

Multimodal intraoperative monitoring: towards a routine use in surgical treatment of severe spinal disorders

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With the rapid development of imaging techniques and better understanding of structural and functional pathology of the spine and spinal cord there has been a worldwide increase in the number of spine surgeries performed, particularly in specialized interdisciplinary spine centers. In addition to congenital and acquired deformities of the spine and relatively rare spinal cord tumors, common degenerative spine disease within the aging general population contributes to a growing number of pathologies with myelopathies. This is important because antecedent myelopathy increases spinal cord risk during surgical treatment. The possibility of having functional neurophysiological assessment during spine and spinal cord surgery was introduced in the 1970s by applying somatosensory evoked potentials (SEPs) as well as spinal evoked potentials.

Meanwhile these modalities and continuous EMG recording have been enhanced by the addition of corticospinal motor pathway monitoring through the use of motor evoked potentials (MEPs) elicited by transcranial electrical stimulation. The application of multimodal intraoperative monitoring (MIOM) became routine in several spine

centers, being documented by publications about the specificity and sensitivity as well as clinical experience and outcome measurements during different spinal surgical procedures. In this supplement on intraoperative monitoring the Spine Center of the Schulthess Clinic presents their experience with the application of MIOM during spine surgery analyzing 1,017 surgeries in the years 2000–2005, as well as pioneers of MIOM such as Profs T.Tamaki, V.Deletis, D.McDonnald and F.Sala contributed with their experience to the supplement.

The Spine Society of Europe (SSE) supported the development of MIOM by presentations of the results at its annual meetings and organized workshops to stimulate discussion and communication between spine surgeons and clinical neuroscientists. The SSE has also introduced quality control management in spine surgeries by establishing Spine Tango, a web-based international registry that includes MIOM documentation (<http://www.eurospine.org>). Recently, the International Society of Intraoperative Neurophysiology (ISIN) was founded to stimulate interdisciplinary communication and collaboration between surgeons, neurologists, neurophysiologists and anesthetists (<http://www.ptsroma.it/isin>).

The aim of a first consensus meeting on intraoperative monitoring during spine surgeries in Verona (28 September 2006) was to provide recommendations for the improvement and appropriate application of monitoring techniques during spine surgeries.

Experts in the field were invited for a meeting with the support of the European Spine Journal (Max Aebi, MD, Editor-in-chief, Marek Szpalski, MD, Deputy Editor in charge of Supplements) to summarize the current state-of-the-art and prepare current opinions and recommendations. This consensus statement represents a work in progress and

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as with all other recommendations or proposals, it must be updated as new information is gained.

The consensus group is however, of the opinion and recommends the establishment of a MIOM as a routine procedure in spine centers dealing with severe spinal disorders, in which surgical procedures could lead to damage of neural structures. The current body of knowledge makes the wake-up test to monitor the correction of spinal deformities of exceptional application. Nevertheless, its use might still be justified in the event of technical failure of neuromonitoring setup.

Close collaboration of the different international scientific societies such as the Spine Society of Europe, the International Society of Intraoperative Neurophysiology, the Scoliosis Research Society, the International Society for Study of the Lumbar Spine and the Cervical Spine Research Society could facilitate interdisciplinary communication as well as the establishment of the monitoring units in spine centers. It is also recommended that

the International Society of Intraoperative Neurophysiology takes this paper as a “study in progress” and elaborates on the development of quality management and standards for intraoperative monitoring as well as educational standards and accreditation.

As the specificity and sensitivity of MIOM is well established, the design of historical studies as presented by Sala should be initiated to gain more sound information on the efficacy of monitoring procedures to reduce neurological complications (as obviously performance of prospective randomized trials is limited by ethical considerations).

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