Intraoperative Loss of Motor and Somatosensory Evoked Potentials and Postoperative Neurologic Deficit Following a Hypotensive Episode During Thoracic Laminectomy.

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Introduction

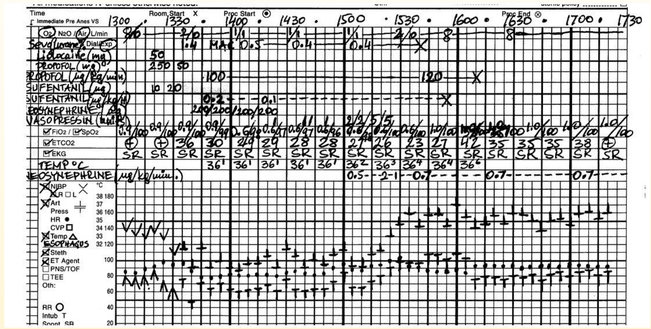
The objective of neurophysiologic monitoring during spine surgery is to avoid neurological injury resulting from surgical manipulation. Combined use of somatosensory evoked potentials (SSEP) and motor evoked potentials (MEP) is superior to SSEP alone in detecting impending injury of central nervous system motor pathways.

Case Description

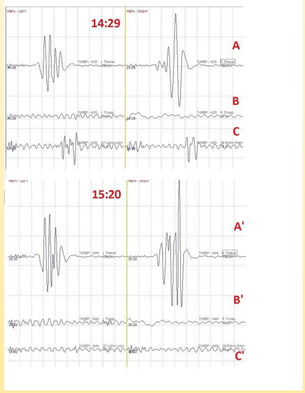
A diabetic, obese, hypertensive 54-year-old female with T2-T3 spinal stenosis with myelomalacia underwent a laminectomy. SSEP and MEP were monitored. General anesthesia was maintained with propofol, sufentanil and 0.5 MAC of Sevoflurane. Fiberoptic endotracheal intubation avoided use of muscle relaxants. A radial arterial line was placed. Scalp SSEP from ulnar nerve and posterior tibial nerve were recorded. MEP elicited by transcranial stimulation were recorded at abductor pollicis brevis, tibialis anterior referenced to gastrocnemius and abductor hallucis. MEP were difficult to obtain, but were recorded at 615 mA in both hands (at 200 µV amplitude) and feet (barely present at 20µV). Lower extremity SSEP were adequate at baseline at low amplitude (0.3- 0.7 µV).Prolonged hypotension (mean arterial pressure, MAP, of 67 mm Hg) in the prone position and concurrent significant blood loss led to loss of MEP and decline of SSEP in lower extremities. Immediate intravenous infusion of neosynephrine increased MAP to 120 mm Hg. Methylprednisolone protocol for spinal cord protection was also started. Some recovery of lower extremity SSEP occurred (<25% of baseline in the left lower extremity, < 50% in the right). Lower extremity MEP did not recover, despite increasing the stimulating current from 644 mA to 1003 mA. The patient woke with significant lower extremity weakness. It improved within hours. MAP augmentation with neosynephrine infusion continued in the ICU until resolution of weakness was obtained 48 hours later. Neurological exam at 17 months was normal.

Hypotension-related Intraoperative Changes in Lower Extremity MEP and SSEP

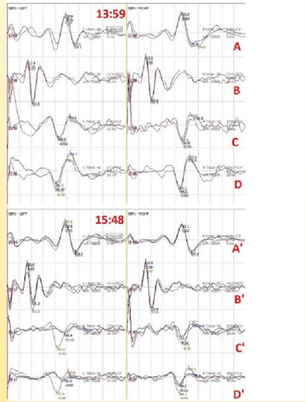
Portion of anesthesia record demonstrating a hypotensive episode

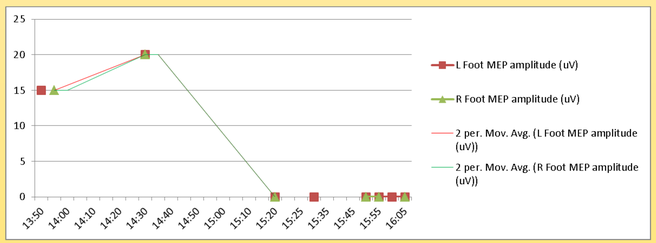


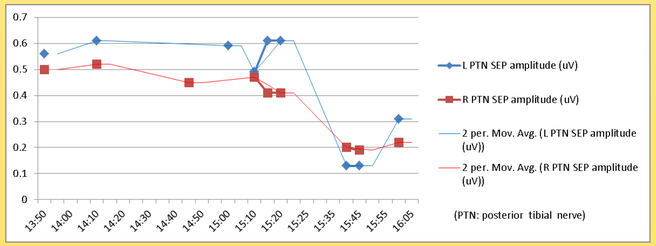
15:20 - Loss of LE MEPs (compare C , C')



15:48 - Change in LE SSEPs (compare C,C' & D,D')







Discussion

The patient's preoperative intermittent lower extremity weakness indicated episodic spinal cord hypoperfusion. Other risk factors for intraoperative spinal cord ischemia were probable presence of diabetic microvascular disease and chronic hypertension, which results in a rightward shift of the cerebral blood flow autoregulation curve. The lower limit of autoregulation, MAP of 60 mm Hg, may be shifted as high as 120 mm Hg. Autoregulation of spinal cord blood flow has been shown in several species. Chronically hypertensive patients may suffer cerebral and spinal cord ischemia at moderate levels of hypotension.

Conclusion

MEP and SSEP sensitivity to ischemia may differ, as motor and sensory tracts of the spinal cord are topographically separate. In this case, lower extremity baseline SSEP and MEP were very weak, so loss of either may not have generated a true alert. However, relative stability at low amplitudes and MEP and SSEP signal loss during hypotension and surgical manipulation with acute blood loss helped identify a true event of critically low spinal cord perfusion.

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