



Guidelines

Intraoperative motor evoked potential monitoring – A position statement by the American Society of Neurophysiological Monitoring



D.B. MacDonald^{a,*}, S. Skinner^b, J. Shils^c, C. Yingling^d

^a Section of Clinical Neurophysiology, Department of Neurosciences, King Faisal Specialist Hospital & Research Center, MBC 76, PO Box 3354, Riyadh, Saudi Arabia

^b Intraoperative Monitoring, Department of Neurophysiology, Abbott Northwestern Hospital, 800 E 28th Street, Minneapolis, MN 55407, USA

^c Intraoperative Monitoring, Department of Neurosurgery, Lahey Clinic, 41 Mall Rd., Burlington, MA 01805, USA

^d ION IntraOperative Neurophysiology, Otolaryngology at Stanford University School of Medicine, USA

ARTICLE INFO

Article history:

Accepted 22 July 2013

Available online 18 September 2013

Keywords:

Motor evoked potentials
Intraoperative monitoring
D-wave
Muscle MEPs

HIGHLIGHTS

- This article comprehensively reviews intraoperative motor evoked potentials.
- It then forms summary recommendations based on current evidence and expert opinion.
- The International Society of Intraoperative Neurophysiology collaborated and endorses this position statement.

ABSTRACT

The following intraoperative MEP recommendations can be made on the basis of current evidence and expert opinion: (1) Acquisition and interpretation should be done by qualified personnel. (2) The methods are sufficiently safe using appropriate precautions. (3) MEPs are an established practice option for cortical and subcortical mapping and for monitoring during surgeries risking motor injury in the brain, brainstem, spinal cord or facial nerve. (4) Intravenous anesthesia usually consisting of propofol and opioid is optimal for muscle MEPs. (5) Interpretation should consider limitations and confounding factors. (6) D-wave warning criteria consider amplitude reduction having no confounding factor explanation: >50% for intramedullary spinal cord tumor surgery, and >30–40% for peri-Rolandic surgery. (7) Muscle MEP warning criteria are tailored to the type of surgery and based on deterioration clearly exceeding variability with no confounding factor explanation. Disappearance is always a major criterion. Marked amplitude reduction, acute threshold elevation or morphology simplification could be additional minor or moderate spinal cord monitoring criteria depending on the type of surgery and the program's technique and experience. Major criteria for supratentorial, brainstem or facial nerve monitoring include >50% amplitude reduction when warranted by sufficient preceding response stability. Future advances could modify these recommendations.

© 2013 International Federation of Clinical Neurophysiology. Published by Elsevier Ireland Ltd. All rights reserved.

Contents

1. Introduction	2293
1.1. History	2293
1.2. Previous guidelines	2293
2. Rationale and clinical basis for MEP monitoring	2293
3. Anatomy and physiology	2294
3.1. Anatomy	2294
3.1.1. Motor cortex	2294
3.1.2. Corticospinal tract	2294

* Corresponding author. Tel.: +966 11 464 72772x32827; fax: +966 11 442 4763.

E-mail addresses: dbmacdon@yahoo.com (D.B. MacDonald), drskinnermd@yahoo.com (S. Skinner), jay.shils@lahey.org (J. Shils), cy@brainmon.com (C. Yingling).

3.1.3.	Corticobulbar tract	2294
3.1.4.	Indirect motor pathways	2294
3.1.5.	Upper motor neuron system	2295
3.1.6.	Propriospinal system	2295
3.1.7.	Neuromodulatory pathways	2295
3.1.8.	Lower motor neuron system	2295
3.1.9.	Neuromuscular junction	2295
3.1.10.	Muscle	2296
3.1.11.	Cerebral blood supply	2296
3.1.12.	Spinal cord blood supply	2296
3.2.	Physiology	2296
3.2.1.	Spinal cord stimulation	2296
3.2.2.	Brain stimulation	2297
3.2.3.	D-waves	2297
3.2.4.	I-waves	2297
3.2.5.	Non-synchronous corticospinal action potentials	2298
3.2.6.	Muscle MEPs	2298
3.2.7.	Muscle MEP variability	2298
3.2.8.	Muscle MEP sensitivity	2298
3.2.9.	Muscle MEP fade	2298
3.2.10.	Muscle MEP deterioration without corticospinal tract or LMN injury	2299
3.2.11.	Peripheral conduction, neuromuscular transmission and nerve roots	2299
4.	Methodology	2299
4.1.	Stimulating electrodes	2299
4.2.	Stimulus montages	2299
4.2.1.	TES electrode arrays	2300
4.2.2.	TES montages	2300
4.2.2.1.	Hemispheric	2300
4.2.2.2.	Inter-hemispheric	2301
4.2.2.3.	Midline	2301
4.2.2.4.	Alternatives	2301
4.2.3.	Intracranial montages	2301
4.3.	TES pulse parameters	2301
4.4.	Intracranial pulse parameters	2302
4.5.	Constant voltage, current or charge?	2303
4.6.	Pulse train parameters	2303
4.7.	Facilitation	2303
4.8.	D-wave recording	2304
4.9.	Muscle MEP recording	2304
5.	Anesthesia and systemic factors	2304
5.1.	Anesthesia	2304
5.2.	Neuromuscular blockade	2304
5.3.	Blood pressure	2304
5.3.1.	Autoregulation	2304
5.3.2.	Dysautoregulation	2304
5.3.3.	Third factors	2305
5.3.4.	Other injury mechanisms	2306
5.4.	Temperature	2306
5.5.	Other systemic factors	2306
6.	Safety	2306
6.1.	Hazardous output	2306
6.1.1.	Excitotoxicity	2306
6.1.2.	Electrochemical injury	2306
6.1.3.	Thermal injury	2307
6.2.	Bite injuries	2307
6.3.	Seizures and afterdischarges	2307
6.4.	Invasive electrode complications	2307
6.5.	Movement-induced injury	2307
6.6.	Arrhythmia	2307
6.7.	Relative contraindications	2307
7.	Indications	2308
8.	Correlation with and impact on outcome	2308
8.1.	Classifying results	2308
8.2.	Outcome description	2308
8.3.	Outcome correlations	2308
8.3.1.	D-waves	2308
8.3.2.	Muscle MEPs	2308
8.4.	Impact on outcome	2308
9.	Interpretation and criteria	2309
9.1.	Confounding factors	2309
9.2.	D-wave interpretation	2309
9.3.	Muscle MEP interpretation	2309

Download English Version:

<https://daneshyari.com/en/article/3044207>

Download Persian Version:

<https://daneshyari.com/article/3044207>

[Daneshyari.com](https://daneshyari.com)