

# Neuromonitoring in Neurosurgery: An imperative redemption

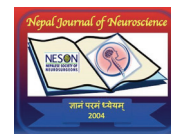
Pritam Gurung<sup>1</sup> 

<sup>1</sup>Department of Neurosurgery, Annapurna Neurological Institute and Allied Sciences, Kathmandu, Nepal

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With the refinement in biomedical gadgetry, it has been a modern day requisite to safeguard the indigenous neuro-architecture and henceforth foretell the postoperative neurological outcome. The intraoperative neuro-physiological monitoring (IONM) comes as no surprise to be the only credible paradigm which can clue the standing of neural pathway directly during general anesthesia.<sup>1,2</sup> By engaging with the IONM appliance, the operating surgeon can acknowledge the risk of injury to critical neural structure while dealing with the pathology within its vicinity. Intraoperative monitoring of motor evoked potentials (MEPs) has been believed to be advantageous in preventing postoperative motor dysfunction while coping up with aneurysmal surgery involving the internal carotid artery (ICA) and middle cerebral artery (MCA) and resection of tumor near sensorimotor areas or corticospinal tract.<sup>3-6</sup> The fundamental essence of MEP monitoring is based on the detection of a pyramidal tract insult expressed as a decrease of the amplitude of the waveform elicited by electrical stimulation.

Conversely, Somatosensory evoked potentials (SSEPs) embraces a series of waveforms that emulate sequential activation of neural structures along the somatosensory pathways.<sup>7</sup> The representative stimulation sites classically used for clinical diagnostic in the course of SSEPs studies are the median nerve at the wrist, the common peroneal nerve at the knee, and the posterior

tibial nerve at the ankle. Over and above that, SSEPs have been used as an indicator of cerebral ischemia during CEA, although far less commonly and as a surrogate alternative to EEG. SSEPs primarily gauge the integrity of the dorsal (sensory) column of the spinal cord. It furnishes with the real-time examination of spinal tracts at risk during surgical manipulation of the spinal cord such as spinal tumor and pedicle screw instrumentation.

Likewise, Auditory brainstem response (ABR) is a test which can assess the brain wave activity and diagnose dysfunctions of the auditory pathways within the auditory nerve and brainstem that occurs in response to an stimuli with clicks or certain tones.<sup>8</sup> This is notably useful in the surgery of CP angle tumor such as vestibular schwannoma, Microvascular decompression for hemifacial spasm and trigeminal neuralgia.

In any neurosurgical endeavour, where a visual field impairment is contemplated during the intraoperative period, the monitoring of flash visual evoked potential (VEP) comes as a rescue to evaluate the state of visual function.<sup>9</sup> This manoeuvre is explicitly virtuous while performing tumorectomy at the optic chiasm of pituitary adenomas, craniopharyngiomas, tuberculum sellae meningiomas, and other tumors; the removal of brain tumors from the optic pathway and structures in its vicinity such as the optic nerve, optic radiation, and occipital lobe; and clip ligation of aneurysm involving the internal carotid artery, which strike a pose of risking injury and impeding blood flow to the ophthalmic artery.<sup>9</sup> Monitoring intraoperative flash visual evoked potentials (VEPs) estimate the functionality of the optic pathway from the retina to the visual cortical area, and hence allows visual impairment to be avoided or minimized.

The bulbocavernosus reflex (BCR) is an illustrious somatic reflex that is convenient in gaining information about the state of the sacral spinal cord segments.<sup>10</sup> When present, it is indicative of an intact spinal reflex arcs (S2–S4 spinal segments) with afferent and efferent nerves through the pudendal nerve. BCR is of the greatest utility for the monitoring of sacral function in detethering of the tethered cord syndrome.<sup>11</sup> A surface electrode is used to electrically stimulate the pudendal afferent fibers at the clitoris or penis and recording of the analogous triggered EMG in external anal sphincter using a subdermal needle electrode.

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## Address for correspondence:

Pritam Gurung

Department of Neurosurgery, Annapurna Neurological Institute and Allied Sciences

Kathmandu, Nepal

E-mail: [preetamgurung@hotmail.com](mailto:preetamgurung@hotmail.com)

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The abnormal muscle response (AMR), which is also known as lateral spread response, is adopted in the microvascular decompression (MVD) for hemifacial spasm.<sup>12</sup> A complete disappearance of AMR after a convincing MVD from root exit zone implicate a postoperative disappearance of the hemifacial spasm. Nonetheless, the persistence of the AMR does not mean incomplete MVD.

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