

TITLE: PERIOPERATIVE CEREBROVASCULAR ACCIDENTS:  
 FREQUENT MULTIMODAL MONITORING FOR EARLY DETECTION AND INTERPRETATION  
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CASE PRESENTATION:

A 63-year-old female presented for elective resection of a left cerebellopontine angle meningioma following a five year history of occasional sensation of pressure in the left ear, with pain and paresthesia in the sensorium of the left trigeminal nerve occurring in the three months prior to surgery. Memory/cognition, gross hearing, motor function and sensation of the bilateral upper and lower extremities, and the functions of cranial nerves II, III, IV, VI, VII, IX, X, XI, and XII were intact and unremarkable at the time of preoperative observation. IOM modalities requested by the surgeon included somatosensory evoked potentials (SSEPs) of the median (MN) and posterior tibial (PTN) nerves, brainstem auditory evoked responses (BAERs), and electromyography (EMG) of the left masseter, left orbicularis oculi, and left orbicularis oris.

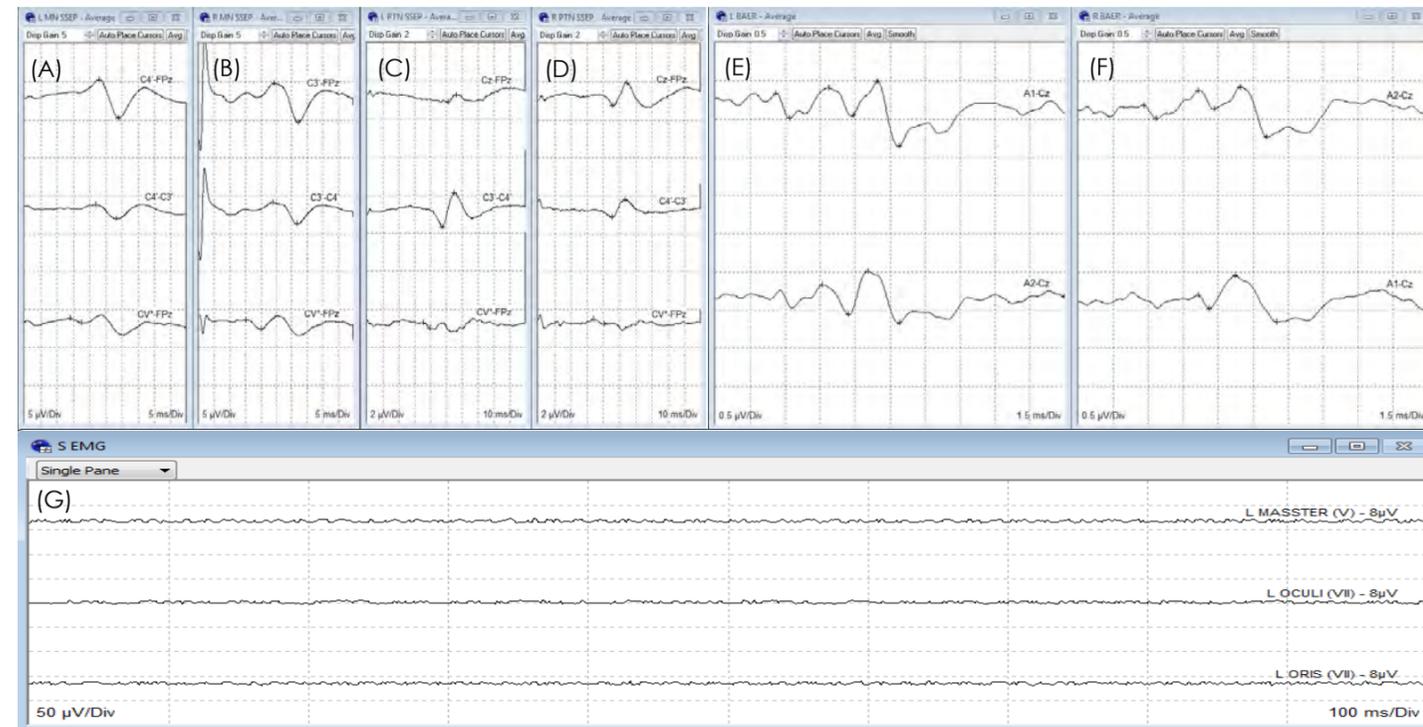


FIGURE 1: Baseline (A) left median, (B) right median, (C) left posterior tibial, and (D) right posterior tibial nerve SSEPs, (E) left and (F) right BAERs, and (G) cranial nerve EMG.

INTRA-OPERATIVE COURSE:

All IOM evoked potentials remained consistent with their baselines and all EMG tracings remained quiet and consistent with pre-surgical tracings throughout the course of surgical exposure and tumor resection. Two minutes following the replantation of the cranial bone flap near the end of the procedure, the following sequence of notable IOM events occurred:

- Two minutes following the replantation of the cranial bone flap, **single burst motor unit action potentials of the left masseter** were observed to fire at a rate of approximately 4Hz and an amplitude of approximately 200µV.
- Over the course of the following two minutes, the **left BAER desynchronized** leading to flattened morphology, reduced amplitudes, and prolonged latencies in waves I, III, and V.
- In the six minutes following, the **right BAER similarly desynchronized** leading to flattened morphology, reduced amplitudes, and prolonged latencies in waves I, III, and V.
- Five minutes after the decimation of the contralateral BAER, **repeating burst groups of motor unit action potentials of the left orbicularis oris** were observed to occur at a rate of approximately 1Hz and an amplitude of approximately 600µV.
- Finally, seventeen minutes after the initial IOM change, the **right median nerve SSEPs desynchronized** leading to flattened morphology, reduced amplitudes, and prolonged latencies in N13 and N20.



FIGURE 2: Critical IOM event sequencing during the detection of transverse sinus thrombosis. (A) Single EMG bursts from the left masseter two minutes after replantation of the bone flap; (B) decay of the left BAER over the following two minutes; (C) decay of the right BAER over the following six minutes; (D) groups of EMG bursts from the left orbicularis oris five minutes later; and (E) decay of the right median nerve SSEPs four minutes later (seventeen minutes following the initial IOM data changes)

INTERVENTION:

Of note, no abnormalities in cardiopulmonary function were observed by the anesthesia team during or following surgical closure. Thirty minutes following skin closure, an emergency CT was ordered by the surgeon and revealed a transverse sinus thrombosis. Over the course of the next twelve hours, the surgeon undertook two surgeries for decompressive craniotomy and revascularization. Following these, the patient remained comatose with a GCS of 3 until seven days after the initial encounter when she regained consciousness.

DISCUSSION:

Multimodality IOM played an essential role in the early detection of cerebral venous sinus thrombosis, a condition known to carry a significant (appr. 16%) risk of mortality despite intervention.<sup>[1]</sup> While the venous thrombosis of this case was characterized by critical changes to the IOM signals of four cranial nerves and the somatosensory pathway, the confidence of diagnosis was established by event sequencing. Additionally, this case highlights the need to sustain IOM throughout surgical closure, particularly during tumor resections of the cerebellopontine angle where the selective sacrifice of veins is a common surgical maneuver but carries the risk of thrombotic injuries with delayed presentation onset.<sup>[2]</sup>

[1] J Neurosci Rural Pract. 2014 Jul-Sep; 5(3): 218-224. [2] Childs Nerv Syst. 2013 Feb;29(2):199-207.