Clinical: MIS fusion-stabilization

Dynamic EMG Testing for the Placement of Lumbar Pedicle Screws
A. Tohmeh, R. Bazzano
1Northwest Orthopaedic Specialists, P.S., Spokane, WA, United States

Introduction: Evoked EMG has been shown to be a sensitive tool for assessing pedicle integrity after the placement of pedicle screws. This post-hoc “Basic” testing allows for identification of breach intraoperatively and repositioning of screws if necessary, but with additional time, trauma, and limited correction ability. A prospective, IRB-approved study was undertaken to evaluate the effectiveness of “Dynamic” EMG testing, which enables active monitoring during pedicle preparation and screw insertion, enabling changes in pedicle trajectory to be made before a breach occurs.

Methods: Lumbar pedicle screws were placed using Dynamic testing where EMG feedback was provided to the surgeon on a randomized basis among screws in each patient. EMG thresholds were collected during cannulation, tapping, and placement of each screw. Final screw positioning was confirmed with a Basic screw test after placement. Intraoperative redirections based on EMG feedback were documented. A neural exam and VAS pain assessment were performed pre-op, post-op, and 4-6 weeks after surgery. A post-op CT scan was obtained and was evaluated for screw placement accuracy by an independent spine surgeon.

Results: A total of 44 levels were treated with instrumented XLIF and/or TLIF with 137 screws placed. 8 (6%) breaches were identified by post-op CT: 6 (4%) medial, 1 (1%) lateral, and 1 (1%) inferior. All breached the pedicle by less than 2mm, were without sequelae, and no revisions were required. Low EMG thresholds during pilot hole formation led to a significant number of redirections (p=0.014) with no correlation to incidence of breach. There was a significant correlation between thresholds during tapping and screw placement and incidence of breach (p< 0.001), suggesting that once a redirection was made and threshold values continued to be low, the surgeon was less likely to redirect and more likely to breach, or that pedicle wall integrity had already been compromised and screw path could not be changed once prepared.

Conclusion: Dynamic EMG testing provides safe, real-time predictive feedback during pilot hole formation and placement of pedicle screws. Earlier warning of low thresholds provides greater opportunity for redirection.