Peripheral Nerve Stimulation

Train of Four
Objectives

- Introduction to Train of four

Figure 1. Electrode placement for twitch monitoring of the (a) ulnar nerve muscle and (b) facial nerve muscle.

Train of Four

- Method used to objectively monitor degree of chemical paralysis
- Peripheral Nerve Stimulation (PNS)
- Allows for correct dosage
  - Too little = movement
  - Too much = adverse effects
  - Lower doses
  - Faster recovery
- The number of responses to the TOF stimuli indicates the degree of neuromuscular blockade
- Only used for non-depolarising blockade
## Percentage of Block

<table>
<thead>
<tr>
<th>TOF Response</th>
<th>Approximate percentage of receptors blocked by agent</th>
<th>Clinical significance</th>
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</thead>
<tbody>
<tr>
<td>Four twitches</td>
<td>0 to 75</td>
<td>May be able to move although may experience weakness amenable to reversal of blockade with antagonists</td>
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<tr>
<td>Three Twitches</td>
<td>75</td>
<td>May need to administer additional drug to prolong relaxation Short or intermediate acting agents may be reversible</td>
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<tr>
<td>Two Twitches</td>
<td>80</td>
<td>Suitable for short term relaxation as well as long term mechanical ventilation</td>
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<tr>
<td>One Twitch</td>
<td>90</td>
<td>Usually gives conditions suitable for short term procedures including intubation and long term mechanical ventilation</td>
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<tr>
<td>Twitches absent</td>
<td>100</td>
<td>Conditions for intubation long-term saturation may lead to prolonged effect.</td>
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</table>
Procedure I

- Electrodes over ulna nerve
- Attach nerve stimulator
- Select the current necessary (20 mA)
- Place your fingers of one hand between the patient’s thumb and hand
Procedure II

- Press TOF once
  - It will deliver a train of four pulses where each is 0.5 seconds apart
- What you are observing for is thumb adduction
- Count the number of twitches the patient had out of four
- Adjust the medication as ordered. Goal is 1/4 to 2/4 twitches
- There is no need to use the other buttons on the stimulator
Procedure III

- If no twitching is seen
  - re-check the connections
  - check the electrodes
  - check the batteries

- If system appears to be working correctly, notify the Medical staff because patient may be 100% blocked

- Turn off the nerve stimulator between uses.
- Remove/replace electrodes as needed.
Threshold

- Do a baseline measurement before neuro muscular blockade is started
  - to determine current necessary to obtain twitch
  - 20 mA is often enough for many patients

- If threshold level is unknown
  - start at mid-range setting
  - increase incrementally until twitching is seen
Documentation

- Record threshold
- Number of twitches (1/4, 2/4 etc.)
References

- Organon Inc.: Train of four: Peripheral nerve stimulation. Organon Inc. West Orange, New Jersey.
- Straumanis J NMB monitoring A Protocol from Denver Children's Hospital
  http://PedsCCM.wustl.edu/CLINICAL/NMB_monitoring.html