



Airway Management: Use of Succinylcholine or Rocuronium

Practice Considerations

Introduction

Each healthcare facility and its staff determine the appropriate medications required to safely manage routine and unexpected patient anesthesia needs. There have been reports of healthcare organizations considering replacing succinylcholine, a malignant hyperthermia (MH) triggering agent, with rocuronium, a non-depolarizing muscle relaxant, or keeping succinylcholine for emergent use and removing dantrolene from the formulary. These organizations are often small ambulatory surgery centers, endoscopy clinics, or office settings where succinylcholine may be the only MH-triggering agent on formulary. If succinylcholine is no longer available in the facility, the need for dantrolene to manage an MH crisis no longer exists. When appropriate for the patient, the combination of rocuronium and sugammadex, a neuromuscular blockade reversal agent, may provide an alternative to use of succinylcholine for emergent airway management in adults by providing complete reversal of the neuromuscular blockade, limiting the need for prolonged ventilation.¹

Position Statement

With a focus on patient safety, anesthetizing locations have access to medications, as identified by anesthesia professionals, to address routine and emergency oxygenation, ventilation, and airway management. All clinicians and staff are aware of the location of emergency equipment, supplies and medications. The facility complies with applicable federal, state and local law and regulations, accreditation standards, and internal policies and procedures.

Practice Considerations

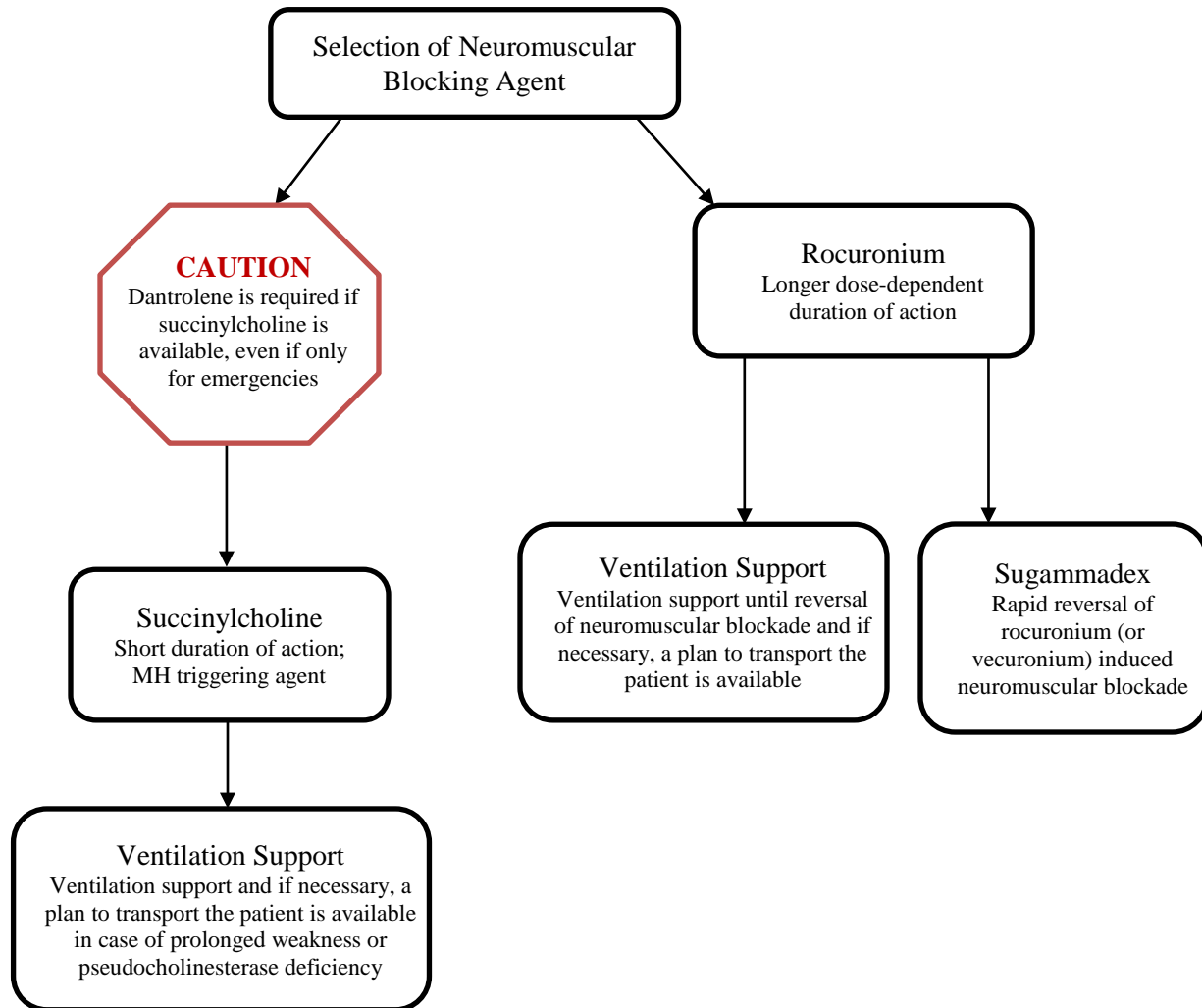
- Succinylcholine is a depolarizing neuromuscular blocking agent (NMBA) with a rapid onset and elimination for spontaneous recovery to manage a difficult or emergent airway when return to spontaneous ventilation is desired and prolonged ventilation may not be available.
- Rocuronium may be used for difficult or emergent airway management, requiring a period of time for recovery of neuromuscular function before neostigmine or other cholinesterase inhibitor reversal agents are effective.
- In December 2015, the U.S. Food and Drug Administration (FDA) approved sugammadex in U.S. markets for the rapid reversal of neuromuscular blockade induced by rocuronium bromide and vecuronium bromide. Sugammadex encapsulates rocuronium or vecuronium, rendering the bound NMBA inactive to be eliminated by the kidneys.
- The combination of rocuronium and sugammadex may be an alternative to succinylcholine for neuromuscular blockade for airway management in many patients.
- When appropriate, consideration of contraindications and available alternatives to medications occurs during the patient assessment, evaluation and the informed consent process when the

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patient is made aware of the medications to be used and the risks, benefits, and implications of those medications before, during, and after the procedure.

- When neuromuscular blocking and reversal agents are administered, monitor neuromuscular response to assess depth of blockade and degree of recovery.²
- Figure 1 highlights considerations and decision points for facilities and clinicians when determining which NMBA to have available in the anesthetizing location.

Figure 1. Use of Succinylcholine Compared to Rocuronium



Succinylcholine

Over time, succinylcholine has been the drug of choice to manage difficult and emergent airway issues in settings where sedation or anesthesia services are provided.³ Succinylcholine is currently the only rapid onset, short-duration depolarizing NMBA that produces an intense, consistent block used for rapid intubation, emergency airway management, and treatment of airway obstruction.⁴⁻⁸ When non-pharmacologic techniques do not resolve a laryngospasm, intravenous or intramuscular succinylcholine,

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when intravenous access is not available, may improve ventilation or facilitate intubation of the airway.⁹ When succinylcholine is administered, possible adverse reactions should be considered (e.g., myalgia; hyperkalemia; bradycardia and cardiac dysrhythmias; increased intraocular, intracranial, and intragastric pressure; pseudocholinesterase deficiency; MH crisis).¹⁰⁻¹² When NMBA's are administered, facility policy includes procedures for ventilation and/or patient transport.

Dantrolene Required for Malignant Hyperthermia Crisis

Succinylcholine and certain inhaled anesthetic agents (e.g., halothane, sevoflurane, desflurane, and isoflurane) are known malignant hyperthermia triggering agents.¹³⁻¹⁵ Approximately 55 percent of MH cases in the United States and Canada have included the administration of succinylcholine, either alone or in combination with volatile anesthetics.¹⁵⁻¹⁷ Therefore, a facility that stocks MH-triggering agents, including succinylcholine, even if only for emergency airway management, should have dantrolene available and an MH crisis protocol in place.^{14,18}

Immediate treatment of an MH crisis, including the use of dantrolene, is essential for patient survival.^{14,19} There is no guarantee that, even with careful health history screening, all patients at risk of MH crisis will be identified.

Rocuronium / Succinylcholine Comparison

When considering the risks and benefits of using rocuronium or succinylcholine, clinicians weigh multiple factors that include airway management, ability to ventilate and oxygenate, anaphylaxis, unanticipated difficult airway, and possible need for assisted or mechanical ventilation.²⁰ A “can’t ventilate, can’t intubate” scenario may be prolonged when rocuronium is administered.^{21,22} A neuromuscular blockade antagonist and equipment for oxygenation, airway management, and mechanical ventilation, and are available when neuromuscular blocking agents are administered.²³

Rocuronium has been administered as an alternative non-depolarizing NMBA for rapid airway management, including airway obstruction for adults and pediatric populations, and when succinylcholine is contraindicated.^{4,11,20,24-27} Rocuronium has a similar onset of action as succinylcholine with a dose of 1.0-1.2 mg/kg IV, but a longer, dose-dependent duration of action.^{12,28} Rocuronium may be used as an alternative to succinylcholine when succinylcholine is contraindicated, a similar rapid onset is desired, and a longer period of recovery from neuromuscular blockade is appropriate.^{25,29} If rocuronium is used in place of succinylcholine, for intubation at doses of 1.0-1.2 mg/kg IV, airway management supplies and equipment should be available to secure the airway and provide prolonged ventilation support until the neuromuscular blockade has been resolved.³⁰⁻³²

Sugammadex

Sugammadex has been shown to be safe and effective for reversal of neuromuscular blockade induced by rocuronium and vecuronium in three minutes or less.^{21,33-38} Reversal occurs at 1.5 min with a dose of 16 mg/kg and 3 min with a dose of 4 mg/kg. The availability of sugammadex provides anesthesia professionals an alternative for rocuronium-induced neuromuscular blockade reversal, minimizing or eliminating the need for succinylcholine for rapid airway management, intubation and treatment of airway obstruction.^{21,29,39} The rocuronium – sugammadex combination may also optimize surgical conditions by allowing anesthesia professionals to maintain deep neuromuscular blockade throughout the procedure until the end of the case.²⁹ The assessment of neuromuscular recovery using a neuromuscular blockade monitor is recommended prior to extubation.⁵

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In studies, sugammadex has been shown to provide a more rapid reversal of moderate rocuronium-induced neuromuscular blockade than neostigmine.^{40,41} Reversal using sugammadex for a high-dose rocuronium-induced neuromuscular block has been shown to take less time than spontaneous recovery from succinylcholine.^{42,43} Similar recovery times have been noted in pediatric and adult populations from sugammadex reversal of rocuronium-induced blockade.⁴⁴ Sugammadex doses vary based on patient age and comorbidities, the neuromuscular blocking agent used, and the depth of the neuromuscular block at the time of reversal.^{21,38} Results from a recent meta-analysis suggest that sugammadex is superior to neostigmine, as it reverses NMB faster and more reliably, with a lower risk of adverse effects.⁴⁵

When considering a combination of rocuronium and sugammadex for a difficult or emergent airway, conduct a risk-benefit analysis of time to prepare the sugammadex with the return of spontaneous respiration. Also, calculate the full reversal dose to have the drug dose and supplies necessary to prepare the drug available in the anesthetizing location.^{39,46}

Contraception Precaution

Since the efficacy of hormonal contraceptives may be reduced, patients using hormonal contraceptives should be advised to use an additional, non-hormonal contraceptive for seven days following sugammadex administration.¹ See package insert for full details on drug contraindications.¹

Conclusion

The ability of sugammadex to reverse rocuronium-induced NMB within 1.5 – 3.0 minutes of administration of a patient-specific dose is a rationale being considered for removal of succinylcholine and dantrolene, where no other MH triggering agents are present, from the formulary. Facilities and clinicians have an opportunity to work together when developing the drug formulary, as well as policy for medications, supplies, equipment, and skills necessary for patient safety regardless of facility type or location. Although studies have shown that there is no statistical difference in intubating conditions when succinylcholine was compared to rocuronium, succinylcholine provides the desirable clinical conditions due to its shorter duration of action.^{25,47} If rocuronium is available for airway management in place of succinylcholine, ventilation support or sugammadex should be available as a rapid reversal agent.^{48,49}

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Adopted by AANA Board of Directors September 2016.

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