

INTRA-OPERATIVE NEUROPHYSIOLOGIC MONITORING (IONM) GUIDELINES

Procedures monitored:

1. Spine surgery for decompression, fusion, trauma or tumor resection.
2. Brain surgery for resection of a lesion, or aneurysm clipping.
3. ENT surgery involving dissection near cranial nerves.

IONM techniques:

1. Somatosensory evoked potentials (SSEP).
2. Transcranial motor evoked potentials (TcMEP).
3. Cranial nerve monitoring of cranial nerves V, VII, VIII, XI, and XII.
4. Brainstem auditory evoked potentials (BAEP).
5. Pedicle screw stimulation.

Spine Surgery:

I. Cervical level:

a. Standard cervical spine monitoring protocol:

- i. Bilateral upper and lower extremity SSEP to monitor injuries of peripheral nerves or plexus from positioning or traction. Also monitors dorsal columns of spinal cord during spine surgery.
- ii. Bilateral upper and lower extremity TcMEP to monitor any injuries from trauma or ischemia during decompression or instrumentation.
- iii. Free running EMG recordings to include deltoids, biceps, triceps and thenar/hypothenar muscles to monitor injuries to nerve roots. Trapezius muscle is monitored in cases involving the upper cervical spine. Additional muscles are added as needed or upon request of the surgeon.
- iv. Pedicle screw stimulation is performed if needed based upon request by the surgeon. This is to monitor for breach of pedicle cortex and to verify proper screw placement.
- v. Recurrent laryngeal nerve monitoring unless requested otherwise by the surgeon.

b. Specific surgical procedures:

- i. ACDFP- Anterior Cervical Discectomy with Fusion and Plating
- ii. Posterior Spinal Fusion (Cervical)
- iii. Cervical Laminectomy

c. Anesthetics

- i. Succinyl choline for intubation.
- ii. Propofol
- iii. Remifentanyl
- iv. Isoflurane - 0.5 MAC or less depending upon its affect on IONM responses.
- v. Sevoflurane - 0.5 MAC or less depending upon its affect on IONM responses.
- vi. Desflurane - 0.5 MAC or less depending upon its affect on IONM responses.
- vii. Rocuronium – optional and dependent upon duration of the surgery. TOF (train of four) needs to be checked prior to attempting TcMEP and pedicle screw stimulation due to Rocuronium’s affect on these modalities. TcMEP and EMG responses may be unreliable

II. Thoracic level:

a. Standard thoracic spine monitoring protocol:

- i. Bilateral upper and lower extremity SSEP.
- ii. Bilateral upper and lower extremity TcMEP.
- iii. Free running EMG recordings from quadriceps, tibialis anterior, gastrocnemius, intrinsic foot muscles and anal sphincter. Additional muscles (e.g. thoracic distribution) are added as needed or upon request by the surgeon.
- iv. Pedicle screw stimulation is performed if needed based upon request by the surgeon.

b. Specific surgical procedures:

- i. Thoracic Spinal Fusion
- ii. Thoracic Laminectomy

c. Anesthetics:

- i. Succinyl choline for intubation.
- ii. Propofol
- iii. Remifentanyl
- iv. Rocuronium – optional and dependent upon duration of the surgery. TOF (train of four) needs to be checked prior to attempting TcMEP and pedicle screw stimulation due to Rocuronium’s affect on these modalities.
- v. Isoflurane - 0.5 MAC or less depending upon its affect on IONM responses.
- vi. Sevoflurane- 0.5 MAC or less depending upon its affect on IONM responses.
- vii. Desflurane- 0.5 MAC or less depending upon its affect on IONM responses.

III. Lumbar level:

a. Standard lumbar spine monitoring protocol:

- i. Bilateral upper and lower extremity SSEP.
- ii. Bilateral upper and lower extremity TcMEP (dependent upon level of surgery).
- iii. Free running EMG recordings from quadriceps, tibialis anterior, gastrocnemius, intrinsic foot muscles and anal sphincter. Additional muscles are added as needed or upon request by the surgeon.
- iv. Pedicle screw stimulation is performed if needed based upon request by the surgeon.

b. Specific surgical procedures:

- i. Lumbar Laminectomy
- ii. TLIF - Transforaminal Lumbar Interbody Fusion
- iii. XLIF - Extreme Lateral Interbody Fusion (Lumbar)
- iv. ALIF - Anterior Lumbar Interbody Fusion
- v. PLIF - Posterior Lumbar Interbody Fusion

c. Anesthetics:

- i. Succinyl choline for intubation.
- ii. Propofol
- iii. Remifentanyl
- iv. Rocuronium – optional and dependent upon duration of the surgery. TOF (train of four) needs to be checked prior to attempting TcMEP and pedicle screw stimulation due to Rocuronium's affect on these modalities.
- v. Isoflurane - 0.5 MAC or less depending upon its affect on IONM responses.
- vi. Sevoflurane - 0.5 MAC or less depending upon its affect on IONM responses.
- vii. Desflurane - 0.5 MAC or less depending upon its affect on IONM responses.

IV. Craniotomies:

a. Standard monitoring protocol:

- i. Bilateral upper and lower extremity SSEP to monitor injuries of peripheral nerves or plexus from positioning or traction. This also monitors long tracks to sensory cortex.
- ii. Bilateral upper and lower extremity TcMEP to monitor any injuries to cortico spinal tracts.

- iii. Cranial nerve monitoring (with or without BAEP) of appropriate cranial nerves depending upon location of surgical dissection. Decided based upon consultation with surgeon.

b. Anesthetics:

- i. Succinyl choline
- ii. Propofol
- iii. Remifentanyl
- iv. Isoflurane - 0.5 MAC or less depending upon its affect on IONM responses.
- v. Sevoflurane - 0.5 MAC or less depending upon its affect on IONM responses.
- vi. Desflurane - 0.5 MAC or less depending upon its affect on IONM responses.
- vii. Versed - only if not performing EEG during procedure.
- viii. Rocuronium – optional and dependent upon duration of the surgery. TOF (train of four) needs to be checked prior to attempting TcMEP and pedicle screw stimulation due to Rocuronium’s affect on these modalities.

V. ENT procedures:

- a. Standard monitoring protocol: Monitoring is tailored to the needs of the surgeon. Specific cranial nerves are monitored depending upon the site of surgical dissection. SSEP may be utilized to monitor against position related peripheral nerve/plexus injuries.**

b. Anesthetics:

- i. Succinyl choline
- ii. Propofol
- iii. Remifentanyl
- iv. Isoflurane- 1 MAC or less depending upon its affect on IONM responses.
- v. Desflurane- 1 MAC or less depending upon its affect on IONM responses.
- vi. Sevoflurane- 1 MAC or less depending upon its affect on IONM responses.
- vii. No Paralytics

VI. Other surgical procedures:

a. Thyroidectomies or neck mass removal:

- i. Recurrent laryngeal nerve monitoring

PLEASE BE ADVISED: In an effort to provide adequate IOM recordings, the IOM technician will be the main individual to coordinate with the Anesthesiologist or CRNA. Without proper communication the quality of IOM data could result in unreliable readings, which could impact patient outcome.