Triggered electromyography

Insertion of instruments or implants into the spine carries a risk for injury to neural tissue. Triggered electromyography (tEMG) is an intraoperative neuromonitoring technique that involves Electrostimulation of a tool or screw and subsequent measurement of muscle action potentials from myotomes innervated by nerve roots near the stimulated instrument. The authors of this study sought to determine the ability of tEMG to detect misplaced pedicle screws (PSs).

Methods: The authors searched the U.S. National Library of Medicine, the Web of Science Core Collection database, and the Cochrane Central Register of Controlled Trials for PS studies. A meta-analysis of these studies was performed on a per-screw basis to determine the ability of tEMG to detect misplaced PSs. Sensitivity, specificity, and receiver operating characteristic (ROC) area under the curve (AUC) were calculated overall and in subgroups.

Results: Twenty-six studies were included in the systematic review. The authors analyzed 18 studies in which tEMG was used during PS placement in the meta-analysis, representing data from 2932 patients and 15,065 screws. The overall sensitivity of tEMG for detecting misplaced PSs was 0.78, and the specificity was 0.94. The overall ROC AUC was 0.96. A tEMG current threshold of 10-12 mA (ROC AUC 0.99) and a pulse duration of 300 µsec (ROC AUC 0.97) provided the most accurate testing parameters for detecting misplaced screws. Screws most accurately conducted EMG signals (ROC AUC 0.98).

Conclusions: Triggered electromyography has very high specificity but only fair sensitivity for detecting malpositioned PSs [1].

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Mikula AL, Williams SK, Anderson PA. The use of intraoperative triggered electromyography to detect misplaced pedicle screws: a systematic review and meta-analysis. J Neurosurg Spine. 2016 Apr;24(4):624-38. doi: 10.3171/2015.6.SPINE141323. Epub 2015 Dec 11. PMID: 26654343.