

Episode 26: Sugammadex

On this episode: Dr. Jed Wolpaw and Dr. Amit Prabhakar

In this episode I welcome [Dr. Amit Prabhakar](#), one of our critical care fellows, to the show to discuss Sugammadex, a relatively recently approved (in the USA) reversal agent for Rocuronium and Vecuronium.

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What is sugammadex?

- [December 2015](#) FDA approval for reversal of “moderate and deep muscular blockade”
- Modified gamma-cyclodextrin that works differently than neostigmine. After IV injection, molecule binds to muscular binding agents (rocuronium or vecuronium) as an inert complex. Sugammadex encapsulates and inactivates the blocker in plasma, creating a gradient for the neuromuscular blocker (NMB) to shift out of the neuromuscular junction and into plasma.
- Does not affect release or breakdown of acetylcholine. Neostigmine, however, does flood the junction with ACh to compete with the NMB.

How do traditional NMB work?

- Acetylcholinesterase inhibitor, usually neostigmine
- With anti-acetylcholine agent, usually glycopyrrolate to counteract unwanted effects of ACh in body, such as nausea, vomiting, heart rate change. Only works on muscarinic receptors.
- Another combo used is pyridostigmine/atropine.
- Not instantaneous – can take up to 20 min for up to full reversal.

More about sugammadex reversal

- Full reversal takes 3 minutes.
 - Primarily excreted through kidneys
 - **Efficacy:** Multicentered, randomized, parallel-group, active-controlled, safety-assessor blinded study to compare efficacy of 2 mg/kg sugammadex vs 50 mcg/kg neostigmine with 10 mcg/kg glycopyrrolate for reversal of moderate blockade (1-2 twitches) by rocuronium or vecuronium.
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- 189 patients with primary endpoint at start of reversal to Train of Four ratio of 0.9 (full reversal).
 - Sugammadex recovery time of 1.7 min reversal for moderate blockade.
 - Another study with similar methodology for deep blockade (1-2 post-tetanic twitches), found time to recover from 4 mg/kg sugammadex of 2.7 minutes.
 - Post-Tetanic Count: After failing to elicit normal ToF, give 5 seconds of stimulus at 50hz, followed by 3 second pause where how many post-tetanic twitches are counted, then 1 stimulus at 1 Hz until no more twitches elicited.

What is emergent reversal?

- Study looked at efficacy of sugammadex given 3 minutes after rocuronium (RSI dose of 1.2 mg/kg) vs succinylcholine (1 mg/kg).
- Recovery from succinylcholine took \approx 7 minutes.
- Recovery from rocuronium took 4.4 minutes, after giving sugammadex 3 min following rocuronium administration.
- Clinically important for patients with contraindications to succinylcholine (eg malignant hyperthermia, hyperkalemia, elevated intracranial pressures).

Special populations?

- No indicated dose adjusted for patients with cardiac/pulmonary/hepatic disease, mild to moderate renal disease, geriatrics.
- Not indicated for severe renal disease, including hemodialysis patients (unless high flux filter, which clears 70% in 2-4 hours ([study](#))). No known toxic effect of buildup.
- What level of renal impairment to not use? CrClearance < 30
- ICU population not fully studied at the time.

What if sugammadex given but need to re-paralyze?

- For sugammadex reversal dose of 4 mg/kg, recommended waiting time is 5 minutes for a dose of rocuronium administered 1.2 mg/kg (RSI dose).
- For emergency dose of 16 mg/kg, manufacturer recommends waiting 24 hours or consider use nonsteroidal NMB agent, like cisatracurium.

What are some downsides to using sugammadex?

- Most common: vomiting, pain, nausea, transient hypotension, headache.
- Case reports of profound bradycardia responsive to anti-Acetylcholine like atropine. This is more associated with large bolus doses (16 vs 2 or 4)
- Uncommon cases of anaphylaxis
- Transient increase in coagulation markers (PT/PTT/INR), but no clinical significance.
- Oral contraceptive pills – Must counsel to use non-OCP or have backup contraceptive devices for next 7 days!
- Possible prolong QTc, like odansetron.

Final thoughts:

- Important to have available, particularly because it can reverse deep or emergent blockades.
- Works faster but decisions made institutionally/ financially
- Effects of rocuronium most significant, then vecuronium.

Is sugammadex used at your institution? How do you reverse neuromuscular blockade?

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Notes by [Brian Park](#)