

Comparing Clip vs. Probe Triggered Electromyography (tEMG) of Minimally Invasive Lumbar Pedicle Screws: A Pilot Study

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No disclosures relevant to this study

Background

- Multimodal neurophysiologic monitoring is commonly used to detect and prevent neurologic complications
- Pedicle screw tEMG identifies thresholds to activate nerve-root specific muscle action potentials to identify screw malposition.



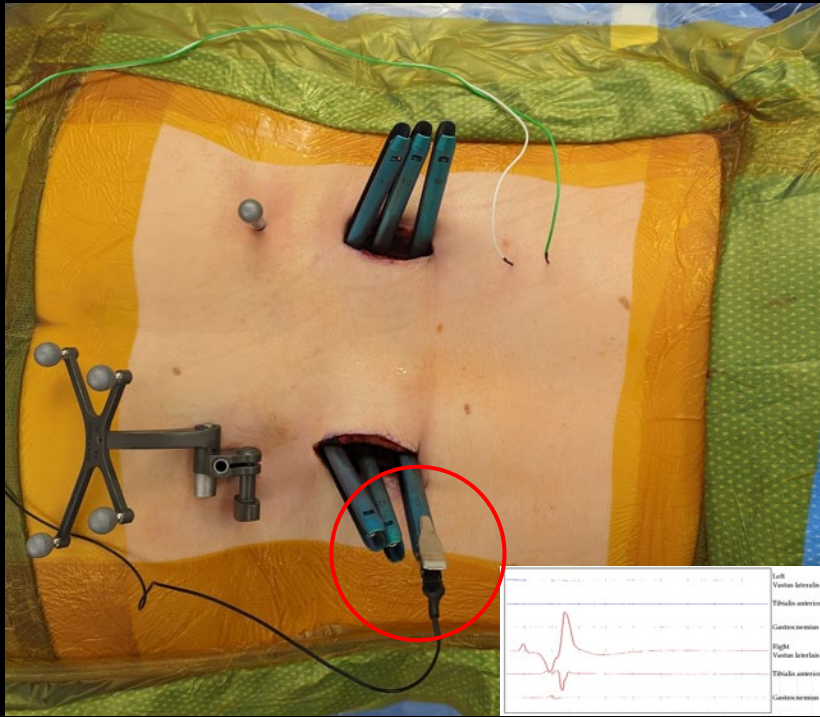
tEMG thresholds were defined using traditional pedicle screws (no tower)

The reliability & accuracy of different tEMG methods is poorly studied in MIS pedicle screws (with tower)



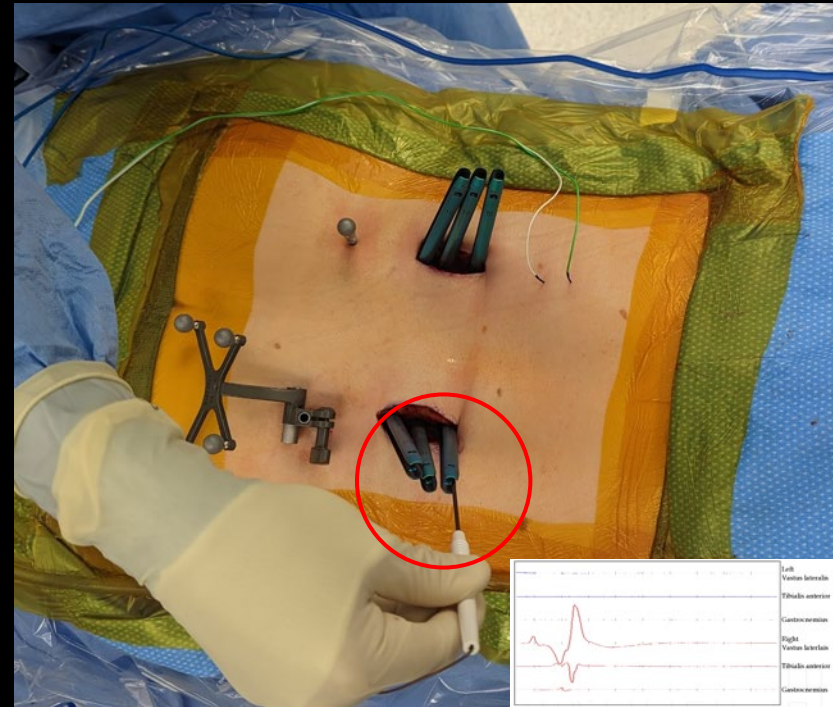
Objective

Evaluate tEMG differences using a clip at the top of the MIS screw tower vs. probe contacting the screw shank in lumbar procedures.



CLIP

vs.



PROBE

Methods

- Prospective, paired-comparison
- Single academic institution, Two surgeons
 - Inclusion: All lumbar cases with MIS screws (with towers)
 - Exclusion: Non-MIS screws, screws placed above L1
- Standardized technique:
 - Anode (needle) placed in paraspinals proximal to screws
 - Clip at top of tower – tEMG reading
 - Probe at head/shank of screw – tEMG reading
 - tEMG method: 0.2msec monophasic pulses at 3Hz with increasing intensity via software until muscle action-potential elicited

Methods

- Data tested for normality
- Descriptives
- Comparisons between Clip v Probe performed with paired-analyses

Post hoc Power Analysis

- Std Deviation from Pilot sample
- Defined clinically-relevant 2mA difference between groups
- 80% power ($\beta=0.20$)
- Calculate sample size to detect differences in future studies

Results

106 minimally invasive pedicle screws tested

- 23 patients (7M; 16F)
- Mean age: 64 ± 12 yrs (33-80)
- BMI: 29.4 ± 4.5 (21.7-37.8)

Lumbar Levels: L3:10 L4:30 L5:42 S1:24

tEMG Values (Mean \pm SD; Median; Range) :

Clip: 58.3 ± 24.0 ; 54.5; 17-100

Probe: 58.3 ± 24.5 ; 52.0; 17-100

$P > 0.05$

Results

- Absolute difference between Clip : Probe $\leq 6\text{mA}$ in 87.7% of screws

Post hoc analysis

- Std Deviation: 24.0 mA
- Clinically relevant mean difference: 2mA

Sample size to detect difference with 80% power:

Need 1157 screw stimulations.

Discussion & Conclusions

- Initial pilot study data found no difference in tEMG readings between Clip and Probe stimulation techniques.
- Despite having a longer, metal tower, tEMG *may* be reliably performed with either technique in MIS screws.

A future study with at least 1157 stimulations is necessary to confirm these preliminary findings with 80% power.

Thank you for your attention.



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