Technological advances help alleviate persistent pain after spinal surgery

by John M. Moossy, MD, Nestor D. Tomycz, MD

Technological advances continue to improve the ability of spinal surgeons to safely stabilize the bony spinal column and remove compressive lesions from nerve roots and the spinal cord. Neurosurgeons specializing in spinal surgery at UPMC offer patients a wide spectrum of possible surgical treatments—from complex, multilevel fusions to correct spinal deformity such as scoliosis to minimally-invasive operations via small ports to remove disk herniations.

Despite technically successful operations, some patients continue to suffer from chronic back and leg pain due to nerve damage. Such patients are often said to suffer from “failed back surgery syndrome.” When medications fail to control their chronic pain, such patients may be candidates for various operations designed to reduce pain. Before a pain operation can be offered, patients must be fully evaluated to ensure that there is not a new or persistent structural problem—such as a recurrent disk herniation, spinal stenosis, or abnormal motion of spinal segments (instability)—which might still benefit from a structural spinal surgery.

Surgery for pain falls into two broad categories: ablative surgery and neuromodulation surgery.

Ablative Surgery

Ablative pain surgery refers to the deliberate surgical injury of parts of the nervous system which are thought to be contributing to chronic pain. Chronic neuropathic pain is often thought to arise from a nerve which is damaged and therefore firing erratically—firing too often or firing from non-painful stimuli.

One ablative pain operation that may help patients with failed back surgery syndrome is a rhizotomy. Rhizotomy means inflicting damage to a nerve and can range from directly cutting a nerve responsible for transmitting pain signals to percutaneously deactivating a nerve with heat.

Percutaneous radiofrequency rhizotomy is a minimally-invasive operation performed with small cannulas though the skin. Fluoroscopic x-rays are used to guide these cannulas into regions around the nerves thought to be causing pain (figure 1). A small radiofrequency electrode is then put down the cannula to deliver a carefully timed thermal lesion to the nerve. The dorsal nerve roots leaving the spinal cord and the nerve fibers surrounding the spinal facet joints may be targeted by radiofrequency lesioning.

Neuromodulation

Neuromodulation are treatments which deliver electricity or drugs to the nervous system to change its activity. The two main neuromodulation operations offered at UPMC are intrathecal pump therapy and spinal cord stimulation and both require a trial to ensure that the therapy is effective prior to implantation of hardware.

Intrathecal pump therapy involves implanting a pump in the abdominal region which connects to a catheter which lies within the spinal fluid sac (intrathecal space) surrounding the spinal cord and nerve roots.

Various pain medications including morphine, dilaudid, and fentanyl and other drugs such as clonidine, baclofen, bupivacaine, and ziconotide may be used to fill the pump. By directly bathing the nerve roots and spinal cord with such drugs using the implanted pump-catheter system, many of the common side-effects of pain medications can be avoided.

The most common pumps are programmable and the delivered medication dose can therefore be carefully titrated to reduce a patient’s pain.

Although morphine alone in the pump has been successful in the majority of patients, some patients benefit from combining an opioid pain medication with another medication.

The “pump trial” surgery involves placing a small catheter, similar to the catheter used for epidural anesthesia for women in labor, into the intrathecal space. The patient is then admitted to the hospital for at least three days during which a chosen drug, most commonly morphine, is pumped into the intrathecal space. If the patient tolerates the drug and a dose is found which reduces pain by at least 50%, the patient may elect to have a permanent catheter and pump placed during the same hospital stay. Once implanted, the pump must be refilled with drug every so often depending on the dose a patient is receiving. Most patients receive refills, which are performed in the office setting, four or five times per year.

Figure 1: AP intraoperative fluoroscopic image demonstrating multiple cannulas being placed during radiofrequency dorsal rhizotomy. AP x-ray in a patient with failed back surgery syndrome treated with two different neuromodulation operations. A spinal cord stimulator lead with four contacts is connected to a right abdominal battery and a left abdominal intrathecal pump delivers morphine to the fluid surrounding the nerve roots and spinal cord.

(continued on back page)
To treat or not to treat...that is the question

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s clinicians, we make decisions on how to treat our patients based on our experience and based on the published literature. In any branch of medicine—but particularly in neurosurgery—our therapeutic decisions, more often than not, have a very significant bearing on the livelihood of our patients.

The decision as to whether to treat a symptomatic lesion is often simpler than whether to treat an asymptomatic lesion where follow up may be completely benign, or—depending on the circumstances—could be devastating. Understanding the natural history of the asymptomatic or minimally symptomatic lesion is crucial for making the most appropriate decision for the specific patient.

However, often the natural history data may have significant flaws. Examples of such dilemmas include:

- **In the brain:** unruptured aneurysm or AVMs, asymptomatic cavernous malformations, asymptomatic meningiomas or low grade glial neoplasms, asymptomatic third ventricle colloid cyst or a pineal cyst, among many other conditions.

- **In the spine:** minimally symptomatic spondylolisthesis, length of conservative management with herniated discs, management of complex scoliosis among others.

For all of these conditions, the neurosurgeon must evaluate and address a number of issues while developing a plan for the specific patient. Many of the questions that need to be answered follow a similar thought process. Important questions pertain to the comparison of the treatment risk (in the hands of the neurosurgeon) versus the natural history of the asymptomatic lesion is often simpler than whether to treat an asymptomatic lesion where follow up may be completely benign, or—depending on the circumstances—could be devastating. Understanding the natural history of the asymptomatic or minimally symptomatic lesion is crucial for making the most appropriate decision for the specific patient.

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As we turn to the literature, two questions are critical: a) what is the natural history of the condition, and b) what are the results of randomized clinical trials that evaluate the specific intervention. Incremental data is being accumulated regarding these two questions on many of the conditions we treat. However, the most important question of all is whether the published information is actually pertinent to the specific patient.

By definition, the data generated, even in prospective randomized controlled studies, is an average of the population included in the specific study evaluated with a specific intervention. We then need to take the average data generated by the study and apply it to the specific patient. This is where the art of medicine is crucial.

As physicians we took the Hippocratic oath stating “I will prescribe for the good of my patients according to my ability and my judgment and never do harm to anyone.” However, how do we interpret the average data and apply it to develop an opinion for the specific patient in question? In making this decision we rely on our experience in understanding the nuances of the specific condition in the specific patient and we assess the risk under our own hands in treating the specific patient.

As neurosurgeons we always strive to do what is best for our patients. At the University of Pittsburgh, we strive to provide patients with all the available options that modern neurosurgery has to offer and deliver the care in the most professional, competent and compassionate manner. Making the best possible decision for the specific patient is our ultimate goal.

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Cranial nerve disorders are a group of diseases that arise from nerve compression by aberrant cerebral vasculature as they course near the brainstem. The most common syndrome is trigeminal neuralgia (tic douloureux), followed by glossopharyngeal neuralgia, geniculate neuralgia, occipital neuralgia and hemifacial spasm. Common symptoms are brief paroxysms of lightning or stabbing like pain that originate in a specific cranial nerve distribution. Often there are specific triggers of non-painful stimulation that can precipitate an attack. First line treatments for these syndromes are medical therapy, which often includes antiepileptic (AED) medications. When medical management is unsuccessful, surgical treatment has been found to be safe and effective.

The surgical approach to treat these disorders was pioneered at the University of Pittsburgh by Peter Jannetta, MD, in which a retro-mastoid craniotomy is performed for access to the brainstem at the site of cranial nerve origin. The proposed etiology for these disorders is that the affected cranial nerves were being compressed by blood vessels near the brainstem. This exposure allows for microvascular decompression of the affected cranial nerves. The technique involves a paramedian sub occipital approach, posterior to the mastoid air cells. Once a craniotomy is made and the dura is opened, the cerebellar hemisphere is seen. With gravity and gentle retraction the cerebellum falls away exposing the pons and medulla. Once exposed Teflon felt can be placed between the offending blood vessels and the affected cranial nerve effectively decompressing the nerve.

Trigeminal neuralgia (TN) is a disorder in which the patient experiences episodes of intermittent lancinating pain in one or more of the trigeminal nerve branches. The pain may be unilateral or bilateral. There are two types of trigeminal neuralgia, typical and atypical. Typical TN has symptoms as described above often with a recurring trigger. Patients with typical TN will often obtain some form of pain relief from AEDs. Typical TN triggers include touch to the face, chewing, cold or hot temperature to the face. Atypical TN has pain in the distribution of the trigeminal nerve branches however the pain more burning in nature. Atypical TN also has more constant pain and does not often respond as well to AED treatment. The surgical treatment includes the approach as described above. Once access is gained to the trigeminal nerve, all potential offending blood vessels are elevated and the felt is placed in between, (figure 1).

Often the superior cerebellar artery is found to compress the nerve. In outcomes from surgery, one study has demonstrated that patients with typical TN and moderate response to AEDs have the best long term response of symptom relief from decompression, whereas patients with atypical TN have the highest reoccurrence of symptoms.

Glossopharyngeal neuralgia (GPN) is a disorder in which the pain symptoms similar in quality to TN are located in the sensory distribution of the glossopharyngeal nerve. Therefore the pain is located often in the posterior pharynx (deep throat pain) but may also extend up deep into the ear. GPN is relatively rare as compared to trigeminal neuralgia, and can be difficult to recognize the condition. This often results in a delayed diagnosis of this condition. Commonly reported triggers for GPN include eating and swallowing. GPN is also primarily treated with medication. Using the microvascular decompression technique cranial nerve IX is decompressed in the surgical treatment of this disorder. In a retrospective review with a mean four-year follow up the greatest long term benefit was seen in patients with deep throat pain only.

Another pain syndrome thought to be caused by vascular compression is geniculate neuralgia. This occurs with compression of a small nerve branch between cranial nerve VII and VIII known as the nervus intermedius. This branch carries sensory and parasympathetic fibers of the facial nerve. Patients with this condition will describe their pain as if “they have been stabbed in the ear with an ice pick.” They describe it as paroxysmal in nature and disabling when it occurs. Triggers vary, however this condition can occur in conjunction with GPN. Decompressing the small branch is not feasible so it is sectioned. As it carries some parasympathetic fibers to the face, side effects can include dry eye and dry mouth.

Occipital neuralgia (ON) is a rare pain syndrome arising from the distribution of the greater and or lesser occipital nerves. Patients with this syndrome complain of paraesthesias, hyperesthesia, or dysesthesia with constant dull ache. It has also been described that these patients can have the aforementioned lightning or electric shock like sensations. Surgical treatment for this condition is not first line, rather a treatment for refractory ON when current medical and physical therapeutic interventions have failed. The approach consists of a standard

(continued on page 6)
Neurosurgeons play an important role in the treatment of facial pain. In December 2010, John J. Moossy MD—director of our department’s Center for Pain Management—spoke at a symposium in Rome, Italy where he highlighted the many significant contributions this department has made over the past four decades to the surgical management of facial pain.

Trigeminal neuralgia or tic douloureux—one of the oldest and most common facial pain syndromes—typically presents as unilateral intermittent stabbing or sharp pain in the distribution of the trigeminal nerve. First described in 1756, “tic” as it is often dubbed, may be triggered by benign stimuli such as chewing, shaving, and wind. Although medications such as carbamazepine are the first-line treatment, trigeminal neuralgia may fail to respond to medical intervention.

Peter Jannetta, MD—the first neurosurgical department chair at the University of Pittsburgh—gained prominence by demonstrating that trigeminal neuralgia and some other facial pain syndromes are caused by blood vessels compressing cranial nerves. In the case of trigeminal neuralgia, the trigeminal nerve is commonly found to be compressed by an artery or a vein. In glossopharyngeal neuralgia—categorized as deep, intermittent throat pain—the glossopharyngeal nerve is often found to be squeezed by a nearby blood vessel.

Dr. Jannetta went on to illustrate through large patient series that these pain syndromes could be successfully treated in a procedure in which the compressing blood vessel is moved away from the affected cranial nerve. This operation, which involves making a small bony opening behind the ear, is called a microvascular decompression (MVD).

Currently two UPMC neurosurgeons, Michael Horowitz, MD, and Paul Gardner, MD, serve on our faculty and perform MVD weekly to treat several different facial pain syndromes.

During an MVD operation, a microscope is used to carefully visualize the cranial nerves as they exit the brainstem. Once the site of blood vessel compression is discovered, one or more pieces of teflon felt is placed to separate the injured cranial nerve from the blood vessels compressing it.

Although MVD can relieve facial pain in a significant number of patients, it is not appropriate for all patients with facial pain.

L. Dade Lunsford, MD, co-director of UPMC’s Center for Image-Guided Neurosurgery, has taken a leading role in developing less invasive techniques for facial pain. He has helped pioneer a surgery for trigeminal neuralgia called percutaneous retroganglionic glycerol rhizolysis. In this minimally-invasive operation, fluoroscopic guidance is used to place a needle through the face into the fluid space or cistern bathing the trigeminal nerves and ganglion. Glycerol, a weak acid, is then injected into this cistern where it acts to decrease trigeminal nerve activity and consequently reduce pain. Glycerol rhizotomy has been proven safe and effective in hundreds of patients and is particularly useful for patients in need of rapid pain relief from trigeminal neuralgia.

Dr. Lunsford, Douglas Kondziolka, MD, and Ajay Niranjan, MD, have amassed considerable experience treating trigeminal neuralgia with Gamma Knife radiosurgery.

Stereotactic irradiation of the trigeminal ganglion was first reported by the inventor of the Gamma Knife, Lars Leksell, MD. The Gamma Knife, a device which crossfires multiple beams of ionizing radiation and focuses them on a single target, may be used to treat the trigeminal nerve in cases of trigeminal neuralgia. After a patient obtains a brain MRI while wearing a special stereotactic head frame, the neurosurgeon along with a radiation oncologist uses a computer to deliver a therapeutic “shot” of radiation to the trigeminal nerve. Although pain relief is not immediate with the gamma knife, this procedure has an extremely low side effect profile.

Dr. Moossy offers two operations for certain facial pain patients: caudalis dorsal root entry zone (DREZ) lesioning and cervicomедullary junction spinal cord stimulation.

In DREZ, an incision is made on the back of the neck and the nucleus caudalis. An approximately 2 cm long region located at the junction of the spinal cord and brainstem is exposed. (See figure 2a on page 6). Pain sensations from all regions of the face and also from parts of the head travel and converge on the nucleus caudalis. In the caudalis DREZ procedure, a radiofrequency electrode is used microscopically to burn very small thermal lesions within the nucleus caudalis.

Although the caudalis DREZ like MVD is a major and technically demanding operation, it is an important tool in the facial pain armamentarium since it may provide patients with the most severe and difficult-to-treat forms of facial pain—such as post-herpetic neuralgia or post-stroke facial pain—some degree of durable pain relief.

Dr. Moossy has also designed a novel, non-ablative (non-damaging) operation for (continued on page 6)
ependymomas are rare primary tumors in adults, accounting for approximately only 2% of all primary central nervous system tumors diagnosed each year in the United States. Ependymomas can be located anywhere along the craniocervical axis, but location in the spinal cord is most prevalent in adults followed by infratentorial location, with supratentorial tumors occurring less frequently.

Currently, the classification of ependymomas is based on the degree of variability of cellular pleomorphism, the number of mitotic figures, cellular density, and the degree of tumor infiltration (invasion) into surrounding brain tissue, with the WHO classification system categorizing ependymomas into either grade I (subependymoma), II (ependymoma), or III (anaplastic ependymoma).

Although distinct grades have been designated, the criteria by which a patient’s tumor is assigned a given grade remains controversial, and misdiagnoses can occur. In one series of cases reviewed in Europe, over 40% of cases were found not to be ependymoma on review.

Like most primary central nervous system tumors, ependymomas do not spread outside of the central nervous system. Tumors are slow growing and tend to recur locally, although dissemination throughout the neuraxis can occur.

Initial standard treatment for ependymoma of any grade is maximum safe resection. Grade I tumors, such as subependymomas, are often cured if completely excised. Tumor location sometimes prohibits complete resection due to risk of neurologic compromise.

With regard to adult patients, there is currently no standard of care beyond surgery, but most patients are treated with radiation if there is residual Grade II or III tumor or at recurrence. The role of chemotherapy is yet to be defined.

The rarity of the disease in adults has, so far, precluded large clinical trials to evaluate the effectiveness of therapy in either newly diagnosed or recurrent tumor patients.

The CERN Foundation and Ongoing Clinical Trials

The Collaborative Ependymoma Research Network (CERN) Foundation is a dedicated group of scientists and adult and pediatric neuro-oncologists working in concert to find a cure for ependymomas.

Founded in 2006 and headed by Mark Gilbert, MD—deputy chairman of neuro-oncology at The University of Texas M.D. Anderson Cancer Center in Houston—and Richard Gilbertson MD, PhD—co-leader of the neurobiology and brain tumor program at St. Jude Children’s Research Hospital in Memphis—the CERN Foundation’s mission is to “develop new treatments for ependymoma, improve the outcomes and care of patients, ultimately leading to a cure.” It consists of a collaborative team of basic and clinical research scientists, and supports clinical treatment trials at a network of 10 pediatric and six adult neuro-oncology centers.

The core structure of CERN is represented by two areas of emphasis: clinical/translational science and patient-related issues including outcomes and education.

The scientific component is organized around five core projects (clinical research, pathology, developmental therapeutics, biology and outcomes) all with the major goal of funneling research results into clinical trials.

Two therapeutic trials are currently ongoing—an adult study headed by Dr. Gilbert and a pediatric study headed by Maryam Fouladi, MD, medical director of neuro-oncology at Cincinnati Children’s Hospital Medical Center. Both studies are open to patients with recurrent ependymoma.

A third, non-therapeutic study—the Tissue Clinical Outcomes Project—is also open and enrolling. This project seeks to correlate clinical endpoints (survival, treatment response) with laboratory observations (histology and gene expression). The project is headed by Terri S. Armstrong, PhD, and Kenneth D. Aldape, MD both associate professors with the The University of Texas M.D. Anderson Cancer Center.

In addition to conducting these studies, the CERN Foundation is also interested in better understanding the course of the disease, and has developed an online Ependymoma Outcomes (EO) Project that is open to all ependymoma patients.

Using separate survey instruments for adult and children, The EO Project enables CERN investigators to gain insight into the clinical course and management of patients living with ependymoma, as well as treatment characteristics across healthcare centers and regional locations. Patients can go to the CERN website at www.cern-foundation.org to participate in the surveys.

The CERN Foundation also provides online education for patients/caregivers as well as healthcare professionals. Receiving over 9,000 unique visitors per year, the CERN website contains information on brain anatomy, diagnosis, treatment options, the latest research as well as a series of videos that address common issues surrounding ependymoma. One-on-one consultation with a CERN investigator regarding care and treatment is also available on-line.

For more information on the Collaborative Ependymoma Research Network and its ongoing clinical trials—or to obtain extensive patient education information on ependymomas—please visit our website or call (713) 792-2078.
Four decades of surgical facial pain treatment

(continued from page 4)

facial pain called cervicomedullary junction spinal cord stimulation, (figure 2b). Similar to a pacemaker, spinal cord stimulation involves placing electrodes in the epidural space around the spinal cord and connecting these electrodes to an implanted battery or pulse generator. By delivering constant electrical impulses to the spinal cord, pain signals can be blocked and replaced with pleasant tingling sensations.

Although spinal cord stimulation has been used to treat back and extremity pain for decades, the application of neurostimulation technology to facial pain is relatively new. In cervicomedullary spinal cord stimulation, an electrode is implanted near the nucleus caudalis at the craniocervical junction for a period of trial stimulation. If the trial provides >50% pain relief, the patient may elect to have a permanent electrode implanted along with a pulse generator.

We published the first case series of spinal cord stimulation for facial pain in the March 2011 issue of Headache: The Journal of Head & Face Pain, describing 35 patients treated by Dr. Moossy at UPMC. Good candidates for cervicomedullary junction spinal cord stimulation are often those patients who have recurrent and constant trigeminal distribution pain despite multiple prior surgical procedures such as MVD, glycerol rhizotomy, and Gamma Knife radiosurgery.

Facial pain remains a complex problem. Multiple medications along with one or more varying forms of surgical intervention may be necessary to obtain satisfactory pain control.

The development and popularization of the entire spectrum of currently available surgical facial pain treatments is deeply rooted in Pittsburgh. The team of neurosurgeons managing facial pain at UPMC continue to provide patients with many options to palliate their discomfort and remains dedicated to collecting outcome data which will improve future patient selection.

Cranial nerve disorders

(continued from page 3)

posterior cervical incision, unilateral laminecties, exposure and opening of the dura, and C1 to C4 (depending on extent of involvement) dorsal rhizotomies.

Lastly, there is a cranial nerve disorder that is primarily a motor disorder of cranial nerve VII called hemifacial spasm. Most commonly patients experience muscle twitching that starts periorbitally and descends inferiorty to the rest of the face. This has also been reported to occur in a retrograde fashion as well. Medical treatment for this has been limited to botox injections often with limited success. With the microvascular decompression, the facial nerve is addressed with the technique. Resolution of the facial spasm occurs in greater than 90% of the time.

Researchers to test brain interface devices in spinal cord patients

Researchers at the University of Pittsburgh have been awarded funding for two projects that will place brain-computer interfaces (BCI) in patients with spinal cord injuries to test if it is possible for them to control external devices, such as a computer cursor or a prosthetic limb, with their thoughts.

The projects build on research conducted in epilepsy patients who had the interfaces temporarily placed on their brains and were able to move cursors and play computer games and in monkeys that through interfaces guided a robotic arm to feed themselves marshmallows and turn a doorknob.

Michael L. Boninger, MD—director of the UPMC Rehabilitation Institute and chair of the University of Pittsburgh’s Department of Physical Medicine and Rehabilitation—is senior scientist on both projects. Elizabeth Tyler-Kabara, MD, PhD, assistant professor of neurological surgery and bioengineering, is lead surgeon on each.

In one project, a BCI based on electrocorticography (ECoG) will be placed on the motor cortex surface of a spinal cord injury patient’s brain for up to 29 days. The neural activity the BCI picks up will be translated through a computer processor, allowing the patient to learn to control computer cursors and virtual hands, computer games, and assistive devices such as a prosthetic hand or a wheelchair.

The second project uses a tiny 10-by-10 array of electrodes, implanted on the surface of the brain to read activity from individual neurons. Those signals will be processed and relayed to maneuver a sophisticated prosthetic arm, currently in development.

This second project—part of a program being led by the Johns Hopkins Applied Physics Laboratory—further develops technology tested in monkeys by Andrew Schwartz, PhD, professor of neurobiology, a senior investigator on both projects.
news & NOTES

In The Media

- C. Edward Dixon, PhD, and Joseph Maroon, MD, were quoted extensively in a spring 2011 University of Pittsburgh PittMed article dealing with the repercussions of traumatic brain injury.
- Dr. Maroon authored an article February 7 for Dr. Sanjay Gupta’s The Chart Health section on CNN.com explaining how his experience in triathlons has changed his life. Dr. Maroon was also featured in an article on the same subject in the February 11 edition of the Pittsburgh Tribune-Review.
- Dr. Maroon was also noted in a January 31 feature article in The New Yorker that examined football, the National Football League and the ongoing concussion issue.
- Robert M. Friedlander, MD, was quoted in a March 12 Alzheimer Research Forum website research brief that summarized the findings of a caspases study and noted why caspase inhibitors would be beneficial in neurodegenerative disease treatment.
- Matt El-Kadi, MD, PhD, was quoted in a March 12 article in The New Yorker that examined football, the National Football League and the ongoing concussion issue.

New Research Funding

- “Biorad Thermal Cycler Project.” To perform real-time PCR on microRNA from medulloblastoma samples to evaluate dysregulation and establish molecular grading system for prognosis. Principal Investigator: Stephanie Greene, MD, $5,300; Caring for Kids: The Carrie Martin Fund.

Honors & Congratulations

- Hideho Okada, MD, PhD, has been selected as a charter member of the National Institute of Health’s Clinical Oncology (CONC) study section.
- Ian Pollack, MD, was named co-chair of the National Cancer Institute’s Brain Malignancies Steering Committee.

Prominent Lectures

- Ian Pollack, MD, was a visiting professor at the National Cancer Institute’s Pediatric Oncology Branch, February 14. He provided the talk, “Vaccine-based immunotherapy for pediatric brain tumors.”

Welcome

- Geri Cottom, medical secretary for Drs. Rutigliano and Wetzel; Mary Beth Kubasky, medical secretary for Drs. Rutigliano and Wetzel; Rebecca (Becky) Shapiro, executive secretary for Dr. Lumsford; Natalie Schollaert, administrative assistant for Dr. Gardiner, Gerszten, Kanter and Fernandez-Miranda; Amanda Andrews, medical secretary for Dr. Bookwalter; Bambi Hilliard, RN, clinical care coordinator for Dr. Maroon.

Upcoming Events

- September 17-19: Gamma Knife Radiosurgery in the Americas Conference, (412) 647-8232.

Drs. Gerszten, Dixon honored with university endowed chair appointments

Two department professors—Peter C. Gerszten, MD, MPH, and C. Edward Dixon, PhD—were recently honored with appointments to University of Pittsburgh endowed chairs, one of the highest honors possible for a faculty member.

Dr. Gerszten, professor of neurological surgery and radiation oncology and director of the department’s percutaneous spine service, has been named recipient of the Peter E. Sheptak Chair in Neurological Surgery. The chair honors the career of Peter E. Sheptak, MD, longtime neurosurgeon and former vice chairman of clinical affairs for the department.

An expert and pioneer in the field of spine radiosurgery, Dr. Gerszten’s specializes in minimally invasive approaches in the treatment of spinal disorders and spinal tumors. In 2008, he was co-editor of the book Spine Radiosurgery, the first-ever book of its kind, covering a wealth of topics in this fast-breaking field. He also oversees the instruction of this developing area of neurosurgery for both the American Association of Neurological Surgery as well as the Congress of Neurological Surgeons.

Known for years as a consummate, energetic and gentlemanly surgeon, Dr. Sheptak was a major teaching influence in the department for almost 40 years. During that period, he assisted in the training of almost 100 neurosurgeons. Dr. Sheptak served the community with great distinction—performing innovative, investigative and clinical work related to spinal degenerative disorders, pain management, cerebro-vascular disease, and brain tumors—before retiring from active clinical practice in 2008.

Dr. Dixon, professor of neurological surgery, anesthesiology, neurobiology & physical medicine and rehabilitation and vice-chairman of research for the department, has been named the inaugural incumbent of The Neurotrauma Chair in Neurological Surgery.

Director of the department’s Brain Trauma Research Center, Dr. Dixon is an expert in the field of traumatic brain injury, publishing nearly 150 papers in refereed journals, one book and over 20 book chapters. He is the principal investigator or coinvestigator on a number of TBI-related grants.

An endowed chair designation recognizes eminence in a field of study that reflects outstanding contributions to a discipline and national and international recognition for those contributions.
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(continued from page 1)

A trial is also required before a patient receives a permanent system implant. During a spinal cord stimulation trial for back or leg pain, a small wire electrode is placed through a needle in the patient’s epidural space using local anesthetic. The electrode is turned on in the operating room while the patient is awake in order to ensure that the induced sensations are “covering” the patient’s painful areas. Afterwards, the patient is admitted for at least three days during which the stimulator is tested with various electrical settings.

During the hospitalization, a company representative helps a patient try different electrical parameter settings to optimize pain control. If a patient is able to achieve at least 50% pain relief with the stimulator, he or she may decide to have a permanent electrode and battery placed during the same hospitalization. Typically, the electrode used for permanent implantation is larger and provides more contacts for steering the stimulation.

During the implantation surgery, the patient is kept asleep for most of the operation but is awakened to test the electrode and ensure that its location is optimal for pain coverage.

Unlike the intrathecal pump, the spinal cord stimulator does not require any drug refills. However, the battery or pulse generator requires routine replacement based on how often a patient is using the stimulator. Some patients have the stimulator “on” constantly while other patients only use it while they are awake.

Batteries typically last three to five years and replacement requires a short outpatient surgery. Recently, rechargeable batteries have appeared on the market and may last as long as a decade before needing replacement.

Several studies have revealed that intrathecal pump therapy and spinal cord stimulation are safe, effective, and can help patients with chronic pain regain employment. Deep brain stimulation, regional pain stimulation with percutaneous electrodes, and motor cortex stimulation are also neuromodulatory options for pain control but remain less studied and more investigational.

Despite our best efforts to treat pain with structural spine surgery, nerve damage may not recover. However, patients should be aware that several surgical pain procedures are available which may help them to reduce oral pain medication requirements and improve their daily lives. •