

# General anesthesia for emergency cesarean section

## Neuromuscular blocking agent



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# Background

## **Suxamethonium:**

**Pro-Airway:** Good profile for RSI: fast onset and fast half-life.

**Con-Airway:** Depolarizing agent – Risks: Hyperkalemia, Malignant hyperthermia, abnormal cholinesterase genotypes.

**Pro-neonate:** The placental transfer is virtually none

## **Rocuronium:**

**Pro-airway:** Fast onset of action, but long half life, no serious adverse effects

**Con-airway:** Long half life – can be reverted by Sugammadex

**Con-neonate:** The placental transfer of Roc is approximately 16%

**Research question: Are Sux and Roc comparable in the obstetric setting?**

- when it comes to airway management and in the effect on the neonate

# PICO

**Population:** Women undergoing general anesthesia for emergency cesarean section.

**Intervention:** Rocuronium given at anesthesia induction in any doses

**Comparison:** Suxamethonium given at anesthesia induction in any doses

**Outcomes:**

1. Neonatal apgar

(as a measure for muscle weakness in the neonatal due to effect from the neuromuscular blocker)

2. Intubation condition

(ease of laryngoscopy/jaw relaxation, position of vocal cord, diaphragmatic activity)

3. Failed intubation

# Search strategy

## Pubmed no filters

- Multiple searches - very few hits
- Search words in different combinations:  
General anesthesia; Emergency; Cesarean section; Rocuronium; Suxamethonium; Neuromuscular blocker; Neonatal; apgar; Intubation condition; Failed intubation.
- We searched through the references in the articles we found.

## Selection of articles.

- We found 15 relevant articles in total.
- We chose the 6 articles with the highest quality of evidence, one article per group member.
- 1 Systematic review, 4 RCTs and 1 prospective multicenter study.

# Articles

- **Systematic review:** Rocuronium vs. succinylcholine for rapid sequence intubation: a Cochrane systematic review. Tran et al. 2017.
- **RCT:** Surgical conditions with rocuronium versus suxamethonium in cesarean section. Blaha et al. IJOA, 2019
- **RCT:** Rapid sequence induction and intubation with 1 mg/kg rocuronium bromide in cesarean section, comparison with suxamethonium. Abu-Halaweh et al., Saudi Med J, 2007
- **RCT:** Low-Dose or High-Dose Rocuronium Reversed with Neostigmine or Sugammadex for Cesarean Delivery Anesthesia: A Randomized Controlled Noninferiority Trial of Time to Tracheal Intubation and Extubation. Stourac et al., Anesth Analg, 2016
- **RCT:** Rocuronium versus suxamethonium for rapid sequence induction of general anaesthesia for cesarean section: influence on neonatal outcomes. Kosinova et al. Int J Obstet Anesth, 2017
- **Prospective study, multicenter:** Rocuronium (Org 9426) for caesarean section. Abouleish et al., Br J Anaesth, 1994,

Certainty assessment							No of patients		Effect	Certainty	Importance
outcome	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	rocuronium	suxamethon	Narrative		
<b>Tran et al. 2017</b>											
Intubation conditions	Meta analysis	serious	not serious	serious	not serious	strong association	2192	1989	Favors Suxa RR=0.86 (0.81, 0.92)	⊕⊕⊕○ Moderate	CRITICAL
<b>Blaha et al. IJOA, 2019</b>											
APGAR score	RCT	serious	not serious	serious	serious	strong association	45	45	No statistical difference in APGAR score between the 2 groups - the study was not powered for this outcome	⊕⊕○○ Low	IMPORTANT

Certainty assessment							No of patients		Effect	Certainty	Impo
outcome	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	rocuronium	suxamethonium	Narrative		
Kosinova et al. Int J Obstet Anesth, 2017											
APGAR score	RCT	not serious	not serious	serious	serious	strong association	263	262	NO statistical difference between groups for APGAR 5-10  Only significant low APGAR score at 1 min for rocuronium group compared to suxamethonium group	⊕⊕⊕○ Moderate	IMPO
Abu-Halaweh et al., Saudi Med J, 2007											
Intubation conditions	RCT	not serious	not serious	serious <sup>c</sup>	not serious	strong association	60	60	Intubation conditions were good in 95% versus 97% roc versus sux	⊕⊕⊕⊕ High	CRIT
Failed intubation	RCT	not serious	not serious	serious <sup>c</sup>	not serious	strong association	60	60	There have not been reported failed intubation events	⊕⊕⊕⊕ High	CRIT

Certainty assessment							No of patients		Effect	Certainty	Importance
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<b>Stourac et al., Anesth Analg, 2016</b>											
APGAR	RCT	serious <sup>d</sup>	not serious	serious <sup>c</sup>	not serious	strong association	120	120	No statistical difference in APGAR score between 5 and 10 min but statistical difference for APGAR 1	⊕⊕⊕○ Moderate	IMPORTANT
Intubation conditions	RCT	serious <sup>a</sup>	not serious	serious <sup>b</sup>	not serious	strong association	120	120	- There was a frequent more less of resistance to laryngoscopy in the rocuronium group compared to suxamethon group	⊕⊕⊕○ Moderate	CRITICAL
Failed intubation	RCT	serious	not serious	serious <sup>c</sup>	serious	strong association	120	120	No failed intubation events were reported	⊕⊕○○ Low	CRITICAL
<b>Abouleish et al., Br J Anaesth, 1994</b>											
Intubation conditions	Prospective multicenter study	very serious	not serious	serious <sup>c</sup>	serious	none	40	No comparison	90% of the patents had excellent to good intubation conditions	⊕⊕○○ Low	CRITICAL
APGAR score	Prospective multicenter study	very serious	not serious	serious <sup>c</sup>	serious	none		No comparison	No difference for APGAR score at 5 min, 3 neonates had an PAGAR under 7 at 1 min	⊕⊕○○ Low	IMPORTANT




Outcomes	No of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with suxamethon	Risk difference with rocuronium
Intubation conditions (IC) assessed with: ease of laryngoscopy, jaw relaxation, position of the vocal cords, diaphragmatic relaxation	4181 (2 RCTs A prospective study and a metanalysis)	⊕⊕⊕○ Moderate <sup>a</sup>		RR 0,86	RR 0,9
Neonatal apgar score (APGAR) as a measure of muscle weakness in the neonate due to the effect of the neuromuscular blocking agent follow-up: range 1 min to 10 min	768 (3 RCTs And a prospective study)	⊕⊕○○ Low	One RCT not powered for APGAR didn't show any difference between the groups. but in a follow up RCT there was a statistical important difference for APGAR 1 between the 2 groups 17,5% versus 10,3% roc versus sux p=0,023		
Failed intubation (FI)	360 (2 RCTs)	⊕⊕○○ Low	There was not a statistical analysis of the outcome for that was an event that was mention that did not happen		

# Discussion

## Results

- Based on the few studies included there is no evidence to suggest a clinically relevant difference between Roc and Sux given as 1 mg/kg for time to intubation or failed intubation
- No difference between Roc and Sux given as 1 mg/kg on the effect on the Apgar score at 5 minutes.
- A statistically significantly larger number of neonates with Apgar < 7 at 1 minutes in the Roc group.
  - That may be due to the placental transfer of Roc (16%).
  - Whether this led to more interventions on the neonates was not reported, that makes it difficult to conclude if it is of any clinical relevance.



# Discussion

## Limitations

- Simple search strategy, few included studies with variable evidence profiles
- The outcomes: neonatal APGAR and intubation conditions, are surrogate outcomes.
- Mixed populations - included both elective CS and emergency CS
  - Two very different populations as airway handling and the impact on the neonate in an emergency CS is very different to an elective CS.
  - Our research question, whether there is a difference in our outcomes between Sux and Roc in *emergency* CS is therefore not answered.

# Discussion

## **Other relevant factors must be weighted in the choice between Roc and Sux for RSI**

- The induction-to-delivery intervals were comparable (Sux/Roc) in the study by Blaha et al.
  - But Roc were superior in allowing better surgical conditions for fetal delivery
  - But the effect of Roc mostly lasted longer than the surgery time and had to be reversed
- In other cases it is the undesirable side-effects of Sux that makes Roc the first choice of muscle relaxant



## Guideline recommendation

Based on the included studies:

Rocuronium 1 mg/kg and Suxamethonium 1 mg/kg is a comparable choices of muscle relaxants in terms of obstetric airway management and in the effect on the neonate at Apgar 5 min. for general anesthesia for emergency cesarean sections.

Roc can cross the placenta to a lesser degree, as opposed to Sux, and maybe in some cases affect the apgar score at 1 min.