

## Mechanomyography (MMG) for Intraoperative Assessment of Screw Placement During Instrumented Spine Surgery

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### Introduction

EMG is widely used to assess pedicle screw placement during spine surgery. Recent studies have questioned the reliability of EMG due to its low specificity.<sup>1-4</sup> Mechanomyography (MMG) monitors the mechanical activity of muscles and is the mechanical counterpart of EMG. Unlike EMG, MMG is not susceptible to electrical interference or stimulus artifact. This study reports the effectiveness of MMG to intraoperatively assess cortical breach prior to screw insertion during lumbar spine instrumentation.

### Methods

Patients were enrolled in a prospective study comparing intraoperative MMG values with post-operative CT scan for the assessment of cortical breach of pedicle screws. Intraoperative MMG values were obtained after screw trajectories were piloted, but prior to screw insertion, by stimulating all four pedicle walls (medial, lateral, inferior, superior) with a 15mA stimulus. If a positive MMG response was observed, stimulation current was decreased until the response disappeared. The minimum level of current capable of eliciting an MMG response for all four walls of each screw hole was noted. CT scans were taken post-operatively with interpretation performed by a single radiologist.

### Conclusions

MMG cutoff values of >7mA decreases the overall breach rate and resulted in a 98.9% likelihood of no medial or inferior breach during lumbar instrumentation. All breaches experienced during the use of MMG were asymptomatic, and none revision surgery. Further studies are needed to directly compare EMG to MMG.

### Results

122 consecutive patients with 896 lumbar pedicle screw pilot holes were tested intraoperatively with MMG. 7.4% of screw trajectories were repositioned intraoperatively prior to screw insertion. Post-operative CT showed a breach rate of 14.94% (95%CI=11.97-17.92), with 2.25% (95%CI=1.02-3.47) being medial or inferior. All breaches were asymptomatic, and no screw revisions were required. Using a cutoff of >7mA, the breach rate for medial and inferior for pilot hole was 1.09% (95%CI=0.17-2.01), compared to 2.17 (95%CI=1.02-3.32) for the screw test.

### Learning Objectives

By the conclusion of this session, participants should be able to:

- 1) Describe the differences between electromyography and mechanomyography (MMG) for the detection of nerve injury during instrumentation
- 2) Discuss the use of MMG for prevention of pedicle breach

### References

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