MUSCLE RELAXANTS FOR INTUBATION

INTRODUCTION
Muscle relaxation is used to keep the child hold still during the procedure. Prior to using a muscle relaxant, you must make sure that you can ventilate a patient. Avoid paralyzing a patient who cannot be easily ventilated.

PHYSIOLOGY
Normal neuromuscular transmission occurs as follows (Figure 1):
1) Acetylcholine (ACh) is released into the extracellular space between the motor neuron terminal and the neuromuscular junction of the skeletal muscle fiber.
2) ACh attaches to the ACh receptors in the junction, causing a chemical depolarization
3) Electrical depolarization follows and the muscle fires a contraction.
4) ACh is quickly metabolized away by a cholinesterase that is present in the junction.
5) Muscle relaxation occurs.

Muscle-relaxants alter this normal progression:
Depolarizing muscle relaxant mechanism of action (Figure 2):
- Structure is similar to ACh, allowing it to bind to the ACh receptor.
- Binding causes the depolarizations and subsequent muscle twitch
- A circulating form of cholinesterase is required to metabolize the relaxant, so until this gets into the neuromuscular junction, the receptor stays occupied and the patient remains paralyzed.
- In patients with normal cholinesterase levels, this takes 5-10 minutes.

Contraindications: Muscle twitching can cause potassium movement extracellularly, leading to increased serum potassium level. As a caution, depolarizing muscle relaxants should not be used in patients with hyperkalemia, with muscle diseases such as congenital myopathies and myotonia, or those suffering from burns, trauma or spinal cord trauma.

Non-depolarizing muscle relaxant mechanism of action (Figure 3):
- In the neuromuscular junction, it blocks ACH from binding to the ACH receptor through competitive inhibition.
- No depolarization occurs, and therefore no muscle twitching.
- Continues blocking the receptor until it is metabolized/excreted.
SUCCINYLCHOLINE
- Depolarizing muscle relaxant
- Advantages: potent, reliable and fast acting
- Onset: 60 seconds
- Duration: 5-10 minutes
- Dose: 1-2 mg/kg IV; 3-4 mg/kg/dose IM
- Good for rapid sequence intubation.
- See contraindications above for depolarizing muscle relaxants.

PANCURONIUM AND VECURONIUM
- Pancuronium
  - Non-depolarizing muscle relaxant, steroid-based compound, vagolytic properties
  - Onset time: 3-4 minutes with low dose, 2-3 minutes with high dose
  - Duration: 45 minutes
  - Dose: 0.1-0.2 mg/kg/dose IV
  - Caution in patients with renal failure
  - Steroid-based component may be harmful in long-term use.

- Vecuronium
  - Non-depolarizing muscle relaxant, steroid-based compound, less vagolytic properties than pancuronium
  - Onset time: 3-4 minutes with low dose, 2-3 minutes with high dose
  - Duration: 20 minutes for low dose
  - Dose: 0.1-0.2 mg/kg/dose IV
  - Caution in patients with renal failure
  - Steroid-based component may be harmful in long-term use.

CISATRICURIUM
- Non-depolarizing muscle relaxant.
- Hofmann degradation (does not require renal or hepatic function)
- Onset time: 2-4 minutes
- Duration: 20 minutes
- Dose: 0.2 mg/kg/dose IV
- Good for patients with hepatic and renal failure.
- May cause histamine release and hypotension at high doses.

ROCURONIUM
- Non-depolarizing muscle relaxant
- Onset time: 2 minutes with 0.06 mg/kg dose, 1 minute with 1.2 mg/kg dose
- Duration: 20 minutes with 0.06 mg/kg dose, 40 minutes with 1.2 mg/kg dose
- Dose: 0.6-1.2 mg/kg/dose IV
- Good for rapid sequence intubation, especially when you do not want to use succinylcholine

SUMMARY
The combination of drugs used for intubation vary depending on the clinical setting. The use of appropriate medications for sedation and muscle relaxation allow the patient to remain comfortable during the procedure, and gives the intubating team the best possible conditions for a successful intubation.