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Original Research Article

A Randomized Double-Blind Study to Compare the Mean Apnoea Time and Intubating Conditions with Different Doses of 0.4, 0.6 &1.0 Mg /Kg of Succinyl Choline

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Abstract:

Introduction: The primary neuromuscular blocking drug for rapid sequence induction endotracheal intubation has been succinylcholine, however it has certain drawbacks. This study was conducted to evaluate mean apnoea time and intubating conditions with various doses of 0.4, 0.6, and 1.0 mg/kg succinylcholine.

Material & Methods: A double-blinded randomised control study with 52 patients in each group was undertaken on 156 patients undergoing surgery. Succinylcholine was given at concentrations of 0.40 mg/kg to Group A, 0.60 mg/kg to Group B, and 1.0 mg/kg to Group C. After delivering the medications in each group, mean apnoea time and intubating conditions and, hemodynamic parameters were evaluated.

Result: The mean aponea time was statistically highly significant($p<0.001$) in group A(mean 3.9 mins) vs C(mean 8.4 mins) and group B(mean 4.40 mins) vs C(mean 8.4 mins).whereas group A(mean 3.9 mins) vs group B(mean 3.9 mins) statistically not significant($p>0.05$). Regarding clinically acceptable intubating conditions there was statistically no significant difference between group B and C($p>0.05$) whereas group A vs group B and group A vs group C statistically highly significant difference($p<0.001$).

Conclusion: A dose of 0.6 mg/kg of succinylcholine produced appropriate intubating conditions compared to a dose of 1.0 mg/Kg with a brief apnea period and time to resume regular spontaneous breathing.

Introduction

The anesthesiologist's contribution to the patient's care includes endotracheal intubation. In the awake patients, Sir William Mac Ewen (1878) inserted a tube from the mouth and trachea using his finger as a guide. Endotracheal intubation has evolved significantly in recent years and is now used frequently in therapeutic settings.

The only depolarizing muscle relaxant remaining in clinical use is succinylcholine. [1] Due to its profound depth of neuromuscular blocking, ultra-short action, rapid onset of block, availability of non-toxic metabolites, and reduced price, succinylcholine is still widely used despite its known side effects.[2-7]

Historically, 1 mg/kg of succinylcholine has been suggested for this use. Less than 0.30 mg/kg of succinylcholine is the effective dosage (ED) 95.[8,9] A dose of 1.0 mg/kg corresponds to 3.5–4 times the ED 95. In patients whose breathing is unassisted, recovery of spontaneous respiration after 1.0 mg/kg succinylcholine treatment might not happen quickly enough to prevent haemoglobin desaturation.[10-11] When breathing is not aided, Benumof et al. projected that considerable to life-threatening haemoglobin desaturation will occur in the vast majority of patients with 1 mg/kg succinyl choline-induced apnoea.[12] The incidence of haemoglobin desaturation fell from 85% to 65% with a succinylcholine dose reduction from 1 mg/kg to 0.6 mg/kg. According to a recent study, succinyl choline at doses of 0.4 to 0.6 mg/kg achieved suitable intubating circumstances 60 seconds after treatment. In addition to bradycardia, junctional rhythm, and asystole in the cardiovascular system, succinyl choline also causes fasiculations and associated muscle discomfort in the skeleton. In individuals with burns, severe abdominal infections, and polytrauma, succinyl choline produces severe hyperkalemia. [1,13] Myoglobinuria in paediatric patients suggests skeletal muscle damage, and succinyl choline is

linked to severe hyperkalemia in people with burn, severe stomach infection, severe metabolic acidosis, hemiplegia or paraplegia muscular dystrophies, and Guillain-Barre syndrome.[14-16] Only a few recent trials have demonstrated that all patients receiving succinylcholine doses of 0.6 and 1 mg/kg experienced excellent and consistent intubating conditions. Apnoea duration and the return of regular spontaneous breathing, however, were dose-dependent.[18]

In order to evaluate mean apnoea time and intubating conditions with various doses of 0.4, 0.6, and 1.0 mg/kg succinylcholine, the current study's goal was to examine these variables.

Material & Method

The institutional ethical committee and review board gave its proper approval for the current study, which was carried out in general surgery and gynaecological surgery at SMS Medical College and its affiliated group of hospitals in Jaipur. Patients also provided written informed consent. This study was an interventional, hospital-based, double-blind, randomised trial. The determined sample size was 52 cases in each group, which was needed to confirm the predicted minimum difference of 0.5(+_0.9) minutes in apnoea time with 95% confidence and 80% power. 52 patients each in 3 groups were randomly assigned to the groups. Patients with mallampati grades I and II, ASA grades I and II, willingness to provide written informed consent, age ranges of 21 to 60, and weight ranges of 40 to 70 kg were posted for elective surgical procedures under general anaesthesia that required endotracheal intubation for a maximum of 60 minutes of surgery. Patients with known anaesthetic agent allergies, BMI greater than 28 kg/m2, pregnancy, arrhythmias, myopathies, thyroid dysfunction, diabetes mellitus, hepato-renal disease, abnormal airway examination and anticipated challenging intubation, and prior or family history of abnormal succinyl choline response were excluded.In operation theatre following premedication, 100% O2 was used for 3 minutes of partial oxygenation (PE). With an IV injection of 2 mg/kg propofol, anaesthesia was induced. Using a computer-generated random number table (sealed envelopes), patients were randomised into one of three groups (each with 52 patients), depending on the dose of succinylcholine to be supplied intravenously (0.40, 0.60, or 1.0 mg/kg): Succinylcholine was given at concentrations of 0.40 mg/kg to Group A, 0.60 mg/kg to Group B, and 1.0 mg/kg to Group C. Succinylcholine was injected into a 2 mL syringe, and 2 mL of saline 0.9% was then added. In order to keep the research investigator blind, all medications were prepared by an anaesthetist who was not participating in the study. Patients were informed of the anaesthetic medication that was administered, however the dose was not covered. 100% oxygen was used to ventilate the patients for one minute. Succinyl choline was administered 60 seconds following laryngoscopy with a size 3 Mcintosh blade and endotracheal intubation using a cuffed endotracheal tube of the proper size.

On the basis of laryngoscopy view as per Cormack & Lehane grades the patients were classified into 4 grades, Grade 1: visualisation of entire vocal cords Grade 2: visualisation of posterior part of laryngeal aperture, Grade 3: visualisation of epiglottis, Grade 4: no glottic structures seen.

Jaw relaxation, cord relaxation, motor response to intubation and overall intubating condition was assessed according to the scheme proposed by Lund and Stovner and was recorded in proforma at the same time. endotracheal tube was secured in position after auscultation. Details of three facets of intubation are: 1.Jaw Relaxation- Good : complete opening, Fair: partial opening, Poor: no opening or very slight opening, Cord relaxation: Good: wide abduction, Fair: gentle pressure required to pass the tube, Slight: almost adducted, Poor: cords opposed, firm pressure required to pass the tube

2. Reaction to intubation- Nil: no movement or bucking, Slight: only slight bucking after insertion of tube, Marked: marked bucking and gross movement of the limbs

Grading scheme for intubation conditions

1. Excellent: good jaw relaxation, vocal cords immobile, no response to intubation.
2. Good: good jaw relaxation, vocal cords moving but passage of tracheal tube easy, minimal diaphragmatic movement only.
3. Poor: good jaw relaxation, vocal cords moving or actively closing, intubation accompanied by coughing/ ‘bucking’
4. Impossible: intubation not possible due to poor jaw relaxation and/or closed vocal cords.

Heart rate and mean arterial pressure was observed pre induction, post induction, post intubation and at 1 min., 2 min., 3 min., 4 min., 5 min.,7 min.,9 min. & 12 min. after intubation.

Apnoea time and time to resumption of regular spontaneous breathing was observed in all three study groups. Surgery was allowed to commence after recording of parameters and anaesthesia was maintained with 60% nitrous oxide & 40% oxygen with 0-0.6% isoflurane. Inj. Atracurium was given 0.5 mg /kg loading dose and 0.1 mg/kg as maintenance dose. Once the surgery was completed patients were reversed with inj. Glycopyrrolate 0.008mg/kg and inj Neostigmine 0.05mg/kg i.v. Extubation was done after thorough suction & complete reversal. In recovery room patients were observed for side effects, Then Statistical Analysis was done on the basis of recorded parameters. Re-

sult and Conclusion were made on basis of statistical analysis.

Results

Demographic characteristics like age, weight, ASA grade and duration of surgery were comparable in all three groups. All patients in the study were female. All patients included in the study were of Mallampati grade 1 & 2. There was statistically no significant difference(p=0.390) in the patients among these three groups as per the mallampati grade.

Table 1: Demographic Data and Mallampati Grade

		Group A (Mean ±SD)	Group B (Mean ±SD)	Group C (Mean ±SD)	P value
Age (years)		29.90 ±6.01	32.88±7.27	30.48±6.61	0.060
Weight (kg)		53±5.66	54.48±6.27	58.44±7.21	0.055
Mallampati Grade N (%)	Grade 1	42 (80.77)	38 (73.08)	36 (69.23)	0.390
	Grade 2	10 (19.23)	14(26.92)	16 (30.77)	

Table 2: Intubating conditions and Apnoea time

		Group A	Group B	Group C	P Value	
Laryngoscopy	Easy	34	37	49	<0.001(hs)	
	Fair	18	15	3	<0.001(hs)	
Cormack laryngoscopy view(N%)	1	39(75%)	40(76.92%)	35 (67.31%)	0.504	
	2	13(25%)	12 (23.08)	17 (32.69%)		
Vocal Cord Position	Abducted	31(59.62)	52 (100%)	52(100)	< 0.001	
	Intermediate	21(40.38)	0	0		
	Closed	0	0	0		
Cough – response to intubtion	None	27(51.92%)	44 (84.62%)	52(100%)	= 0.000	
	Diaphragm	15(28.85%)	8 (15.38%)	0		
	Sustained	10(19.23%)	0	0		
Limb movement – response to intubation	None	31 (59.62%)	48 (92.31%)	52 (100%)	=0.000	
	Slight	8 (15.38%)	4 (7.69%)	0		
	Vigorous	13 (25%)	0	0		
Grades of intubation	Excellent	27 (51.92%)	50(96.15%)	52 (100%)	Group A VS B	P<0.001
	Good	4 (7.69%)	2 (3.85%)	0	Group A Vs C	P<0.001
	Poor	21 (40.38%)	0	0	Group B VS C	P<0.001
Apnoea		3.90±0.53	4.40±0.59	8.40±0.64	P <0.001	

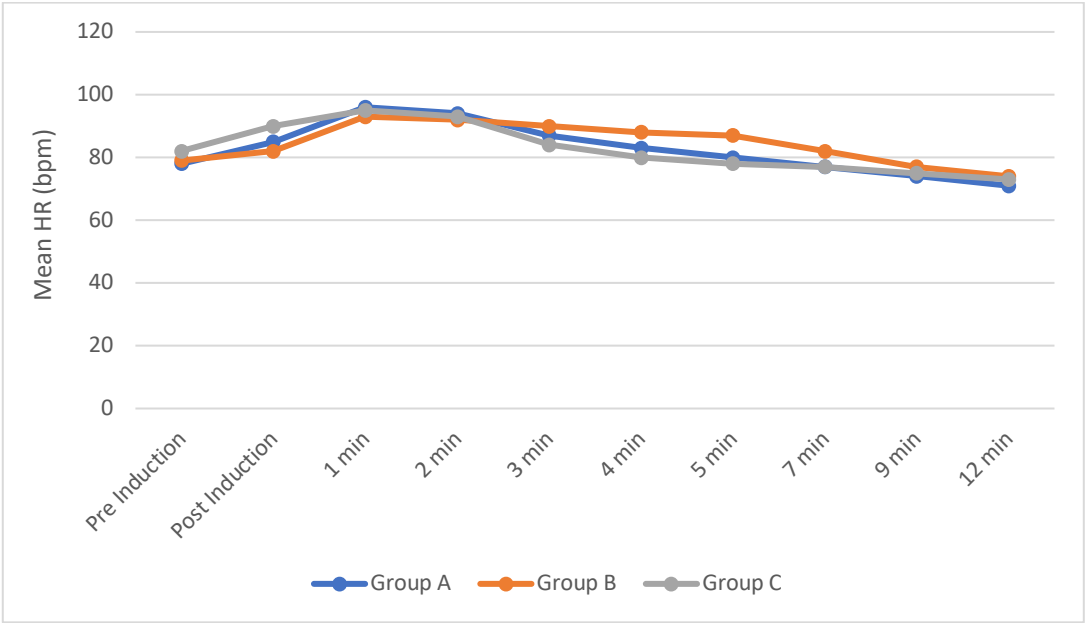

Figure 1: Mean Heart Rate (Beats/min) at various time intervals

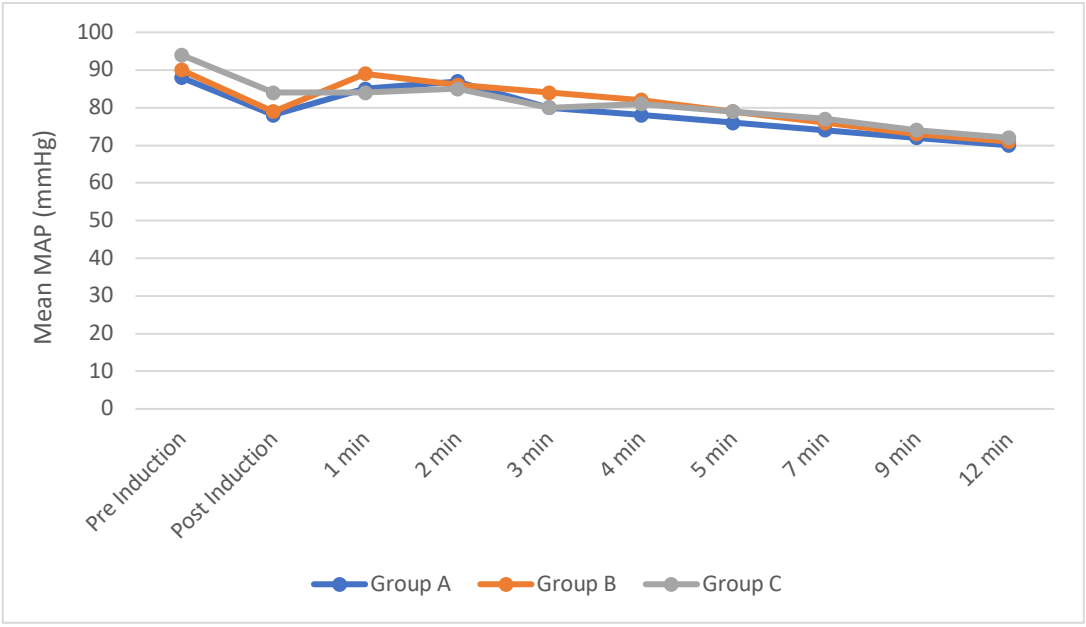

Figure 2: Mean MAP (mmHg) at various time intervals

Discussion

In this study all the patients were premedicated with inj ranitidine 1 mg/kg and inj metaclopromide inj 0.1 mg/kg, inj midazolam 0.01 mg/kg and inj glycopyrrolate 0.04 mg/kg, and fentanyl 2 mcg /kg. After preoxygenation for 3 minutes, induction was done with inj propofol 2 mg/kg. After induction succinylcholine in a dose of 0.4 mg/kg in group A patients, 0.6 mg/kg in group B patients and 1.0 mg/kg in group C patients. within 60 seconds intubation was done and intubating conditions were scored.

Intubating conditions were assessed and scored according to Lund and Stovner criteria in our study

According to CORMACK LARYNGOSCOPY VIEW, in our study's group A on laryngoscopy, 39 patients (75%) were in class 1 and 13 patients (25%) were in class 2, respectively. Similarly, in group B, 12 patients (23.08%) and 40 patients (76.92%), respectively, were in class 1 and class 2, respectively. There were 17 patients (32.69%) in class 2 and 35 patients (67.31%) in class 1 in group C. Regarding the laryngoscopic view, there was no statistically significant difference between the groups (p=0.504).

In our study, 58.6%, 100%, and 100% of the patients received 0.4, 0.6, and 1.0 mg/kg succinylcholine, respectively, and were considered to have overall intubating conditions that were clinically acceptable (excellent and good grade combined). The statistical difference was substantial (P 0.001) Similar findings were reported by Mohd. EL Orbany et al. They found that succinylcholine, when administered at a dose of 0.5 to 0.6 mg/kg, can result in acceptable intubation conditions 60 seconds after administration.[17] Conditions attained with a dose of 0.6 mg/kg are comparable to those attained with 1.0 mg/kg. Good intubating circumstances were attained in all patients receiving succinylcholine at a dosage of 0.25 mg/kg, according to Nimmo et al. [20]. The ED90 value was also reported by Aaron F. Kopman et al. [21] at 0.273 mg/kg, which was less than our study.

However, Ramkumar et al.'s study [22] concluded that a dose of 0.3 mg/kg does not produce clinically acceptable circumstances. Despite the fact that it reduces apnea time in comparison to 1.0 mg/kg dose. After succinylcholine dosages of 0.6 and 1.0 mg/kg, intubating circumstances were comparable ($p>0.05$). When the medication dose was raised, the frequency of excellent intubating circumstances rose from 85.7% for doses of 0.45 mg/kg to 90% for doses of 0.6 mg/kg, and 94.7% for doses of 1 mg/kg. Patients in group A receiving 0.4 mg/kg succinylcholine frequently (40.38%) experienced difficult tracheal intubation.

According to our findings, the duration of aponea and the time it took for regular spontaneous breathing to resume were dose-dependent. According to a study by Smita Prakash et al., there is a statistically and clinically significant difference in aponea time between succinylcholine doses of 0.6 mg/kg and 1.0 mg/kg (4.40.59 min versus 8.40.64 min, respectively). [18] According to recent data, succinylcholine's duration of action at the laryngeal adductors does not seem to be considerably different from that at the adductor pollicis.[22-24] By lowering the incidence of succinylcholine-induced myalgia and hemodynamic alterations, the succinylcholine dose (from 1.5 mg/kg to 0.5 mg/kg) provides additional therapeutic benefits.

Pre-induction heart rate (beats per minute) used as baseline. Pre-induction mean heart rates for groups A, B, and C were 78.0± 6.47, 79.0± 5.24, and 82.0 ±4.10, respectively. Statistics showed that it was not significant (p>0.05). The post-induction and post-intubation heart rates were statistically insignificant (p>0.05) at various time periods.

Prior to induction, the mean arterial pressure in groups A, B, and C was 88±6.61, 90±4.87, and 94±3.80, respectively. Statistics showed that it was not significant (p>0.05). The heart rates following induction and intubation at various time points were statistically insignificant (p>0.05). Similar outcomes were seen in the research by Kopman et al. [26]

The numerous negative effects associated with succinylcholine administration In other investigations, there were laryngospasms, bronchospasms, cardiac dysrhythmias, myalgia, etc. However, none of the cases included in the current study showed any negative effects. Studies by Smita Parkash et al. [18] and Alaa Ezzat et al.[27] showed comparable findings with no negative side effects.

In conclusion, a dose of 0.6 mg/kg of succinylcholine produced appropriate intubating conditions compared to a dose of 1.0 mg/Kg with a brief aponea period and time to resume regular spontaneous breathing. With a non-clinically significant delay in the commencement of action, it reduces the length of abdominal fasciculation and neuromuscular block. Because succinylcholine's duration of effect is dose dependent, decreasing the dose enables a quicker recovery of spontaneous breathing and airway reflexes. Along with lowering the incidence of succinylcholine-induced side effects and problems, it also narrows the window of susceptibility in airway control during the induction of anaesthesia.

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