

Correlation Between Quality of Tracheal Intubation and Laryngeal Morbidity with Succinylcholine and Rocuronium

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ABSTRACT

Background: Complete relaxation of the jaw, laryngeal and pharyngeal muscles is needed for excellent intubating conditions and to reduce the risk of trauma. Sore throat and hoarseness, besides pain and nausea are among the most common complaints after tracheal intubation for general anaesthesia.

Methods: This prospective randomized double blind study was conducted on 100 adult patients of ASA physical status I or II of either sex, aged 18-60 years undergoing elective surgery under general anaesthesia. Patients were randomized to receive either succinylcholine 1mg/kg (group I) or rocuronium 0.6mg/kg (group II) after induction with propofol 2mg/kg. Intubating conditions were assessed by Cooper grading scale. Postoperative hoarseness and sore throat were assessed at 6 and 24 hrs after surgery.

Results: Succinylcholine group had significantly higher incidence of excellent intubation conditions at 60s as compared to rocuronium group (86% > 60%, p value =0.013). However, the incidence and severity of postoperative hoarseness and sore throat was comparable in both the groups.

Conclusion: Succinylcholine should be used if excellent intubating conditions are desirable and the rate of laryngeal morbidity was comparable between the two drugs.

Keywords: Endotracheal Intubation, Postoperative Hoarseness, Sore Throat.

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INTRODUCTION

Muscle relaxation is an indispensable part of administration of anaesthesia during surgical procedure to facilitate endotracheal intubation and to provide surgical relaxation.

Succinylcholine has been the most commonly and widely used muscle relaxant for more than 40 yrs. In addition to fasciculations, serious side effects can occur with Succinylcholine infrequently.¹ Rocuronium has the potential to replace Succinylcholine, with faster onset and intermediate duration of action without the adverse effects associated with Succinylcholine. However, succinylcholine creates excellent intubation conditions more reliably than Rocuronium.²

Complete relaxation of the jaw, laryngeal and pharyngeal muscles and diaphragm are needed for excellent intubating conditions and to reduce the risk of trauma. The response to intubation is a function of both muscular block and the level of anaesthesia. The muscle relaxant paralyses the vocal cords that may decrease post intubation coughing and bucking.³ Apart from injury to the teeth, the most common complications of endotracheal intubation are postoperative hoarseness and sore throat.⁴

Some studies have shown no significant difference in incidence of laryngeal morbidity in patients with either excellent or good

intubating conditions^{5,6} while others have shown that excellent intubating conditions are associated with fewer postoperative laryngeal symptoms than are associated with non-excellent conditions.³ Hence, optimizing intubating conditions by using neuromuscular blocking drugs would be required to decrease these symptoms and injuries related to tracheal intubation.

Thus the aim of this study was to compare tracheal intubating conditions and the incidence of postoperative hoarseness and sore throat associated with the use of 1mg/kg succinylcholine and 0.6mg/kg rocuronium in patients undergoing general anaesthesia for elective surgery.

METHODS

After obtaining approval from Institutional ethics committee and informed written consent from the patients, this randomized double blind study was conducted on 100 patients between 18 to 60 yr of age of ASA physical status I or II scheduled for elective surgery under general anaesthesia. Patients were randomly allocated by computer generated randomization and sealed opaque envelopes to one of the two groups (n=50 each) to receive Succinylcholine (group I) or Rocuronium (group II). All

patients underwent oro-tracheal intubation for surgical procedure. Exclusion criteria consisted of patients with difficult airway (Mallampati class 3 or 4), gastro esophageal reflux disease, neuromuscular disorders or medications known to influence neuromuscular functions, patients with contraindication to use of succinylcholine such as burns, denervation injury and acute head injury.

Intravenous access was established in operating room and baseline heart rate, non-invasive arterial blood pressure, arterial oxygen saturation were recorded. Following preoxygenation with 100% O₂ for 3minutes, patients in both groups received inj. glycopyrrolate 0.004mg/kg, inj.fentanyl 2mcg/kg and inj.propofol 2mg/kg IV. This was followed by either succinylcholine 1mg/kg or rocuronium 0.6 mg/kg diluted to 10 ml with normal saline. All drugs were administered into a rapidly running intravenous infusion by one anaesthetist who was unaware of the drug administered.

Laryngoscopy and tracheal intubation were performed by anaesthetist who was unaware of the type of relaxant administered. Intubating conditions were assessed at 60 seconds after administration of muscle relaxant then every 30 seconds (up to 120seconds) until clinically acceptable conditions were observed according to Cooper Scoring system.⁷

Oral endotracheal intubation was done with appropriate size endotracheal tube. The excellent and good intubating conditions

were taken as acceptable whereas the fair and poor intubating conditions were considered as unacceptable. Any adverse reactions like dysrhythmias, bronchospasm, masseter muscle spasm and anaphylactic reaction associated with use of succinylcholine and rocuronium at the time of laryngoscopy was noted.

Intraoperative monitoring was done and at the end of surgery, neuromuscular block was reversed by using inj. glycopyrrolate 10mcg/kg and inj.neostigmine 40mcg/kg. After thorough oropharyngeal suctioning, patients were extubated when fully awake and fulfilled the criteria of extubation. Postoperatively all patients were assessed for hoarseness and sore throat at 6hrs and at 24hrs.(Appendix) Postoperative hoarseness was defined as acoustic quality different than the previous voice quality of the patient and sore throat was defined as continuous throat pain.

Statistical analysis was performed using SPSS version 23, IBM corp. 2015; New York. Age and weight in both the groups were compared using Student's t-test. Cooper score was analyzed using Wilcoxon Mann Whitney test while sex distribution, intubating conditions and postoperative hoarseness and sore throat were analyzed with the Chi-square test. For 90% power of study and an α=0.05, 78 patients (39 patients in each group) were needed. So a total of 100 patients were enrolled i.e., 50 patients in each group. Results were considered statistically significant when p <0.05.

Table 1: Demographic Data

	Group I(n=50)	Group II(n=50)	P value
Age(years)	34.32±11.68	36.54±12.50	0.361
Weight (kg)	59.70±8.22	58.62±8.17	0.512
Sex ratio (M/F)	17/33	23/27	0.221

Table 2: Comparison of patients according to Cooper score

Cooper Score	Group I	Group II	P value	Significance
At 60 Seconds	8.10±1.05	7.32±1.69	0.020	S
At 90 Seconds	8.00±0.00	8.71±0.487	0.222	NS
At 120 Seconds	0.00	0.00		

Table 3: Cooper Scoring of intubating conditions.⁷

Score	Jaw relaxation	Vocal cords	Response to intubation
0	Impossible to open	Closed	Severe coughing/bucking
1	Opens with difficulty	Closing	Mild coughing
2	Moderate opening	Moving	Slight diaphragmatic movement
3	Easy opening	Open	None
Total score	Excellent (8-9), Good(6-7), Fair(3-5), Poor(0-2)		

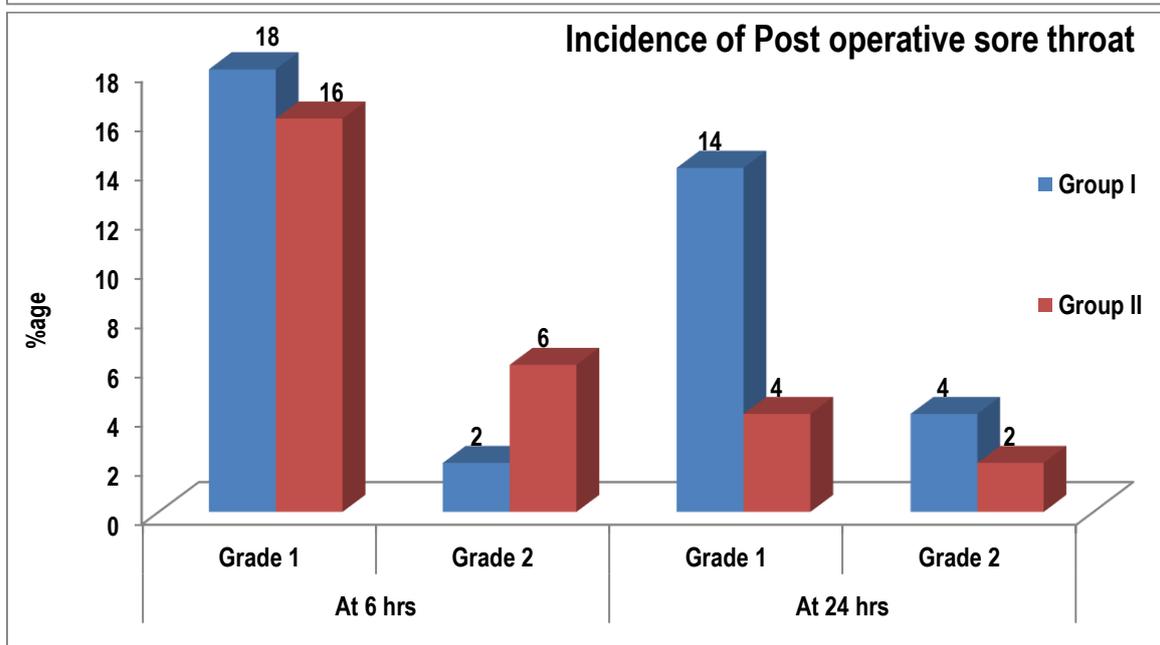
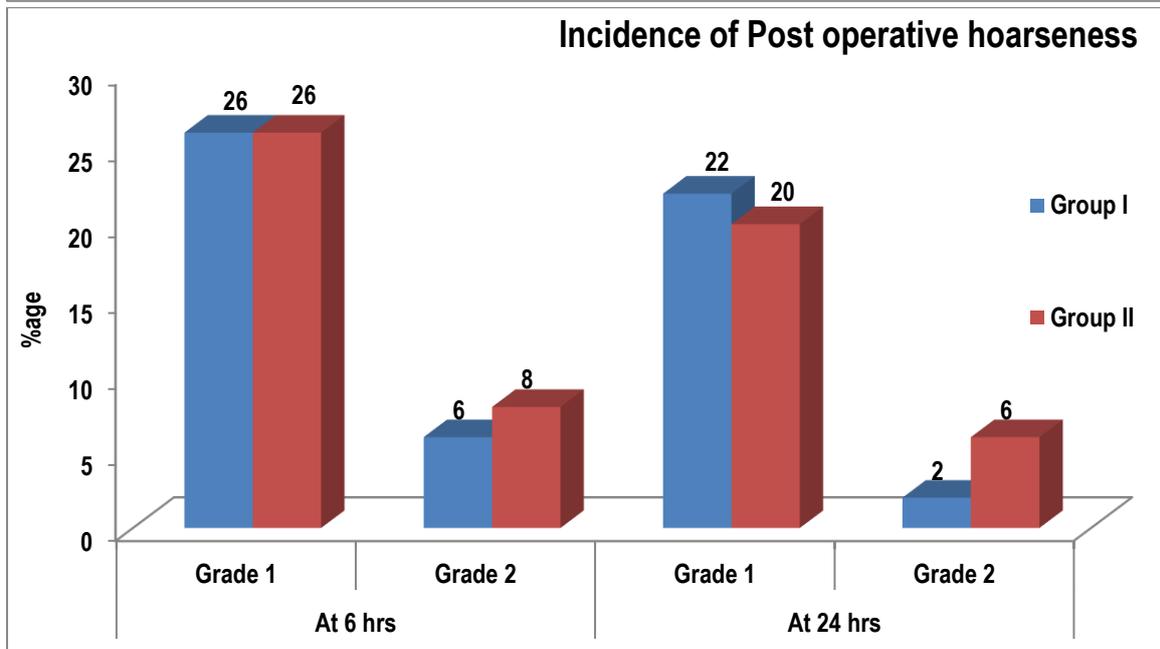
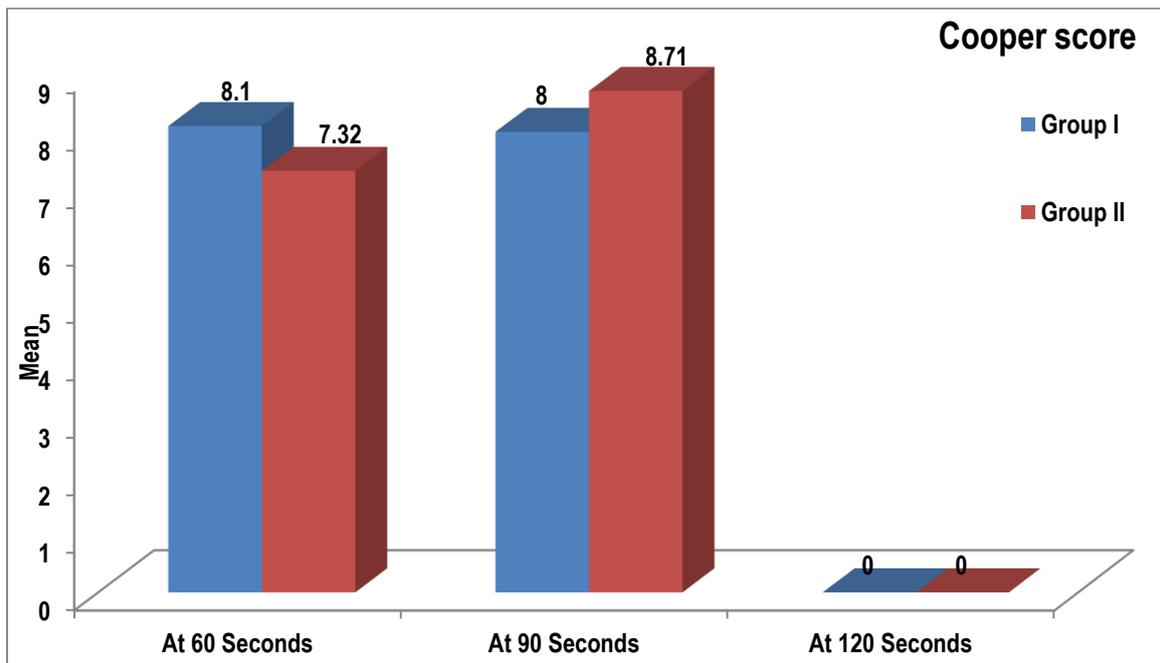
Table 4: Intubating conditions at 60seconds

Group	EXCELLENT	GOOD	FAIR	POOR	P value
Group I	43	5	2	0	
Group II	30	13	7	0	0.013

P<0.05 Significant

Table 5: Incidence of Postoperative hoarseness and Sore throat

	POSTOPERATIVE HOARSENESS			SORE THROAT		
	Group I	Group II	P value	Group I	Group II	P value
At 6hrs	13(grade 1)	13(grade 1)	0.945	9(grade 1)	8(grade 1)	0.314
	3(grade 2)	4(grade 2)		1(grade 2)	3(grade 2)	
At 24hrs	11(grade 1)	10(grade 1)	0.315	7(grade 1)	8(grade 1)	0.527
	1(grade 2)	3(grade 2)		2(grade 2)	1(grade 2)	



RESULTS

There was no significant difference in distribution of age, sex and weight of patients in both the groups. (Table 1)

Table 2 shows that succinylcholine group had significantly higher cooper score at 60seconds (8.10 ± 1.05) as compared to rocuronium group (7.32 ± 1.69), whereas at 90seconds mean score was not significantly different between the two groups.

Table 4 shows significantly higher number of patients in Succinylcholine group achieved excellent and clinically acceptable (excellent and good) intubating conditions as compared to Rocuronium at 60 seconds. ($P < 0.05$) Intubating conditions were acceptable in 100% subjects at 90 seconds in both the groups. Tracheal intubation was successful in all patients of both groups

The overall incidence (succinylcholine and rocuronium groups together) of postoperative hoarseness was 33% (33 patients) at 6hrs and 25% (25 patients) at 24hrs. Postoperative hoarseness at 6hrs and 24hrs did not differ significantly between two groups, as shown in Table 5. Incidence (both study groups together) of sore throat was 21% (21 patients) at 6hrs and 18% (18 patients) at 24hrs. Sore throat did not differ significantly between two groups at 6hrs and at 24hrs.

DISCUSSION

The present study demonstrated that Succinylcholine created better intubation conditions than Rocuronium at 60seconds. The rate of excellent as well as clinically acceptable intubating conditions was significantly higher in the Succinylcholine group as compared with the Rocuronium group. However, the incidence and severity of postoperative hoarseness and sore throat was similar in both the groups. In this study we used standard intubating dose of both drugs. Some studies have shown that intubating conditions at 60 s are generally excellent or good with a 0.6 mg/kg dose of Rocuronium.⁷⁻⁹ While studies conducted by McCourt KC et al,¹⁰ Andrew JJ et al,¹¹ Perry JJ et al,¹² Sluga M et al,¹³ Tran DT et al,¹⁴ have shown that rocuronium (0.6mg/kg) provided acceptable intubation conditions, but unable to provide excellent intubating conditions in all the patients. In our study too, we found that succinylcholine created better intubation conditions. Intubating conditions with rocuronium may be improved by using higher dose than used in our study, but this would be associated with long duration of action and this may be inappropriate in some situations. Magorian et al suggested that 0.9–1.2 mg/kg of rocuronium may be necessary as an alternative to succinylcholine.¹⁵

Quality of intubating conditions as a risk factor for laryngeal injury during tracheal intubation is still under discussion. We demonstrated that quality of intubating conditions was not associated with postoperative hoarseness and sore throat. Despite the statistical significant difference in intubating conditions, the incidence and severity of postoperative hoarseness and sore throat was comparable in both the groups.

There is a large variation in the reported incidence (4%–40%) of postoperative hoarseness immediately after short-term tracheal intubation.¹⁶ In our current study, however, the overall incidence of postoperative hoarseness was 33% at 6hrs and 25% at 24hrs.

Oczenski et al. reported postoperative hoarseness in 44% patients after rocuronium 0.6 mg/kg (the same dosage as in our study).¹⁷ This frequent incidence in their study can be explained by the relatively large size of tracheal tubes that were used. Mencke et al

have reported comparable incidence of postoperative hoarseness between the succinylcholine and the rocuronium groups (50% versus 51%).¹⁶ The use of stylet, stomach tube and cricoid pressure might have contributed to the higher incidence of hoarseness in their study.

The incidence of postoperative sore throat also varies between 14.4%–50%.¹⁸ In the present study, however, the overall incidence of sore throat was 21% at 6hrs and 18% at 24hrs, being comparable between both study groups. Mencke et al. reported 33% incidence of sore throat which was also comparable with the use of succinylcholine and rocuronium.¹⁶ Higgins PP et al. in their study reported an incidence of 45.4% of sore throat with the use of endotracheal tube. Careful airway management technique is most important to minimize the symptoms related to throat discomfort.⁶ However, sore throat occurred even in unintubated patients with use of succinylcholine when an ordinary facemask was used.¹⁹ Christensen et al. reported 14.4% incidence of sore throat in their study and it was not associated with multiple intubation attempts, administration of succinylcholine or non-depolarizing neuromuscular blocking agent on.²⁰ However, Solatpur et al. demonstrated that use of high dose of cisatracurium for rapid sequence intubation carried a lower chance of developing sore throat.²¹ A baseline incidence of postoperative hoarseness and sore throat exists independently of the quality of tracheal intubation that may explain laryngeal damage in patients with clinically acceptable intubation conditions. Laryngeal damage not only occurs during intubation, but may also be the result of demographic factors such as sex and technical factors such as size of the tube, cuff pressure, or gastric suction and intraoperative factors such as duration of surgery. Heavy smokers and reflux, both suspected to be risk factors for hoarseness, were controlled (excluded from study) but intracuff pressure, type and duration of surgery were not evaluated.

In conclusion, the intubating conditions were significantly better in the succinylcholine group as compared with the rocuronium group at 60sec. However, the rate of laryngeal morbidity was not different between the two groups. Succinylcholine should be used if excellent intubating conditions are desirable. We found no correlation between quality of intubating conditions and laryngeal morbidity.

APPENDIX

Assessment of Postoperative hoarseness and Sore throat.¹⁶

A. Postoperative hoarseness (PH)

Do you have any hoarseness?

If the answer is no, PH grade 0 = no hoarseness;

If the answer is yes, PH grade 1-3 as follows

1 = noticed by patient

2 = obvious to observer

3 = aphonia.

B. Sore throat (ST)

Do you have any sore throat?

If the answer is no, ST grade 0 = no sore throat

If the answer is yes, ST grade 1–3 as follows

1 = Mild (pain with deglutition)

2 = Moderate (pain present constantly and increasing with deglutition).

3 = Severe (pain interfering with eating and requiring analgesic medication).

REFERENCES

1. Rao M H, Venkatraman A, Mallleswari R. Comparison of intubating conditions between rocuronium with priming and without priming: Randomized and double-blind study. *Indian J Anaesth* 2011;55:494-8
2. Sparr HJ, Luger TJ, Heidegger T, Putensen-Himmer G. Comparison of intubating conditions after rocuronium and suxamethonium following "rapid-sequence induction" with thiopentone in elective cases. *Acta Anaesthesiol Scand.* 1996; 40:425-30.
3. Combes X, Andriamifidy L, Dufresne E, Suen P, Sauvat S et al. Comparison of two induction regimens using or not using muscle relaxant: impact on postoperative upper airway discomfort. *Br J Anaesth.* 2007; 99(2): 276-81.
4. Jaensson M, Gupta A, Nilsson UG. Risk factors for development of postoperative sore throat and hoarseness after endotracheal intubation in women: a secondary analysis. *AANA J.* 2012; 80(4 Suppl):S67-73.
5. Baillard C, Adnet F, Borron SW, et al. Tracheal intubation in routine practice with and without muscular relaxation: an observational study. *Eur J Anaesthesiol* 2005; 22: 672-7.
6. Higgins PP, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. *Br J Anaesth* 2002; 88: 582-4.
7. Cooper R, Mirakhur RK, Clarke RS, Boules Z. Comparison of Intubating conditions after administration of ORG9426 (Rocuronium) and Suxamethonium. *Br J Anaesth* 1992;3:269-73 .
8. Huizinga AC, Vandenbrom RH, Wierda JM, Hommes FD, Hennis PJ. Intubating conditions and onset of neuromuscular block of rocuronium (Org 9426); a comparison with suxamethonium. *Acta Anaesthesiologica Scandinavica* 1992; 36: 463-8.
9. Puhlinger FK, Khuenl-Brady KS, Koller J, Mitterschiffthaler G. Evaluation of the endotracheal intubating conditions of rocuronium (ORG 9426) and succinylcholine in outpatient surgery. *Anesth Analg* 1992; 75: 37-40.
10. McCourt KC, Salmela L, Mirakhur RK, Carroll M, Mäkinen MT, Kansanaho M et al. Comparison of rocuronium and suxamethonium for use during rapid sequence induction of anaesthesia. *Anaesthesia.* 1998 Sep; 53(9):867-71.
11. Andrews JI, Kumar N, Van Den Brom RHG, Olkkola KT, Roest GJ, Wright PMC. A large simple randomized trial of rocuronium versus succinylcholine in rapid-sequence induction of anaesthesia along with propofol. *Acta Anaesthesiolog Scand.* 1999; 43:4-8.
12. Perry JJ, Lee J, Wells G. Are intubation conditions using Rocuronium equivalent to those using Succinylcholine? *Acad Emerg Med* 2002; 9(8):813-23.
13. Sluga M, Ummenhofer W, Studer W, Siegemund M, Marsch S C. Rocuronium versus Succinylcholine for rapid sequence induction of anaesthesia and endotracheal intubation: A prospective, randomised trial in emergent cases. *Anesth Analg* 2005; 101:1356-61.
14. Tran DT, Newton EK, Mount VA, Lee JS, Wells GA, Perry JJ. Rocuronium versus succinylcholine for rapid sequence induction intubation. *Cochrane Database Syst Rev.* 2015: 29;(10).
15. Magorian T, Flannery KB, Miller RD. Comparison of rocuronium, succinylcholine, and vecuronium for rapid-sequence induction of anesthesia in adult patients. *Anesthesiology* 1993; 79: 913-8.
16. Mencke T, Knoll H, Schreiber JU, Echternach M, Klein S, Noeldge-Schomburg G et al. Rocuronium is not associated with more vocal cord injuries than Succinylcholine after rapid-sequence induction: A randomised, prospective, controlled trial. *Anesth Analg* 2006; 102:943-9.
17. Oczenski W, Krenn H, Dahaba AA, et al Complications following the use of the combitube, tracheal tube and laryngeal mask airway. *Anaesthesia* 1999;54:1161-5.
18. McHardy FE, Chung F. Postoperative sore throat: cause, prevention and treatment. *Anaesthesia* 1999; 54:444-53.
19. Capon LM, Bruce DL, Patel KP, Turndorf H. Succinylcholine induced postoperative sore throat. *Anesthesiology* 1983;59:202-6.
20. Christensen AM, Willemoes-Larsen H, Lundby L, Jakobsen KB. Postoperative throat complaints after tracheal intubation. *Br J Anaesth* 1994; 73:786-7.
21. Solatpur F, Teymourian H, Mohajerani SA, Hoseinzadegan Shirazi F, Saran Lotfollah et al. Comparison of the Incidence of Sore Throat After Rapid Sequence Intubation With Succinylcholine and Cisatracurium. *Anesth Pain Med.* 2014; 4(3): e20030.

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