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Intraoperative Monitoring of A Patient With Craniovertebral Junction Meningioma

Ayçe ATALAY[1]
Başar ATALAY[2]
Oya Ümit YEMİŞÇİ[3]
Metin KARATAŞ[4]
Nur ALTINÖRS[5]

[1,3,4] Başkent University, Faculty of Medicine, Department of Physical Medicine and Rehabilitation, Ankara, Turkey
[2,5] Başkent University, Faculty of Medicine, Department of Neurosurgery, Ankara, Turkey

ABSTRACT

Intraoperative monitoring is considered as a useful tool to prevent neurological damage during different neurosurgical procedures. Somatosensory evoked potentials (SEP) allow simultaneous assessment of several cortical and sub cortical centers. In this case presentation, we report intraoperative monitoring of an elderly patient with craniovertebral junction meningioma. Tibial SEP responses were elicited by stimulation of the tibial nerve; the recordings were visually analyzed for the presence of the main peaks P40-N50, peak to peak amplitudes, peak latencies and compared to baseline recordings throughout the procedure. During decompression from the medial aspect of the medulla SEP responses were lost for a brief period of time. Surgeons achieved total tumor removal and the patient left the operating room without any neurological deficit.

KEY WORDS: Intraoperative monitoring, Somatosensory evoked potentials, Tibial

INTRODUCTION

Intraoperative monitoring (IOM) is a useful tool to monitor neurological damage during various neurosurgical operations. Monitoring modalities include electroencephalography (EEG), computer processed EEG, somatosensory evoked potentials (SEP), auditory (BAEP) and visual evoked potentials (VEP) and cranial nerve monitoring (1). SEP can be obtained in one minute, easily applicable in the operating room and enable direct evaluation of the brain function (2).

We report an elderly patient with craniovertebral junction meningioma who was successfully operated under continuous SEP monitoring.

CASE DESCRIPTION

A 68-year-old male admitted with the complaint of weakness in all his extremities and difficulty in walking. He was unable to walk without assistance for the last one year. He was 3/5 quadriparetic in all four extremities and pathological reflexes were evident like clonus. Magnetic resonance imaging (MRI) revealed an extra axial mass in the anterior craniovertebral junction with the compression of the underlying medulla and the upper cervical spine (Figure 1). Patient was operated in prone position with a posterior approach. Anesthesia used during surgery included isoflurane, propofol, vecuronium bromide, fentanyl and neostigmin.

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Correspondence Address:
Ayçe ATALAY
Başkent University, Department of Physical Medicine and Rehabilitation
5.Sokak No:48 Bahçelievler Ankara
Turkey 06500
Fax: + 90 312 215 78 40
E-mail: aycea@baskent-ank.edu.tr

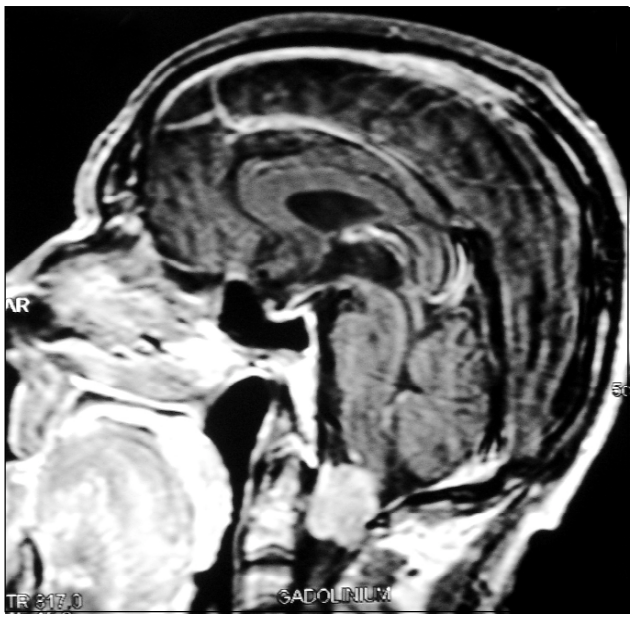

Figure 1: Preoperative T1 sagittal magnetic resonance imaging with gadolinium enhancement showing an intradural mass lesion enhancing homogenously in the region of foramen magnum.

Medelec Synergy Electromyography was used to obtain evoked potentials. Tibial SEP responses were elicited by stimulation of the tibial nerve posterior to the medial malleolus, using square-wave electrical pulses (duration 0.1 ms, 20 mA intensity). Stimulation intensity was sufficient to elicit a toe twitch. For recording, active electrode was placed as Cz with a reference electrode at Fz according to the international 10-20 system. A ground electrode was placed over tibialis anterior muscle. The time base was set to 100 ms and a filter band pass of 10Hz to 2kHz was used. 500 trials were averaged. SEP monitoring was applied during baseline and continuously throughout the procedure (Figure 2). The recordings were visually analyzed for the presence of the main peaks P40-N50, peak to peak amplitudes, peak latencies and compared to baseline recordings.

After insertion of the SEP electrodes, bilateral C1-C2 laminectomy and widening of the foramen magnum was performed. Dura was opened medial to the entrance of the left vertebral artery. Extra axial mass was removed with a micro neurosurgical technique with the help of an operating microscope. During decompression from the medial aspect of the medulla SEP were lost for a brief period of time which alerted the surgeons to stop for a while and release the retraction although very little from the medulla and C1-C2. No further changes occurred during the course of anesthesia like hypotension. Surgeons achieved total tumor removal and patient left the operating room without any neurological deficit. Post operative period was uneventful and patient was discharged on the 5th postoperative day. Control physical examination after 2 months was within normal limits and the MRI revealed total removal of the tumor (Figure 3). Pathological diagnosis was meningothelial meningioma.

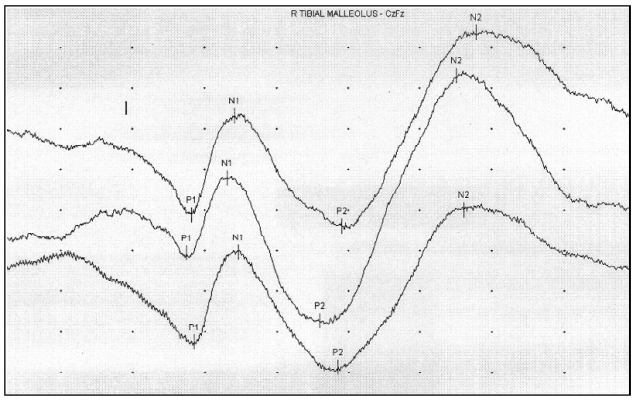

Figure 2: Intraoperative recordings showing tibial nerve somatosensory evoked potential traces.

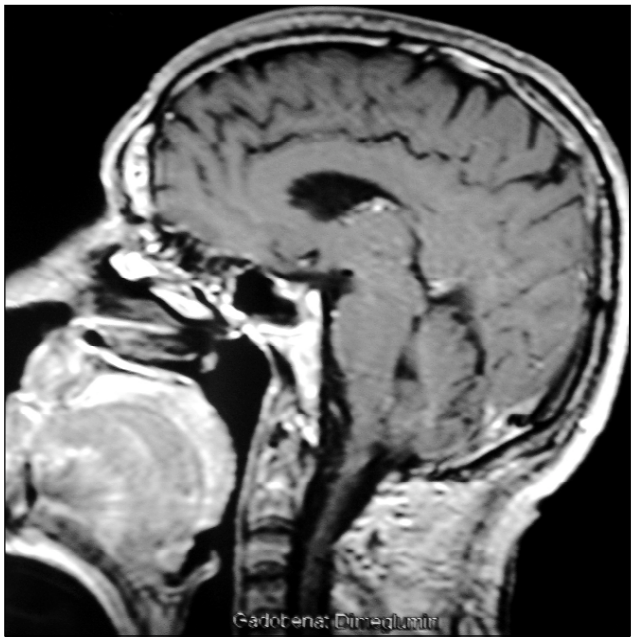

Figure 3: Postoperative T1 sagittal magnetic resonance imaging with gadolinium enhancement showing total removal of the foramen magnum tumor.

DISCUSSION

IOM has been shown to have acceptable sensitivity for detecting neurological damage during different neurosurgical procedures (5). SEP recordings are advantageous since they provide simultaneous recording of several cortical areas or even subcortical centers (2). For SEP recordings criteria of an event is 50% reduction in amplitude of the cortical complex and/or 10% increase in peak latency compared with baseline if sustained for two consecutive trials (5). It is often considered that amplitudes are more sensitive than latencies to cerebral blood flow decrease because metabolic needs of axons are lower than those of neural bodies (3). Anesthesia and hypothermia may induce SEP alterations by influencing brain function. All halogenated inhalational agents including isoflurane produce a dose-related increase in latency and reduction in amplitude of the cortically recorded SEP responses, they need to be used in restricted concentrations (4).

Appropriate monitoring is obligatory in order to protect nervous tissue. IOM needs some well trained staff, equipment. Additionally, the surgeon must be willing to act according to the findings of IOM for the technique to be helpful for the outcome. However certain limitations of SEP monitoring should be considered. Basic physiological knowledge suggests that with SEP monitoring only parts of the lemniscal system are covered so SEPs are insensitive to isolated damage to structures outside this system such as motor pathways (5). Also SEP monitoring has no etiological specificity i.e. they do not allow differentiating a cerebral blood flow decrease due to hemodynamic disturbance or embolism (2). Despite certain limitations of the technique, IOM can help to reduce surgical complications in selected cases.

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