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## Analysis of onset time and intubating conditions following intravenous administration of rocuronium 0.6 mg/kg and rocuronium 0.9 mg/kg doses and its comparison with succinylcholine 1.5 mg/kg for rapid sequence induction

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### Abstract

**Background:** The purpose of this study was to compare rocuronium to succinylcholine in adult patients undergoing elective surgery using two different doses of 0.6 mg/kg and 0.9 mg/kg for rapid sequence endotracheal intubation.

**Methodology:** Total of 90 cases were randomly divided into three groups of 30 in each. Group S was intubated with 1.5 mg succinylcholine chloride per kg of body weight, group R1 intubated with 0.6 mg rocuronium bromide per kg of body weight, and group R2 was intubated with 0.9 mg rocuronium bromide per kg of body weight.

**Results:** 90% in group S, 53.33% in group R1, and 76.67% in group R2 cases had excellent intubating conditions. The onset time of group S was significantly shorter than that of group R2 and group R1. There was statistical significance difference observed among group S, group R1, and group R2 regarding clinical onset of action ( $45.58 \pm 4.198$ ,  $56.38 \pm 5.032$ , and  $52.59 \pm 3.966$  seconds). Group S, group R1, and group R2 had mean duration of action of  $5.24 \pm 1.453$ ,  $23.96 \pm 2.14$ , and  $43.18 \pm 2.12$  minutes respectively. In group R1 and group R2, the mean heart rate was increased by 47.1% and 33.9%, and mean arterial pressure increased by 28.56% and 24.92% observed one min after intubation, and returned to preinduction levels after 5 minutes. In all three groups, no significant side effects were observed.

**Conclusion:** Rocuronium at 0.9 mg/kg dose is preferable and alternative to succinylcholine in cases where succinylcholine is contraindicated.

**Key words:** rapid sequence induction, succinylcholine chloride, rocuronium bromide, intubation.

## Introduction

The ideal neuromuscular blocking agent for rapid sequence induction should have a fast onset, brief duration of action, should provide profound relaxation and should be free from any haemodynamic changes.<sup>1</sup> To meet the demand for jaw relaxation, the first non-depolarizing skeletal muscle relaxant, d-tubocurarine, was released in 1942. It also had a delayed onset of jaw relaxation, rendering it inappropriate for use in emergency situations requiring quick sequence intubation. As a result, a quest for a relaxant with a quick onset and brief duration of action began.<sup>2</sup> Succinylcholine chloride is a synthetic ultrashort acting depolarizing muscle relaxant that was released in 1951. It became the medication of choice for endotracheal intubation in emergency situations requiring rapid sequence intubation.<sup>3,4</sup> Due to side effects, such as hyperkalemia, increased intragastric, intraocular, and intracranial pressures, and cardiovascular consequences, a search for an alternative to succinylcholine has begun. Rocuronium, a non-depolarizing amino steroidal muscle relaxant a low potency compound.<sup>5,6</sup> It offers early onset of action, intermediate duration of action and excellent to good intubating conditions. In 60 seconds, two to three times the ED<sub>95</sub> dose of rocuronium bromide is said to generate good to outstanding intubating circumstances. There were less studies were established to make comparison of succinylcholine and rocuronium.<sup>7,8</sup> The current study compared the onset time, clinical duration of action and intubating conditions, haemodynamic effects and adverse effect by using rocuronium bromide at 0.6 mg/kg, 0.9 mg/kg of body weight with that of succinylcholine 1.5 mg/kg of body weight IV at 60 seconds.

## Methodology

**Study design:** A prospective randomized comparative study was conducted in the department of Anesthesia, Guntur medical college from January 2020 to December 2021.

**Sample size:** Inclusion criteria includes age group between 18–60 years, ASA grade 1 and 2, cases who give informed valid consent, and cases who are undergoing for various elective surgeries. Exclusion criteria were patients with anticipated difficult airway, Modified Mallampati airway classification III and IV, Pregnant women, Hypertension & Diabetes mellitus, Bronchial asthma, Ischemic heart disease, presence of neuromuscular disease, known allergy to study drugs, and hepatic and renal diseases.

Sample size calculated based on the previous study results assuming that 20% difference in mean post-operative pain score would be detectable between the three groups using sample size of 30 cases per group for analysis of variance with a power of 80% and alpha level of

0.05. Patient randomization was done by lottery method using “computer generated random number table” to one of the three groups:

- Group S (n = 30) were scheduled to receive succinylcholine chloride 1.5 mg/kg of body weight and at 60 seconds intubation was attempted intravenously.
- Group R1 (n = 30) were scheduled to receive rocuronium bromide 0.6mg/kg of body weight and at 60 seconds intubation was attempted intravenously.
- Group R2 (n = 30) were scheduled to receive rocuronium bromide 0.9 mg/kg of body weight and at 60 seconds intubation was attempted intravenously.

The dosage was selected as per studies done by Weiss et al., and Bhatia Pradeep Kumar et al.<sup>9,10</sup>

**Anesthesia technique:** A day before surgery, pre-anesthetic evaluation was performed, and essential investigations done. On the night before surgery, all patients were given Tab. alprazolam 0.5 mg and Tab. pantoprazole 40 mg. Prior to surgery, patients were kept nil by mouth for a period of 10 hours. On the day of surgery, the patient is linked to a multichannel monitor that includes a pulse oximeter, electrocardiogram (Lead II), heart rate, non-invasive blood pressure, and capnography after being transported to the operating theatre. All patients received intramuscular injections of glycopyrrolate 0.2 mg and injection midazolam 1 mg 20–30 minutes previous to receiving the induction drug. For 3 minutes, patients were pre-oxygenated with 100 percent oxygen via a face mask. Injection begins one minute after preoxygenation. Fentanyl was given intravenously at a dose of 2 mg/kg of body weight. They were induced using thiopentone sodium 2.5%, 5 mg/kg of body weight intravenously. In group S, succinylcholine chloride of 1.5 mg kg/body weight intravenously given after loss of eyelash reflex is elicited. In groups R1, and R2 rocuronium bromide 0.6 mg/kg and 0.9 mg/kg were given intravenously after the loss of eyelash reflex. In all three groups of patients, oral endotracheal intubation is attempted at 60 seconds following muscle relaxant administration, and intubating conditions were assessed according to the following criteria.

Three parameters taken into consideration to assess intubating conditions [Table 1]. The final assessment was considered:

1. “Excellent” if all parameters were judged excellent.
2. “Good” if one or more parameters were good and none were rated as poor.
3. “Poor” if any of the parameters was rated poor.

All patients were intubated using well-lubricated oral PVC cuffed endotracheal tubes, with the cuff inflated, bilateral air entrance checked, and the tube

**Table 1.** Assessment of intubating conditions<sup>9</sup>

Variable assessed	Excellent	Good	Poor
Laryngoscopy	Easy	Fair	Difficult
Vocal cord position	Abducted	Intermediate or moving	Closed
Reaction to insertion of Tracheal tube and cuff inflation	None	Slight (1 or 2 weak contractions/movement lasting < 5 sec)	Vigorous or sustained (> 2 contractions or diaphragmatic movement for > 5 sec)

firmly fastened. During the intubation research time, no unpleasant stimuli were allowed. Anaesthesia was maintained by a mixture of 40% oxygen and 60% nitrous oxide, as well as an inhalational anaesthetic agent and IPPV. Following intubation, vital measures such as the electrocardiogram (Lead II), heart rate, oxygen saturation, systolic, diastolic, and mean arterial blood pressures were monitored.

The period from the injection of the relaxant to the first attempt at respiration of first bolus doses of Succinylcholine and Rocuronium bromide was recorded as the clinical duration of effect. The muscle relaxation was maintained with additional dosages of NDMRs until the surgery was completed. All patients were given injections of neostigmine 0.05 mg/kg of body weight and injection glycopyrrolate 0.01 mg/kg of body weight at the conclusion of the surgery. Patients were extubated after the extubation criteria were met. After extubation, patients were ventilated with 100% oxygen for 5 minutes before being transferred to the post-operative ward.

**Statistics:** Statistical analysis was performed with SPSS (IBM Corp. Version 20.0. Armonk, NY, USA). One way ANOVA was performed for multiple comparisons followed by Tukey – post hoc test for pairwise comparisons. Results were displayed as mean  $\pm$  standard deviation, and for all statistical tests, P-value  $\leq$  0.05 was taken as significant.

## Results

There were no differences among three groups with respect to age, body weight, ASA class, and duration of surgery ( $p > 0.05$ ). The percentage of females was found to be higher than males in each group showing statistically significant difference ( $P = 0.03$ ). There was statistically significant difference was observed among three groups with respect to onset of action ( $p < 0.01$ ) and duration of analgesia ( $p < 0.001$ ). There was statistically significant quick onset of analgesia in patients of group S ( $45.58 \pm 4.19$  seconds) when compared with group R1 and R2 ( $56.38 \pm 5.032$  sec vs  $52.59 \pm 3.96$  sec) with P-value of  $< 0.01$ . The mean duration of action of the drug in group S was  $5.24 \pm 1.45$  minutes, in group R1 was  $23.96 \pm 2.14$  minutes and in group R2 was  $43.18 \pm 2.12$  minutes. The difference in the mean duration of action of the drugs was statistically significant ( $p < 0.001$ ) [Table 2]. Patients in all the three groups were comparable with respect to intubation conditions. Data analyzed using chi-square test and observed as statistically significant with P-value of 0.02. In group R1, four patients (13.34%) experienced poor intubating conditions, with vocal chords moving and a strong reaction to the tracheal tube insertion. In group R2, 23 (76.67%) cases had excellent intubating conditions and 6 (20%) patients had good intubating conditions and 1 (3.33%) patient had poor intubating conditions. There

**Table 2.** Demographic profile, duration of surgery and anaesthesia in two groups

	Group S	Group R1	Group R2	P-value
Age [range] years	$34.31 \pm 8.11$ [20–48]	$29.97 \pm 5.5$ [20–41]	$31.37 \pm 8.3$ [20–49]	0.075a
Gender (male/female)	10/20	14/16	20/10	0.034b
Body weight (range) kg	$54.93 \pm 5.1$ [44–63]	$55.55 \pm 4.42$ [44–65]	$53.88 \pm 6.9$ [43–68]	0.507
ASA (I/II)	23/7	20/10	16/14	0.5
Duration of surgery (min)	$97.5 \pm 9.1$	$98.0 \pm 8.8$	$105.9 \pm 10.2$	0.4
Onset of action distribution (seconds)	$45.58 \pm 4.19$	$56.38 \pm 5.032$	$52.59 \pm 3.966$	$< 0.01c$
Duration of analgesia (range) minutes	$5.24 \pm 1.45$ [37–54]	$23.96 \pm 2.14$ [47–67]	$43.18 \pm 2.12$ [44–65]	$< 0.001c$
Intubation Score (At 60 sec)	8	5	7	$< 0.001$

<sup>a</sup> ANOVA test, <sup>b</sup> Chi-square test, <sup>c</sup> ANOVA & Bonferroni Post Hoc test.

**Table 3.** Intubation condition distribution of the patients among the groups

Intubation Condition	Group S	Group R1	Group R2	Total	Chi-Square	P-value
Excellent	27	16	23	66	11.15	0.0249
	90.00%	53.33%	76.67%	73.30%		
Good	3	10	6	19		
	10.00%	33.33%	20.00%	21.10%		
Poor	0	4	1	5		
	0.00%	13.34%	3.33%	5.60%		
Total	30	30	30	90		
	100.00%	100.00%	100.00%	100.00%		

was statistically significant increase duration of analgesia in patients of group R2, followed by group R1, and group S ( $p < 0.001$ ) [Table 3].

The heart rate, mean Arterial Pressure, Systolic blood pressure, and diastolic blood pressure were recorded. There were no abnormal ECG findings noted in any of the cases following the administration of drugs. There was a significant ( $p < 0.05$ ) rise in heart rate by 35.4%, 47.1%, and 33.9% from the basal value within group S, R1, and R2 respectively. This increase in mean heart rate declined to 14%, 20.3%, and 9.9% at 5 minutes following intubation [Table 4].

There was a significant ( $p < 0.05$ ) rise in mean arterial pressure by 18.5%, 28.56%, 24.92% from the basal value at 1 minute following intubation in group S, group R1, and group R2 respectively. This rise in mean arterial pressure declined to 14.98%, 16.18%, and 16.44% at 5 minutes following intubation. In all three groups, there was a trend towards returning to baseline mean arterial pressure at 5 minute following intubation [Table 5].

Systolic blood pressure changes during the entire intraoperative period was statistically not significant in all the three groups ( $p > 0.05$ ). Mean diastolic blood pres-

sure changes during the entire intraoperative period was statistically not significant in three groups ( $p > 0.05$ ) (Figure 1). Oxygen saturation before and following induction of anaesthesia and tracheal intubation was ranged between 97% and 100%. No episodes of flushing, laryngospasm, bronchospasm, generalized rigidity, tachycardia or hypotension were observed in three groups.

## Discussion

In the present study, we have compared onset time and intubating conditions achieved with succinylcholine 1.5 mg/kg and rocuronium 0.6 mg/kg and 0.9 mg/kg IV.

In our study, the mean onset of action of succinylcholine was  $45.58 \pm 4.19$  seconds. The result was similar to other studies.<sup>4,5,7,11-16</sup> Variable results was found in other study<sup>17</sup>, which caused due to different doses.

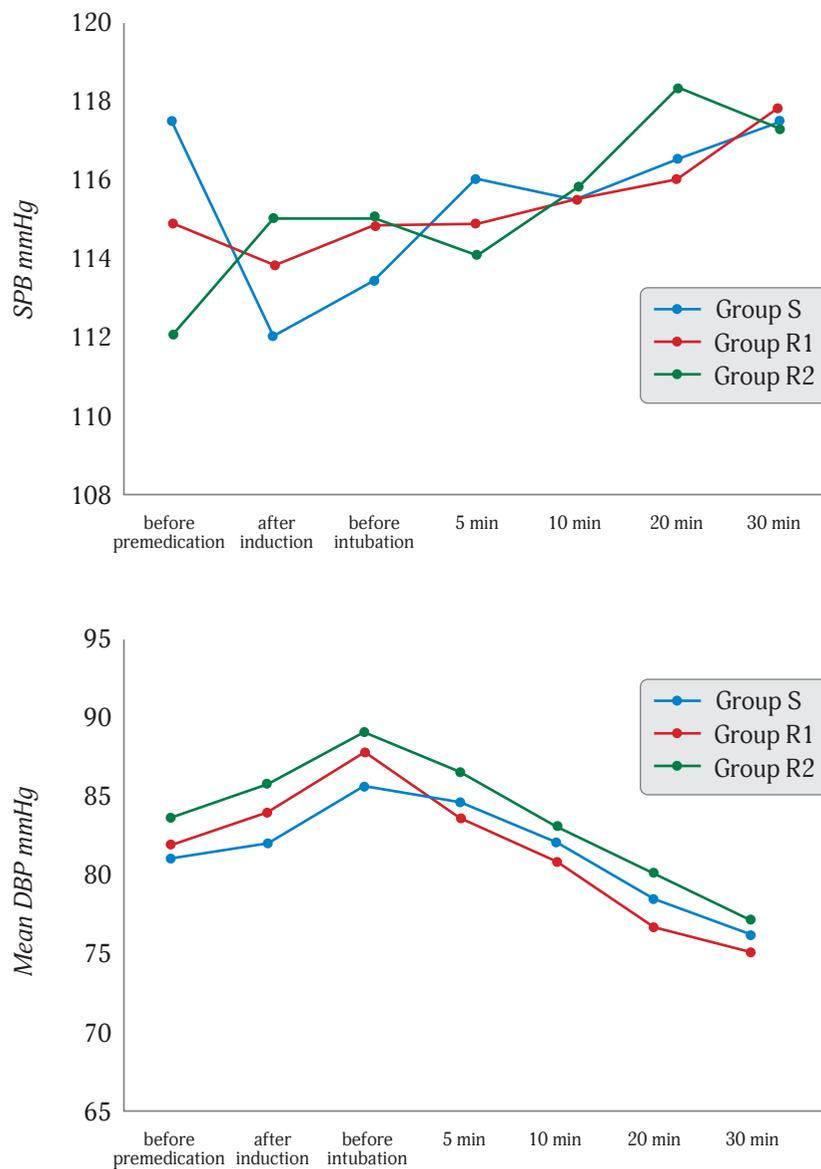
In our study, the mean onset of action of rocuronium of 0.6 mg/kg was  $56.38 \pm 5.032$  seconds. The mean onset of action of Rocuronium of 0.9 mg/kg was  $52.59 \pm 3.966$  seconds. This result agrees with other studies.<sup>5,6,7,18</sup> The difference in the results was due to different methods of detecting the onset of neuromuscular blockade.

**Table 4.** Heart rate response to induction and intubation

Heart Rate	Heart Rate (beats/minute)						F-value	P-value
	Group S		Group R1		Group R2			
	Mean	% ↓	Mean	% ↓	Mean	% ↓		
Pre-induction	83.34 ± 7.48		83.12 ± 5.608		85.01 ± 7.539		0.664	0.517
One Min After Induction	112.82 ± 8.51	35.4	122.3 ± 11.83	47.1	113.86 ± 7.274	33.9	9.73	< 0.001
3 Min	100.2 ± 8.7	-11.2	111.2 ± 9.66	-9.1	101.17 ± 7.473	-11.1	12.29	< 0.001
5 Min	86.19 ± 6.63	-14	88.61 ± 7.904	-20.3	91.15 ± 8.359	-9.9	3.136	0.048

**Table 5.** Mean arterial pressure response to induction and intubation

Time point	Mean Arterial Pressure (mm Hg)						F-value	P-value
	Group S		Group R1		Group R2			
	Mean	% ↓	Mean	% ↓	Mean	% ↓		
Pre-induction	94.62 ± 5.6		92.28 ± 5.85		92.13 ± 5.49		1.819	0.168
One Min After Induction	112.13 ± 9.52	18.5	118.64 ± 9.35	28.56	115.09 ± 7.72	24.92	4.18	0.018
3 Min	107.03 ± 8.66	-4.54	116 ± 9.407	-2.22	111.42 ± 7.33	-3.18	8.341	< 0.001
5 Min	90.99 ± 8.37	-14.98	97.23 ± 6.80	-16.18	93.1 ± 4.12	-16.44	3.182	0.046



**Fig. 1.** Comparison of mean systolic and diastolic blood pressure among the groups

A study conducted by Franklin et al.<sup>19</sup> observed that the onset time was significantly more with rocuronium 0.6 mg/kg and 0.9 mg/kg as ( $195.72 \pm 34.62$  sec) and ( $111.00 \pm 19.13$  sec) than succinylcholine ( $64.72 \pm 10.91$  sec). Hence, the onset time is complementary to information provided by the intubation score. It is very important to note that all the patients in the rocuronium group were intubated with good to excellent intubating conditions when there was no diaphragmatic activity. This was acceptable even in emergency tracheal intubation in those patients in whom succinylcholine is contraindicated because of the presence of other problems. A study conducted by Mahalaxmi et al.<sup>20</sup> observed a shorter duration for the onset of action in the succinylcholine group compared to other two groups of Rocuronium, a study conducted by Kulkarni KR et al.<sup>21</sup> supported our findings for a shorter duration of onset in succinylcholine group. Magorian et al.<sup>22</sup> found that increasing the dosage of rocuronium from 0.6 mg/kg to 0.9 mg/kg nearly halved the onset time.

In our study, the mean duration of action of the drug in group S, group R1, and group R2 were  $5.24 \pm 1.45$ ,  $23.96 \pm 2.14$ ,  $43.18 \pm 2.12$  minutes with statistically significant difference ( $p < 0.001$ ). This investigation observed shorter duration of action, which is similar to the findings of Bhandari et al. This result matches with the studies done by Venkateswaran R et al.<sup>23</sup> and Penchalaiah C et al.<sup>24</sup> But, comparable result was observed in other studies.<sup>6,17,22</sup>

The degree of neuromuscular inhibition at the laryngeal adductors has a greater impact on intubating conditions than that at the adductor pollicis. For appropriate intubating settings, total laryngeal or diaphragmatic blockage may not be required. The onset of relaxant is much faster in the muscles required for proper intubating circumstances than in the muscle that is normally monitored.<sup>25,26</sup>

Using succinylcholine at 60 seconds with a dose of 1.5 mg/kg, we established excellent intubating circumstances. This is similar to other studies.<sup>5,6,7,18</sup> Whereas Mc Court KC et al.<sup>27</sup> study achieved excellent intubation in 80% of cases.

In our study, excellent intubating conditions were achieved in 76.67% of the patients at 60 second with rocuronium 0.9 mg/kg dose. This was comparable to the findings of other studies.<sup>5,6,7,17,18,22</sup>

While study by Mc Court et al., showed 58.2% of patients had excellent intubating condition. This difference in intubating conditions may be due to the relaxation of laryngeal muscles occurs before the adductor pollicis of the thumb.

Study conducted by Kulkarni KR et al.<sup>21</sup> observed acceptable intubating conditions at 60 sec in 100% of the patients in groups S and R2 and 92% in group R1. 8%

of case in group R1 had a poor score at 60 sec which is statistically significant at 5% probability and insignificant at 1% probability, whereas at 90 sec as insignificant when comparing the three groups. A similar study by Cheng AY et al.<sup>28</sup> for intubating conditions in children of 1–12 years, observed a significant difference in intubating conditions of three groups. Rocuronium 0.9 mg/kg provided similar intubating conditions at 30 seconds as with succinylcholine 1.5 mg/kg during modified rapid-sequence induction using alfentanil and thiopentone anesthesia ( $P = 0.671$ ). Rocuronium 0.6 mg/kg was inadequate. Our observations were also similar to the studies. Thus increasing the dose to 0.9 mg/kg of rocuronium provides faster onset time and better tracheal intubating conditions thus minimizes the risk of coughing, bucking, or aspiration. Puhlinger 4 noted onset time of 0.8 min and 1.2 min with 1 mg/kg of succinylcholine and 0.6 mg/kg of rocuronium respectively under balanced anesthesia.

Fuchs-Buder T<sup>29</sup> noted an onset time of 190 sec with 0.6 mg/kg of rocuronium with alfentanil-thiopentone induction in children. Baskaran et al.<sup>30</sup> found that with Succinylcholine 1.5 mg/kg (100%) compared to any dose of Rocuronium, the excellent intubating condition was substantially higher. Rocuronium 0.9 mg/kg (95%), compared to Rocuronium 0.6 mg/kg, showed a considerably higher incidence of excellent intubating condition (30%). Between Rocuronium 0.9 mg/kg and Succinylcholine 1.5 mg/kg, there was no statistically significant difference. Cheng et al.,<sup>28</sup> and Weiss et al.,<sup>9</sup> had similar findings. Cooper et al.,<sup>6</sup> found that 95% of patients were ready in 60 seconds and all patients were ready in 90 seconds.

The best neuromuscular blocking agent can produce cardiovascular stability. After one minute of intubation, the heart rate in group S increased by 35% from the baseline before intubation compared to group R1, and it was virtually identical to group R2, which increased by 47% and 34% respectively, and this mean difference was statistically significant after one minute of intubation.

At 3 and 5 minutes, heart rates declined in all three groups, but in group S, heart rate remained stable, compared to group R1 and group R2, with statistically significant ( $p = 0.01$ ). Mean arterial pressure was not statistically significant at baseline ( $p = 0.168$ ), but increased only 14% in group S after 1 minute of intubation, compared to 28% in group R1 and 26% in group R2, which was statistically significant ( $p = 0.01$ ). After one minute, three minutes, and five minutes, it reduced by 20% and stabilised in group S, compared to group R1 and group R2, both of which revealed statistically significant observations ( $p = 0.01$ ). Following delivery of drugs, all three groups observed an increase in heart rate and mean arterial pressure, according to Bhandari et al. The current study findings were consistent with Shukla A et al. and

Cooper & Penchalaiah et al., Nitschmann et al.<sup>31</sup> and Levy et al.<sup>32</sup> This is also in compact with the findings of Booth et al.,<sup>33</sup> who reported heart rate increased by 36% in the first minute after rocuronium injection. According to Theshelf et al.,<sup>34</sup> there was a rise in mean arterial pressure after succinylcholine injection, which was explained by stimulation of the autonomic ganglia. Furthermore, the response to laryngoscopy and endotracheal intubation resulted in a clinically minor elevation in hemodynamic parameters, which dropped to approach pre-medication levels 10 minutes after intubation.

In our study, the haemodynamic changes with succinylcholine of 1.5 mg/kg dosage was compared to the haemodynamic changes with rocuronium of 0.6 mg/kg and 0.9 mg/kg dosages. The findings were similar to other studies.<sup>5,6,7,17,18,22</sup>

Furthermore clinically insignificant increase in haemodynamic parameters were due to the response to laryngoscopy and endotracheal intubation, which subsided to near pre medication value ten minutes after intubation. There were no adverse events such as bradycardia, tachycardia, hypotension, hypertension, bronchospasm, laryngospasm, cutaneous flushing, urticaria, or anaphylactic reactions in any of the three groups.

Studies reported similar results in their investigations. Although fasciculations were the sole side event observed by 95% of subjects in the succinylcholine group.<sup>5,6,7,18,22</sup>

## Conclusion

Succinylcholine chloride with its rapid termination of action (3–7 min) is a safer agent for use in patients with anticipated difficulty in intubation. Increasing the dose of rocuronium bromide from 0.6 mg/kg of body weight to 0.9 mg/kg of body weight enhances the incidence of clinically acceptable, excellent intubating conditions. Rocuronium of 0.9 mg/kg dose is an alternative to succinylcholine for rapid sequence induction in patients, at situations where succinylcholine is contraindicated.

## Funding

Nil.

## Conflicts of interest

There were no conflicts of interest declared.

## Ethics statement:

Consent was obtained by all participants. Institutional Ethics Committee approved study protocol by Guntur Medical College [GMC/IEC/232/2019 dated 07–12–2019].

## Authors contribution

Supervision: MVB; Literature search & collected data: NSK, DK, GCS, BPKN; Analyzed data & manuscript write:

NSK, GCS, BPKN; Conceived and designed the analysis: DK, MVB; Assessment of research report process: MVB.

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Аналіз часу початку та умов інтубації після внутрішньовенного введення рокуронію 0,6 мг/кг і рокуронію 0,9 мг/кг і порівняння їх із сукцинілхоліном 1,5 мг/кг для індукції швидкої послідовності

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#### Анотація

**Довідкова інформація:** метою цього дослідження було порівняння рокуронію та сукцинілхоліну у дорослих пацієнтів, яким проводили планову операцію, використовуючи дві різні дози 0,6 мг/кг та 0,9 мг/кг для швидкої послідовної ендотрахеальної інтубації.

**Методологія:** 90 випадків випадковим чином розділили на три групи по 30 у кожній. Групу S інтубували 1,5 мг сукцинілхоліну хлориду на кг маси тіла, групу R1 інтубували 0,6 мг рокуронію броміду на кг маси тіла, а групу R2 інтубували 0,9 мг рокуронію броміду на кг маси тіла.

**Результати:** 90% у групі S, 53,33% у групі R1 та 76,67% у групі R2 мали різні умови інтубації. Час початку дії доз групи S був значно коротшим, ніж у групі R2 і R1. Спостерігалася статистично значуща різниця між групою S, групою R1 і групою R2 щодо клінічного початку дії ( $45,58 \pm 4,198$ ,  $56,38 \pm 5,032$  і  $52,59 \pm 3,966$  секунд). Група S, група R1 і група R2 мали середню тривалість дії  $5,24 \pm 1,453$ ,  $23,96 \pm 2,14$  і  $43,18 \pm 2,12$  хвилин відповідно. У групі R1 і R2 середня частота серцевих скорочень зросла на 47,1% і 33,9%, а середній артеріальний тиск підвищився на 28,56% і 24,92%, що спостерігалось через одну хвилину після інтубації, і повернувся до рівня перед індукцією через 5 хвилин. У всіх трьох групах суттєвих побічних ефектів не спостерігалось.

**Висновок:** рокуроній у дозі 0,9 мг/кг є кращим і альтернативним сукцинілхоліну у випадках, коли сукцинілхолін протипоказаний.

**Ключові слова:** швидка послідовна індукція, сукцинілхоліну хлорид, рокуронію бромід, інтубація.