Spring ■ 2017

Spine Section Newsletter

AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves

American Association of Neurological Surgeons and the American Association of Neurosurgeons

Congress of Neurological Surgeons — Education and Innovation

Greetings!

We are pleased to present you with the latest Newsletter of the Joint Section on Disorders of the Spine and Peripheral Nerves of the American Association of Neurological Surgeons and Congress of Neurological Surgeons.

In this issue, Rick Fessler gives us an overview of very exciting preliminary results from the ongoing Asterias clinical trial for stem cell transplantation in spinal cord injury. Cheerag Upadhyaya interviews our outgoing Section Chair, Jack Knightly on the eve of the Spine Summit in Las Vegas. Line Jacques speaks with Eric Zager on advances in peripheral nerve care and technology. Also from the Peripheral Nerve corner, Zack Ray and Thomas Wilson offer an excellent and concise review of Parsonage-Turner Syndrome. John Ratliff provides an update from the RUC, and Kurt Eichholz gives us an overview of recent payor and policy issues.

Hope everyone thoroughly enjoys the Annual Meeting in Las Vegas, March 8-11, 2017!

John O'Toole, MD john_otoole@rush.edu

Rapid Response and Coding Policy Update

Kurt Eicholz, MD, FAANS

The Rapid Response Committee continues to work aggressively to protect patient access to appropriate spine care. Two issues been recent focuses of the committee in an effort to maintain proper access and proper payer interpretation of coding.

Revision Cervical Arthroplasty

Cervical arthroplasty has been FDA approved for almost a decade. However, for the first several years, cervical arthroplasty was coded with a category III code. As a reminder, Category III codes are temporary codes for to allow for data collection and track utilization of new and emerging technology, whereas Category I codes are used for procedures which are consistent with standard medical practice, and are widely performed. While a device may be FDA approved, it may have a category III code. In most cases, this becomes an impetus for payers to consider the device "experimental and not medically necessary." The category III code for cervical arthroplasty limited widespread utilization of the procedure for many years until enough data was published in the literature, and a category I code was obtained. Since then, cervical arthroplasty has become more widespread, and is now part of the medial policy for most payers.

While cervical arthroplasty, which has been studied extensively since its IDE studies in the mid-2000's, has achieved acceptance by payers and a category I CPT code, the code for revision of cervical arthroplasty has remained a category III code (0095T). Considering that the prototypical patient undergoing cervical arthroplasty is young, with one or two soft disc herniations, and minimal degenerative or spondylytic disease, it is not unexpected that the number of revisions of cervical arthroplasty devices would be small. However, as with any treatment,

■ *Continued on page 2*

Rapid Response and Coding Policy Update

■ *Continued from page 1*

there will be failures, although rare. Since initial cervical arthroplasty is considered a standard and accepted procedure, the revision should also achieve a category I code for those indicated cases.

Bundled Laminectomy and Fusion

As many of us know, a National Correct Coding Initiative (NCCI) edit was published in January 2-15 which stated that decompression codes, specifically 63042 and 63047, could no longer be reported at the same level as interbody fusion codes 22630 or 22633. This was based on an incorrect coding column from a spine organization which was subsequently corrected in a later publication. The progression of events leading to this change was delineated by Dr. John Ratliff in AANS Neurosurgeon (Volume 25, Number 1, 2016).

Unfortunately, this has led to a significant decrease in revenue for many spine surgeons. Since CMS has not overturned the incorrect NCCI edit, other payers are now starting to change their policy to disallow the use of decompression codes when combined with interbody fusion, which has only exacerbated the problem. The Rapid Response Committee, as well as the Washington Committee, are continuing to work with both payers and policymakers to try to change this policy which was based on a publication error.

References

1. Ratliff, JK. *Laminectomy and Interbody Fusion Confusion*. **AANS Neurosurgeon**: Volume 25, Number 1, 2016

2. **AANS/CNS Letter to National Correct Coding Initiative**, February 3, 2015.

NREF "Honor Your Mentor" Funds

Honor Your Mentors – Section

You trained with the best, you succeeded and your patients have benefited. Now you can show your gratitude through the Neurosurgery Research & Education Foundation (NREF) by honoring a mentor who helped you achieve success in your field.

By honoring a mentor, you are helping recognize the incredible people who have advanced neurosurgery. Each **Honor Your Mentor** fund has a specific purpose. Your gift will fund a research or educational endeavor in their name. This is your opportunity to acknowledge those who have established the specialty by aiding those who will follow.

NREF
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To learn more about the honored spine mentors and the research they dedicate themselves to, please visit the Honor Your Mentor page for **Sanford Larson**, **Regis Haid**, **Charles Kuntz**, **Volker Sonntag** or **Stewart Dunsker** and donate today.

Don't see your mentor on the list?
To establish a new fund, please contact Joanne Bonaminio at 847.378.0541 or via email at **jmb@nref.org.**

What's up with the RUC?

John Ratliff, MD

Most of the coding changes for 2017 were already reviewed in the last edition of the DSPN Newsletter. However, since publication of the newsletter final code designations have been released. We will review those in this short column, along with noting some changes from the most recent RUC meeting and CPT changes for 2018 affecting vertebral corpectomy.

We talked at length last time about the elimination of 22851 and the institution of new codes to replace it. The final designation of those codes is:

1. **22853** *Insertion of interbody biomechanical device(s) (e.g., synthetic cage, mesh) with integral anterior instrumentation for device anchoring (e.g., screws, flanges) when performed to intervertebral disc space in conjunction with interbody arthrodesis, each interspace.*

2. **22854** *Insertion of intervertebral biomechanical device(s) (e.g., synthetic cage, mesh) with integral anterior instrumentation for device anchoring (e.g., screws, flanges) when performed to vertebral corpectomy(ies) (vertebral body resection, partial or complete) defect, in conjunction with interbody arthrodesis, each contiguous defect.*

Note that these first two codes incorporate integral instrumentation, so if you are placing a device with screws that anchor it to the adjacent vertebral bodies, the screw fixation is included in 22853 or 22854. If, however, you separately place a stand-alone anterior plate, that should be reported separately. Both of these codes are for arthrodesis procedures.

3. **22859** *Insertion of intervertebral biomechanical device(s) (e.g., synthetic cage, mesh, methylmethacrylate) to intervertebral disc space or vertebral body defect without interbody arthrodesis, each contiguous defect.*

This code also includes integral fixation, but assumes a reconstruction where arthrodesis is not performed. An example would be reconstruction of a corpectomy defect with PMMA in treatment of spinal metastasis.

Last time, we also discussed the new interlaminar/interspinous process devices. The final designation of those codes is:

1. **22867** *Insertion of interlaminar/interspinous process stabilization/distraction device, without fusion, including image guidance when performed, with open decompression, lumbar; single level.*

2. **22868** *Additional level*

3. **22869** *Insertion of interlaminar/interspinous process stabilization/distraction device, without open decompression or fusion, including image guidance when performed, lumbar; single level.*

4. **22870** *Additional level*

Note that the difference between 22867 and 22869 is whether or not a decompression is concurrently performed with the insertion of the spinous process spacer. For 22867 and 22868, the decompression is included and you cannot report any additional decompression codes for that level. For interlaminar/interspinous process devices used in arthrodesis procedures, you report an unlisted code (22899).

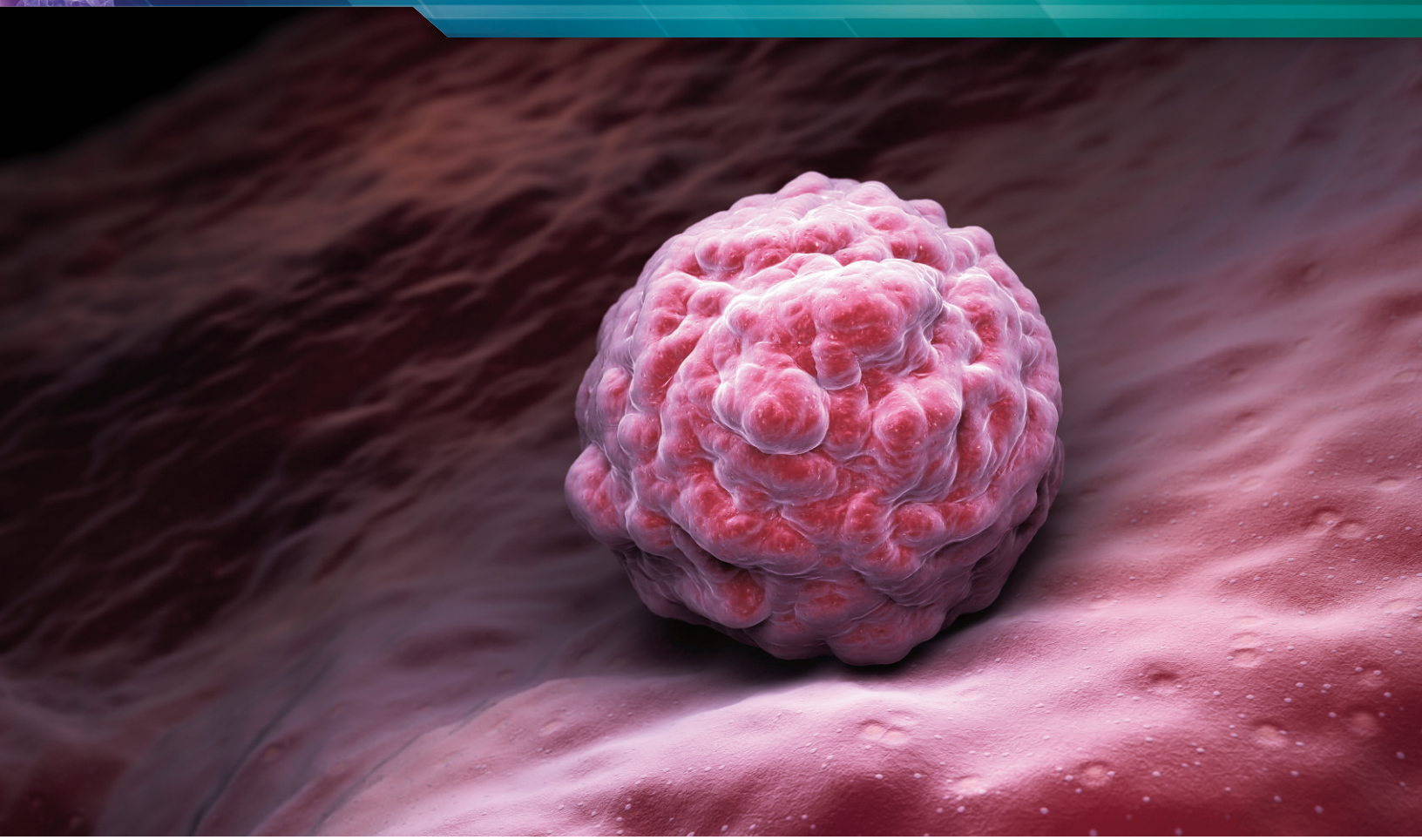
Upcoming RUC/CPT Activity

There is constant motion between the RUC and CPT that members should stay aware of and that keeps our RUC and CPT volunteers busy.

63090 *(Vertebral corpectomy (vertebral body resection), partial or complete, transperitoneal or retroperitoneal approach with decompression of spinal cord, cauda equina or nerve root(s), lower thoracic, lumbar, or sacral; single segment)* came up on a "reported together" screen in 2015 with **22558** *(Arthrodesis, anterior interbody technique, including minimal discectomy to prepare interspace (other than for decompression); lumbar).* This is the same screen that led to the development of the combined anterior cervical decompression and fusion code (22551).

Your Coding and Reimbursement Committee was concerned that some surgeons may be reporting lumbar corpectomy when performing an anterior lumbar interbody fusion, because there is not an anterior lumbar decompression code available in CPT nomenclature. To better define what performing a vertebral corpectomy entails, we developed introductory language that will be included in the 2018 CPT manual that will define partial vertebral corpectomies as 50% resection in the cervical spine and 33% resection in the thoracic and lumbar spines.

Finally, **38220** *Bone marrow; aspiration only* was re-defined for 2018 CPT to only entail bone marrow aspiration for diagnostic purposes, as in by Hematology/Oncology. That would prevent it from being used in harvest of BMA for spinal fusion. Your Coding and Reimbursement Committee team developed a new code specific for BMA for spinal fusion that was just surveyed and valued at the RUC; thanks to everyone who completed a survey. We will provide further details on these changes as we approach 2018.



Interim Safety and Efficacy Findings from the SCiStar Study

A Phase 1/2a Trial of Human Embryonic Stem Cell-Derived Oligodendrocyte Progenitor Cells (AST-OPC1) in Patients with Subacute Cervical Spinal Cord Injury

■ Richard Fessler, M.D., Ph.D. ■ Donald Leslie, M.D. ■ Gary Steinberg M.D., Ph.D. ■ Charles Liu, M.D., Ph.D.
■ Shekar Kurpad, M.D., Ph.D. ■ Kevah Khajavi, M.D. ■ Jane Lebkowski, Ph.D. ■ Edward Wirth III, M.D., Ph.D.

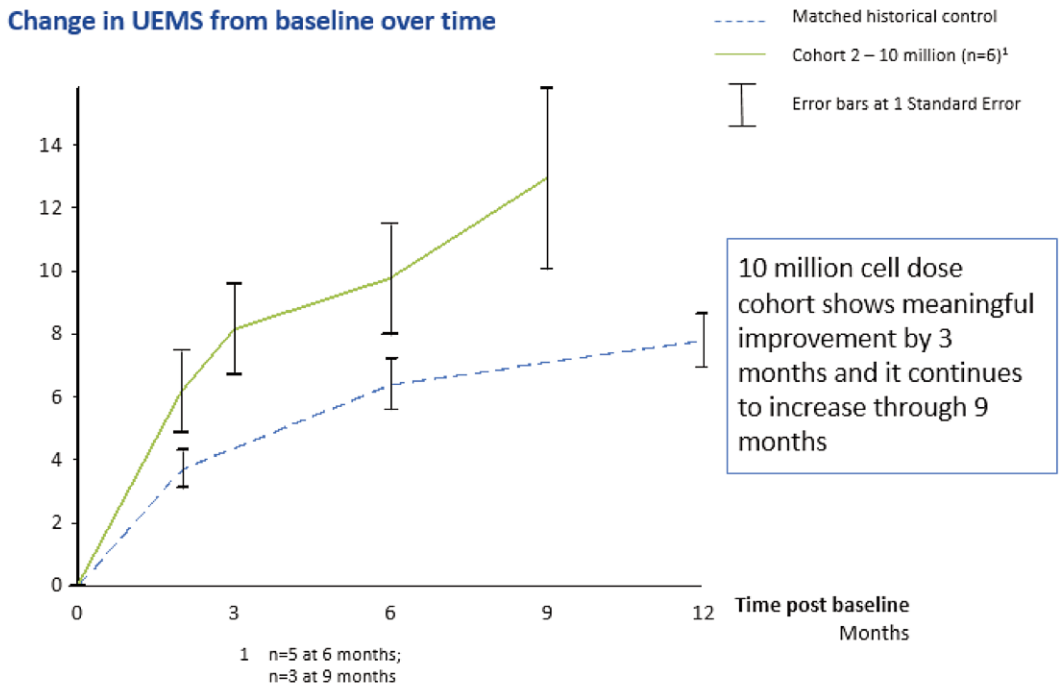
The Proposal

Worldwide, the annual incidence of SCI is estimated to be 15 to 40 cases per million of population. In the United States there are approximately 17,000 new cases annually (National Spinal Cord Injury Database 2013). The most common causes of SCI are motor vehicle crashes, falls, violence (such as gunshot wounds), and sports injuries. SCI predominantly affects men (80.7%), and the average age at time of injury is 42.6 years. Since 2010, the most frequent categories of injury are as follows: incomplete tetraplegia (40.6%), incomplete paraplegia (18.7%), complete paraplegia (18.0%), and complete tetraplegia (11.6%). Currently, the leading causes of death for persons with SCI are pneumonia and septicemia.

AST-OPC1 is a stem cell line derived from human embryonic stem cells that are converted into oligodendrocyte progenitor cells. Previous laboratory studies suggest that the continuously regenerating AST-OPC1 cell line produces neurotrophic factors, stimulate vascularization, and induce remyelination of denuded axons.

The initial clinical safety of AST-OPC1 was evaluated in a phase 1 trial that enrolled five patients with neurologically complete T3-T11 thoracic spinal cord injuries. Based on the favorable safety data from that study, the FDA approved the initiation of a phase 1/2a trial (SCiStar Study) to evaluate the safety and efficacy of AST-OPC1 in

UEMS scores in AST OPC1 AIS-A 10 Million Cell Cohort Compared to EMSCI Matched Control Group



patients with motor complete ASIA Impairment Scale A or B (AIS-A or B) in C5-C7 cervical spinal cord injury.

In this study, three escalating doses of AST-OPC1 (2, 10, & 20 million cells) are being evaluated following administration via direct intraparenchymal injection between 14 and 30 days post spinal cord injury. Enrollment of Cohort 1 (N=3 AIS-A patients, 2 million cell dose) and Cohort 2 (N=6 AIS-A patients, 10 million cell dose) has been completed and enrollment in the remaining study cohorts is in progress. All patients are treated post-operatively with a low dose of tacrolimus, which is then tapered over 60 days. Subjects are being followed for 1 year under the main study protocol and will be followed for an additional 14 years under a long-term follow up protocol.

To date, there have been no intraoperative complications or serious adverse events (SAEs) related to AST-OPC1, the injection procedure, or immunosuppression with low-dose tacrolimus. Interim ISNCSCI exam data are currently available through 1 Year for all subjects in Cohort 1 and through 6 months for 5 subjects in Cohort 2.

The mean Upper Extremity Motor Score (UEMS) improvement at Day 90 relative to baseline was 5.0 points in Cohort 1 and 13 points in Cohort 2. All subjects have improved at least one motor level, and 2 of the 5 subjects in Cohort 2 have improved two motor levels on at least one side. These data were compared to matched controls from the EMSCI database, the most complete and current spinal cord injury database available. Matching criteria included: traumatic injury, baseline assessment between 16-40 days from injury, AIS A at baseline, age 18-69, Neurologic level of injury of C5-C7 at baseline, UEMS at baseline between 7 and 32. The attached figure shows the comparative data of these two groups. ***(See graph above.)***

The data to date suggest that AST-OPC1 can be safely administered to patients in the subacute period after severe cervical spinal cord injury. It further shows that subjects in cohort 2 (10 million cells) have shown a greater degree of motor level recovery than matched controls, and that a dose response effect on upper extremity motor recovery appears to be emerging through 6 months post-injection. Although early, these encouraging results suggest the possibility of meaningful recovery of function in patients with complete, ASIA-A cervical spinal cord injury, following intra-parenchymal injection of oligodendrocyte progenitor cells (AST OPC1).

Interview with Outgoing DSPN Chair, Jack Knightly

Interviewed by Cheerag Upadhyaya, MD

What is your favorite part about being Chair of the AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves (DSPN)?

The privilege of shaping the goals of the AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves, the opportunity of working with people who bring so many diverse strengths to what is truly a team effort, and the honor in continuing to serve a wonderful organization. I had some trepidation in being selected to serve as Chair of the DSPN as I am in private practice; however I was fortunate to be able to build upon the great work done by Past Chair, Praveen Mummaneni; Past Annual Meeting Chair, Zoher Ghogawala; and Past Scientific Program Chair, Adam Kanter (who is now serving Annual Meeting Chair). I was also blessed to have a wonderful officer team in Chair Elect and Secretary Marjorie Wang; Treasurer, Michael Wang; Scientific Program Chair, Daniel Hoh and Media Chair John O'Toole. Daniel Hoh and Adam Kanter have worked tirelessly to make the annual meeting in Las Vegas a success and have spent countless ours in this endeavor.

What have you learned about leadership through your experiences this past year?

That I enjoy being part of a team. That one should shape the goals of the organization, surround yourself with people smarter than you, and then delegate appropriately responsibility. I believe in the concept of a "team of teams" - the idea of combining the advantages of small teams of people (e.g.,

rapid response, rapid decision making, little bureaucracy) with the power of a large organization. Fortunately, there is a shared consciousness within the Section in this regard and consequently most of the goals we set out for ourselves have been achieved.

The Section is comprised of a phenomenal group of selfless surgeons. For example, Past Chairs Regis Haid, Chris Shaffrey, Mike Groff, Joe Cheng, John Hurlbert and Praveen Mummaneni were all willing to help to make this past year very successful.

What was your biggest challenge this year?

Ensuring that the interests of the DSPN continue to be well represented within our parent societies. We have a great relationship with the AANS and are very respected within the CNS; however it is important that we continue to foster these good relationships. It is also crucial that DSPN continue to support efforts to break down silo mentality and promote inter-section and inter-society relationships.

What do you see as the significant near term challenges to spine surgery?

Neurosurgeons and spine surgeons must lead the effort to define quality as payers transition from a traditional fee for service model to one in which value is paramount. We must not only advocate for our operative patients, but also for non-operative patients. Indeed, we must become the leaders of a multi-disciplinary team of providers comprised of spine surgeons, physical medicine & rehabilitation, pain management, psychology, and ancillary services to improve care.

Section members are well positioned throughout all of organized neurosurgery to help lead this effort. For example, Section members are represented on the Washington Committee and NeuroPoint Alliance (Quality Outcomes Database, QOD); and John Ratliff chairs the AANS/CNS National Quality Council.

Who were your mentors in neurosurgery and spine surgery?

Dr. Volker K H Sonntag taught me much about spine, neurosurgery, as well as being a neurosurgeon in the greater community. He emphasized the maxim that whenever you choose to do something, then you're all in and you don't do things halfway. Drs. Chris Shaffrey, Regis Haid, Rich Ellenbogen and R

Michael Scott have also been very supportive of me throughout the years.

What advice would you give someone who wants to become more involved in the Section?

I would encourage them to get involved at any level of organized neurosurgery; however the Section represents a wonderful opportunity, as it is functions as a meritocracy. Reach out to the Section leadership seeking opportunities to contribute. Those who remain active and who function as part of the team will be recognized and ultimately tasked with greater responsibility. It is not easy and one must be patient, but the rewards are the opportunity to work with wonderful, smart people; advocate for neurosurgeons and spine surgeons; and ultimately improve patient care.

What advice would you give to a young neurosurgeon and spine surgeon?

Despite all of the changes and uncertainty in healthcare today, always remember that we are privileged to be neurosurgeons and spine surgeons. In the 1990's there too was tremendous anxiety and concern about changes in health care; but ultimately people will always need our help. Indeed, I feel that this is an exciting time for neurosurgeons and spine surgeons as the development of population health tools and an increased understanding of coexisting morbidities, such as depression and anxiety, will help improve the management of our patients.

Lastly, it is crucial to that one find balance in life, both professionally and personally, and this must defined by each of us individually.

On behalf of the entire Section, I would like to thank you for your hard work and service to the DSPN.

Thank you. It has been a tremendous honor to serve as Chairman. Charlie Kuntz's tragic passing two years ago prevented him from filling this position and we have worked hard to honor the work he had done. I find gratification in being part of this wonderful organization and the Annual Meeting has been the one meeting that I attend every year. I believe that it is through the Spine Section that we must all work together to address the many challenges facing spine surgery today.

Interview with Eric Zager: New Technology and Advances in Peripheral Nerve Care

Dr. Eric Zager
Professor of Neurosurgery
Perelman School of Medicine
University of Pennsylvania
Endowed Chair: Neurosurgical Professorship in Academic Excellence

by Line Jacques, MD

In the last 20 years what are the most significant changes you implemented in the surgical approach to the peripheral nerve?

Zager: In recent years the most exciting changes in surgical management of peripheral nerve injuries have been developed in the area of nerve transfers. While the concept of nerve transfer has been recognized for over a century, the routine use of a functional and redundant or expendable nerve or nerve fascicle as an axon donor to restore a more important neurological function has been a relatively recent phenomenon. It was the breakthrough by Christophe Oberlin in the early 1990s with his ulnar nerve fascicular transfer to the biceps branch of the musculocutaneous nerve that triggered major advancement in this field. His Oberlin procedure has become the single most effective and widely used nerve transfer for restoring the crucial function of elbow flexion in patients who have suffered an upper trunk brachial plexus injury, a postop C5 palsy, and even for the occasional Parsonage Turner patient who is not recovering spontaneously from a presumably inflammatory condition causing biceps paralysis. Following the development of this important technique, the world of peripheral nerve surgery has exploded with a variety of creative nerve transfers designed to exploit the frequent redundancy in the nervous system that allows us to sacrifice a nerve fascicle without producing any important deficit in order to restore important motor and/or sensory function. The sky seems to be the limit in the development of new transfers, and we look forward to longer term outcome studies that evaluate the role of transfers for nerve injuries in the future. We would caution surgeons to move cautiously with new and unproven transfers, however, as some of the proposed transfers may not make sense in terms of the risk-benefit ratio. For example, there have been some optimistic reports about lower extremity transfers (tibial branch to peroneal) to restore foot dorsiflexion using an antagonistic nerve donor – this concept does not make sense, and likely asks too much of cortical plasticity. Similarly, motor nerve transfers that restore hand movement without sensation will likely not be very functional in daily life. We will need to balance our enthusiasm for new nerve transfers with well-designed outcome studies that emphasize the patient's perspective on functional outcome rather than the examiner's grading of muscle force alone. The new nerve transfers for spinal cord injury are a case in point.

What is the most important technological advancement, pertinent to your practice in the peripheral nerve field?

Zager: Preoperative and intraoperative high-resolution ultrasonography of nerve has enhanced our surgical care of various nerve disorders in recent years. For nerve entrapments, ultrasound has been validated and may replace electrodiagnostic studies in some cases. Of course it is strongly preferred by patients since it is painless. Ultrasound devices are portable and thus useful in clinic as well as in the OR. For unusual or atypical entrapments, ultrasound provides detailed imaging that can reliably detect the site of entrapment as well as the occasional tumor or ganglion cyst. It also provides information regarding relationships to surrounding vessels and other important structures.

Ultrasound can also help guide incision placement in the case of small deep tumors that are not palpable, or for small nerves with variable anatomy (e.g., the lateral femoral cutaneous nerve). Diagnostic and therapeutic nerve blocks are performed more safely when ultrasound is used to create a roadmap. Recent studies from Germany have demonstrated that traumatic neuromas in continuity can be evaluated in the OR with high-resolution ultrasound, so that better decisions can be made regarding resection and nerve grafting vs. external neurolysis

How can we advance the care provided to the patient with peripheral nerve pathology?

Zager: For all types of nerve pathology and surgical intervention, we need better measures of outcome with multi-institutional studies. Most centers do not see adequate volumes of nerve patients to report meaningful outcomes with different management paradigms. We also need better diagnostic criteria for controversial clinical disorders such as thoracic outlet syndrome (TOS), piriformis syndrome, tarsal tunnel syndrome, radial tunnel syndrome, etc. We must discover ways to manage neuropathic pain better; all too often, we may succeed in providing recovery of motor and/or sensory function following nerve injury, but the patient simply will not use the affected limb because of ongoing debilitating pain. We are also still frustrated with poor outcomes for malignant tumors affecting nerve. We must submit our tumor specimens for genetic analysis so that personalized immunotherapy may be developed as it has been for other malignancies.

What is needed to improve our outcomes, and how can we measure the outcomes?

Zager: In order to improve our outcomes, we will need multi-institutional studies in which the emphasis is on patient-reported outcomes in terms of improvements in quality of daily life. Surgeon-reported outcome studies are notoriously biased and unreliable. We should be well-past the days of the "academic" neurological result which shows off a restored motor function that has no impact on a patient's activities of daily living in the real world. Objective movement monitors of limb use at home should become standard practice for outcome studies. As difficult as these studies may be, sham surgical controls may become the standard for assessing surgical procedures designed to treat pain, particularly for the controversial entrapment syndromes such as TOS, piriformis and radial tunnel syndrome, as well as for chronic regional pain syndromes. This sham-controlled trial format has been completed recently for nerve decompressions of lower extremity diabetic neuropathy (currently being prepared for publication).

What measure can be taken in order to avoid iatrogenic nerve injuries?

Zager: Iatrogenic nerve injuries are the most unfortunate of all that we see. All too often, the operating surgeon adopts a denial and delay approach, hoping that the nerve deficit will recover spontaneously, as it often does. However, it only adds insult to injury – and harms the patient's chances for a good outcome – if timely referral to a nerve specialist is not pursued. In my clinic, I dread the consultation in which the patient with the iatrogenic nerve injury has been told – "just wait a year, it will get better". Of course, by then it's usually too late for nerve repair, and we are only providing disappointing and disheartening news. The best approach, of course, is better education for our surgical colleagues to avoid the iatrogenic nerve injuries to begin with. That means a better appreciation for the anatomy, along with variants, and avoidance of excessive use of cautery and retraction which are the usual culprits in iatrogenic nerve injuries.

Any comments on future development in technology and advancements in care?

Zager: I look forward in the near future to the development of bioengineered constructs that will allow successful microsurgical repair of nerve injuries with long gaps. These will be developed first for peripheral nerve injuries, and then will be applied to the central nervous system. Root avulsion injuries may well be an ideal place to direct these new constructs. These will find applications not only for PNS and CNS trauma, but also for reconstruction of nerve pathways in degenerative conditions and following ischemic injury, both in the brain and the spinal cord. Most likely, these nerve repair guides of the future will be comprised of biomechanical constructs combined with cellular therapy, well-timed electrical stimulation and a carefully selected gradient of growth factors to optimize nerve fiber outgrowth and reinnervation of distal targets. These advances are within our grasp.

Parsonage-Turner Syndrome:
An Oft-forgotten Member of the Differential Diagnosis

Thomas J. Wilson and Wilson (Zack) Ray

Some combination of pain, sensory symptoms, and motor deficits in the upper extremities is a typical patient presentation. An oft forgotten member of the differential diagnosis is Parsonage-Turner syndrome (PTS), alternatively known as idiopathic brachial plexitis or neuralgic amyotrophy. Symptoms of this disorder are thought to be secondary to immune-mediated inflammation of the brachial plexus or extraplexal nerves. While it is important to obtain a thorough history and perform a detailed neurologic examination for every patient, it is particularly important when considering PTS. It is especially important to establish a clear chronology of the symptoms, as the chronology may not be apparent from the patient's initial complaints. For example, a patient complaining of right upper extremity pain and weakness: the temporal relationship of pain and subsequent weakness is critical to making the correct diagnosis.

The classic clinical history for PTS is the acute onset of pain in the upper extremity (particularly the shoulder) that lasts for 1-2 days. Night pain is often prominent, and the pain is typically non-mechanical. After 1-2 days, the pain typically resolves or markedly improves, followed by the onset of weakness. Many times the patient will have a recent history of trauma that may be trivial or severe. Because this history is common, many times PTS is not considered and the deficits are thought to be secondary to traumatic injury. Importantly, traumatic nerve injuries should be maximal at the time of injury. PTS, on the other hand, typically has pain followed by delayed weakness, with the weakness often being progressive. Over 50% of patients with PTS report some sort of priming event, such as surgery, childbirth, vaccination, infection, or trauma.[3]

While any portion of the brachial plexus can be involved, there is a predilection for certain nerves, including the long thoracic, suprascapular, axillary, posterior interosseous, musculocutaneous, and anterior interosseous nerves. Furthermore, extraplexal nerves can be involved, most frequently the spinal accessory nerve. In fact, if a clear mechanical cause or direct trauma cannot be identified, unilateral trapezius palsy increases the likelihood of PTS.[1] The neurologic examination in patients with PTS typically reveals patchy, multi-focal neurologic deficits. When a nerve is affected, it is not uniformly affected, with select fascicles affected more than others. Close neurologic examination will usually reveal deficits that cannot be localized to a single peripheral nerve or spinal nerve root. In approximately 1/3 of cases, the neurologic deficits are bilateral, though often asymmetric.[2] Due to the asymmetric nature, the patient may only be aware of symptoms in a single extremity.

Electrodiagnostic testing can be valuable in defining which nerves are involved, as some may be subclinical. Imaging is useful to exclude structural causes, but it is important for clinicians not to falsely attribute symptoms to incidental structural lesions such as minor disc bulges. Recognition of PTS is important in order to avoid inappropriate and unnecessary surgery, as the management of PTS is non-surgical. Management focuses on rehabilitation and pain management. During the acute phase, limited data support the use of steroids in order to improve motor recovery.[2-4] It is important to counsel patients in this regard, even if the patient is being seen outside of the acute phase, since 25% of idiopathic cases have at least one recurrence.[2]

One context in which the neurosurgeon may encounter patients in the acute phase of PTS is in the post-operative period. Surgery is thought to be a potential trigger or priming event for PTS. When it occurs following a neurosurgical operation, it can be easily confused for iatrogenic injury. Taking a thorough history and performing a detailed neurologic examination will often reveal multi-focal deficits, bilateral deficits, deficits not referable to the surgical area, and/or a delay between surgery and symptom onset. Recognizing this as potential PTS allows appropriate treatment with steroids, avoids further unnecessary testing, and minimizes risk that may be incurred with further operations, since additional surgery is associated with recurrent or exacerbated PTS.

PTS is an often-overlooked diagnosis. Understanding the classic features of the syndrome will help guide the neurosurgeon in taking the appropriate history focused specifically on the temporal relationship of symptom manifestation, performing a neurologic examination paying particular attention to commonly affected nerves, and obtaining the appropriate diagnostic testing that allow the clinical diagnosis to be established and treatable lesions ruled out. Recognizing this syndrome will help the neurosurgeon avoid unnecessary surgery, facilitating early referral to physiatrists and neurologists who specialize in the management of PTS, with subsequent referral to a peripheral nerve surgeon if recovery is unsatisfactory.

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1. Seror P, Stojkovic T, Lefevre-Colau MM, Lenglet T: Diagnosis of unilateral trapezius muscle palsy: 54 cases. **Muscle Nerve**, 2016

2. van Alfen N, van Engelen BG: The clinical spectrum of neuralgic amyotrophy in 246 cases. **Brain 129**:438-450, 2006

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4. van Eijk JJ, van Alfen N, Berrevoets M, van der Wilt GJ, Pillen S, van Engelen BG: Evaluation of prednisolone treatment in the acute phase of neuralgic amyotrophy: an observational study. **J Neurol Neurosurg Psychiatry 80**:1120-1124, 2009

Peripheral Nerve
Updates for DSPN Members

Line Jacques, MD

1. The peripheral nerve business dinner during the 2017 AANS annual meeting will be held on Tuesday April 25th 2017 at 7:30PM location TBD.

2. The 2017 Kline lecture will be presented by Dr. Rajiv Midha (University of Calgary) on April 26th 2017 during the AANS meeting in Los Angeles, Ca. The lecture entitled: "Advances in nerve repair: experimental and clinical."

3. The Kline Research Award will be offered again this year to support either basic or clinical research related to peripheral nerves with funding in the amount of 10 000$. The research award provides means of peer review for clinical projects, and therefore, to enhance competitiveness for potential National Institutes of Health (NIH) funding.

Dr. Stepan Capek, MD (Dr. Spinner, Mayo Clinic) will present a talk entitled: MR elastography of peripheral nerve on Wednesday, April 26 th 2017 during the AANS annual meeting in Los Angeles.

Winner of the 2017 Kline Research Award will be announced at the 2017 DSPN meeting in Las Vegas.

4. The Kline Top PN Abstract Award and the top PN Kuntz Abstract Award will be offered at the DSPN meeting and the abstracts will be podium presentations.

5. Kline NREF Fund "Honor your mentor" is on the NREF website. If you would like to contribute to the fund please visit Kline NREF Fund website:www.nref.org/donate.

Note that the Peripheral Nerve Division leadership controls the use of the NREF PN funds (including the Kline fund) for research or education, within the guidelines of the NREF.

6. **Upcoming meetings**

World Federation of Neurosurgical Society
(http://wfns2017.com/)
August 20-25 2017
Istanbul Turkey (socolovsky@fibertel.com.ar) for peripheral nerve abstracts and programl

ASPN annual meeting
(www.peripheralnerve.org)
January 12-14th 2018, Puerto Rico

Sunderland Society meeting
March 3-6, 2018 in Stanford, CA, USA

7. We had the 3rd annual Peripheral Nerve Dissection Course: "The Kline Legacy" in New Orleans, Louisiana on February 4-5th 2017. The next course, the date will be determine shortly.