Evaluation of an Independent Neuromuscular Blockade Monitoring Device

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Abstract
AcceleroMetrix has developed an independent muscle response sensor to objectively measure the level of neuromuscular blockade (NMB) in patients under general anesthesia without interfacing with a nerve stimulator.

Introduction
Neuromuscular blocking agents temporarily paralyze muscles to allow for easy tracheal intubation.

Gold standard NMB monitoring
- Train-of-four (TOF) monitoring measures the contraction of the adductor pollicis by electrically stimulating the ulnar nerve
- Determines appropriate time to prepare patient for extubation

Prototype Testing

Types of Hand Motions
1. Thumb Twitch
2. Wrist Flexion
3. Hand Flip

Test Procedure*
- 5 subjects
- 6 trials of each hand motion
- 2 Hz frequency (metronome)
*Performed without NMBAs or nerve stimulation

Data Analysis
- Signals of twitch vs. other hand motions
- Equivalence test: Software TOF vs. Manual TOF calculation
- Pass/fail criteria ± 0.05 of manually calculated TOF ratio

Results and Analysis
Each of the 3 axes has a different baseline based on the device’s orientation

The root mean square composite of the 3 axes creates a consistent baseline regardless of clip orientation

Discussion
- Root mean square of 3 axes used to eliminate the effect of gravity
- Identified peaks belonging to twitches
- Frequency of thumb twitches were consistent in a TOF test
- Challenges arise when identifying correct peak in compiled data

Potential Benefits

Relationship: TOF to level of NMB

0.0 ← TOF Ratio → 1.0
High ← Level of NMB → Low

- Faster objective monitoring
- Determine critical level to intubate and extubate patient
- Prevent residual paralysis
- Reduce risks of NMBAs and reversal drug over dosage and related complications
- Compatible with independent stimulator

Recommendations
- Compare TOF Clip to existing TOF monitors interfaced with stimulator
- Evaluate in clinical trials on subjects under NMBA with nerve stimulation

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References