Transcranial Electric Motor Evoked Potential Alert Criteria
Maria Zuccaro PhD, CNIM and James Zuccaro DC, DABNM

- Objective: Transcranial motor evoked potentials (tCMEP) and somatosensory evoked potentials (SSEP) are part of Multimodality monitoring utilized during spinal deformity surgery, and may help to reduce post operative deficits that result from intraoperative injury during surgery (Schwartz et al., 2007, Schwartz et al., 2021, Fasbender et al., 2007, Haung 2012, & Zuccaro et al., 2022). Various alert criteria exist for tCMEP, although the monitoring community. Some of these alert criteria include: threshold increase (Courney et al., 1996), amplitude decrease (Shima et al., 2007, Langlois et al., 2009, Schwartz et al., 2007), and morphologic changes from baseline data (Langlois et al., 2007). This paper examined the incidence of post operative deficits with the following different tCMEP alert criteria: 0-49% decrease in amplitude, 50% decrease in amplitude, 60-74% decrease in amplitude, 75-90% decrease in amplitude, and 100% decrease in amplitude.

- Methods: After obtaining IRB approval, a retrospective quantitative analysis was performed on 920 patients (282 males, 738 females). All patients were diagnosed with scoliosis and undergoing spinal deformity correction surgery. tCMEPs were stimulated at the cortex and recorded from the following muscles through the use of subdermal electrodes: abductor pollicis brevis, quadriceps femoris, tibialis anterior, gastrocnemius, and abductor hallucis. All baseline were obtained by a consistent neuromonitoring team using Cadwell cerecos, pro. Anesthesia for each patient consisted of a total intravenous anesthetic protocol and neuromuscular blockade. Baselines were recorded prior to incision and were present bilaterally in all recording muscles. tCMEPs were recorded every 15-20 minutes throughout the entire procedure.

- Results: Total number of tCMEPs performed and recorded for the 920 patients was 16,734, with 1600 amplitude decreases identified. The number of tCMEP recorded and performed tCMEP, was integrated into a single online database: 0-49% decrease in amplitude (N=35,653), 50% decrease in amplitude (N=159), 60-74% decrease in amplitude (N=14,481), 75-90% decrease in amplitude (N=4,381), and 100% decrease in amplitude (N=1,015). Post operative neurologic deficits for each group were as follows: 0-49% decrease (0 deficits), 50% decrease (10 deficits), 60-74% decrease (20 deficits), 75-90% decrease (18 deficits), and 100% decrease (1 deficit). tCMEP sensitivity was calculated for the following groups: 50% decrease (100%), 60-74% decrease (50%), 75-90% decrease (27%), and 100% decrease (8%).

- Conclusion: tCMEP offer an increase in patient safety from intraoperative injury during surgery (Schwartz et al., 2022). Various alert criteria exist for interpretation of tCMEP that result in post operative deficits. Results from this study indicated tCMEP were most sensitive with the alert criteria in the range of 50-40% decrease in amplitude. Additionally, this study suggests using an all or none approach (100% decrease) may give a surgeon false information on postoperative neurologic status of the patient.

References


