Motor evoked potentials

MEP monitors motor pathways, transcranial Electrostimulation elicits excitation of corticospinal projections at multiple levels. Depending on the intensity of stimulation and the placement of electrodes, motor evoked potentials are generated at different levels of the brain, including superficial white matter just underneath the motor cortex, the deep white matter of the internal capsule, and pyramidal decussation. The electrical potential is recorded at the spinal cord or muscles. MEP is generated and transported via the pyramidal tract.

Motor evoked potential (MEP) is used to monitor motor function, and is the most important in neurosurgical operations [1) 2)].

There is evidence that monitoring of motor evoked potentials (MEPs) is useful in preventing and predicting postoperative motor deficit during surgery for supratentorial lesions [3) 4)].

Transcranial Motor evoked potentials

Transcranial Motor evoked potentials.

Direct cortical motor evoked potentials

Direct cortical motor evoked potentials

Contraindications

Contraindications to MEP:

1. history of epilepsy/seizures
2. past surgical skull defects
3. metal in head or neck
4. use special care with implanted electronic devices

Case series

Yi et al., from the Seoul National University Hospital investigated 25 cases in which infants younger than 3 months (mean age 72.8 days, range 39-87) underwent neurosurgery between 2014 and 2017. Myogenic MEPs were obtained through transcranial Electrostimulation. In all cases, surgery was

performed under total intravenous anesthesia, maintained with remifentanil and propofol.

MEPs were documented in 24 infants, the sole exception being 1 infant who was lethargic and had 4-limb weakness before surgery. The mean stimulation intensity maintained during monitoring was 596 ± 154 V (range 290-900 V). In 19 of 24 infants MEP signals remained at ≥ 50% of the baseline amplitude throughout the operation. Among 5 cases with a decrease in intraoperative MEP amplitude, the MEP signal was recovered in one during surgery, and in the other case a neurological examination could not be performed after surgery. In the other 3 cases, 2 infants had relevant postoperative weakness and the other did not show postoperative neurological deficits. Postoperative weakness was not observed in any of the 20 infants who had no deterioration (n = 19) or only temporary deterioration (n = 1) in MEP signal during surgery.

Transcranial electrical MEPs could be implemented during neurosurgery in infants between 1 and 3 months of age. Intraoperative MEP monitoring may be a safe adjunct for neurosurgical procedures in these very young patients [5].

References

1)
Burke D, Hicks RG. Surgical monitoring of motor pathways. J Clin Neurophysiol. 1998;15:194–205.
2)
Kombos T, Kopetsch O, Suess O, Brock M. Does preoperative paresis influence intraoperative monitoring of the motor cortex? J Clin Neurophysiol. 2003;20:129–34.
3)
Kombos T, Picht T, Derdilopoulos A, Suess O: Impact of intraoperative neurophysiological monitoring on surgery of high-grade gliomas. J Clin Neurophysiol 26:422–425, 2009
4)
Talacchi A, Turazzi S, Locatelli F, Sala F, Beltramello A, Alessandrini F, et al: Surgical treatment of high-grade gliomas in motor areas. The impact of different supportive technologies: a 171-patient series. J Neurooncol 100:417–426, 2010
5)
Yi YG, Kim K, Shin HI, Bang MS, Kim HS, Choi J, Wang KC, Kim SK, Lee JY, Phi JH, Seo HG. Feasibility of intraoperative monitoring of motor evoked potentials obtained through transcranial Electrostimulation in infants younger than 3 months. J Neurosurg Pediatr. 2019 Mar 15:1-9. doi: 10.3171/2019.1.PEDS18674. [Epub ahead of print] PubMed PMID: 30875681.