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A comparative study on minimum intubating dose of sccinylcholine

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ABSTRACT

BACKGROUND : Succinylcholine remains the gold standard and satisfactory muscles relaxants for endo tracheal intubation.

The aims of this study to assess three minimum dose of Succinylcholine for tracheal intubation as the modern balance anaesthesia consist of amnesia, analgesia & muscles relaxation.

MATERIAL & METHODS : 60 adults patient of ASA grade I & II posted for elective surgery under general anaestheisa who also required endo tracheal intubation, was induced with inj. fentanyl, 2 mcg / kg. and propofol 2 mg / kg. iv.

The patient were randomly allocated in to three groups according to dose of succinylcholine [0.4 mg/kg., 0.6 mg/kg. & 1 mg/kg.]. The overall intubation condition assessed after 60 seconds of succinylcholine inj.

RESULT: The acceptable intubating condition (excellent & good grade combined) were obtained in 65%, 100%, 100% of the patient who received 0.4 mg, 0.6 mg & 1 mg/kg of Succinylcholine respectively, P<0.001, excellent intubation condition were obtained in 51%, 96% and 100% of the patient after 0.4, 0.6 and 1 mg/kg of Succinylcholine respectively P<0.001.

CONCLUSION : The 0.6 mg/kg Succinylcholine can be used as minimum intubating dose as it provide acceptable intubating condition within 60 seconds as compared to 1 mg / kg which may be excessive. Duration of action of Succinylcholine is dose dependent & reducing the dose allow a more rapid return of spontaneous respiration, reflexes and decreases the apnoea time.

KEYWORDS : Anaesthesia, succinylcholine, intubating conditions

THE AIMS & OBJECTIVE OF THE STUDY

This study was aimed to assess the minimum dose of succinylcholine as muscles relaxant for endo tracheal intubation in three minimum dose of 0.4, 0.6 and 1 mg/kg during general anaesthesia in elective surgery.

Inclusion Criteria -

- Age - 20 - 50 years of either sex
- ASA Grade I & II
- Posted for elective surgery

Exclusion Criteria

- Patient refusal
- Anticipated difficult intubation
- Posted for any emergency surgery
- Patient with (co-existing cardiac, renal hepatic, electrolyte imbalance etc.]
- Pregnant women
- Family history of prolong apnoea [abnormal response to succinylcholine]

MATERIAL & METHODS

The comparative study was conducted in Rama Medical College and other Associated Hospital, Kanpur who needed general anaesthesia with endotracheal in intubation in elective surgery.

A detailed pre anaesthetic checkup were done in all patients. Written & informed consent were obtained and patient shifted in operation theater after overnight fasting of 6 hours. Essential monitors NIBP, ECG, SPO2, Caprography were attached to patient and base line [pre induction] vitals recorded.

An intravenous access was secured and pre-medicated with inj. glycopyrrolate 0.2 mg and inj. fentanyl 2 mcg/kg. iv. The patient were randomly allocated into three groups (20 patient each) according to dose of succinylcholine administered.

Group A - Received succinylcholine 0.4 mg/kg.
Group B - Received succinylcholine 0.6 mg/kg.
Group C - Received succinylcholine 1 mg/kg.

Injection succinylcholine was taken in 2 ml syringe and 0.9% saline was added to make a volume of 2 ml.

After pre oxygenation with 100% oxygen for a period of 3 minutes patients were induced with injection propofol 2 mg/kg iv. After loss of eye lash reflexes the set dose of succinylcholine was administered to patient by colleague not in volved in study. After 60 seconds, Laryngoscopy were done and endotracheal intubation done by investigator. Ananesthesia was maintained on O2 + N2O + Isoflurane and inj. vecuronium bromide on IPPV mode. Patient were reversed with inj. Neostigmine 0.05 mg/kg and inj. Glyopyrrolate 0.01 mg/kg at the end of surgery and extubated with through oral suction.

Excellent or good intubating conditions were regarded as clinically acceptable; poor intubating conditions were regarded as clinically not acceptable. [9] Duration of laryngoscopy (time from start of laryngoscopy until tracheal intubation and removal of laryngoscope blade from the mouth) was noted. Blood pressure heart rate (HR) and SpO2 were recorded before induction of anaesthesia (preinduction), after induction (post-induction) and then every 1 min after tracheal intubation for 5 min (time 1-5).

INTRODUCTION

Succinylcholine still the muscles relaxant of choice for intubation because of rapid onset, rapid reocovery and short duration.

Traditionally, the dose of succinylcholine recommended for this purpose is 1 mg/kg. The effective dose (ED) 95 of succinylcholine is less than 0.30 mg/kg.[2,3] Doses equivalent to twice the ED 95 are generally considered to be the appropriate dose of non-depolarizing NMBAs for intubation.[4] A 1.0 mg/ kg dose represents

3.5-4-times the ED 95. Recovery of spontaneous respiration following 1.0 mg/ kg succinylcholine administration may not occur rapidly enough to prevent haemoglobin desaturation in patients whose ventilation is not assisted.[5,6] Based on a mathematical model of haemoglobin desaturation during apnoea, Benumof et al. [7] predicted that in the large majority of patients with 1 mg/kg succinylcholine induced apnoea, significant to life-threatening haemoglobin desaturation will occur when ventilation is not assisted. Heier et al.[5] reported that significant haemoglobin desaturation (SpO2 <80%) occurred in one-third of the volunteers during the period of apnoea induced by 1 mg/kg succinylcholine. Decreasing the dose of succinylcholine would allow a more rapid recovery of spontaneous respiration, thereby providing a greater margin of safety in airway management. The aim of this comparative study was to compare the minimum dose of succinylcholine for tracheal intubating conditions and the duration of apnoea following administration of 0.4, 0.6 and 1.0 mg/kg of succinylcholine.

Table 1: Assessment of intubating conditions[9]

Variables	Intubating conditions		
	Clinically acceptable		Not acceptable
	Excellent	Good	Poor
Laryngoscopy	Easy	Fair	Difficult
Vocal cords			
Position	Abducted	Intermediate	Closed
Movement	None	Moving	Closing
Coughing (<10 s)	None	Diaphragm	Sustained
Movement of the limbs	None	Slight	Vigorous

RESULTS

Sixty eligible patients were enrolled in the study, 20 in each group.

There were no significant differences in patient characteristics among the three groups [Table 2]. The modified Mallampati class of pharyngeal structures, Cormack grade of laryngoscopy and the duration of laryngoscopy in the three groups was comparable. Intubation was completed successfully in all (100%) patients.

Excellent intubating conditions were obtained in 52.4%, 95.7% and 100% of the patients after 0.4, 0.6 and 1.0 mg/kg succinylcholine, respectively; P<0.001. The 0.6 and 1.0 mg/kg groups were similar with regard to the incidence of excellent intubating conditions; P>0.05. Overall intubating conditions were regarded as acceptable (excellent and good grade combined) in 66.7%, 100% and 100% of the patients after 0.4, 0.6 and 1.0 mg/kg succinylcholine, respectively. This difference was statistically significant (P<0.001) [Table 3]. Comparable intubating conditions were achieved after 0.6 and 1.0 mg/kg succinylcholine; P>0.05. Patients receiving 0.4 mg/kg succinylcholine had a frequent incidence (31.7%) of poor tracheal intubating conditions.

Laryngoscopy was easy in all patients except one patient in group 0.4 mg/kg succinylcholine. A greater number of patients (four of 20 patients) had sustained coughing in the group receiving 0.4 mg/kg succinylcholine compared with patients receiving 0.6 and 1.0 mg/kg succinylcholine, P=0.04). Six patients in group 0.4 mg/kg succinylcholine had vigorous limb movement compared with none in the other two groups; P<0.001 [Table 4].

Table 2: Patient data

	Group 0.4 (n=20)	Group 0.6 (n=20)	Group 1.0 (n=20)	P
Age (years)	31.4±9.5	38.8±13.2	36.9±10.6	
Gender (M:F)	8:12	9:11	6:14	
Weight (kg)	55.2±7.7	51.8±7.2	56.6±11.6	
Height (cm)	156.0±5.3	158.7±6.0	152.6±7.9	
Mallamapati class				
1	20 (95.2)	16 (82.6)	17 (85)	0.180
2	0 (4.8)	4 (17.4)	3 (15)	
Cormack Laryngoscopic view				
Grade 1	20 (100)	20 (100)	20 (100)	–
Grade 2	0 (0)	0 (0)	0 (0)	
Duration of laryngoscopy (s)	8.9±1.9	9.6±2.1	10.8±2.5	0.100

Values are mean±SD or numbers (%), where appropriate

Table 3: Intubating conditions

Intubating conditions	Group 0.4 (n=20)	Group 0.6 (n=20)	Group 1.0 (n=20)	P
Excellent	10 (50.0)	19 (95.0)	20 (100)	0.000
Good	3 (15.0)	1 (5.0)	0 (0)	
Poor	7 (35.0)	0 (0)	0 (0)	
Overall intubating conditions				
Clinically acceptable	13 (65.0)	20 (100)	20 (100)	0.000
Clinically unacceptable	7 (35.0)	0 (0)	0 (0)	

Values are number (%)

Apnoea time and the time to regular spontaneous breathing (end tidal CO2 waveform) were dose dependent, and are presented in Table 5.

Haemodynamic responses to induction and intubation are shown in Tables 6 and 7. Pre-induction HR and MAP were comparable in the three groups. There was no statistically significant difference in mean HR and MAP between the three groups at any time point.

Oxygen saturation before as well as following induction of anaesthesia and tracheal intubation ranged between 97% and 100%. No episodes of laryngospasm, bronchospasm, masseter spasm, or generalized rigidity were observed.

DISCUSSION

The effectiveness of small doses of succinylcholine in achieving satisfactory intubating conditions has been previously described. [4,10-12] Stewart et al.[11] reported that 26 (96%) of 27 patients receiving 1.5 mg/ kg succinylcholine and 30 (94%) of 32 patients receiving 0.5 mg/kg had acceptable intubating conditions. However, in patients with a full stomach or in those with raised intracranial pressure, excellent intubating conditions are warranted. In our study the administration of 1.0 and 0.6 mg/kg succinylcholine was associated with 100% and 95.7% incidence of excellent tracheal intubating conditions. In contrast, Stewart et al.[11] reported that, after induction of anaesthesia with 5 mg/kg thiopental, 23 (85%) of 27 patients receiving 1.5 mg/kg succinylcholine, and 18 (56%) of 32 patients receiving 0.5 mg/kg succinylcholine had excellent intubating conditions at 60 s. Naguib et al.[12] also found the incidence of excellent intubating conditions following induction with 2 µg/kg fentanyl and 2 mg/kg propofol to be 0.0%, 43.3%, 60.0%, 63.3%, 80.0% and 86.7% of patients after 0.0, 0.3, 0.5, 1.0, 1.5, and 2.0 mg/kg succinylcholine, respectively.

Table 4: Details of intubating conditions

	Group 0.4 (n=20)	Group 0.6 (n=20)	Group 1.0 (n=20)	P
Laryngoscopy (easy/ fair/difficult)	20/0/0	18/2/0	19//1/0	0.404
Vocal cords position (abducted/ intermediate/closed)	20/0/0	19/1/0	19/1/0	–
Vocal cords movement (none/moving/closing)	20/0/0	20/0/0	20/0/0	–

Coughing (none/ diaphragm/sustained >10 s)	12/5/3	13/6/1	20/0/0	0.004
Movement of the limbs (none/slight/vigorous)	14/2/5	17/3/0	19/1/0	0.012

Values are numbers

Table 5: Apnoea time and time to resumption of regular spontaneous breathing

	Group 0.4 (n=20)	Group 0.6 (n=20)	Group 1.0 (n=20)	P
Apnoea time (min)	3.9±1.1	4.9±0.9	9.1±3.4	0.000
Time to regular spontaneous breathing (min)	5.7±1.2	5.9±1.1	9.7±3.5	0.000

Table 6: Heart rate response to induction and intubation

Time point	Heart rate (beat / min)			
	Group 0.4 (n=20)	Group 0.6 (n=20)	Group 1.0 (n=20)	P
Pre-induction	77±17	82±16	86±12	
Post-induction	85±17	87±19	95±15	
Post-intubation				
1 min	99±11	95±15	92±19	
2 min	96±14	93±19	90±17	
3 min	87±14	85±11	84±17	
4 min	80±15	83±19	80±18	
5 min	76±14	80±19	76±16	

Values are mean±SD

Our results indicate that apnoea time and time to resumption of regular spontaneous breathing (end tidal CO2 waveform) were dose-dependent. In all the three groups, start of regular spontaneous breathing occurred approximately 1 min after the detection of the first diaphragmatic movement. There was a statistically and clinically significant difference in apnoea time between 0.6 mg/kg and 1 mg/kg dose of succinylcholine (4.9±0.9 min versus 9.1±3.4 min, respectively). Return of regular spontaneous breathing occurred significantly earlier when the 0.6 mg/kg dose of succinylcholine was used compared with the 1 mg/kg (5.9±1.1 min and 9.7±3.5 min, respectively) dose.

Our findings have clinical relevance in patients with unanticipated difficult airway. The faster return to spontaneous ventilation with the 0.6 mg/kg dose increases the margin of safety in the event of a "Cannot Intubate, Cannot Ventilate" situation compared with the 1.0 mg/kg dose.

CONCLUSION

The 0.6 mg/kg Succinylcholine can be used as minimum intubating dose as it provide acceptable intubating condition within 60 seconds as compared to 1 mg / kg which may be excessive. Duration of action of Succinylcholine is dose dependent & reducing the dose allow a more rapid return of spontaneous respiration, reflexes and decreases the apnoea time. The faster return of spontaneous respiration with the 0.6 mg / kg. dose increases the safety margin in event of a "cannot intubate, cannot ventilate" situation compared with the 1 mg / kg.

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