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Evidence-Based Medicine

ROCURONIUM VS. SUCCINYLCHOLINE IN THE EMERGENCY DEPARTMENT: A CRITICAL APPRAISAL

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□ **Abstract—Background: Two methods of paralysis are available for rapid sequence intubation (RSI) in the emergency department (ED): depolarizing agents such as succinylcholine, and non-depolarizing drugs such as rocuronium. Rocuronium is a useful alternative when succinylcholine is contraindicated. Contraindications to succinylcholine include allergy, history of malignant hyperthermia, denervation syndromes, and patients who are 24–48 h post burn or crush injury. Non-depolarizing drugs have the advantage of causing less pain due to post-paralysis myalgias. Clinical Question: Can rocuronium replace succinylcholine as the paralytic of choice for RSI in the ED? Evidence Review: Four relevant studies were selected from an evidence search and a structured review performed. Results: For the outcomes of clinically acceptable intubation conditions and time to onset, the two agents were not statistically significantly different. Succinylcholine seems to produce conditions that have higher satisfaction scores. Conclusion: Succinylcholine remains the drug of choice for ED RSI unless there is a contraindication to its usage. © 2009 Elsevier Inc.**

□ **Keywords—evidence-based medicine; EBM; rapid sequence intubation; RSI; rocuronium; succinylcholine; intubation**

CASE

A 29-year-old man presents to the Emergency Department (ED) via paramedics after a rollover motor vehicle accident with associated blunt head trauma and an apparent left femur fracture. He is in a cervical collar on a backboard with oxygen by facemask. He has received 250 cc of normal saline en route. His Glasgow Coma Scale score (GCS) is 9 (Eye = 1, Verbal = 3, Motor = 4) and his left pupil is sluggish to light. The FAST (focused assessment with sonography in trauma), four views, is negative and his vital signs are: blood pressure 155/100 mm Hg, heart rate 122 beats/min, respiratory rate 16 breaths/min, and temperature 36.6°C (98.0°F). Airway evaluation suggests no apparent problems with intubation visualization except for low neck mobility secondary to the presence of a cervical collar. The decision is made to perform rapid sequence intubation (RSI) before immediate diagnostic imaging and neurosurgical consultation.

CLINICAL QUESTION

Can rocuronium replace succinylcholine as the paralytic agent of choice for ED RSI in patients similar to this patient?

CONTEXT

Although RSI has revolutionized ED airway management and is routinely used, clinicians continue to search

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for the optimal paralytic agent. Succinylcholine is the agent most frequently employed. The agent has rapid onset, a short half-life, and reliably creates excellent intubating conditions. The drawbacks to succinylcholine include several contraindications, myalgias, and post-paralysis pain due to the fasciculations caused by the drug, as well as concerns about hyperkalemia (1–3). These concerns, although often noted, may not be as pertinent as widely believed. For example, in clinical situations where hyperkalemia exists up to 6.0 mEq/L, succinylcholine was used safely in a large trial of over 41,000 intubations (4).

Non-depolarizing drugs like rocuronium have fewer contraindications, do not cause fasciculations, and have a much longer half-life. Rapacuronium, initially marketed as the non-depolarizing solution to this debate, was a very rapid-onset non-depolarizing drug that was pulled from the market due to a serious side effect of bronchospasm (5).

With rapacuronium's withdrawal, rocuronium remains the sole contender as an alternative to succinylcholine. Neither vecuronium nor pancuronium is fast enough in onset to be seriously considered in this setting. Rapid sequence induction in the operating suite is frequently different from rapid sequence intubation in the ED. For this reason, articles from the anesthesia literature are not necessarily externally valid or generalizable to the ED setting. In ED RSI, the potential for a difficult airway is greater when there is trauma to the head and neck, blood in the mouth, a full stomach, or the presence of cervical spine precautions. These conditions are common in the ED and relevant to the clinical scenario presented. Therefore, differences between paralytic agents in creating optimal conditions for intubation are likely to be magnified in ED RSI.

Finally, the long duration of non-depolarizing drugs can be a problem if intubation is difficult because prolonged bag-valve-mask ventilation (BVM) will be required. A new reversal agent for non-depolarizing agents, sugammadex, recently has been released and has rekindled the discussion about replacing succinylcholine as the agent of choice for RSI, but evidence of its safety for use in ED settings is not yet available (6).

EVIDENCE SEARCH

Using PubMed, search terms used were "succinylcholine and rocuronium." Limits on the search were "Clinical trial, randomized controlled trial or meta-analysis and clinical journals." Terms were entered with these limits and 80 items were displayed and reviewed. Four relevant studies were acquired and critically appraised.

EVIDENCE REVIEW

Rocuronium versus succinylcholine for rapid sequence induction of anesthesia and endotracheal intubation: a prospective, randomized trial in emergent cases. *Anesthesia and Analgesia*, 2005 (7).

Population. There were 234 adult patients undergoing emergent surgery under general anesthesia. After application of the exclusion criteria, 180 patients were randomized and included in analysis.

Study design. Non-blinded, randomized, controlled trial.

Intervention. Rocuronium was given as a paralytic agent at a dose of 0.6 mg/kg.

Control. Succinylcholine was given as a paralytic agent at a dose of 1.0 mg/kg.

Primary outcome. Intubating conditions as assessed by the intubating anesthesiologist using both numerical and qualitative scales. The numerical scale consisted of a nine-point grading system for intubating conditions, with a difference of at least one point being considered clinically relevant. Intubating conditions were assessed at the time of intubation in the group receiving succinylcholine vs. at 60 s after administration in the group receiving rocuronium.

Secondary outcome. Time to intubation.

Exclusion criteria. Hyperkalemia, neurologic disorder, burn, family history of malignant hyperthermia, known or anticipated difficult endotracheal intubation warranting awake fiberoptic intubation, cesarean delivery, complications during birth before delivery, contraindication against propofol, and allergy to rocuronium.

Main results. Intubating conditions were significantly better after administration of succinylcholine than with rocuronium. The numerical grading score results were 8.6 ± 1.1 for succinylcholine vs. 8.0 ± 1.5 for rocuronium ($p < 0.001$). The time interval between the beginning of the administration of propofol and the first appearance of end-tidal carbon dioxide after endotracheal intubation was significantly shorter ($p < 0.0001$) in the succinylcholine group (median time, 95 s) compared with the rocuronium group (median time, 130 s).

Comparison of rocuronium and suxamethonium (succinylcholine) for use during rapid sequence induction of anaesthesia. *Anaesthesia*, 1998 (8).

Population. There were 348 adult patients scheduled for elective or emergency surgery requiring endotracheal