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 has taken 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 is destined to 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 3 of 22.

CLINCAL ASSESSMENT FOLLOWING ACUTE CERVICAL SPINAL CORD INJURY

RECOMMENDATIONS

Neurological Examination:

Standards**:** There is insufficient evidence to support neurological examination standards.

Guidelines**:** There is insufficient evidence to support neurological examination guidelines.

Options**:** The ASIA international standards for neurological and functional classification of spinal cord injury is recommended as the preferred neurological examination tool for clinicians involved in the assessment and care of acute spinal cord injury patients.

Functional Outcome Assessment

Standards**:** There is insufficient evidence to support functional outcome assessment standards.

Guidelines**:** The Functional Independence Measure (FIM) is recommended as the functional outcome assessment tool for clinicians involved in the assessment and care of acute spinal cord injury patients.

Options**:** The modified Barthel Index (MBI) is recommended as a functional outcome assessment tool for clinicians involved in the assessment and care of acute spinal cord injury patients.

RATIONALE

Acute traumatic spinal cord injury affects 12,000 to 14,000 people in North America each year. The functional consequences of an acute spinal cord injury (ASCI) are variable, therefore the initial clinical presentation of patients with ASCI is a key factor in determining triage and therapy and predicting prognosis. Consistent and reproducible neurological assessment scales are necessary to define the acute injury patient's neurological deficits and to facilitate communication about patient status to caregivers. Prognostic information provided by comparing injury victims to the outcomes of historical patients with similar injuries is of value to patients and families. The evaluation of new therapies proposed for the treatment of ASCI require the use of accurate, reproducible neurological assessment scales and reliable functional outcome measurement tools, not only to measure potential improvement following therapy, but to determine its functional significance. For these reasons, the clinical neurological assessment and the determination of functional abilities are important aspects of the care of patients with ASCI. The purpose of this review of the medical literature is to determine which neurological assessment scales and which functional impairment tools have the greatest utility in the care of patients with acute spinal cord injuries.

SUMMARY

A variety of injury classification schemes have been utilized to describe patients who have sustained spinal cord injuries. There are two general types of assessment scales, neurological examination scales and functional outcome scales. The most accurate and meaningful description of spinal cord injury patients, in the acute setting and in follow-up, appears to be that accomplished by using a neurological scale in conjunction with a functional outcome scale. At present, the most utilized and studied neurological assessment scales are the ASIA scores including the motor index scores, sensory scores and the ASIA Impairment scale. After multiple revisions and several refinements these scales are easy to apply, and are reliable.

The 1996 ASIA recommendations for international standards of neurological and functional classification of spinal cord injury include the ASIA scales, as noted, and the Functional Independence Measure (FIM). FIM as a functional outcome tool has been studied extensively. It appears to be the best functional outcome scale used to describe disability among SCI patients, both early and late after injury. It is easy to administer and is valid and reliable. Inter-rater agreement with FIM has been high in several studies with reported Kappa values of 0.53 to 0.76.

KEY ISSUES FOR FUTURE INVESTIGATION

Any future investigation of or clinical trial involving spinal cord injury patients must include both a neurological examination scale and a functional outcome assessment. Therapeutic trials of spinal cord injury patients should include reliable neurological and functional scoring systems

and should verify the validity and inter-rater reliability of those scoring scales as part of the investigational paradigm.

EVIDENTIARY TABLE: Neurological Examination Scales

First Author Reference	Description of Study	Data Class	Conclusions
Jonsson, 2000, *Spinal Cord*	A study of the inter-rater reliability of the ASIA ISCSCI-92. Physicians and physiotherapists classified 23 patients according to the ISCSCI-92 and calculated Kappa values.	Class III	This study indicates a weak inter-rater reliability for scoring incomplete SCI lesions using the 1992 ASIA standards.
Cohen. 1998, *Spinal Cord*	This study was a test of the ASIA ISCSCI-92. Participants completed a pretest and posttest in which they classified two patients who had a SCI.	Class III	Further revision of the ASIA 1992 standards and more training was needed to ensure accurate classification of spinal cord injury.
El Masry, 1996, *Spine*	A study to assess the reliability of the ASIA and NASCIS motor scores. The motor scores of 62 consecutive acute SCI patients were retrospectively reviewed.	Class III	The differences in correlation coefficients between the ASIA motor score and the NASCIS motor score were not statistically significant. The ASIA and NASCIS motor scores can both be used for the neurological quantification of motor deficit and motor recovery.
Wells, 1995, *J Spinal Cord Med*	A comparison of the Frankel Scale, Yale Scale, Motor Index Score, MBI, Functional Independence Measurement (FIM) in 35 consecutive acute SCI patients.	Class III	The best assessment tool is a combination of two scales, one based on neurological impairment and the other on functional disability.
Waters, 1994, *Arch Phys Med Rehab*	An assessment of strength using motor scores derived from ASIA compared with motor scores based on biomechanical aspects of walking in predicting ambulatory performance in 36 SCI patients.	Class III	The ASIA scoring system compared favorably with the biomechanical scoring system. ASIA motor score strongly correlates with walking ability.
Davis, 1993, *Spine*	A prospective study of 665 acute SCI patients to determine the reliability of the Frankel and Sunnybrook scales.	Class III	Demonstrated high inter-rater reliability of Frankel and Sunnybrook scales. Both scales correspond to total sensory and motor function but are insensitive to walking and bladder function.
Bednarczyk, 1993, *J Rehab Research & Dev*	A study comparing ASIA scale, NASCIS scale and wheelchair basketball (BB) Sports Test in 30 SCI patients classified by the same examiner.	Class III	ASIA Scale showed the greatest discrimination in grouping subjects with ASCI. NASCIS scale had negative correlation with ASIA scale and BB sports test.

First Author Reference	Description of Study	Data Class	Conclusions
Botsford, 1992, *Orthopedics*	Description of a new functionally oriented scale with assessment of motor and sensory function, rectal tone and bladder function.	Class III	Botsford scale was sensitive for the detection of improvement in function over time following SCI.
Priebe, 1991, *Am J Phys Med & Rehab*	A study of the interobserver reliability of the 1989 revised ASIA standards assessed by quiz given to 15 physicians.	Class III	The interobserver reliability for the revised ASIA (1989) standards were improved compared to previous versions, but less than optimal. Changes were recommended.
Bracken, 1990 *New England Journal of Med*	Multi-center North American trial examining effects of methylprednisolone or naloxone in ASCI. (NASCIS II)	Class III for neurological assessment	Motor scores of 14 muscles on 0-5 point scale, right side of body only. Sensory scores of pin prick and light touch, 1-3 point scale, bilateral. No inter-rater reliability comparison.
Lazar, 1989, *Arch Phys Med & Rehab*	A prospective study of the relationship between early motor status and functional outcome after SCI in 78 patients. Motor status was measured by the ASIA Motor Index Score and functional status was evaluated with the Modified Barthel Index.	Class III	The MIS correlated well with functional status for quadriplegic patients, poorly for paraplegic patients. Individual differences in ambulation limit its predictive utility.
Bracken, 1985 *J Neurosurg*	Multi-center North American trial examining effects of methylprednisolone in ASCI. (NASCIS I)	Class III for neurological assessment	Motor scores of 14 muscles on 1-6 point scale. Right side of body only. Sensory scores of pinprick and light touch, 1-3 point scale, bilateral. No inter-rater reliability comparison.
Tator, 1982, *Early Management of Spinal Cord Injury*	Initial description of the Sunnybrook Scale, a 10 grade numerical neurological assessment scale.	Class III	Improvement from the Frankel scale. Motor grading subdivided but not very sensitive.
Cherazi, 1981, *J Neurosurg*	Initial description of the Yale scale and its use in a group of 37 patients with SCI.	Class III	Provides assessment of the severity of SCI.
Lucas, 1979, *American Surgeon*	Initial description of a motor classification of patients with SCI and its use in 800 patients.	Class III	Allows the clinical researcher to evaluate current treatments and assess the potential of new treatment regimes.
Bracken, 1977 *Paraplegia*	Description of 133 ASCI patients classified using motor and sensory scales developed by Yale Spinal Cord Injury Study Group.	Class III	Considerable discrepancy between motor and sensory impairment scales among patients with greater motor than sensory loss.
Frankel, 1969 *Paraplegia*	The first clinical study of the Frankel scale to assess neurologic recovery in 682 patients treated with postural reduction of spinal fractures.	Class III	First neurological examination scale for ASCI.

EVIDENTIARY TABLE: Functional Outcome Scales

First Author Reference	Description of Study	Data Class	Conclusions
Field-Fote, 2001, *J Rehabil Med*	SCI-FAI offered as functional assessment scale for gait assessment.	Class III	Reliable and relatively sensitive measure of walking ability in patients with SCI. Interrater reliability good. No kappa values offered.
Kucukdeveci, 2000, *Scan J of Rehab Med*	To determine the reliability and validity of the MBI in Turkey.	Class III	Adaptation of the modified Barthel Index successful in Turkey as long as its limitations are recognized. Kappa values > 0.5.
Ditunno, 2000, *Spinal Cord*	WISCI offered as index for ambulation skills following SCI in pilot study.	Class III	Good reliability, excellent interrater reliability but needs assessment in clinical settings.
Yavuz, 1998, *Spinal Cord*	Assessment of the relationship of two functional tests, FIM and QIF, to ASIA scores.	Class III	Strong correlation between FIM and QIF to ASIA scores.
Catz, 1997, Spinal Cord	SCIM offered as new disability scale for spinal cord lesions. Thirty patients assessed with SCIM and FIM.	Class III	SCIM more sensitive than FIM.
Hamilton, 1994, *Scan J of Rehab Med*	Assessment of interrater agreement of FIM in 1018 patients in 89 UDS hospitals.	Class II	Kappa values for 7 level FIM ranged from 0.53 to 0.66. Kappa values higher in subset of UDS hospitals with experienced rehab clinicians, 0.69 to 0.84.
Dodds, 1993 *Arch Phys Med Rehabil*	Assessment of reliability of FIM in characterizing 11,102 UDS rehab patients.	Class III	FIM has high internal consistency, adequate discriminative capabilities, and was good indicator of burden of care.
Hamilton, 1991, *Arch Phys Med Rehabil*	Interrater agreement assessment of FIM in 263 patients in 21 UDS hospitals.	Class II	Kappa values for 7 level FIM ranged from 0.61 to 0.76, mean 0.71.
Shah, 1989, *Journal of Clin Epidemiology*	Description of Modified Barthel Index (MBI).	Class III	The MBI has greater sensitivity and improved reliability than the original version, without additional difficulty or implementation time.
Gresham, 1986 *Paraplegia*	Assessment of QIF as functional scale, compared to Barthel Index.	Class III	The QIF was more sensitive and reliable than the Barthel Index.

First Author Reference	Description of Study	Data Class	Conclusions
Tator et al, 1993, *Surg Neurology*	A study of 201 ASCI patients, ICU care, hemodynamic support compared to 351 prior patients	Class III	Less severe cord injuries due to immobilization, resuscitation and early transfer to ICU setting.
Armitage et al, 1990, *BMJ*	Case reports of four patients who developed respiratory problems during airplane transport.	Class III	Airplane air is less humid and measures to optimize humidity and pulmonary function travel in high cervical injury patients may be required
Boyd et al, 1989 *J Trauma-Injury Infection & Crit Care*	A prospective cohort study to determine the effectiveness of air transport for major trauma patients when transferred to a trauma center from a rural emergency room.	Class III	Patients with severe multiple injury from rural areas fare better with helicopter EMS than ground EMS
Burney et al, 1989 *J Trauma-Injury Infection & Crit Care*	Retrospective review of the means of transport and type of stabilization used for all patients with ASCI.	Class III	Acute SCI patients can be safely transported by air or ground using standard precautions. Distance and extent of associated injury are the best determinants of mode of transport.
Tator et al,1984 *Can J of Surg*	A retrospective review of results of innovations between 1974 to 1979 at Sunnybrook Medical Centre in Toronto.	Class III	Patients transferred to the SCI unit earlier, with consequent marked reduction in complications and cost of care.
Hachen, 1977 *J Trauma*	A study of 188 ASCI managed in centre ICU, aggressive treatment of hypotension, respiratory insuffiency	Class III	Reduced morbidity and mortality with early transfer, attentive ICU care and monitoring, and aggressive treatment of hypotension and respiratory failure.
Zach, et al, 1976 *Paraplegia*	A study of 117 ASCI at Swiss Center, ICU setting aggressive BP, volume therapy. Rheomacrodex x 5d Dexamethasone x 10d	Class III	Improved neurological outcome with aggressive medical treatment. Better outcome for early referrals.
Hachen,1974 *Paraplegia*	Retrospective review of effectiveness of emergency transportation of spinal injury patients in Switzerland. Between 1965-1974 all SCI patients were immediately transported by air to SCI center. Mortality reduced to zero, during transport. Average time for the rescue operation reduced from 4.5 hours to 50 minutes. h Significant reduction in cardiovascular and respiratory morbidity.	Class III	Mortality and morbidity of patients with acute spinal injury is reduced by a well-organized medical response with smooth and rapid transfer by helicopter to a specialized SCI center.

ANNUAL MEETING – TAMPA BAY, FLORIDA

The AANS/CNS Section on Disorders of the Spine and Peripheral Nerves will hold its 19th annual meeting in Tampa Bay, Florida at the beautiful Saddlebrook Resort from March 5 - 8. Make your reservations now!

AWARDS

RESEARCH FUNDING: The AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves has established two Research Grants: the ***Larson Award*** and the ***Sonntag Award***. They are intended to establish funding for clinical projects related to the spine and peripheral nerves, and to provide a means of peer review for clinical research projects to help improve the quality of the proposal and therefore, enhance competitiveness for National Institutes of Health (NIH) funding. The awards are also meant to provide continued funding on an annual basis to establish the AANS/CNS Spine Section as a known source for quality clinical research aimed at answering questions pertaining to the treatment of disorders of the spine and peripheral nerves.

The awards range from $15,000 - $30,000 and are intended for primary investigators of planned clinical studies requiring national level funding to support the preparation of grant proposals and external consultations and to assist in the development of the proposal, planning meetings, and the collection of pilot data. Work that can be completed without such support (such as literature review and preliminary protocol design) should be completed before applying for the Larson or the Sonntag Awards.

The format of the proposal should follow that of the NIH grant package. Specifically, applications should not exceed five single-spaced pages. The applicants should address their specific aims, pertinent literature review and previous studies review, include a brief summary of the proposed study, and a plan for utilization of the funds, as well as a detailed budget and budget justification. The budget should not include salary support for the primary investigator or co-investigators.

Application details for research grants are available from James D. Guest M.D., Ph.D., FRCS (C), Assistant Professor or Neurological Surgery, University of Miami, Lois Lope LIFE Center, 1095 NW 14th Terrace (D4-6); Miami, FL 33136, or check out our website at www.neurosurgery.org. The application deadline for grants to be awarded for 2003 is Dec. 1, 2002.

FELLOWSHIP FUNDING: The ***Cloward Fellowship Award*** is sponsored by Medtronic / Sofamore Danek and is awarded annually to one or two U.S. or Canadian trained neurosurgical residents to provide supplemental funds for advanced education and research in disorders of the spine or peripheral nerves in the form of fellowship training. The amount of the award is $30,000.

Application information for the Cloward Fellowship Award can be acquired from Timothy C. Ryken, MD, The University of Iowa Hospitals & Clinics, Division of Neurosurgery, 200 Hawkins Drive, Iowa City, IA 52242. E-mail: Christopher G. Paramore, M.D., Lake Norman Neurological and Spine Surgery, 156 Centre Church Road, Suite 204, Mooresville, NC 28117, c.paramore@lnrmc.hma-corp.com , or check out our website at www.neurosurgery.org

The application deadline for the 2004 Cloward Fellowship Award is Sept. 15, 2003.

RESIDENT AWARDS: The Mayfield Award is presented annually by the Joint Section on Disorders of the Spine and Peripheral Nerves to the neurosurgical resident who authors an outstanding research manuscript detailing a laboratory or clinical investigation in the area of spinal or peripheral nerve disorders. Two awards are available, one for clinical research and one for basic science research. Each award is valued at $500.00.

For further information and submission forms, please contact: Christopher G. Paramore, M.D., Lake Norman Neurological and Spine Surgery, 156 Centre Church Road, Suite 204, Mooresville, NC 28117, c.paramore@lnrmc.hma-corp.com , or check out our website at www.neurosurgery.org

DEADLINES

- December 1, 2002: Sonntag and Larson Clinical Research Grants
- September 15, 2003: Cloward Fellowship Award

- September 15, 2003: Mayfield Awards

CODING CORNER – Gregory J. Przybylski, MD

MINIMALLY-INVASIVE SPINE SURGERY CODING

We have seen substantial attention at our annual and regional meetings given toward minimally-invasive spinal surgery techniques. While the potential benefits of reduced perioperative morbidity are commonly accepted, a frequent question arises concerning the physician coding of these new procedures. This coding corner addresses the current concepts and future options regarding codes for minimally-invasive spinal surgery.

Although the use of CPT (current procedural terminology) codes for describing physician services has been a part of practice for several decades, the codes are revised annually as new technology evolves. However, some common procedures are incompletely described by current codes. Whereas a physician may choose the code best describing the service provided, there has been an increasing effort at the American Medical Association (AMA) to make the descriptions more specific as part of the CPT-5 project. Moreover, the Centers for Medicare and Medicaid Services (CMS, formerly HCFA) are demanding use of existing codes only is the procedure performed is exactly the same as the service descriptor in the code.

Consequently, the nearly all of the current codes for decompression as well as arthrodesis and instrumentation describe open rather than endoscopic or minimally-invasive techniques. The only recent exception was the revision of 63030 (lumbar hemilaminotomy for discectomy), which was revised at CPT to include an open or endoscopic technique. Otherwise, other percutaneous procedures that only currently have open procedure counterparts must be coded with an unlisted code such as 22899 or 64999. The reimbursement implications of using unlisted codes include manual review, requirement of documentation, and a likelihood of payment denial.

The AANS/CNS Coding and Reimbursement Committee, the Joint Section Coding Committee, and the North American Spine Society Operative Coding Committee are all currently discussing this issue to evaluate various options. Given the recommendation of the AMA and the insistance of CMS that open codes should not be used for percutaneous or endoscopic procedures, alternatives to unlisted codes need to be explored. However, the issue is much more complicated than simply creating a new series of codes for these techniques.

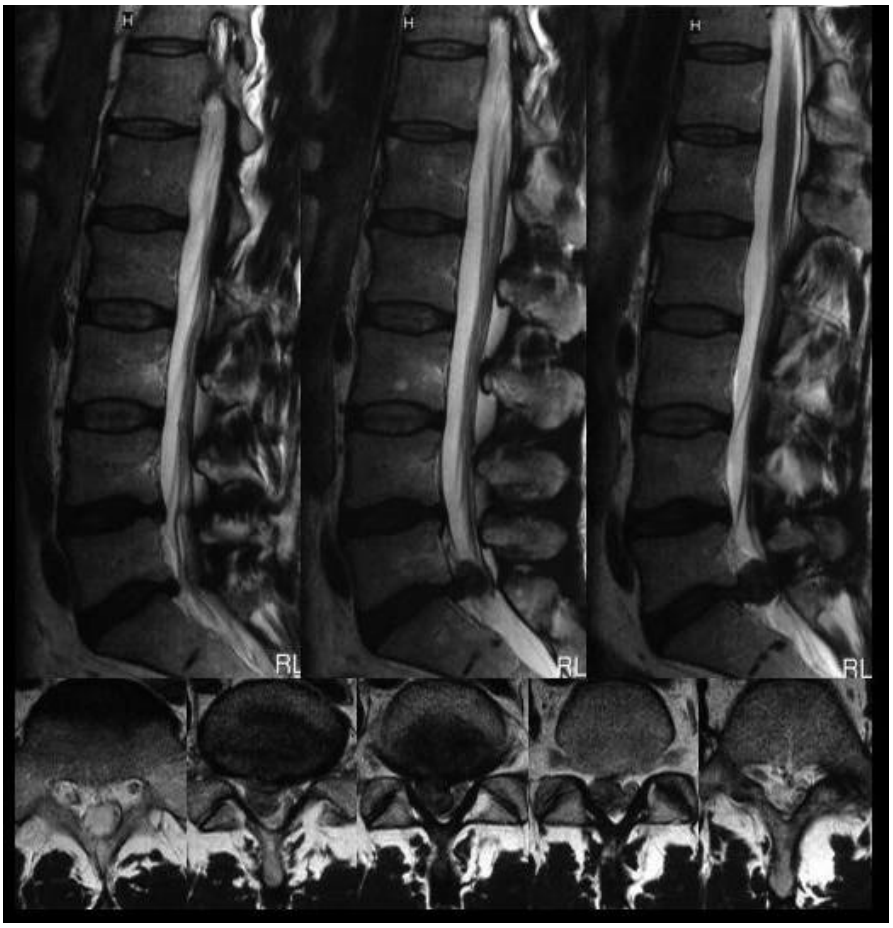
One option would involve the development of a endoscopic-assistance add-on code similar to the microdissection code 69990 that would be used in conjunction with the open code. The AANS/CNS recently had such an add-on code approved by CPT for 2003 and valued by the Relative-value Update Committee (RUC) of the AMA for endoscopically-assisted placement of a ventricular catheter. A similar add-on code previously existed for endoscopic biliary surgery. However, this method only addresses the issue of endoscopic-assistance for open, or perhaps minimally-open, procedures, but not percutaneous procedures.

Alternatively, new codes can be developed for these techniques and valued on their own merit. However, CMS has held the position that minimally-invasive procedures require less physician work and therefore will be paid less by CMS in comparison to the open procedures. Likewise, the RUC desires a "significant burden of proof " to value a minimally-invasive procedure higher than an open procedure. The predominant driving force of valuing physician work is the time required to provide the service. This includes both surgical intraoperative time as well as postoperative follow-up care for the 90-day global period. Since a significant advantage of minimally-invasive procedures includes shorter hospital stays and diminished postoperative care, the estimated physician work is less than that of an open procedure.

Consequently, the coding committees of the various societies are carefully examining the available options as well as the future reimbursement implications of these approaches. In the interim, the recommendation for minimally-invasive procedures that do not already have a specific "non-open" code should be billed using an unlisted code, with the exception of endoscopically-assisted lumbar discectomy which can be coded 63030.

CONSULTANTS CORNER

Last month we presented incidental imaging studies from a 36 year old asymptomatic patient.



We asked our panel of experts their opinion on management. Here's what they said:

- "If he were asymptomatic I would not have gotten the MRI and would not be in this quandary. If he is truly asymptomatic, I would warn him to look out for radicular or bowel and bladder symptoms and follow him. If he had any symptoms, I would offer him a microdiscectomy."

- "If he's asymptomatic why did he have this scan? If indeed he is asymptomatic, ie no post void residual,etc. etc., I would leave it alone."

- "I would recommend elective surgery. The risk of neurological demise is great. I have followed several patients nonoperatively with very large free fragment disc herniations at L4-5 or L5-S1, but in those patients the fragment migrated to below the level of the subjacent pedicle (to behind the lower vertebral body). In those patients, their radicular pain subsided. They were followed closely for signs and symptoms of perineal numbness or worse. In this case, however, the fragment is larger than any that I have followed nonoperatively. I would also request that flexion and extension x-rays be obtained to rule out an occult instability. If none is present, then I would recommend laminectomy (right-sided, but extending past midline) and discectomy."

- "Given the history of back and leg pain, now asymptomatic; I am assuming that there is no neurological deficit on exam. If that is the case, I would treat this with observation only. Despite the very impressive findings (I read this as a large central L5S1 disc herniation), I could not bring myself to operate on an asymptomatic patient. There is evidence in the literature of this type of herniation "disappearing" (likely just being auto-digested). I could certainly make someone worse than normal with an operation."

- "I understand that he was completely asymptomatic by the time you saw him and his neurological exam was normal. I am assuming that he has no bowel/bladder or sexual dysfunction. The MRI demonstrates degenerative changes in the L4-5 and L5-S1 discs. There is a very large HNP at L5-S1 that causes severe canal compromise. In addition, there appears to be mild retrolisthesis at L5-S1. In this asymptomatic patient, there is no need for further workup or interventions. There is no indication for surgery here. I would recommend exercises for low back strengthening/stretching exercises. Because the herniation is large, I would see him back in clinic in several months to make sure he remains asymptomatic."

FINAL SCORE: OBSERVATION 4 : SURGERY 1. This is a tough scenario and certainly tests the nerves of anyone who has been involved in a case like it. Clearly there is no right or wrong answer. In this instance management was observational. The patient continues to do well 1 year later and has no neurological complaints (including bowel or bladder). He has not been re-imaged.

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

- Dr. Carl Lauryssen, Washington University School of Medicine, St. Louis MO
- Dr. Christopher Paramore, Lake Norman Neurological Surgery, Mooresville NC
- Dr. Daniel Resnick, University of Wisconsin, Madison WI
- Dr. Gerald E. Rodts Jr., Emory University, Atlanta GA
- Dr. Julie York, Loyola Medical Center, Maywood IL

AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves – Executive Committee Elections

In accordance with Joint Section Bylaws, the Nominating Committee has forwarded the names of the following individuals for positions on the executive committee:

President Elect: Gerald E. Rodts, Jr.

Secretary Treasurer: Timothy Ryken

Member at Large: Joseph Alexander

Comments, Submissions, or Suggestions for the Spine Section?

Please e-mail John Hurlbert at jhurlber@ucalgary.ca or contact through surface mail: Dr. R.J. Hurlbert, University of Calgary Spine Program, Foothills Hospital and Medical Centre, 1403-29th St. N.W., Calgary, AB Canada T2N 2T9