Update: Intraoperative Spinal Monitoring with Somatosensory and Transcranial Electrical Motor Evoked Potentials

Case Presentation

R.G. is a 15-year-old female with a history of progressive scoliosis first discovered during a physical examination for the school basketball team. This scoliosis has been nonresponsive to bracing, and she is therefore scheduled to undergo spinal deformity corrective surgery with posterior spinal fusion with instrumentation.

She has no significant past medical or family history. She takes a multivitamin daily and has no allergies. On exam her weight is 51.1 kg, and height is 64 in. Her BP is 110/62, RR is 18, P is70, and T is 98.6. She has apparent scoliosis without lordosis and has no skin lesions. Neurologic exam reveals normal mental status, and no anxiety is noted. Cranial nerve exam is unremarkable.

Motor exam reveals normal muscle tone and strength. DTRs are 2+ throughout; plantar responses are downgoing. Sensation is intact to light touch/pinprick/vibration at toes. Coordination testing shows no ataxia of trunk, no dysmetria, and negative Rhomberg. Gait reveals no abnormality, and patient is able to tandem walk without difficulty.

The patient undergoes preoperative testing and completion of a screening questionnaire to see whether there is any contraindication to transcranial electrical stimulation (TCES) evident and to discuss the surgical monitoring. Also during the preoperative evaluation, testing is done, including evoked potentials (EPs), which can be helpful to uncover any unexpected abnormalities prior to the surgical procedure. An assessment of which muscle groups would be most useful for the pedicle screw monitoring is planned. Patient is instructed to wash her hair the day before surgery and refrain from use of any lotions on her hair or skin the day of surgery.

The surgeon is planning on placing pedicle screws from T5–L2 if possible and has asked the neurophysiologic monitoring team to set the patient up for TCES, somatosensory evoked potentials (SEPs), and pedicle screw EMG monitoring. This is done as described in the 2012 AAN guideline on intraoperative monitoring.[1]

On the day of surgery, the monitoring team sets up bilateral ulnar nerve and posterior tibial nerve SEPs, and transcranial stimulation with recording from electrodes placed in at flexor carpi radialis, flexor carpi ulnaris, abductor pollicis brevis, abductor digiti minimi of the hand, tibialis anterior, medial gastroc, abductor hallucis, and abductor digiti minimi of the foot muscles. Free-running EMG is recorded from the same muscles and from surface electrodes placed over intercostal muscles at and below T5 levels and from abdominal muscles.

Questions

1. The risk of paraplegia during spinal corrective surgery is estimated at <5% when performed by experienced surgeons. Neurophysiologic intraoperative monitoring (IOM) during spinal corrective surgery is associated with a lower risk of paraplegia than when these surgeries are done without neurophysiologic IOM. Which modalities are often used in monitoring these surgeries?
A. SEPs
B. TCES
C. Pedicle screw EMG monitoring
D. All of the above

The correct answer is D. Neurophysiologic IOM is most useful when done using multiple modalities so that the motor tracts, sensory tracts, and roots are being evaluated because of the potential for injury to any of these areas.

2. Preoperative testing is *least* useful for which of the following reasons:
A. Allows the patient to be screened for contraindication to TCES
B. Allows explanation of the monitoring to be done the day of surgery and to answer questions from the patient/family regarding this
C. Allows assessment of monitoring modalities preoperatively and troubleshooting any unexpected abnormalities
D. The monitoring modalities are usually not tolerated by the patient

The correct answer is D. Most patients can tolerate EP modalities without difficulty if proper explanation is given. In some patients, particularly younger ones, sedation may be needed. TCES cannot be done in a patient who is awake; however, transcranial magnetic stimulation may be useful as part of a preoperative study to evaluate motor tract function, if available.

3. The correct CPT® codes for the baseline SEP and TCES motor procedures are:
A. CPT® 92925, 95926, 92928, plus 92929
B. CPT® 95938 plus 95939
C. CPT® 95864
D. CPT® 95900 plus 95937

The correct answer is B. New for 2012 are two codes for 4-limb SEP, 95938, and 4-limb motor TCES, 95939. The old system of using four codes 92925–95929 is now obsolete.

4. The correct ICD-9CM[3] diagnosis codes for this patient would be 737.30, Idiopathic scoliosis. The diagnosis codes will be replaced by the ICD-10CM[4] system soon. That change will be required:
A. For date of service January 1, 2013, or later
B. For date of billing January 1, 2013, or later

C. For date of service October 1, 2013, or later
D. For date of billing October 1, 2013, or later

The correct answer is C. The diagnosis coding system will change on October 1, 2013. Services provided on or after that date will be coded with ICD-10 CM. All neurologists and their staff need to be preparing for this transition. As with many codes in ICD-10-CM, scoliosis codes capture far more information than in ICD-9-CM. In this case, both the age range and location would also be captured with code M41.125, Adolescent idiopathic scoliosis, thoracolumbar region.[3] More specific documentation will be very important with ICD-10-CM.

[1]Nuwer MR, Emerson RG, Galloway G, et al. Evidence-based guideline update: Intraoperative spinal monitoring with somatosensory and transcranial electrical motor evoked potentials. Report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology and the American Clinical Neurophysiology Society. *Neurology*® 2012;78:585–589.
[2]Centers for Disease Control and Prevention. International classification of diseases, ninth revision, clinical modification (ICD-9-CM). *www.cdc.gov/nchs/icd/icd9cm.htm.*
[3]Centers for Disease Control and Prevention. International classification of diseases, tenth revision, clinical modification (ICD-10-CM). *www.cdc.gov/nchs/icd/icd10cm.htm.*

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