Intraoperative monitoring (IONM) Alerts in a Pediatric Deformity Center

Authors: Zuccaro M, Zuccaro J, Samdani A, Hwang S, Pahys J.
Shriners Hospital for Children Philadelphia

Introduction: IONM involves the use of somatosensory evoked potential (SSEPs) and transcranial motor evoked potentials (TceMEPs). The question often arises in reference to the most specific and sensitive modality used in neuromonitoring. In this retrospective study we examined the sensitivity and specificity of both SSEPs and TceMEPs during pediatric spinal deformity surgeries.

Methods: After obtaining IRB approval, a retrospective quantitative analysis was performed on 809 patients (198 males and 611 females), from December 2011 until October 2015. All patients were diagnosed with scoliosis that was classified as one of the following: adolescent idiopathic (AIS) (38%), congenital (22%), and syndromic (40%). Also, 53 cases underwent vertebral column resections (VCR). This study observed the sensitivity and specificity of TceMEPs and SSEPs data with regard to post-operative deficits. All surgeries were monitored by high level neuromonitoring specialists, and were performed with total intravenous anesthesia. Alerts were described as a decrease in amplitude by 50% or greater (bilateral or unilateral) in SSEPs, TceMEPs, or both.

Results: True positive alerts for TceMEPs were observed in 60 of the 809 patients (7.4%). True positive alerts for SSEPs were observed in 7 of the 809 patients (0.9%). In contrast, no reported numbers occurred for either false positive or false negative outcomes. Only 1 case (0.1%) was reported with a permanent post-operative deficit. No reported false negatives or false positives were observed, thereby calculating a 100% sensitivity value and 100% specificity value for TceMEPs. The rate of sensitivity was calculated at 13.2% and the rate of specificity was calculated at 100% for SSEPs. Alert case breakdowns were 3.6% in AIS cases, 8.9% in congenital, and 10.2% in Syndromic cases. Neurologic injury rate were significant less than previous studies as there were 0% for AIS (p=0.12), 0% for syndromic (p=0.07), and 0.6% for congenital (p=0.17). The congenital injury occurred during a VCR, which had an injury rate of 1.9% (p<0.005). IONM alerts occurred during 34% rod/correction, 25% thoracic screw, 20% osteotomy, 17% resection, 3% cage, and 2% sublaminar wire.

Conclusion: We hypothesize this study will support the necessity of multimodality neuromonitoring during high risk pediatric spinal deformity surgery due to the decrease in post-operative deficits. Our data suggests that the TceMEPs are more sensitive than SSEPs, but used in combination offers the patient a level of safety that would otherwise not exist. Lastly, these findings support better outcomes with high level IONM professionals.