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Original Research Article

A Comparison of Intubating Condition and Hemodynamic Effect of Rocuronium and Succinylcholine in Geriatric Patient- A Double Blinded Randomised Control Study

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Abstract:

Background and Objectives: The elderly patient population is growing at a rapid pace, and as they age, their need for high-quality healthcare increases. However, quantifying their health problems can be difficult due to the lack of a standardized definition for the elderly population in medical literature. The Working Party into the Perioperative Care of the Elderly 2014 even suggested abandoning the use of chronological age to define "older. To compare intubating condition of rocuronium and succinylcholine in geriatric patient. To observe the hemodynamic effect and adverse effect of the study-drugs.

Methods: This randomized controlled trial was conducted in the Department of Anaesthesiology in Narayan Medical College & Hospital, Sasaram, a tertiary care, referral and teaching hospital during the study period. All adult patients who fulfil the inclusion criteria, are aged between beyond 65 years, undergoing elective surgery under general anaesthesia with succinylcholine or rocuronium as neuromuscular blocking agent were recruited in the study after written informed consent. Permission for the study was granted from the Institutional Ethics Committee.

Conclusion: Mean values of HR and MAP trends were significantly lower (p- values 0.018 and <0.0001 respectively) for Rocuronium group. SpO2 values were however comparable statistically. Adverse events were noted in higher number in Succinylcholine group; however, the comparison was found to be insignificant statistically (p-value 0.407). Scoring and grading of intubating conditions were comparable amongst both groups. Mean scores of 8.3 + 1.13 and 8.35 + 0.88 were noted in R and S groups with an insignificant p-value of 0.87. Intubation conditions were rated as excellent in 80% (16 patients) and good in 20% (4 patients) of the patients who received Rocuronium, and excellent in 85% (17 patients) and good in 15% (3 patients) of the patients who received Succinylcholine with a p-value of 0.67.

Keywords: Intubatinhg, Rocuronium, Succinylcholine.

Introduction

The elderly patient population is growing at a rapid pace, and as they age, their need for high-quality healthcare increases. [1] However, quantifying their health problems can be difficult due to the lack of a standardized definition for the elderly population in medical literature. The Working Party into the Perioperative Care of the Elderly 2014 even suggested abandoning the use of chronological age to define "older." [2] Some estimates suggest that there is a gradual decline of around 1% in functionality per year after the age of 40, which can be attributed to the natural process of aging affecting cellular processes and leading to a decline in the cell's capabilities and ultimately its death. Elderly patients are often excluded from research trials due to various factors, which is why this age group is rarely included in large randomized controlled trials. [3] There are several reasons why elderly patients are excluded from drug studies. One of the main reasons is that they often have multiple health issues and take numerous prescription medications that cannot be discontinued. Additionally, their physiological functions tend to decline over time, resulting in varying responses to treatments, which requires the study of a large number of variables. As a result of these factors, there is a shortage of studies on drug action in the elderly, making it challenging to predict how drugs will affect them. [4] As people age, the volume of distribution (VD) decreases and clearance decreases, which leads to higher drug concentrations in the blood. [5] Plasma cholinesterase is responsible for breaking down muscle relaxants like succinylcholine and mivacurium, and a reduction of enzyme levels due to aging can cause these drugs to

remain active for longer periods. [6] Proper management of NMBAs is crucial for elderly patients during surgery, particularly in the airway management needed for mask ventilation and tracheal intubation. Any remaining neuromuscular blockade after surgery may lead to respiratory complications. [7] NMBAs play a significant role in the development and consequences of unintentional consciousness during GA, as nearly all (97%) of the potential cases of awareness occurred in patients who were administered NMBAs. [8] Additionally, prompt reversal might be necessary for the treatment of unsuccessful tracheal intubation. As people age, all organs undergo changes, with the most significant reduction occurring in the cardiovascular, respiratory, renal, hepatic, and central nervous system. [9] In elderly patients, there is a decrease in lean body mass and total body water, while body fat increases. Elderly patients tend to require smaller doses of muscle relaxants, as fat-soluble drugs have a higher volume of distribution in this population. [6] Furthermore, geriatric patients have lower levels of protein-bound drugs, leading to increased free drug concentration and more significant pharmacological effects. [10] Older adults also experience a reduction in regional muscle blood flow, potentially leading to a lower concentration gradient between the effect site and plasma, which is illustrated by a lower keo in this population. [11]

Objective

To compare intubating condition of rocuronium and succinylcholine in geriatric patient.

To observe the hemodynamic effect and adverse effect of the study-drugs.

Material and Methods

This randomized controlled trial was conducted in the Department of Anaesthesiology in Narayan Medical College & Hospital, Sasaram, a tertiary care, referral and teaching hospital during the study period. All adult patients who fulfil the inclusion criteria, are aged between beyond 65 years, undergoing elective surgery under general anaesthesia with succinylcholine or rocuronium as neuromuscular blocking agent were recruited in the study after written informed consent. Permission for the study was granted from the Institutional Ethics Committee.

Inclusion Criteria

1. Patients of both the gender.
2. Patients aged 65 years or older undergoing surgery under general anaesthesia with succinylcholine or rocuronium.
3. ASA grade 1, 2 or 3.
4. Patients giving consent voluntarily

Exclusion Criteria

1. Known / suspected difficult Intubation
2. H/o any neuromuscular disorder
3. Renal / Hepatic disorder
4. Head injuries with GCS < 13
5. Hypovolemia/ Shock
6. Severe metabolic/electrolyte/ acid-base disturbances

In all the patients, Age, I.P No, Body Weight, Baseline vital parameters will be recorded. History regarding previous anaesthesia, surgery, any significant medical illness, medications and allergy will be taken. The fasting time was taken as the time interval between the last meal/drink and the time of trauma. The patients will pre-oxygenated with 100% O2 for 3 minutes and induced with a fixed dose of inj. Thiopentone sodium 250 mg I.V. Cricoid pressure can be given when Thiopentone is administered and released following successful tracheal intubation and inflation of the cuff. In patients with Ryle's tube inserted prior to induction, Sellick's manoeuvre will be carried with Ryle's tube in-situ.

In-*group R*, inj. Rocuronium bromide will be given in a dose of 0.6 mgkg-1 (2 x ED95) and the patients in-*group S* will receive Suxamethonium 1.5 mgkg-1. 60 seconds after injection of muscle relaxant, in the patients intubated orally; Simultaneously, intubating conditions will be noted and scored according to a modification of the method described by Mirakhur R.K., Cooper A.R. and Clarke R.S.J (Table 1 & 2)

Table 1: Scoring of intubating conditions

Score	Jaw Relaxation	Vocal Cords	Response To Intubation
0	Poor (impossible)	Closed	Severe coughing or bucking
1	Minimal (difficult)	Closed	Closed mild coughing
2	Moderate (fair)	Moving	Slight diaphragmatic movements
3	Good (easy)	Open	None

Table 2: Grading of intubating conditions

Intubating conditions	Score
Excellent	8-9
Good	6-7
Poor	3-5
Bad	0-2

Patients will be maintained with O2 + N2O, Vecuronium/Atracurium and at the end of surgery; muscle paralysis will be reversed with inj. neostigmine and inj. Glycopyrrolate. At the end of study, the data collected will be analysed statistically.

This study was conducted to compare intubating condition and hemodynamic effects of rocuronium and succinylcholine in geriatric patients by comparing the heart rate, MAP values and scoring and grading the intubating conditions in these patients.

Results

Age and gender distribution of patients:

Table 3: Age distribution of the patients.

Age	Group R (N=20)	Group S (N=20)	
65	4	5	
66	3	4	
67	1	3	
68	2	1	
69	2	1	
70	3	3	p-value 0.32
71	1	0	Std Error 0.894
72	2	2	t-statistic –
73	1	1	-1.007
75	1	0	CI -2.709 to
Mean	68.60	67.70	0.909
SD	3.00	2.64	

Table 4: Gender distribution of the patients

Gender	Group R (N=20)	Group S (N=20)	Grand Total
F	9	9	18
M	11	11	22
Grand Total	20	20	40
p-value (X^2)	**1.0**		

BMI distribution of Participated Patients:

Table 5: BMI distribution of participants.

BMI	S	R	
20-23	1	1	
24-26	5	5	p-value Std Error
27-28	6	8	t-statistic CI
29-30	8	6	
Grand Total	20	20	
Mean			
SD			

Comorbidities in participants:

Table 6: Comorbidities in participants.

Comorbidity	Control	Test	Grand Total
CAD	2	1	3
DIABETES	5	6	11
DYSLIPIDEMIA	2	2	4
HYPERTENSION	8	7	15
NONE	3	4	7
Grand Total	**20**	**20**	**40**
p-value (X^2)	**0.96**		

MAP trend in both groups:

Table 7: MAP blood pressure trend.

MAP	S Mean	S SD	R Mean	R SD
Baseline	85.70	4.80	85.50	5.10
NMBA	84.75	5.02	82.75	4.25
Intubation	105.37	6.45	87.87	7.63
1 min	100.40	4.13	86.75	6.09
3 min	99.32	3.15	83.75	4.15
5 min	86.25	5.52	85.45	5.07
Mean values	93.63	4.85	85.34	5.39
p-value	**<0.001***			

SpO2 trend in both groups:

Table 8: SpO2 trend.

SpO2	**S Mean**	**S SD**	**R Mean**	**R SD**
Baseline	99.10	0.31	99.10	0.31
NMBA	99.15	0.37	99.10	0.31
Intubation	99.10	0.31	99.15	0.37
1 min	99.10	0.31	99.10	0.45
3 min	99.15	0.37	99.10	0.31
5 min	99.05	0.22	99.10	0.31
Mean values	99.11	0.31	99.11	0.34
p-value	**1.0**			

Scoring of intubating conditions:

Table 9: Scoring of II intubating conditions

6	3	1	4
7	1	2	3
8	3	6	9
9	13	11	24
Grand Total	**20**	**20**	**40**
Mean	8.30	8.35	-
SD	1.13	0.88	-
p-value	**0.87**		

Grading of intubating conditions:

Table 10: Grading of intubating conditions.

Excellent	**16**	**17**	**33**
Good	4	3	7
Grand Total	**20**	**20**	**40**
p-value	**0.67**		

Discussion

The comparison of various NMBAs have been evaluated in multiple studies in geriatric population without a definitive conclusion. Succinylcholine has a prolonged effect in this population due to a relative lack of enzyme cholinesterase in blood. Many complications have been observed with the use of this agent in elderly patients. Rocuronium as a relatively newer agent has been seen to have smoother onset with predictable duration of effects due to primary elimination through urine and bile. Hence, we endeavoured to evaluate the newer agent rocuronium against succinylcholine for its efficacy and hemodynamic effects. 46 patients were assessed for eligibility. 5 patients did not meet the inclusion criteria and in addition two participants declined to participate. 41 patients were randomized to R and S groups out of which one patient was again excluded in R group as there was a break-in protocol. Finally, 20 patients in each group underwent the procedure and were evaluated. The BMI between the two groups was comparable with a P value of 0.64. The result was non-significant with the mean value of 27.6 ± 1.9 and 27.3 ± 2.2 kg/m^2 in the S and R groups respectively. The commonest co- morbidities found in patients were hypertension and diabetes in 15 and 11 patients respectively with a comparable p-value of 0.96 between the two groups. In both groups 4 and 16 pts each add ASA categories 1 and 2 respectively. Whereas Magorian et al. and Wright et al. [56,57] conducted a study on 50 and 48 patients in the age group 18-70 years with a mean of 37 ± 12, 30 ± 7, 32 ± 13 & 45 ± 16 and 50 ± 16, 43 ± 16, 43 ± 15 &

41 ± 19 for the Rocuronium group and Succinylcholine group respectively. In both studies, ASA 1-3 was randomly designated to receive one of three intravenous doses of rocuronium (0.6, 0.9 and 1.2 mg/kg) and succinylcholine (1.0 mg/kg) respectively. The previous study was conducted by Almeida et al on 80 patients in the age group of 18 to 65. They evaluated patients with a body mass index (BMI) of 40 kg/ m^2 or more. Patients were assigned to 1 of 4 groups for tracheal intubation. Group 1 received 1 mg of succinylcholine per kilogram of ideal weight, group 2 received 1 mg of succinylcholine per kilogram of real weight, group 3 received 0.6 mg of rocuronium per kilogram of ideal weight, and Group 4 received 0.6 mg of rocuronium per kilogram of real weight. Tracheal intubation was performed 60 seconds later and intubation conditions were recorded using a clinical scoring system. [Almeida et al 2009] In another study conducted by Li G et al. (2021) on 267 patients age group selected >18 years, 73 males with a mean age of 58 years and 53 females with a mean age of 42 years in group RM and 95 males with a mean age of 67 years and 46 females with a mean age of 33 years in SY group participated in the study with a p-value of 0.128. The BMI of both groups was 24.41 ± 1.45 and 24.12 ± 2.22 for the RM and SY group respectively with a comparable p- value of 0.213. The result was non-significant and it advocates our study. The commonest co-morbidities found in patients were hypoxemia and arterial hypotension in RM and SY groups respectively. Whereas arterial hypotension was the second-highest complication found in group RM after hypotension. [Li G et al. 2021] MAP was also recorded at the same intervals of onset, NBMA institution, intubation and 1,3- and 5-minutes post-intubation. The mean value was significantly higher with succinylcholine at 93.63 + 4.85 as compared to 85.34 + 5.39 with rocuronium. The p-value was highly significant at 0.001. SPO2 levels were also compared at similar intervals, and mean values were found to be comparable at 99.1 + 0.3 and 99.1 + 0.34 in S and R groups respectively with a p-value of 1.0. Whereas a study conducted by Andrews et al. failed to excellent grades were obtained. Intubation conditions were found excellent in 66% (88 patients), good in 27 % (36 patients), poor in 8 % (6 patients) and failed in 1 % (1 patient) who received Rocuronium and excellent in 74% (103 patients), good in 23 % (32 patients), poor in 2 % (3 patients) and failed in 1 % (1 patient) who received succinylcholine. [12]

Conclusion

Adverse events were noted in higher number in Succinylcholine group; however, the comparison was found to be insignificant statistically (p-value 0.407). Scoring and grading of intubating conditions were comparable amongst both groups. Mean scores of 8.3 + 1.13 and 8.35 + 0.88 were noted in R and S groups with an insignificant p-value of 0.87. Intubation conditions were rated as excellent in 80% (16 patients) and good in 20% (4 patients) of the patients who received Rocuronium, and excellent in 85% (17 patients) and good in 15% (3 patients) of the patients who received Succinylcholine with a p-value of 0.67.

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