ACCU KIT OF THE WEEK

THE ROYAL LONDON HOSPITAL

Peripheral Nerve Stimulator/ TOF

JM January 2021

What?

A device used at the bedside for monitoring depth of neuromuscular blockade (NMB) in paralysed patients.

Why use NMBAs?

Neuromuscular blocking agents (NMBA) block postsynaptic ACh Receptors in the neuromuscular junction. There are several uses of NMBAs in ACCU. In a ventilated patient with severe covid-19 respiratory failure, muscle relaxation allows advanced modes of ventilation, reduces patient-ventilator dyssynchrony, facilitates safe transfer off the unit, and permits safe proning manoeuvres.

What are the risks of using NMBAs in Critical Care?

NMBAs are commonly implicated in anaphylaxis and bronchospasm. Muscle relaxation should only be given with deep sedation as it is frightening and uncomfortable to be paralysed and aware. NMBAs provide no analgesia or anaesthesia- because many patients have deranged vital signs already it can be difficult to know if the paralysed patient on ACCU is aware and uncomfortable. Unintentional awareness and pain is likely to contribute to delirium.

ICU acquired weakness is a very serious complication of critical illness that can delay or even prevent recovery. There are multiple contributory factors, however, NMB is commonly implicated.

Why monitor depth of NMB?

Deep NMB prevents patients exercising many of their important muscles (including skeletal limb muscles, accessory muscles of breathing and the diaphragm). Excessive blockade and excessive duration of treatment should each be minimised to avert avoidable muscle wasting and weakness.

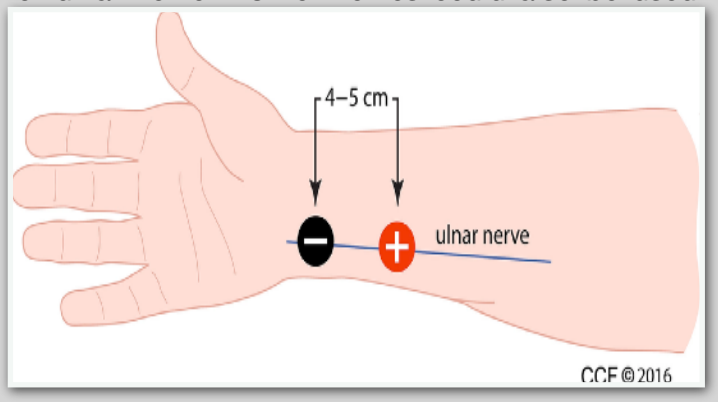
How does it work?

Train of four (TOF): 4 electric stimuli are delivered over a chosen nerve, separated by 0.5 seconds and muscle twitching of the affected group is observed. A device to record amplitude of response is used in research (not used on ACCU). Increasing doses of non-depolarising NMBAs (roc and atrac) cause progressive loss of twitches. The first one to go is the 4th twitch. Profound paralysis is present at 0/4.

Note that unless TOF shows no NMB, it does not tell you anything about adequacy of sedation and analgesia.

How do I perform a TOF?

Apply the positive and negative electrodes as shown for ulnar nerve. Other nerves could also be used.



Set the device to TOF and begin. Count the muscle twitches of the little finger. Titrate NMBA accordingly and repeat after 30 mins.

Avoid post-tetanic stimulation as this will underestimate paralysis and lead to excessive NMBA administration.

What should I aim for?

The ACCU consultant will advise on depth of NMB. Consensus documents routinely advocate a target of 2/4. This corresponds with 90% blockade at the NM junction. Paralysis of the diaphragm needs higher blood concentrations of NMBA than muscles of the limb. At a depth of 2/4, some useful contractility of the diaphragm is probably still preserved whilst patient-ventilator dyssynchrony is usually avoided.