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A prospective study of the utility of preoperative somatosensory evoked potentials in spinal surgery

Received: 17 September 2004
Accepted: 3 October 2004
Published online: 26 January 2005
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Intraoperative somatosensory evoked potential (SSEP) monitoring is a routine procedure in spinal surgery. SSEPs are sensitive in the detection of neurological insults caused by mechanical stress, surgical manipulation and ischemia [1]. However, they can be unreliable in cases with poor waveform morphology, both preoperatively and intraoperatively. In some centers, an additional preoperative SSEP study is not performed as a routine.

With local ethical committee approval, we aimed to prospectively assess the value of preoperative SSEP studies in the general hospital setting. Over an 18 month period, all cases of spinal surgery requiring intraoperative monitoring (IOM) had preoperative SSEP studies in all four limbs. This included median and posterior tibial SSEP studies performed bilaterally. The patients then had identical studies performed intraoperatively, where data were obtained immediately before actual surgical manipulation.

Using our laboratory controls, upper limit of cortical potential latencies (N20 and P37) analyzed for median and posterior tibial SSEP studies, were 23 ms and 45 ms respectively. A total of 85 consecutive patients (58 men; mean age: 50; range: 14–86) were entered. Preoperatively, group 1 (normal latency in four limbs), group 2 (abnormal latency in at least one limb), group 3

(absent SSEP in at least one limb) and group 4 (absent SSEP in four limbs) consisted of 51, 25, 7 and 2 patients respectively. Intraoperatively, all 51 patients in group 1 had normal SSEP latencies. Three of 25 (12%) patients in group 2 and five of seven (71%) patients in group 3 had absent SSEPs in two limbs. Hence, eight of 32 (25%) patients from groups 2 and 3 showed absent SSEPs in two limbs intraoperatively. Both patients in group 4 also had absent SSEPs in all four limbs intraoperatively. All surgeries in this study were performed using inhalational anesthesia, consisting of nitrous oxide, isoflurane or desflurane. In all cases with abnormal intraoperative SSEPs, the intraoperative team, consisting of a neurophysiologist, neurotechnician and neuro-anesthetist, ensured adequate maintenance of vital parameters to within normal ranges, before concluding absence of SSEPs with certainty. Table 1 summarizes these results in terms of clinical diagnoses of all patients.

Our findings showed that intraoperative SSEP monitoring can be technically difficult and inadequate if preoperative SSEPs have already been shown to be abnormal. Conversely, if preoperative SSEPs were unremarkable (group 1), the success rate in monitoring SSEPs in all four limbs would be high.

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Table 1 Summary of patient diagnoses in groups 1–4

Group	Total number	Preoperative diagnoses	Preoperative diagnose (absent SSEPs intraoperatively)
1	51	Cervical myelopathy (45) Lumbar spondylosis (6)	0
2	25	Cervical myelopathy (23) Lumbar spondylosis (2)	Cervical myelopathy (3)
3	7	Cervical myelopathy (5) Lumbar spondylosis (2)	Cervical myelopathy (4) Lumbar spondylosis (1)
4	2	Cervical myelopathy (2)	Cervical myelopathy (2)

Breakdown of number of patients is indicated in brackets in each group

Abnormalities of preoperative SSEPs are often encountered in tandem with the severity of primary spinal disease. In such cases, cortical

SSEP responses could be lost even without major surgical manipulation intraoperatively [4]. However, it is known that anesthetics can play a

major role in such situations. Hence, while inhalational anesthetics have their inherent advantages, an alternative approach to increasing the success of SSEP monitoring may be the use of total intravenous anesthetic regimes [3].

The loss of SSEPs intraoperatively in two limbs would render IOM inadequate in many types of spinal surgeries. In these situations, additional modalities, such as motor evoked potentials [2], should be utilized for more comprehensive monitoring. A preoperative SSEP study is thus of value in alerting the IOM team for the preparation of additional monitoring methods.

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