Pharmacy Friday

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Airway Series: Paralyzing Agents

Introduction

1. Rapid sequence intubation (RSI) is a process whereby an induction agent and a neuromuscular blocking agent are given in rapid succession to facilitate endotracheal intubation
2. The selection of a specific sedative depends on multiple factors: the clinical scenario, which includes patient factors (includes cardiorespiratory and neurologic status, allergies, comorbidity) and the clinician's experience/training and institutional factors, as well as the characteristics of the paralytic
3. Succinylcholine remains the most commonly used paralyzing agent, however, it does have pharmacologic considerations
4. The use of rocuronium continues to increase due to its unique pharmacologic profile and its niche is becoming prevalent in situations where the risk of hyperkalemia and bradycardia are high

	Succinylcholine	**Rocuronium**
Dose	IV: 1.5 mg/kg; IM: 3-4 mg/kg (ABW)	1-1.2 mg/kg (IBW)
Administration	IV push	IV Push
Formulation	200 mg/ 10 ml vial (must be refrigerated)	**100 mg/10 ml vial** (non-refrigerated)
PK/PD	Onset: **40-60 seconds** **Duration: 4-10 minutes** Metabolism: Rapidly hydrolyzed by plasma pseudocholinesterase to inactive metabolites Renal Excretion:10%	Onset: ~ **IV 45-90 seconds** **Duration: 30-90 minutes** Metabolism: N- demethylation Renal Excretion:
Adverse Effects	**Bradycardia, Hyperkalemia, fasciculations,** ↑ intraocular pressure, transient ↑ ICP ~5-10 mmHg, malignant hyperthermia (rare)	**Very few reported** Increased peripheral vascular resistance (abdominal aortic surgery)
Drug Interactions	No major reactions	No major reactions
Compatibility	Incompatible with sodium bicarbonate, nafcillin, oxacillin, phenytoin, phenobarbital	Incompatible with furosemide, regular insulin, lorazepam, phenytoin, pantoprazole, and Zosyn

	Succinylcholine	Rocuronium
Contraindications	Hypersensitivity to succinylcholine or any component of the formulation; personal or familial history of malignant hyperthermia; skeletal muscle myopathies; >3-5 days following major burns,	Hypersensitivity to rocuronium

	intra-abdominal sepsis, multiple trauma, extensive denervation of skeletal muscle, or upper motor neuron injury.	

	Advantages per EM Physicians	Considerations per EM Physicians
Succinylcholine	Shorter duration of paralysis	Can see hyper-K with CNS/spinal cord injury (>3 days), myopathies, burns (few days late), IA sepsis, critical illness, and occasionally with severe traumatic injury acutely due to succinic acid mechanism. Avoid sux when possible in pediatric populations (<8)
Rocuronium	Has reversal agent, not associated with malignant hyperthermia, not associated with hyperkalemia (no fasciculation), dosed on ideal body weight (100mg will give 1.2 mg/kg for male that is 6'4) Certain centers (not GHS) may have access to sugammadex (Bridion) instead of neostigmine + atropine for reversal.	Longer paralytic time, however has reversal agent

Overview of Evidence			
Author, year	Design/ sample size	Intervention & Comparison	Outcome
April, 2018	Prospective cohort study/ n= 4,275	Succinylcholine ≥ 1.5 mg/kg vs Rocuronium ≥ 1.2 mg/kg	First-pass intubation success rate was **no difference between the agents** with 87.0% with succinylcholine versus 87.5% with rocuronium (adjusted OR 0.9; 95% CI 0.6- 1.3 **Incidence of any adverse events were no difference** There was a difference in first pass intubation success with rocuronium ≥ 1.2 mg/kg compared to (<1.2 mg/kg)
Tran, 2017	Cochrane Meta-Analysis / n= 4151	Succinylcholine ≥ 1 mg/kg vs Rocuronium ≥ 0.6 mg/kg	Overall, **succinylcholine was superior** to rocuronium for achieving excellent intubating conditions (risk ratio (95%CI) 0.86 (0.81 to 0.92), n = 4151) and clinically acceptable intubation conditions (risk ratio (95%CI) 0.97 (0.95–0.99), n = 3992). **A high incidence of detection bias** amongst the trials
Patanwala, 2016	Retrospective cohort study/ n=233	Succinylcholine (dosing not reported) vs Rocuronium (dosing not reported)	**In the high-severity** TBI patients**, succinylcholine was associated with increased mortality compared with rocuronium (OR 4.10, 95% CI 1.18–14.12).**
Patanwala, 2011	Retrospective analysis/ n=327	Succinylcholine 1.65 mg/kg vs Rocuronium 1.19 mg/kg	**The rate of first-attempt intubation success was similar** between the succinylcholine and rocuronium groups (72.6% vs. 72.9%, p = 0.95).
Watt, 2012	retrospective cohort study/ n=200	Succinylcholine 1.7 ± 0.7 mg/kg vs Rocuronium 1.3 ± 0.4 mg/kg	After intubation, 77.5% (n=155) of patients were initiated on a sedative infusion of propofol (n=148) or midazolam (n=7). **Mean time to post intubation sedation was significantly greater with rocuronium compared to succinylcholine (27 min vs 15; p <0.001)**
Smith 2002	Prospective, blinded Study/ n=100	Rocuronium 1 mg/kg vs Vecuronium 0.15 mg/kg	**Intubation was successful in 95% of patients in the vecuronium group and 100% in the rocuronium group**
Weiss,1997	RCT/ n=45	Succinylcholine 1.5 mg/kg vs Rocuronium 0.7 and 0.9mg/kg	Rocuronium bromide at a dose **of 0.9 mg/kg provides intubating conditions similar to succinylcholine 1.5 mg/kg at 1 minute**. Intubating conditions at 1 minute following rocuronium **0.7 mg/kg** inferior to higher dose of rocuronium or succinylcholine.
Magorian 1993	RCT/ n= 50	Succinylcholine 1 mg/kg vs Rocuronium 0.6, 0.9, and 1.2 mg/kg vs Vecuronium 0.1 mg/kg	Onset time of rocuronium 0.9 mg/kg and 1.2 mg/kg rocuronium and succinylcholine 1 mg/kg) were similar; **onset times fo rocuronium 0.6 mg/kg and vecuronium mg/kg) were much longer.** **Rocuronium (1.2 mg/kg) had a mean onset time of 55 seconds**, which was similar to the mean onset time of succinylcholine (50 seconds)

References

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