Clinical Summary

Accuracy and Precision of Three Acceleromyographs, Three Electromyographs, and a Mechanomyograph Measuring the Train-of-Four Ratio in the Absence of Neuromuscular Blocking Drugs

Background:
The accuracy and precision of new AMG and EMG monitors have not been well studied, particularly in the context of comparing these readings to MMG without the use of neuromuscular blocking drugs (NMBDs).

Objective:
To compare the accuracy and precision of AMG and EMG monitors with MMG under conditions of no NMBDs. The hypothesis was that EMG and MMG would be more accurate and precise than AMG and that normalizing AMG train-of-four ratio (TOFR) would correct overshoot issues.

Methods

Participants	Design	Procedure
• 28 patients undergoing elective general anesthesia cases with a supraglottic airway. • **Inclusion:** No NMBDs, both arms available for monitoring. • **Exclusion:** Known neuromuscular abnormalities.	• RCT involving 3 AMGs (Philips, Stimpod, TOFscan), 3 EMGs (TetraGraph, Stimpod, TwitchView), and an MMG. • Over 1000 TOF readings per device.	• Monitors placed on arms, with TOFR recorded manually every 12–20 seconds. • Expected TOFR was 1.0 due to the absence of NMBDs. • Normalization of AMG TOFR evaluated.

Results:
Baseline characteristics: since no NMBDs were present, expected TOFR is 1.0 (or 100%)1

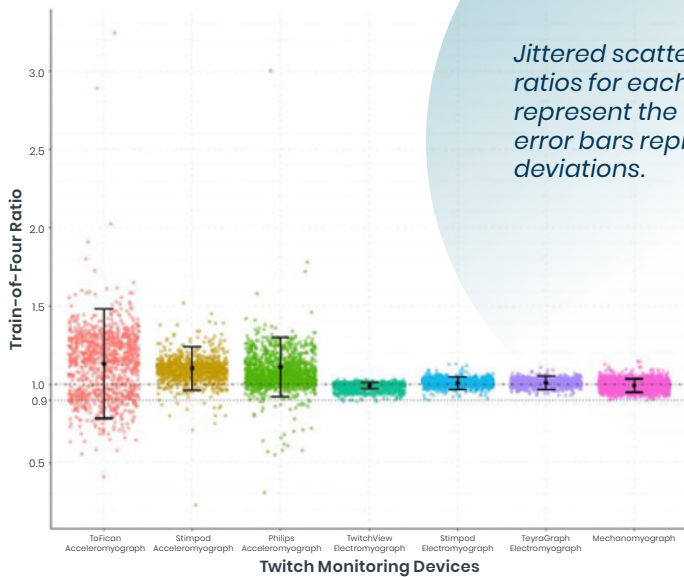| AMG Monitors	EMG Monitors	MMG Monitor
Wide baseline response range (23%–324%), significant overshoot (mean TOFR: 110%–113%).	Narrow baseline response range (89%–113%), mean baseline TOFR close to expected 100% (99%–101%).	Intermediate range (60%–116%), mean baseline TOFR of 99%.

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Jittered scatter plot of train-of-four ratios for each device. Black dots represent the estimated mean and error bars represent 2 standard deviations.

Key Findings:

- Normalizing AMG corrected overshoot but did not reduce variability.

- 51% of TOFscan, 27% of Stimpod, and 29% of Philips normalized TOFRs were outside the range of 0.9-1.1.

- Only 0.3% of EMG and MMG TOFRs were outside 0.9-1.1.

- EMG monitors, including TetraGraph, showed TOFRs within 1% of expected 100%.

Conclusion:

EMG monitors, including the TetraGraph, showed significantly better accuracy and precision than AMG monitors when measuring TOFR without NMBDs. AMG monitors exhibited overshoot and significant variability, which was not fully corrected by normalization. EMG monitors produced results similar to MMG, reinforcing their reliability for quantitative neuromuscular monitoring.

Clinical Relevance:

EMG should be considered the new standard for quantitative neuromuscular block (NMB) monitoring, offering consistent and accurate TOFR measurements, unlike AMG monitors which tend to overshoot despite normalization attempts.

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Access additional clinical evidence as well as learn more about quantitative train-of-four monitoring and the benefits of EMG technology.

References:
1. Harvey A, Masland R: A method for the study of neuromuscular transmission in human subjects. Bulletin of the Johns Hopkins Hospital 1941; 68: 81-93

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