

**AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves  
Updated Position Statement: Intraoperative Electrophysiological Monitoring  
April 2014**

Intraoperative electrophysiological monitoring (IOM) during spinal surgery may assist in diagnosing neurological injury. However, there currently exists no evidence such monitoring either (1) reduces the incidence of neurological injury, or (2) mitigates the severity of it.<sup>1-3</sup> IOM should be performed in procedures when the operating surgeon feels that the diagnostic information is of value, such as deformity correction, spinal instability, spinal cord compression, intradural spinal cord lesions and when in proximity to peripheral nerves or roots.<sup>4,5</sup> Spontaneous and evoked electromyography is recommended for minimally invasive lateral retroperitoneal transpsoas approaches to the lumbar spine, and may also be of utility during pedicle screw insertion.<sup>6,7</sup>

**References:**

- 1) Resnick DK, Anderson PA, Choudhri T, Groff M, Heary R, Holly L, Ryken T, Vresilovik E, Matz PG: Guidelines for the management of cervical degenerative disease: Electrophysiological monitoring during surgery for cervical degenerative myelopathy and radiculopathy. *Journal of Neurosurgery: Spine* 11(2): 245-252, 2009  
*“Although the use of EP monitoring may serve as a sensitive means to diagnose potential neurological injury during anterior spinal surgery for cervical spondylotic myelopathy, the practitioner must understand that intraoperative EP worsening is not specific—it may not represent clinical worsening and its recognition does not necessarily prevent neurological injury, nor does it result in improved outcome (Class II). Intraoperative improvement in EP parameters/indices does not appear to forecast outcome with reliability (conflicting Class I data).”*
  
- 2) Watters WC, Wang J, Walters BC, Hadley MN: Guidelines for the performance of lumbar fusion for degenerative disease of the lumbar spine. Part 15: electrophysiological monitoring and lumbar fusion. *Journal of Neurosurgery: Spine* 2: 732-730, 2005  
*“Intraoperative SSEP, DSEP, EMG, and/or evoked EMG monitoring are recommended only as adjunctive options during instrumented lumbosacral fusion procedures for degenerative spinal disease. The use of any of these modalities has not been convincingly demonstrated to influence patient outcome favorably.”*
  
- 3) Traynelis VC, Abode-Ivamah KO, Leick KM, Bender SM, Greenlee JD: Cervical decompression and reconstruction without intraoperative neurophysiological monitoring. *J Neurosurg Spine* 16(2):107-13, 2012

*“This study demonstrates that decompression and reconstruction for symptomatic cervical spine disease without IOM may reduce the cost of treatment without adversely impacting patient safety.”*

4) Thirumala PD, Bodily L, Tint D, Ward T, Deeney VF, Crammond DJ, Habeych ME, Balzer JR. Somatosensory-evoked potential monitoring during instrumented scoliosis corrective procedures: validity revisited. *The Spine J.* epub 2013  
*“SSEP monitoring alone during idiopathic scoliosis continues to be a highly reliable method for the detection and prevention of iatrogenic injury. Our results confirm the high sensitivity and specificity of SSEP monitoring alone published in earlier literature. As such, we suggest the continued use of SSEP alone in idiopathic scoliosis surgeries.”*

5) Kothbauer KF, Intraoperative neurophysiologic monitoring for intramedullary spinal-cord tumor surgery. *Neurophysiologie Clinique/Clinical Neurophysiology* 37(6), Pages 407–414, 2007  
*“The sensitivity of muscle MEPs for postoperative motor deficits is nearly 100%, its specificity is about 90%. Thus MEP data indeed reflect the clinical “reality”. Present and stable recordings document intact motor pathways and allow the surgeon to confidently proceed with a tumor resection. Loss of muscle MEPs and/or decrease of the D-wave amplitude constitutes a “window of warning”. It reflects a pattern of MEP change indicating a reversible injury to the essential motor pathways. Using this information, the surgical strategy can be adapted before irreversible neurological damage is caused by the surgical manipulation.”*

6) Sharan A, Groff MW, Dailey AT, Ghogawala Z, Resnick DK, Watters WC, Mummaneni P, Choudhri TF, Eck J, Wang JC, Dhall SS, Kaiser MG. Guideline Update for the Performance of Fusion Procedures for Degenerative Disease of the Lumbar Spine. Part 15: Electrophysiological Monitoring and Lumbar Fusion. *J Neurosurg: Spine* 2014  
*“The use of direct screw stimulation evoked EMG responses, as a diagnostic modality, during lumbar fusion surgery, is an option since evidence suggests that EMG monitoring can be highly sensitive in detecting breaches of the pedicle. (One Level III study). The data is insufficient to support a recommendation regarding the use of neuromonitoring as a modality that can be used for the preservation of nerve root function during lumbar fusion surgery (One Level IV study).”*

7) Uribe JS, Vale FL, Dakwar E. Electromyographic monitoring and its anatomical implications in minimally invasive spine surgery. *Spine* 2010;35:S368–74.  
*“EMG has been used during minimally invasive lateral transpsoas approach to the lumbar spine for interbody fusion. The addition of EMG to the lateral approach has contributed to decrease the complication rate from 30% to less than 1%.”*