, but did not include the thoracic cavity. Since the physician work of peritoneal and pleural placement of the distal shunt was somewhat similar, an editorial change to the code describing peritoneal placement (63173) was recommended to the CPT Editorial Panel, allowing for pleural placement as well.

Pump Refill by Physicians

Precedent for implantable pump refilling excluded consideration of physician work. The Centers for Medicare

and Medicaid Services (CMS) spends significant money annually on payments for drug infusions, typically through an intravenous route for delivery of chemotherapeutic agents. Since these intravenous injections are usually performed by non-physician providers, CMS has not included physician work in the drug delivery code values. However, pumps delivering intrathecal or intraventricular drugs such as Baclofen or Morphine may require direct physician injection of the medication into the pump. In order to allay concerns about differentiating situations in which a non-physician provider performs the pump refill, a companion code was developed that specifies refilling performed by a physician (95991). Despite resistance to acknowledge this legitimate physician work, new ground was broken when the Relative-value Update Committee (RUC) recommended physician work to be included in this code, which was subsequently accepted by CMS. In contrast to 95990, the new code can only be used if the physician personally performs the injection.

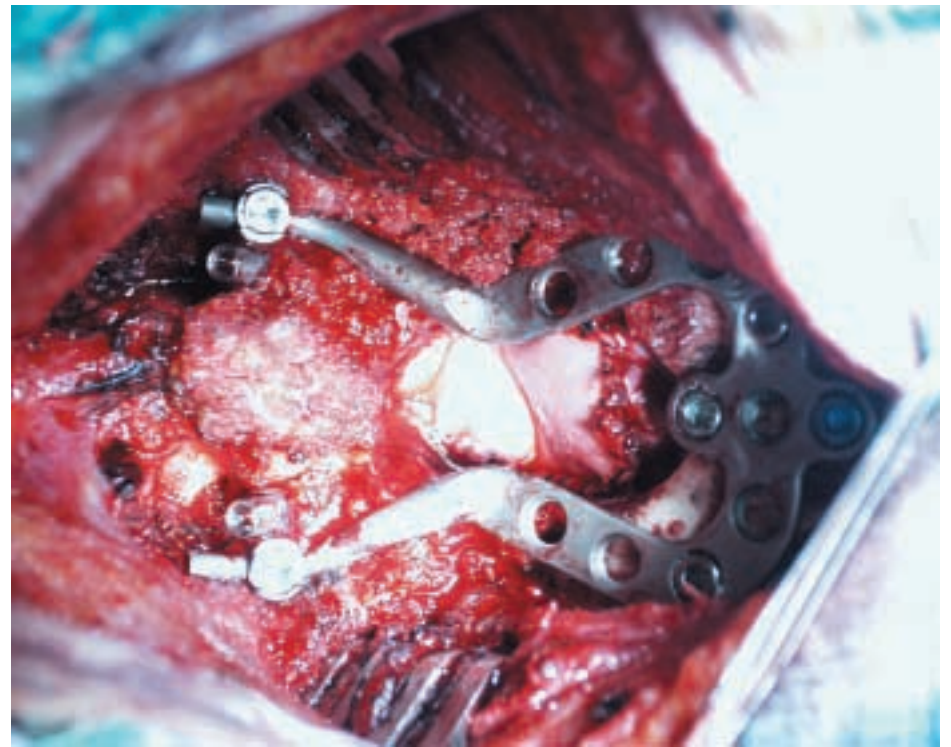
Miscellaneous Codes

Finally, several injection codes were developed to improve the comprehensiveness of this section. For example, a code for catheter placement to infuse anesthetic agents to the lumbar plexus (64449) was added to complement 64448 for femoral nerve infusions. In addition, two codes for injection of a neurolytic drug to the celiac plexus (64680) or superior hypogastric (64681) plexus was developed.

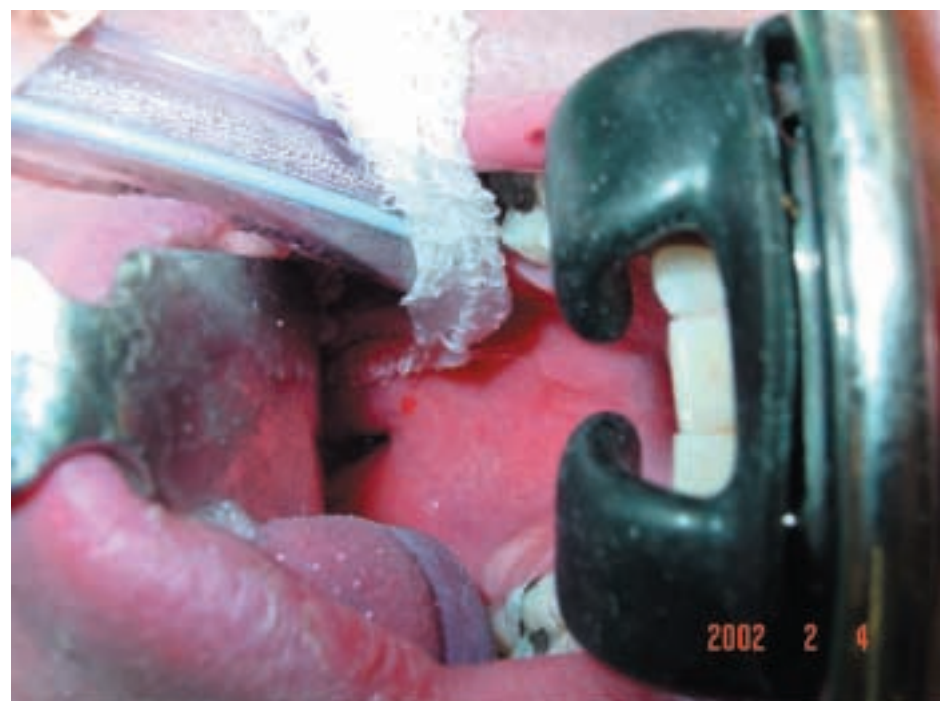
CPT remains an evolving process that must be constantly refined to account for changes in techniques as well as to identify older procedures not well described by the current nomenclature. Although lags in FDA approval, sparse peer-reviewed publication of efficacy, and low frequency of performance may delay the development of new codes, the Joint Section Coding Committee chaired by Dr. William Mitchell continues to work with the Coding and Reimbursement Committee of the AANS and CNS to keep the nomenclature of CPT contemporary with the current practice of spinal neurosurgery.

Consultants Corner

In the last Neurosurgery News we presented a 29-year-old right-handed systems engineer who developed pain and numbness in the left side of his chest, aggravated by coughing and sneezing eight years prior. Investigations at that time demonstrated a Chiari I malformation with cervical syringomyelia. A syringosubarachnoid shunt was placed in the upper thoracic spine. He did well until 18 months ago when he began to notice symptom recurrence, worsening



Photograph demonstrating application of short segment craniocervical fixation device. The posterior ring of C1 has been removed and an occipital craniectomy has been performed. A synthetic dural graft substitute can be seen sutured into place extending from the occiput to the C2 lamina for the expansive duraplasty. Caudal screws achieve C1/2 transarticular fixation. Rostral screws anchor the plate device into the thick midline occipital bone.



Photograph depicting setup for anterior approach. Soft palate split was required to reach the tip of the odontoid process inside the foramen magnum.

numbness, occipital cough headaches, and physical findings of an early myelopathy. Imaging studies showed congenital fusion of the atlas to the clivus and upward migration of the odontoid with compression of the brainstem, tonsillar descent to the level of C2, and a large cervical syrinx.

We asked our panel of experts what they would do. In random order, here is what they said:

- This case presents a difficult problem. I would simplify this process by dividing the problem into three component parts from a treatment strategy determination perspective. First, the upward migration of the odontoid process and brainstem compression, in my opinion, should be initially treated with cervical traction. I would begin with small weights in the range of five pounds and gradually increase this to twenty-five or thirty pounds over

five days. I would do this during the five-day period prior to a planned surgery.

Regardless of whether or not the deformity is reduced with traction, I would then plan a suboccipital craniectomy, duraplasty and occipital cervical fusion to C2 or C3, depending on the lower extent of the tonsils and the lower extent of the decompression. I would use a polyaxial screw fixation system with screw fixation to the occiput. If symptoms were not significantly relieved by this surgery, and if significant brainstem compression persisted, I would perform a transoral decompression, approximately one week after the first operation.

- This scenario is not entirely uncommon.

Continued on page 6

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Joint Section of Disorders of the Spine and Peripheral Nerves

Continued from page 4

mon. There are three distinct problems present in this case: 1) vertical migration of the odontoid process; 2) Chiari I malformation; 3) cervicothoracic syringomyelia. As I find shunting a low-pressure

syrinx to be frequently futile, my treatment would be aimed at eliminating the mechanical obstruction to CSF flow, which I believe is responsible for the current clinical picture. If the CSF pathways can be restored, then there is a reasonable likelihood that the syrinx may resolve over time.

Treatment plan—On Rotorest bed,

place Gardner-Wells tongs. Begin with 5 lbs. skeletal traction and follow serial neurologic exams and lateral cervical spine radiographs. Increase traction in 2 lb. increments, over 24 hours, up to a maximum of 15 lbs. After 3 days of traction, repeat the CT scan, performed with the patient in traction, and compare the sagittal reformations versus the previous CT scan.

If the vertical subluxation is reduced, perform a posterior surgical procedure. This surgery would include a suboccipital craniectomy with C1 laminectomy and relaxing Y-shaped dural release (with the patient still in traction to maintain the reduction), and fuse the occiput to the cervical spine. A large block of autologous iliac graft, with the inner cortex removed, can be wedged in between the decorticated occiput and the decorticated C2 spinous process. Stabilization would be accomplished with a screw-plate-rod system which includes an occipital plate secured in the midline keel with 12-14 mm screws, bilateral pedicle screws at C2, and bilateral lateral mass screws at C3 and C4. Additional generous quantities of morselized iliac autograft bone would be used from the occiput to C4. Rods would be contoured to secure the occipital fixation points to the cervical spine (while still in traction). After securing the construct, release the traction. This maneuver violates the principle of not “loading” screws; however, it allows the reduction achieved preoperatively to be preserved. This is the reason why the C2 pedicle screws are “backed up” with 2 pairs of lateral mass screws (to protect the C2 screws). A postoperative CT scan would be performed on the third postoperative day to assess the adequacy of the decompression, the alignment, and the placement of the instrumentation.

If the vertical subluxation was unable to be adequately reduced preoperatively with traction, then a transoral resection of the odontoid process would be performed initially, followed by the occipitocervical procedure outlined above. The only difference is that the traction would be removed prior to any definitive fixation if the transoral procedure were performed.

No definitive treatment of the syrinx would be performed initially. Serial neurologic examinations would be performed over the first 3 months postoperatively with an MRI repeated at 3 months to evaluate the Chiari decompression, the size of the syrinx, and the positioning of the odontoid, or its remnant, with respect to the brainstem. Plain radiographs and clinical follow-up evaluations would be maintained for a minimum two year period postoperatively to confirm the fusion status and the clinical outcome.

- There are several interrelated problems. A Chiari Malformation, C1-2 subluxation and basilar invagination, plus the syringomyelia. I would recommend treat-

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Joint Section of Disorders of the Spine and Peripheral Nerves

Continued from page 6

ing the Chiari and craniovertebral junction deformity simultaneously. I would place the patient in halo traction in extension to try and reduce the invagination and C1-2 subluxation. If the deformity is completely reducible, then I would perform a suboccipital craniectomy and upper cervical laminectomy plus an occipitocervical fixation and fusion. If however the invagination is not reducible and there is residual ventral compression, then a staged transoral procedure may also be needed. I would not perform any immediate surgery to reshunt the syrinx. With adequate decompression of the Chiari, the syrinx should resolve or improve.

- This patient is exhibiting signs of spinal cord dysfunction primarily related to the syrinx cavity. The syrinx is almost certainly related to the Chiari malformation, the effects of which are magnified by the upward translation of the dens into the foramen magnum.

In terms of treatment, given the patient's age and history of progressive symptoms, I believe that intervention is appropriate at this time. I would first recommend placement of a halo ring for a trial of axial traction. Hopefully, traction applied over a few days would result in a reduction of deformity at C1-2. Following traction and reduction, a posterior decompression of the foramen magnum via a suboccipital craniectomy and C1 laminectomy would be performed in order to decompress the posterior fossa. Although we are not provided parasagittal CT images, it is doubtful that transarticular screw fixation at C1-2 is feasible given the assimilation of C1 into the occiput. I would, however, examine the studies and consider this an option if it were anatomically possible. Assuming this technique is not viable, an occipito-cervical fixation procedure would be used with fixation to both C2 and C3. Lateral mass screw fixation would be used at C3. Fixation at C2 would be accomplished with either pars or pedicle screw fixation if possible, otherwise sublaminar cable fixation may be used. Autologous bone graft from the iliac crest would be used for the arthrodesis, and the patient would be maintained in either the halo vest or a rigid collar for 6-8 weeks following surgery.

In the event that the deformity is not fully reducible, a judgment call must be made as to whether or not a transoral resection of the odontoid would be required. This call would be made based upon the extent of reduction achieved. I would certainly endeavor to avoid the anterior decompression if at all possible.

- I would place this man in traction for 48 hours and repeat his MR scan (while in the traction). If his alignment was improved and the anterior compression produced by

the odontoid relieved then I would perform a posterior fossa decompression and duraplasty in conjunction with a posterior fusion. The fusion would be accomplished using rigid screw fixation from the occiput to C2. I would obtain purchase in the C1 lateral mass but without a more complete set of images I do not know if this would be via a transarticular screw or direct placement of a C1 screw. Rib

would serve as the autograft substrate. If the traction did not eliminate the brainstem compression then a transoral resection of the odontoid would need precede the previously described posterior procedure.

- Given that the patient has recurrent and progressive symptoms, I

Continued on page 8

CNS Meeting ad new 4/c

Joint Section of Disorders of the Spine and Peripheral Nerves

Continued from page 7

would recommend surgery. I would add cervical spine x-rays including flexion extension views as well as a cine MRI to further delineate the level and degree of obstruction of CSF flow around cervical medullary junction. Typically patients with congenital pathology resulting in upward migration of the odontoid, do not respond to traction in an attempt at reducing the compression and I would not include this in the treatment regimen. Since the patient has significant ventral bony compression of the medulla which is irreducible I believe that the patient will require a transoral decompression. Given the Chiari I mal-

formation and the posterior compressive pathology including the posterior lip of the foramen magnum – I would perform a small posterior fossa craniectomy, C1, C2 laminectomy and occipito-cervical fusion.

The treatment plan ultimately involves restoration of CSF flow around the foramen magnum to reduce the size of the cervicothoracic syrinx.

Final Score:

Primary Posterior Decompression & Fusion	2
Primary Anterior Decompression & Posterior Fusion	4
Primary Syrinx Shunting Procedure	0



Pre- and postoperative imaging studies. (1) The T1 weighted sagittal MR sequences in the top panel display the degree of anterior and posterior decompression achieved in front of the medulla and below the cerebellum. (2) The T2 weighted sagittal MR images in the second panel show the size of the syrinx before and after surgery. (3) The bottom panel attests to ongoing craniocervical stability one year post-operatively.

Editor's Note

This is a case of mine, treated almost 2 years ago. All but one of our experts indicated a role for pre-operative traction. When I read their comments I was somewhat surprised at how optimistic they sounded that reduction might be achieved. I was personally more pessimistic in view of the congenital nature of the deformity, sharing the opinion of the last reviewer. Nonetheless traction was attempted for 3 days with 40 lbs but did nothing to extricate the odontoid from the cranium at all. The patient subsequently went on to have a transoral odontoid resection, posterior craniectomy, duraplasty and instrumented fusion under a single anesthetic. The single surgery was his request; I would have preferred to stage the procedure.

There was a tremendous amount of tongue and pharyngeal edema post-operatively requiring a temporary tracheostomy. Recovery was otherwise unremarkable. Follow-up one year post-operatively documented the patient's headaches to have resolved, his numbness and tingling to have subjectively improved, and motor and sensory exam to be normal, with residual mild hyperreflexia. MR follow-up at 1 year showed no further compression of the brainstem with a significant reduction in the size of the cervical syrinx. Plain x-rays suggested the presence of a solid bony union.

Many thanks to our expert panel consisting of, in alphabetical order:

Dr. A. Levi (University of Miami)
 Dr. Curtis Dickman (Barrow Neurological Institute)
 Dr. Vincent Traynelis (University of Iowa)
 Dr. Daniel Resnik (University of Wisconsin)
 Dr. Robert Heary (Neurological Institute of New Jersey)
 Dr. Ed Benzel (Cleveland Clinic)

John Hurlbert, Editor

Comments, Submissions, or Suggestions for the Spine Section?

Please e-mail Larry Khoo at LKhoo@mednet.ucla.edu or contact through surface mail: Dr. Larry Khoo, 10833 Le Conte Avenue, Suite 74-140 CHS, Division of Neurosurgery, UCLA Medical Center, Los Angeles, CA 90095. □

CNS Membership: Applications in Progress

The following individuals have applied for Membership to the Congress of Neurological Surgeons. Commentary or questions should be directed to Robert M. Friedlander, M.D., Chairman Membership Committee, phone: 847-240-2500.

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 Michael G. Kaplitt
 Kent Kilbourn
 Phyo Kim
 Andrew Law

Jae Whan Lee
 P. Mark Li
 Kimberly Livingston
 Thomas Loftus
 Lloyd Maliner
 Frederick Marciano
 William McCormick
 Rajesh Mehta
 Peter Nora
 Jonathan Pollock
 Patrick Roth
 Faheem Sandhu
 Figueroa Santiago
 Thomas Sernas
 David Smith
 Michiyasu Suzuki
 Christopher Taleghani
 Travis Tingle
 Rudie Tjong-Tjin-Joe
 Sagun Tuli
 Keisuke Ueki
 Hasan Ugur
 Brian Walsh
 Charles Leonard Wolff III
 Peter Yeh

JOINT SECTION ON CEREBROVASCULAR SURGERY

From the Chair

Warren R. Selman, M.D.

Stroke Care at a Crossroads

Are Primary Care Centers the Right Way to Go?

I went down to the crossroads, tried to flag a ride.

I went down to the crossroads, tried to flag a ride.

Nobody seemed to know me; everybody passed me by.

Robert Johnson



Stroke care is at a crossroads. Efforts are now underway to certify primary centers of care for stroke patients. The growth of the AANS/CNS Cerebrovascular Section, which was established in 1975, serves as evidence that specialization is an accepted part of organized neurological surgery. By definition, the goal of specialization is to permit the development of special expertise and ultimately improve outcome. It is intuitive that specialized expertise is beneficial in providing optimal care for patients with cerebrovascular disorders. Demonstrating proof of this intuition, however, is not as straightforward. Volume and outcome in the management of cerebral aneurysms is a subject that has come to the forefront in two recent articles in the *Journal of Neurosurgery*.^{4,5} These articles and the thoughtful editorials provided by Roberto Heros, M.D., deserve and warrant careful examination by all members of our section.^{8,9}

A Correlation Between Volume and Mortality?

The question as to why hospital death rates vary is not new. In fact, it was raised by Florence Nightingale in 1863, and again by Codman in 1914.^{3,11} Just over 20 years ago, Luft and colleagues demonstrated that hospitals with higher volumes of specific surgical procedures experienced significantly lower inpatient mortality rates than did their lower volume counterparts.¹⁰ It is important to remember that there are many fundamental factors that may underlie and trigger differences in outcome. These include patient selection, preoperative, anesthetic and postoperative intensive care, and surgical judgment, skill, and technique. Although identifying the relative contribution of these factors is a

substantial undertaking, we must be committed to this process in an effort to help identify those best practices that can be incorporated by all surgeons and hospitals.

This is especially important since it is

clear that volume is not an immutable determinant of the rate of adverse outcomes. This was demonstrated for cardiac bypass surgery in New York state, where the risk-adjusted mortality of high-volume surgeons decreased, but the risk-adjusted mortality of low-volume surgeons decreased to an even greater extent.⁷ In this experience, the gap in risk-adjusted mortality between high-volume and low-volume surgeons narrowed, and the mortality for both

groups decreased substantially. Similarly, improving the outcomes for all practitioners providing care to patients with cerebral aneurysms is clearly the goal for which we should strive.

Epstein notes that the imperfect correlation between volume and mortality stands as a reminder that volume alone is not an indicator of quality of care. He goes on to further comment that the

Continued on page 10

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Joint Section on Cerebrovascular Surgery

Continued from page 9

volume-outcome hypothesis has created a policymaker's dilemma.⁶ This dilemma posed for the management of cerebral aneurysms and subarachnoid hemorrhage is complicated by the nature of the data from which the studies have been conducted. The excellent studies by Cross and colleagues as well as Cowan and colleagues have limitations—the retrospective uncontrolled nature of these studies and the lack of specific data on the initial neurological condition of the patients treated—that must be considered before adopting recommendations for transferring patients to high-volume centers.^{8,9}

Given the limitations imposed upon these studies by the databases utilized, it is the conclusion of the American Association of Neurological Surgeons (AANS) that, at this time, a mandate for regionalization of neurosurgical care would be premature.¹ The recommendation of Cowan and colleagues that practitioners should refer patients to centers in which superior outcomes are consistently demonstrated deserves thoughtful consideration. Although, for all the reasons cited, this recommendation cannot be viewed as a mandate, but rather should serve as a timely and appropriate reminder of the need for neurosurgeons to take the lead in the development of tools that would permit identification of specific processes of care that improve outcomes.

New Stroke Certification

In this regard, I want to call your attention to my discussion in the Fall 2003 issue of Cerebrovascular News of the American Stroke Association which, in conjunction with the Joint Commission on Accreditation of Healthcare Organizations, will begin offering Disease Specific Stroke Care Certification. This certification is based upon the Brain Attack Coalition's Recommendations for the Establishment of Primary Stroke Centers.² Neurological surgery played a major role in the development of the recommendations for primary stroke centers, and the availability of neurosurgical services is a key component. I would urge the members of the Cerebrovascular Section to participate and actively support the American Stroke Association in this important effort to improve the care of stroke patients.

In recognition of the belief that committed multidisciplinary teams offer distinct advantages through their ability to provide all the therapeutic options to bear on the management of patients with cerebrovascular disorders, the Brain Attack Coalition is currently in the process of developing recommendations for comprehensive stroke centers. As with the primary centers, the AANS, Congress of Neurological Surgeons and Cerebrovascular Section have been instrumental in the development of these recommendations. It

is anticipated that a comprehensive stroke center will possess all the comparable characteristics of a primary stroke center, and much of what will distinguish a comprehensive stroke center is specific, documented expertise and infrastructure in several key areas including diagnostic radiology, endovascular therapy, intensive care, and neurovascular surgery.

CV-ASITN Annual Meeting Opportunities

Providing the opportunity to observe and discuss the latest innovations in the basic scientific and clinical foundation for the management of patients with cerebrovascular disease has always been the priority of the Cerebrovascular Section's Annual Meeting. The upcoming Seventh Joint Meeting of the AANS/CNS Cerebrovascular Section and the American Society of Interventional and Therapeutic Neuroradiology will be held at the Sheraton San Diego Hotel, Feb. 1-4. The scientific program will feature practical courses, special symposia and seminars that specifically address the details and processes of care. The scientific program was designed to highlight up-to-the-minute information on clinical trials, discuss current topics of interest such as volume and outcome, and focus on "real world" experience in the management of cerebrovascular disorders. I encourage you all to attend and participate, and I look forward to seeing you in San Diego.

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Notes From the Editor

By Robert M. Friedlander, M.D., MA

Changes Pave the Way for Our Future

It has been a great pleasure and honor to serve as editor of Cerebrovascular News over the past three years. Important changes have taken place both in our subspecialty as well as in the newsletter during this period of time. At the completion of my tenure as editor, I would like to take this opportunity to summarize my observations and thoughts on some of these changes.

We have an electronic-only newsletter. Entering into the electronic era, our newsletter made the transformation from a print publication to an online, electronic-only publication. The section is realizing many of the advantages of electronic media not the least of which is significant financial savings of printing and mailing expenses. However, this comes at the potential cost, especially in the initial stage of the transformation, of decreased readership.

We have a new name. The name of the section changed from the AANS/CNS Section on Cerebrovascular Surgery to the AANS/CNS Cerebrovascular Section. The latter name was thought to more accurately reflect the section's membership, particularly for members with dual neurosurgical and endovascular training.

Studies Shed Light on Aneurysm Treatments

Findings of the International Study of Unruptured Intracranial Aneurysms, ISUIA, were published in the *New England Journal of Medicine* and the *Lancet*. The initial paper questioned the notion that the risk of rupture for most unruptured intracranial aneurysm is in the order of 0.1 percent to 0.3 percent and the findings reported were significantly different from what was previously understood. This study changed the manner in which many clinicians approached patients with intracranial aneurysms. The second, follow-up study more closely resembled the previously quoted risks of rupture. However, this study provided much more insight into the intricacies of aneurysm location and size as they pertain to rupture risk.

The International Subarachnoid Aneurysm Trial, ISAT, another landmark study, likely will likely change the manner in which we practice the management of patients with aneurysms. Clearly the results of this study are being scrutinized constantly and require continued follow-up and careful evaluation. However, the question of the superiority of aneurysm coiling over microsurgical clipping is staring us right

in the face. The question still remains as to how to proceed with the systematic and scientific evaluation of this important issue.

It is clear that our subspecialty has changed significantly, and will continue to do so. Technological advances are aiding us in the management of our patients. I believe that the major advances in our field over the next 10 to 15 years, in addition to improved endovascular technology, will involve the incorporation of improved pharmacological management of ischemia damage. Advances in basic sciences likely will translate to our patients.

What is next for Cerebrovascular News? I leave the newsletter in the very capable hands of Murat Gunel, M.D., of the Department of Neurosurgery, Yale University. Dr. Gunel has served as associate editor of the newsletter for the past year. I am sure that he will put into the newsletter his personal and insightful touch.

CV Section-ASITN Annual Meeting Preview

Harold J. Pikus, M.D.

Seventh Annual Joint Meeting Promises Science, Sun and Fun

The AANS/CNS Cerebrovascular Section and the American Society of Interventional & Therapeutic Neuroradiology are preparing for the Seventh Annual Joint Meeting, which will be held in San Diego, Calif., at the Sheraton San Diego Hotel and Marina, Feb. 1-4. Annual Meeting Co-Chairs Harold J. Pikus, M.D., from the CV Section, and Gary Duckwiler, M.D., from the ASITN, have assembled an outstanding scientific program which will feature five "state-of-the-art" practical courses, and five scientific plenary sessions which will emphasize recent advances and current controversies in cerebrovascular practice, among other highlights. One of our goals this year is to provide increased opportunity for case presentations and discussion during courses, scientific sessions, and luncheon seminars.

Science

Scientific Session 1, which will focus on the "real world" management of cerebral aneurysms, promises to be an interesting look into the application of the multidisciplinary team to this disease. Teams of microsurgeons and endovascular surgeons will present their integrated approaches to various specific cases, while supporting their decisions with appropriate clinical and basic science data.

Continued on page 11

Joint Section on Cerebrovascular Surgery

Continued from page 10

Scientific Session 2 will present historical and current thinking on diagnosis and management of intracranial atherosclerosis, patient selection, endovascular and microsurgical revascularization options.

Scientific Session 3 will provide an update on emerging techniques and technologies for the treatment of acute hemorrhagic and ischemic stroke.

Current and interim cerebrovascular trial results will be discussed during Scientific Session 4 including the Surgical Treatment for Ischemic Heart Failure (STICH) trial, among others, and a special presentation by Ralph Dacey, M.D., on subarachnoid hemorrhage case volume and outcome.

The final scientific session, Session 5, will be dedicated to political and economic issues pertinent to cerebrovascular training and practice. Interspersed will be oral presentations presenting a total of 100 abstracts will be presented.

An additional 120 poster presentations will be available for viewing throughout the meeting. Nineteen excellent luncheon seminars will provide exposure to a broad spectrum of neurovascular topics. This year's Luessenhop Lecture, given by Fernando Vinuela, M.D., will take place on Wednesday, Feb. 4 at 9:40 a.m.

Sunday, February 1, will be devoted to five special courses.

- * **Special Course 1—Management of Dural AV Fistulae** will provide an all-day, in-depth look into the issues pertinent to surgical and endovascular treatment of these interesting and difficult lesions. The course will be directed by Pierre Gobin, M.D..
- * **Special Course 2—Acute Stroke Management**, a morning course directed by Adnan Qureshi, M.D., will focus on the state of the art management of acute stroke. Topics will include ischemic and hemorrhagic stroke, endovascular and surgical options. The importance of the multidisciplinary approach to stroke will be outlined.
- * **Special Courses 3 and 5—Rat Anastomosis Workshop**, a top choice at last year's meeting, has been revisited this year. Two sessions—morning (3) and afternoon (5)—will be offered so that we can accommodate all those interested. The course will be directed by Saleem Abdulrauf, M.D., and includes a hands-on instructional workshop as well as illustrative videos. This session sold out quickly last year, so early registration is advised.
- * **Special Course 4—Critical Care Management in the Neurologi-**

cal ICU, another popular course, will focus on the critical care management of cerebrovascular disorders. This afternoon course, directed by Josh Bederson, M.D., will be of benefit to the neurosurgeon, neurologist, and interventional neuroradiologist alike.

Sun and Fun

San Diego provides a wonderful and diverse winter getaway for those who hail from cooler climates. The San Diego Zoo is world renowned, with more than 4,000 animals on exhibit. The San Diego Wild Animal Park and Sea World also are enjoyable diversions. Legoland is only 30 minutes north of the city in Carlsbad. San Diego also has numerous excellent restaurants and shopping venues, the historical Old Town section, Balboa Park, and, of course, chic La Jolla. There is truly something for everyone, so bring the whole family!

Registration forms at <http://www.neurosurgery.org/cv/meetings/index.html> can simply be printed, completed and returned by fax or mail. The landmark Sheraton San Diego Hotel and Marina is on San Diego Bay and provides panoramic views of the city, marina, and adjacent coastal regions. We look forward to seeing you in San Diego!

Endovascular Corner

Kai U. Frerichs, M.D.

SAH Successfully Treated with Coils and Glue

A 45-year-old male was admitted to the hospital with a history of four to five days of headaches that became acutely worse on the day of admission. His history also included metastatic prostate cancer.

A head computed tomography scan (Figure A) showed subarachnoid hemorrhage around the midbrain, mainly on the right and extending anteriorly into both sylvian fissures. The computed tomography angiogram suggested an aneurysmal dilatation of the right posterior cerebral artery (PCA) in close proximity to a clot. He became obtunded, and an external ventricular drain was placed.

The angiogram revealed a fusiform aneurysm of the right PCA (Figure B). Interestingly, the parietooccipital branch of the left PCA was absent, and an abnormal collateral network reconstituted the calcarine artery on that side, which may be additional evidence of an underlying vasculopathy in this patient.

Endovascular segmental sacrifice was



Figure A

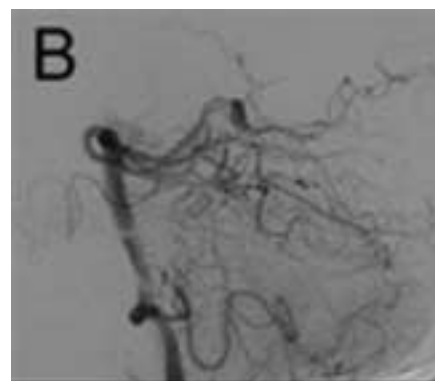


Figure B

then carried out by first placing three ultrasoft Guglielmi detachable coils into the distal outflow of the aneurysm. This was followed by injection of n-butyl cyanoacrylate into the aneurysm until the entire aneurysm was filled selectively (Figure's C, D). Distal runoff of glue was prevented by the coil mass.

This aneurysm most likely represented a pseudoaneurysm secondary to dissection, and dense packing with coils may have had a higher chance of aneurysm perforation. The combined use of glue and coils allowed this aneurysm to be obliterated safely without the need of tight coil packing, and vessel sacrifice could be restricted to just the affected vessel segment.

Repeat angiography on day eight after subarachnoid hemorrhage confirmed a stable result. Collateral flow to the calcarine and parietooccipital region is often sufficient to preserve perfusion unless distal embolization occurs. This patient recovered without a field deficit, and no diffusion changes were noted on magnetic resonance imaging (Figure E).

Technology Report

E. Sander Connolly Jr., M.D., Sean D. Lavine, M.D., and Philip M. Meyers, M.D.

“Swell” Device: Hydrogel Coil Theoretically Fills Vascular Space

As an increasing number of intracranial aneurysms come to be treated by

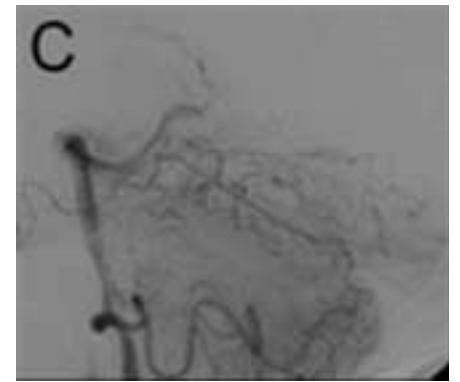


Figure C

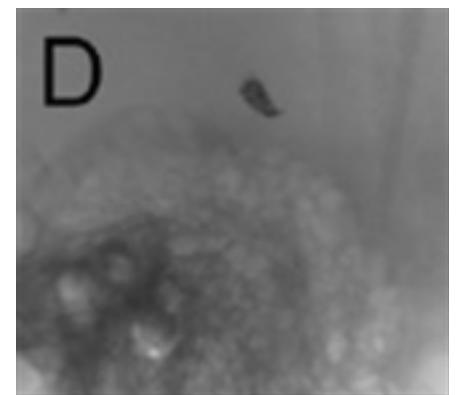


Figure D

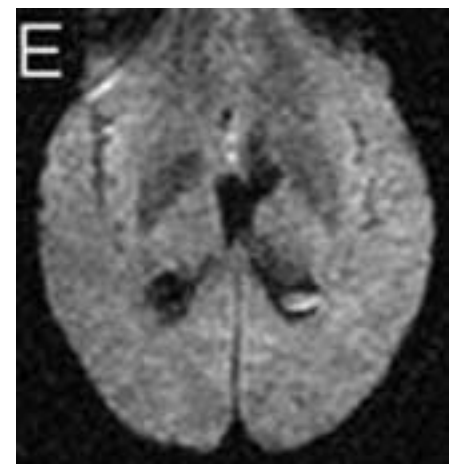


Figure E

endovascular means, there is a growing need to address the problem of coil compaction and aneurysm recanalization and/or regrowth. A whole host of technologies have been developed to address this problem, including stents and bioactive (vicryl-coated) coils. One recent addition to the interventionalist's armamentarium is the HydroCoil® Embolic System from Microvention, Inc., in Aliso Viejo, Calif.

The HydroCoil Embolic System is a platinum helical coil with an outer layer of a hydrophilic, acrylic polymer (hydrogel) that provides additional filling of a vascular space (Figure 1). Hydrogels are three-dimensional networks of hydrophilic polymers produced by the simple reaction of one or more monomers. The most characteristic property of a hydrogel is that it swells in the presence of water and shrinks in the absence of water. The advantage of this coating is that it allows for more complete filling of the aneurysm and more immediate thrombosis. Theoretically, this in turn leads to reduced coil migration and compaction, thereby significantly improving the likelihood of healing at the aneurysm neck and in turn of delivering a durable long-term result, espe-

Continued on page 12

Joint Section on Cerebrovascular Surgery

Continued from page 11

cially in wide-necked lesions. Prior applications of hydrogels in biomedical fields include contact lenses, intraocular lenses, wound dressing materials, and catheter coatings.

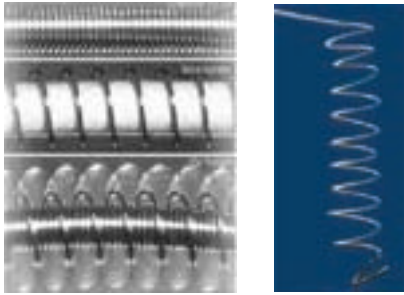


Figure 1

The single published report showed that the device is easily tracked, deployed, repositioned, and detached through standard microcatheters, and high rates of delayed, progressive occlusion were seen clinically.³ In addition to this report, at least 20 abstracts have been presented at national and international meetings detailing both clinical and pre-clinical results with this technology.

Some of the key preclinical findings include:

- In rabbits and in dogs, the material is biocompatible and fosters growth of cells across the necks of embolized aneurysms.^{1,4}
- In a porcine model, the coils also obviated the need for complete filling of the aneurysm with coils, appeared to prevent recanalization in the long term, and reduced the number of coils needed to achieve aneurysm obliteration.^{2,5}
- When compared to conventional platinum coils, the treatment durability of canine aneurysms embolized with the hydrogel-coil system was statistically higher ($p=0.002$), aneurysms organized at a higher rate, and flow stagnation within the aneurysm was superior without local increases in pressure.^{6,8}
- Results were especially promising in experimental, wide-necked aneurysms.⁷

In addition to these findings, both Moret and Berenstein have reported in Val d'Isere 2003 positive initial results in the clinic. Complication rates have been no greater than would be expected with conventional systems, and aneurysmal filling has been excellent.⁸ While these results remain very preliminary with long-term outcomes lacking, there is a growing feeling that this technology, especially in combination with other endovascular adjuncts, may hold great promise for the treatment of aneurysms currently underserved by conventional Guglielmi detachable coil technology alone.

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What Would You Do?

Case contributed by Arun Amar, M.D., and Murat Gunel, M.D.

To contribute a case to the next issue, go to <http://www.neurosurgery.org/cv/newsletter/wwydsbmit.html>

The patient is a 40-year-old, right-handed male who presents with a several month history of progressive numbness and weakness in the right arm and leg. The onset of symptoms was gradual. There were no episodes of incontinence. In July 2003 he underwent magnetic resonance imaging of the spine, which revealed a solid, intramedullary lesion at the C3-4 level (Figure 1). The center of the mass was to the right of midline and appeared to occupy about half the dimensions of the normal cord (Figure 2). It demonstrated uniform enhancement with gadolinium. There was mild surrounding edema, as well as a small syrinx extending from the lower brainstem to the upper thoracic cord. However, there was no evidence of associated hemorrhage.

The patient reported smoking 15 packs of cigarettes per year; otherwise, his medical history and family history were negative for risk factors associated with tumors.

Physical examination was significant for mild atrophy and weakness (4+/5) of the right upper extremity as well as mild weakness (5-/5) of the right lower extremity. His gait was mildly spastic. Hyperreflexia and clonus were present in both legs. Proprioception was nearly absent in the right arm.

The patient was admitted to a community-based hospital and underwent attempted resection via a C3-4 laminectomy. Numerous engorged, tortuous vessels consistent with arterialized veins were draped over the dorsal surface of the cord. A biopsy was taken, and the diagnosis of hemangioblastoma was made. However, due to the excessive vascularity, no excision was performed. Postoperatively, the patient remained at his neurological baseline. He subsequently underwent a limited catheter angiogram, which demonstrated the presence of a hypervascular mass in the



Figure 1

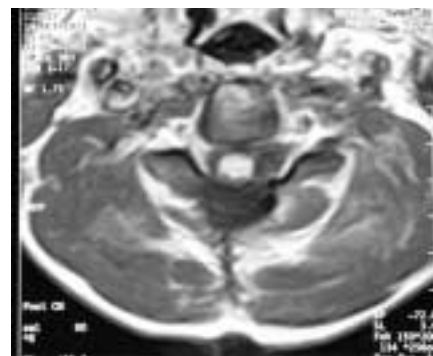


Figure 2



Figure 3

cervical cord. Arteriovenous shunting was present, but there was no definite nidus of a vascular malformation. The feeding arteries appeared to arise from branches of the right and left vertebral arteries. However, their association with the anterior and posterior spinal arteries was not clear (Figure 3).

The patient was then referred to an academic medical center for further management. At the time, the possibility of Von Hippel-Lindau disease was considered. Several therapeutic options were contemplated, including repeat

surgery, repeat angiography with possible embolization, and stereotactic radiosurgery.

What Would You Do? Results and Expert Opinions

Please note that the discussion of the results to this and all "What Would You Do" cases does not represent the opinion of the AANS/CNS Cerebrovascular Section nor does it represent standard of care. No formal medical recommendation regarding any specific case can be provided by the below summary of opinions.

The Case

This case was presented in the Fall 2003 issue of *Cerebrovascular News* and is available at <http://www.neurosurgery.org/cv/newsletter/fall03/whatwouldyoudo.html>.

A 60-year-old, right-handed woman with a history of significant coronary artery disease presented with acute onset diplopia. She was also noted to have epistaxis, and no prior history of it. The severity of her symptoms required deep packing by an otolaryngologist.

On examination, her vital signs were stable. She had no chemosis, proptosis or bruits. Her cranial nerve exam, including the third, fourth, and sixth nerves, was normal. The balance of the thorough neurological exam also was normal. A computed tomography scan of the head with sagittal and coronal reconstructions showed a right cavernous segment aneurysm of the internal carotid artery (ICA). A conventional angiogram also was performed.

Together, these studies revealed an aneurysm which predominantly involved the cavernous segment, and which projected superiorly involving the clinoidal and intradural segments of the ICA.

Her coronary artery disease was stable and she was cleared for treatment of this condition.

Continued on page 13

What would you do?

Please take a few moments to submit your response to this edition of What Would You Do? This case closes on Feb. 15.

Which of the following treatment options would you choose for patients age 20, 40, 60 or 80?

	20	40	60	80
Repeat surgery and attempted resection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Repeat angiography and possible preoperative embolization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stereotactic radiosurgery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Observation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Joint Section on Cerebrovascular Surgery

Continued from page 12

The Results and Expert Opinions

Felipe C. Albuquerque, M.D.; Arthur L. Day, M.D., and Edward G. Vates, M.D., Ph.D.; Christopher C. Getch, M.D.; Christopher S. Ogilvy, M.D.

Felipe C. Albuquerque, M.D.

Felipe.Albuquerque@bnaneuro.net

In a patient 20 to 60 years of age I would favor three-dimensional angiography. If the 3-DA shows a good working angle in which the aneurysm projects distinctly from the parent artery, then stent-assisted coiling would be a good option. I suspect, however, given the images, that the aneurysm involves the parent artery circumferentially. This makes it difficult to coil safely even when using a neuroform stent. If the aneurysm is not treatable in this fashion, I would favor balloon test occlusion and then permanent occlusion if she passes the BTO.

The epistaxis is of great concern and could certainly be from the aneurysm. For this reason urgent treatment is warranted. If she fails the test occlusion, one could consider trying to coil the dome of the aneurysm and then performing a bypass. Once the bypass matures, the artery then could be sacrificed endovascularly.

For an elderly patient, I would favor balloon test occlusion and endovascular occlusion of the parent artery.

Arthur L. Day, M.D., and Edward G. Vates, M.D., PhD

This 60-year-old woman with a 2 cm proximal right cavernous segment aneurysm of the internal carotid artery (ICA) presents with complaints of diplopia (without observable cranial neuropathy) and epistaxis that currently is tamponaded by deep nasal packing. The patient is now hemodynamically stable. The computed tomography angiogram clearly shows the aneurysm inferior to the anterior clinoid process, and the undersurface of the ACP is eroded from below. The aneurysm is contained by the lateral wall of the cavernous sinus, and the images provide no direct evidence that the lesion has eroded through the skull base to produce epistaxis. The aneurysm does not project above the dural ring into the subarachnoid space. The arteriogram demonstrates an aneurysm of the anterior genu of the cavernous segment of the ICA, projecting anteriorly and inferiorly. The images are of insufficient quality and projection to define the aneurysm's relationship to the ophthalmic artery, other than its origin is well proximal to that branch.

Assuming that the aneurysm is respon-

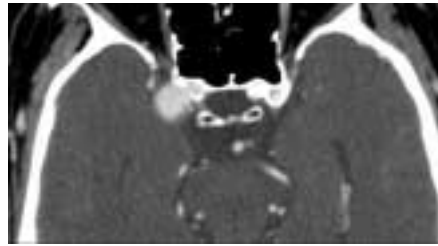


Figure 1

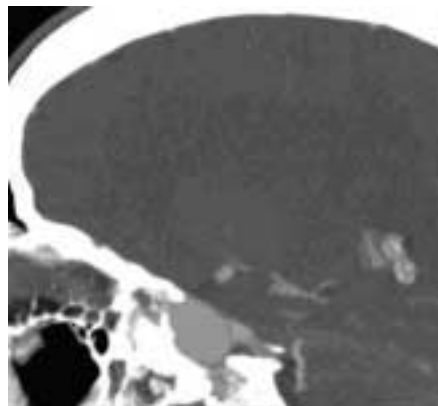


Figure 2

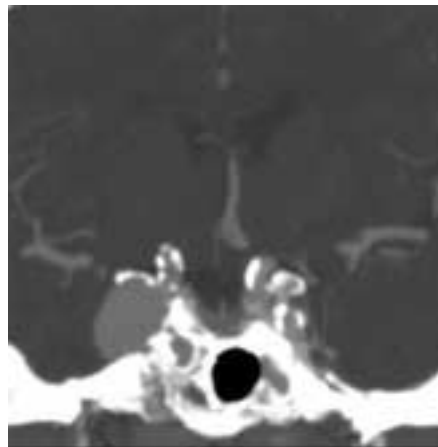


Figure 3

sible for the epistaxis, immediate treatment should be directed towards this presenting feature, regardless of the age of the patient. The aneurysm must be obliterated by a secure barrier so that life-threatening nasal bleeding does not recur. The intracavernous location makes direct surgical obliteration difficult and associated with high morbidity to the cranial nerves within the sinus. Endovascular aneurysmal obliteration alone carries the risk of coil displacement into the adjacent basal sinuses with repeat bleeding. If a covered stent is added, however, the carotid lumen can be preserved while eliminating recanalization risks. If a stent cannot be deployed for various technical reasons (unavailability, tortuosity of the ICA, etc.), then the ICA must be sacrificed, with trapping of the affected segment above and below the aneurysm to assure that the lesion does not refill from either direction.

If the carotid is to be sacrificed, safety should be assessed by a trial balloon occlusion test using clinical and physiological testing of tolerance. Because the bleeding has been stabilized with packing, treatment can be delayed 12-48 hours until this test has been completed.

For patients 20, 40 or 60 years old, we would advise a balloon test occlusion (BTO) of the right ICA, followed by an extracranial-intracranial bypass in combination with permanent trapping of the ipsilateral ICA. The clinical and

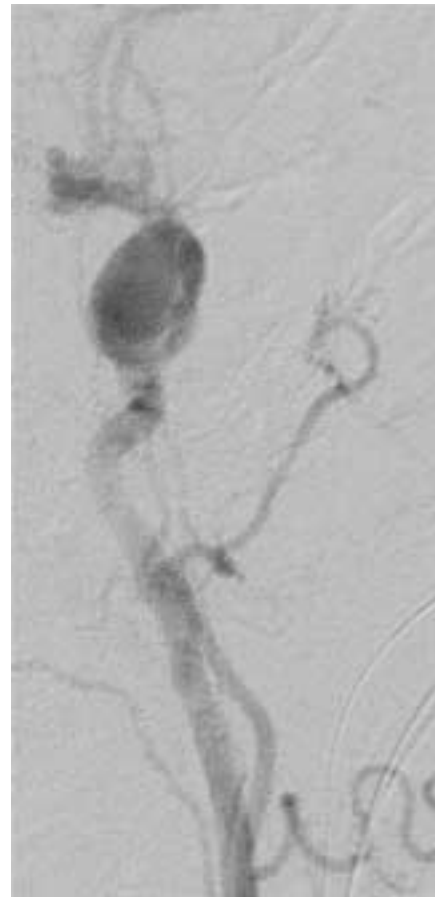


Figure 4

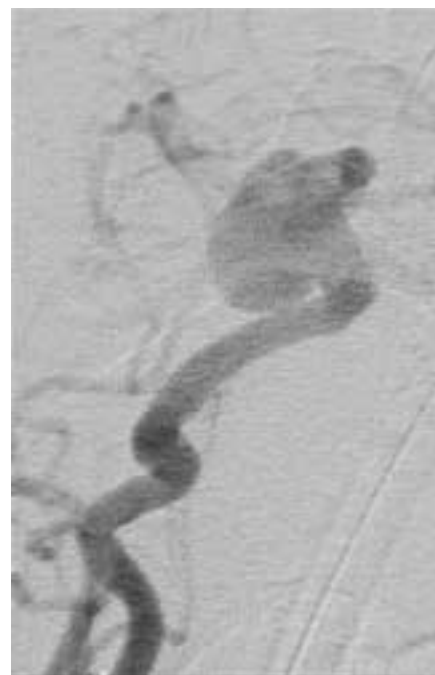


Figure 5

cerebral blood flow assessments performed at the same time as the BTO would define whether a high-flow (radial artery or saphenous vein) or low-flow (superficial temporal artery) would be selected as the donor source.

An 80-year-old patient may be less likely to tolerate BTO due to decreased physiological reserve and atherosclerotic vessels. Such patients are also poorer candidates for a lengthy operative procedure (extracranial-intracranial bypass), and have fewer years to live with the risks of the effects of losing one carotid artery (increased stress on the anterior and posterior communicating arteries and leptomeningeal collaterals, as well as reduction of cerebrovascular reserve in the event of another major vessel compromise over time). If the 80-year-old patient were to pass the clinical and physiological assessments during the BTO (she remains asymptomatic clinically and

cerebral blood flow remains $>30\text{cc}/100\text{g}/\text{min}$ in the right hemisphere), then endovascular trapping of the affected artery would be the only treatment offered, assuming a covered stent were not available.

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The management of large and giant intracavernous aneurysms can evolve into a complex decision-making process as there are a number of treatment options available, including observation, reconstructive (endovascular or surgical) or deconstructive (endovascular or surgical). The management is ultimately determined by presenting symptoms, anatomy, patient age, and risk of intervention versus natural history risk. In a patient with a truly intracavernous large or giant aneurysm that is asymptomatic, a reasonable treatment option could be to follow the patient closely for neurological changes.

In this case, the aneurysm appears to be symptomatic subjectively as the patient complains of double vision, but this is not confirmed on exam. Epistaxis for a ruptured intracavernous aneurysm is associated with profuse bleeding, and even when packed the C-C fistula can persist with the presence of other signs and symptoms. It is not certain in this case that the epistaxis is related to an aneurysmal rupture as there are no clinical symptoms of C-C fistula, and the aneurysm projection and its relationship to the sinuses make this unlikely.

A fine-cut, high-resolution computed tomography scan or computed tomography angiogram centering on the sinuses might be helpful in assessing bony erosion into the adjacent air cell and the possible presence of a subarachnoid component. In this case, obtaining a complete, six-vessel angiogram is important. It may elucidate the cause of the epistaxis, and furthermore it will provide information on the anatomy of the superficial temporal arteries to ascertain their suitability for future bypass. The study also should include provocative maneuvers to assess the intracranial Circle of Willis. An ophthalmological examination also would help to document whether this aneurysm is creating a subtle cranial nerve weakness. If it is determined that the patient's cranial nerve palsy is transient and the epistaxis is not related to the aneurysm, then an expectant management strategy could be adopted.

If the patient has evidence of a subtle palsy of the third or fourth nerve ipsilateral to the aneurysm, then I would advocate treatment. The configuration of this aneurysm is such that a direct surgical reconstruction is unlikely to have a favorable result with acceptable cranial nerve morbidity, leaving options of endovascular reconstruction (stent or coil), surgical occlusion of the carotid with or without bypass, or a strategy

Continued on page 14

Joint Section on Cerebrovascular Surgery

Continued from page 13

that combines surgical bypass with endovascular vessel sacrifice.

A balloon occlusion study under conditions of mild hypotension to assess collateral and reserve would answer the question of whether the patient would tolerate a deconstructive procedure with or without a bypass. Passing the balloon occlusion test with no evidence of changes in the electroencephalogram or clinically with hypotension, as well as evidence of good anatomical collaterals, would allow for the option of carotid sacrifice without bypass with a low risk of delayed stroke.

A potential risk in patients undergoing carotid sacrifice is the development of flow-related aneurysms as a result of the altered hemodynamics. In this particular patient, the risk is low given her age. Technically it is important that the vessel could be endovascularly sacrificed proximal to the ophthalmic origin for preservation of retinal blood flow and as a source of collateral supply, and, if it is not feasible endovascularly, this could be accomplished surgically. If the patient does not pass the balloon occlusion test then the patient will need to be revascularized prior to carotid occlusion with a vein or superficial temporal artery graft.

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This patient has the interesting problem of a partially intracavernous aneurysm that extends into the subarachnoid space. She presents with epistaxis and a third nerve palsy. This implies that the aneurysm has not only enlarged to compress the third nerve, but also eroded through the bone to cause epistaxis. While epistaxis as a presentation for intracavernous aneurysms is rare, it does indeed happen, and when it does it is a true neurosurgical emergency. The aneurysm needs to be obliterated as soon as possible.

Options for management include endovascular approaches involving

direct coiling of the aneurysm, or stenting of the artery with coiling of the aneurysm. Endovascular Hunterian ligation of the vessel with coil obliteration of the entire artery is also a possibility if the collateral supply is adequate and there are no other intracranial aneurysms. Of course, in a 60-year-old woman with coronary disease, even if the occlusion is tolerated, typically we work to maintain carotid patency whenever possible. With the advent of coil procedures and stent and coils, this possibility is increasingly available.

Given the overall picture, the patient should be taken directly to the endovascular suite and at the time of angiography the best theoretical construct to cure the aneurysm would be a stent in the carotid artery and a coil placed in the aneurysm. While this may well serve to obliterate the acute problem of epistaxis, the issue of third nerve palsy remains. While we certainly have seen some cranial neuropathies improve with coil embolization of an intracavernous aneurysm, it appears as though proximal balloon occlusion with aneurysmal thrombosis produces a much more rapid response.

In the patient presented to us, the most pressing issue is that of epistaxis. The other issue with coil therapy is, of course, long-term compaction or aneurysmal growth, and the patient will need careful follow-up. It is difficult to know what to tell patients and their families regarding the long-term efficacy of the stent and coil procedure. While this is a very attractive theoretical construct to cure the aneurysm, actual data on safety and efficacy of this strategy is lacking in the neurosurgical and radiological literature.

If endovascular strategies of coil or stent and coil are employed, one critical issue is that of follow-up. We would tend to perform standard X-rays within a week of treatment to assure there has been no shift in the shape or the size of the coil mass. Further follow-up with angiography at six months, one year, three years and five years would seem prudent for this type of patient. We have observed such patients to require repacking of a previously coiled aneurysm at the three-year interval. □

CSNS NEWS

Chairman's Report

Frederick A. Boop, M.D.

Chairman, CSNS



As we begin a new year, it is worth taking a moment to reflect upon events of this past year and make preparations for the upcoming election cycle. The year 2003

found neurosurgeons winning the "most likely to be sued" award among physicians. The statistics would suggest that the average neurosurgeon can expect a new lawsuit to be filed against him every other year, with awards continuing to rise. Tort reform legislation made it to the forefront this last year, with the HEALTH Act easily passing the House and with President Bush favoring tort reform, but with tangible reform dying in the Senate. Interestingly, all voting senate Republicans voted in favor of the bill, whereas all voting Democrats voted against it. In the upcoming election cycle, changing those seats up for grabs will be crucial to our chances for furthering tort reform.

On another note, physicians were anticipating a 4.5% reduction in Medicare reimbursement, with increasing numbers of physicians threatening to limit the number of Medicare patients they could afford to see; however, the sweeping Medicare reform bill passed, promising a 1.5% increase in Medicare reimbursement for 2004 and 2005. Given that many of the indemnity insurers tie their reimbursement to a percentage of Medicare, this will have a significant impact on physician reimbursement for the next two years. It should be noted, however, that this bill did not contain language to alter the long-term Medicare formula. As such, unless further legislation is passed, physicians can anticipate as much as a 6% reduction in Medicare reimbursement in both 2006 and 2007.



This leads to my main point. As health care becomes more and more regulated, it will be politics (hence political process) that will determine our ability to continue to practice medicine in a fashion with which we can live. Gone are the days when we can ignore the language of reimbursement contracts, medical liability contracts and ever-dwindling collections. For us to even maintain our current practice standards, much less improve the way we practice, we must become involved in the political process. To take the attitude that health care reform is a foregone conclusion or that "my vote doesn't count" can only doom us to fail. As such, the AANS and CNS, through the Council of State Neurosurgical Societies, is organizing the 3rd National Leadership Development Conference which will take place in Washington D.C. this summer, from July 17-20. Slated to be held 2 weeks before the beginning of the Democratic Convention, the conference will give neurosurgeons a key opportunity to learn how to effectively lobby your congressman. Katie Orrico has organized an all-star cast of lecturers to teach us what matters and what is taboo on Capitol Hill. Following a day of lectures, the Washington office will arrange meetings between neurosurgeons and their congressman's office staff, allowing us to drive home our concerns at a crucial moment in the midst of the election campaign. It will be important for any neurosurgeon who has a personal relationship with a congressman or who contributes significantly to a congressman's campaign to plan to

Continued on page 15

The Winter Meeting of the European Association of Neurosurgical Societies (EANS)

will be held in Budapest, Hungary. For more information please visit the Web site:

www.budapest.eans2004.hu

The main topic will be:

State of the Art Treatment of Aneurysms: ISAT

One of the highlights of the congress will be the first ever report on patients treated but not randomized during ISAT study: "What Happens with ISAT? Preliminary Results from a UK Observational Study" by Kenneth Lindsay, chairman of the Steering Committee.

Neurosurgical Leadership Development Conference

July 18-20, 2004

The Washington Court Hotel, Washington, DC

For more information contact:

American Association of Neurological Surgeons

5550 Meadowbrook Drive, Rolling Meadows, IL 60008

(847) 378-0500

NEW PRODUCTS/PRESS RELEASES

Leica Presents the New M520 MS3 Surgical Microscope

Leica Microsystems has introduced the new Leica M520 MS3 for neurosurgery, ENT and spine surgery. The Leica M520 MS3 is the newest addition to Leica's family of surgical operating microscopes, which includes the Leica OH3, Leica MS2, and Leica OHS1.

According to the manufacturer, the Leica M520 MS3 combines the best optical performance available with an innovative and unique stand and offers many advanced features that make surgery easier and more precise.

The optics carrier features motorized tilt and X/Y inclination so that the surgeon can easily and precisely position the optical axis and focal point.

Leica has increased the inclination and tilt angles, which gives more flexibility during surgical procedures.

The solid, ergonomic M520 MS3 features handles that make it easy to control the position of the optics carrier by releasing three or all six electromagnetic brakes, as well as the zoom and focus; full functionality can also be achieved with the foot pedal.

The Leica M520 MS3 is fully IGS capable, including smart autofocus and tool tracking (remote controlled X/Y) functions. Each of the handles incorporates a joystick that allows the surgeon to effectively control X/Y, Dual Imaging and IGS applications. When combined with the Leica DI C500 digital imaging system, all diagnostic and intra-operative data: correlated IGS overlays, diagnostic CTs, MRIs and monitoring data, as well as non-correlated endoscopic videos are clearly displayed.

The outstanding optical performance of the Leica M520N optics carrier, combined with the high flexibility of the stand, including auto balancing (based on the Leica MS2 design), make the Leica M520 MS3 a powerful tool for every surgeon.

For more information, please contact Pam Jandura, Leica Microsystems Inc., 2354 Waukegan Road, Bannockburn, IL 60015; phone: 847-405-7062; fax: 847-405-0164; email: pam.jandura@leica-microsystems.com; Web site: www.leica-microsystems.com. □



CSNS News

Continued from page 14

attend. It is you who will be most influential. Also, anyone interested in learning how to become politically active or involved in the political process should attend. We are hoping that each state neurosurgical society will plan to send a minimum of three neurosurgeons to the conference. For those of you who would like to attend but feel you can't afford the time away from your practice, send your practice manager, as the NERVES members are also encouraged to be involved. Dr. Lyal Leibrock

and his organizing committee have worked hard to gain funding for this event to help defray the costs. The venue, the Washington Court Hotel, is centrally located and a wonderful facility. Given that the meeting will take place over the summer, it is hoped that attending neurosurgeons will use the opportunity to bring their wives and children with them, so that the family can enjoy Washington while you attend the conference. Please calendar the dates and make plans to attend the Third National Leadership Development Conference, July 17-20. Registration information can be found by contacting the AANS office. □

CLASSIFIED ADVERTISING

POSITIONS AVAILABLE

FLORIDA

HCA Neurosurgery Opportunities in Florida! From 1,100 miles of breathtaking sandy beaches to over 1,000 golf courses surrounded by lush rolling hills-Florida has something for you and your family. HCA, the leading provider of healthcare services nationwide, has many outstanding practices in Florida seeking to add to their staff or solo start-ups. We are building for the future and we want YOU to join us. Currently we have opportunities in the following cities: Brandon, Port Charlotte, Aventura, Ft. Pierce, Panama City, Tallahassee, and Margate-Peds. Contact Shellie Ferrara, HCA Physician Services, toll free at (800) 706-2987, and fax (866) 432-4840 or Shellie.Ferrara@hcahealthcare.com for more information. Don't miss YOUR chance to "Practice in Paradise!"

WASHINGTON

SEATTLE/TACOMA METRO - HIGH INCOME - TOP FLIGHT FACILITIES. Premier neuroscience group seeks BC/BE Neurosurgeon. New state-of-the-art Neurosciences Center and ORs. Fully integrated stealth stations with 3-D C-arm imaging. Spinal, cranial, and peripheral cases available. Call 1:4 and will go to 1:5. Income potential above the 75th percentile. Tacoma has it all - mountains, ocean, and an affordable cost of living. The city is located on the southern tip of Puget Sound within sight of Mt. Rainier, 36 miles south of Seattle and 28 miles north of Olympia. The area offers a tremendous variety in terrain and outdoor activities. Enjoy hiking alpine meadows, rock climbing, ocean kayaking, skiing at five nearby resorts, and boating on the area's 361 lakes. All artistic tastes can be satisfied with Tacoma's first-rate music, excellent museums, and expanding theatre district. Contact Ann Lamb at (800) 678-7858, x3486; fax (314) 726-0026; e-mail alamb@cejkasearch.com. ID#22338UJ. For more opportunities, visit www.cejkasearch.com.

NEUROSURGERY PRACTICE OPPORTUNITY OLYMPIA, WASHINGTON

Excellent opportunity for one or two BE/BC neurosurgeons to join a well-established practice in its twenty-third year. Imagine living in an outdoor paradise where fishing, kayaking, and hiking can be steps from your waterfront home and you can bike commute to work.

The office is a short walk from St. Peter Hospital, which offers panoramic vistas from every room of the eleventh floor Neurosciences Unit. A 60 million dollar expansion is just being completed and the hospital administration is dedicated to developing a Neurosurgical Center of Excellence.

Neurosurgeons with cranial interest and spinal experience are being sought. The community needs neurosurgeons who have the experience and stamina to handle acute emergencies. Compassion and dedication are also necessary, because no patient is turned away, or has preferential status, based on insurance.

Call will initially be one in two or three. A close working relationship, nurse practitioner support, and low overhead allow high income and quality time off. Department of Labor certification is in process so eligible foreign medical graduates will be considered. If you are interested please call or forward your curriculum vitae to:

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