



Articles of Interest - Lumbar Spine Surgery

Bose, B.; Wierzbowski, L. R. & Sestokas, A. K. (2002), 'Neurophysiologic monitoring of spinal nerve root function during instrumented posterior lumbar spine surgery.', Spine 27(13), 1444 –1450.

ABSTRACT:

The author describes application of intraoperative neurophysiologic monitoring to surgical treatment of lumbar stenosis. Benefits of somatosensory and motor evoked potential studies during surgical correction of spinal deformity are well known and documented. Freerunning and evoked electromyographic studies during pedicle screw implantation is an accepted practice at many institutions. However, the functional integrity of spinal cord, cauda equina, and nerve roots should be monitored throughout every stage of surgery including exposure and decompression. Somatosensory evoked potentials monitor overall spinal cord function. Intraoperative electromyography provides continuous assessment of motor root function in response to direct and indirect surgical manipulation. Electromyographic activities observed during exposure and decompression of the lumbosacral spine included complex patterns of bursting and neurotonic discharge. In addition, electromyographic activities at distal musculature were elicited by impacting a surgical instrument or graft plug against bony elements of the spine. All electromyographic events provided direct feedback to the surgical team and were regarded as a cause for concern. Simultaneously monitored evoked potential and electromyographic studies protect spinal cord and nerve roots during seemingly low-risk phases of a surgical procedure when neurologic injury may occur and the patient is placed at risk for postoperative myelopathy or radiculopathy.

Krassioukov, A. V.; Sarjeant, R.; Arkia, H. & Fehlings, M. G. (2004), 'Multimodality intraoperative monitoring during complex lumbosacral procedures: indications, techniques, and long-term follow-up review of 61 consecutive cases.', J Neurosurg Spine 1(3), 243 – 253.

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The author describes application of intraoperative neurophysiologic monitoring to surgical treatment of lumbar stenosis. Benefits of somatosensory and motor evoked potential studies during surgical correction of spinal deformity are well known and documented. Freerunning and evoked electromyographic studies during pedicle screw implantation is an accepted practice at many institutions. However, the functional integrity of spinal cord, cauda equina, and nerve roots should be monitored throughout every stage of surgery including exposure and decompression. Somatosensory evoked potentials monitor overall spinal cord function. Intraoperative electromyography provides continuous assessment of motor root function in response to direct and indirect surgical manipulation. Electromyographic activities observed during exposure and decompression of the lumbosacral spine included complex patterns of bursting and neurotonic discharge. In addition, electromyographic activities at distal musculature were elicited by impacting a surgical instrument or graft plug against bony elements of the spine. All electromyographic events provided direct feedback to the surgical team and were regarded as a cause for concern. Simultaneously monitored evoked potential and electromyographic studies protect spinal cord and nerve roots during seemingly low-risk phases of a surgical procedure when neurologic injury may occur and the patient is placed at risk for postoperative myelopathy or radiculopathy.

Raynor, B. L.; Lenke, L. G.; Bridwell, K. H.; Taylor, B. A. & Padberg, A. M. (2007), 'Correlation between low triggered electromyographic thresholds and lumbar pedicle screw malposition: analysis of 4857 screws.', Spine 32(24), 2673 – 2678.

STUDY DESIGN:

A retrospective analysis of 1078 spinal surgical procedures with lumbar pedicle screw placement at a single institution. **OBJECTIVE:** Based on previously established normative values, triggered electromyographic stimulation (TrgEMG) was reexamined to evaluate its efficacy in determining screw malposition.

SUMMARY OF BACKGROUND DATA:

Threshold values for confirmation of intraosseous placement of pedicle screws with EMG stimulation is controversial. **METHODS:** TrgEMG threshold values for 4857 pedicle screws placed from L2 to S1 from 1996 to 2005 were analyzed. An ascending method of constant current stimulation was applied to each pedicle screw to obtain a compound muscle action potential (CMAP) from lower extremity myotomes. Previously determined threshold value normative data from a published clinical series of 233 screws were as follows: 0 to 4 mA, high likelihood of pedicle wall breach; 4 to 8 mA, possible pedicle wall breach; >8 mA, no pedicle wall defect.

RESULTS:

A total of 7.74%(376 of 4857) of all screws tested had threshold values <8.0 mA. A total of 19.1% (72 of 376) of these were <4.0 mA: 54% (39 of 72) were repositioned (26) or removed (13) while the remaining 33 screws were left in place following repalpation. A total of 80.9%(304 of 376) had thresholds between 4 and 8 mA: 17.4%(53) were repositioned (38) or removed (15). Nine screws had thresholds of <or=2.8 mA and were either repositioned or removed following confirmation of a medial wall breach. A total of 74.5% (280 of 376) of all screws with thresholds <8.0 mA were verified as correctly placed by repalpation/ radiography and therefore left in place.

CONCLUSION:

The probability of a medial breach pedicle screw detected by triggered EMG stimulation increases with decreasing triggered EMG thresholds: 0.31%for >8.0 mA, 17.4% for 4.0 to 8.0 mA, 54.2%for <4.0 mA, and 100%for <2.8 mA. At 2.8 mA, triggered EMG has a specificity of 100%, with sensitivity of 8.4%; at 4.0 mA, specificity of 99%and sensitivity of 36%; and at 8.0 mA, 94% specificity and 86%sensitivity. TrgEMG is an adjunct technique and should always be used in conjunction with palpation and radiography

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