Analysis of the Effects of Intraoperative Neurophysiological Monitoring on Anterior Cervical Surgery: A Michigan Spine Surgery Improvement Collaborative (MSSIC) Study

Conner D. Ahlgren, Philip Zakko[1], Andrew Zachary Blankenship, Daniel K Park
[1]Beaumont Health

INTRODUCTION:

The utility of intraoperative neurophysiological monitoring (IOM) for anterior cervical surgery remains controversial. Despite insufficient evidence demonstrating a clear benefit, IOM continues to be utilized and in some areas is considered standard of care. The aim of this study was to evaluate the effects of IOM on anterior cervical surgery outcomes by utilizing data from the Michigan Spine Surgery Improvement collaborative.

METHODS: Anterior cervical surgeries from February 2014 to November 2019 were included for analysis. IOM (EMG, MMG, SSEPs, or MEP) was the primary variable examined. Primary outcome measures were: new weakness after surgery, new radicular symptoms, return to OR, operative time and length of stay (LOS). Logistic Generalized Estimation Equations (GEE) were used for multivariate analysis adjusting for demographic, premorbid, and disease specific variables.

RESULTS: There were 10,853 cases with 4,218 (38.9%) where IOM was used. Comparing IOM cases to those without there were no differences in weakness (6% vs 6% n.s.), radicular symptoms (10% vs 11% n.s.), return to OR (4% vs 3% n.s.) and LOS. Operative time was longer in the IOM group, 1.8 hours (CI 1.3-2.4) vs 1.4 hours (CI 1.1-2) $p<0.001$. On multivariate GEE, IOM was not found to decrease the risk of post-operative weakness, radicular symptoms or return to OR. For weakness, baseline weakness (OR 1.63, CI 1.29-2.06, $p<0.001$), myelopathy (OR 1.51, CI 1.21-1.9, $p<0.001$), CAD (OR 1.33, CI 1.07-1.65, $p<0.05$) and ASA>2 (OR 1.23, CI 1.01-1.5, $p<0.05$) were all associated with increased risk. For radicular symptoms, baseline weakness (OR 1.25, CI 1.04-1.49, $p<0.05$), ASA>2 (OR 1.24, CI 1.06-1.44, $p<0.05$ and previous spine surgery (OR 1.22, CI 1.06-1.4, $p<0.05$) were associated with increased risk. For return to OR, previous spine surgery (OR 1.51, CI 1.18-1.93, $p<0.001$), myelopathy (OR 1.52, CI 1.07-1.9, $p<0.05$), male gender (OR 1.32, CI 1.04-1.68, $p<0.05$) were associated with increased risk. Finally, IOM (OR 1.06, CI 1.03-1.09, $p<0.001$) was also associated with longer operative time.

DISCUSSION AND CONCLUSION:

Our study found no correlation between the use of IOM and reduction of post-operative weakness and new radicular symptoms. Conversely, we did find significant associations with increased operative time. Baseline weakness had the highest correlation with both negative outcomes.