

# An Observational Study on Effects of Rocuronium Bromide during Tracheal Intubation among Elective Caesarean Section Patients

Nitin Dagdu Waghchoure<sup>1</sup>, Sushil Vishnu Boraste<sup>2</sup>

<sup>1,2</sup>Assistant Professor, Department of Anaesthesiology, SMBT Institute of Medical Sciences and Research Centre, Dhamangoan Nashik, Maharashtra 422403, India.

## Abstract

**Background:** Aspiration of gastric content, during induction and intubation is a major risk factor which determines the outcome of anaesthesia. As all the patients undergoing caesarean section are considered full of stomach due to delayed gastric emptying, rapid intubation is mandatory in them. The ideal muscle relaxant is the one who produces faster onset of action; resultant in to reduction in the incidence of side effects. The aim of this study was to determine the effects of rocuronium during tracheal intubation on patients who were scheduled for elective caesarean section.

**Material and Methods:** Total 90 ASA grade I and II near term patients who were to undergo elective caesarean section were included. Selected patients were randomly divided in to 3 groups consisting 30 patients in each. Group I (S60) patients received suxamethonium 1.5 mg/kg with intubation attempted at 60 seconds and patients of groups II (R60) and III (R90) received rocuronium 0.6 mg/kg with intubation attempted at 60 seconds and rocuronium 0.6 mg/kg with intubation attempted at 90 seconds respectively.

**Results:** The intubating conditions were acceptable in all the patients belonging to group I (S60) and group III (R90), while 04 patients in group II (R60) had unacceptable intubating conditions. Rocuronium found haemodynamically stable as suxamethonium.

**Conclusion:** Rocuronium provides acceptable intubating conditions in patients undergoing elective caesarean section with no incidence of side effects or complications.

**Keywords:** Rocuronium; Suxamethonium; Caesarean Section; Intubating Conditions.

## Introduction

The most important aspect of general anaesthesia is rapid and safe endotracheal intubation. Tracheal intubation is a routine procedure to ensure a safe protected airway through which one can provide intermittent positive pressure ventilation during all procedures carried out under general anaesthesia. Aspiration of gastric content, during induction and intubation is a major risk factor which determines the outcome of anaesthesia and endotracheal intubation is mandatory to avoid morbidity and mortality due to this. The ease with which

endotracheal intubation is performed depends upon degree of muscle relaxation, depth of anaesthesia and skill of anaesthesiologist [1]. The ideal muscle relaxant is the one who produces faster onset of action; resultant in to reduction in risk of side effects.

As all the patients undergoing caesarean section are considered full of stomach due to delayed gastric emptying, rapid intubation is mandatory in them. Traditionally, suxamethonium is being used to facilitate rapid sequence induction and endotracheal intubation. Although suxamethonium has rapid onset of time and brief duration of action it also showed many adverse systemic effects including cardiac

**Corresponding Author:** Sushil Vishnu Boraste, Assistant Professor, Department of Anaesthesiology, SMBT Institute of Medical Sciences and Research Centre, Dhamangoan, Nashik, Maharashtra 422403, India.  
E-mail: [drsushilboraste@yahoo.co.in](mailto:drsushilboraste@yahoo.co.in)

Received on 16.12.2017, Accepted on 10.01.2018

dysrhythmias, muscle fasciculation, hyperkalemia, elevated intracranial, intragastric and intraocular pressure. Different techniques have been tried including 'priming' [2] to decrease the effective onset time of nondepolarizing muscle relaxants like vecuronium, pancuronium or atracurium. Though priming accelerates the onset of block of most non depolarizing relaxant by 30-60 seconds, intubation time is still long and is considered unsafe.

Rocuronium is a non depolarizing muscle relaxant introduced in nineties and whose formula was based on vecuronium bromide [3]. Different studies suggested that unlike suxamethonium rocuronium has little or no cardiovascular effects, placental transfer is limited and it has no adverse effects towards neonate. In contrast to conventional anaesthetic neither priming nor marked increased doses are required to achieve a rapid onset. So rocuronium could be potentially ideal for fast intubation with no or minimum side effects in all patients receiving general anaesthesia including caesarean section. With this background in mind current study was conducted with following aim and objectives.

#### *Aim*

To study effect of rocuronium bromide during tracheal intubation in patients undergoing elective caesarean section.

#### *Objectives*

- To assess the intubating conditions with rocuronium bromide and suxamethonium.
- To study the changes in hemodynamic parameters.
- To assess the effect of rocuronium on neonates.

#### **Material and Methods**

The present study was conducted after institutional ethical committee's approval. Patients were enrolled after explaining the purpose and procedure of the study and written informed consent was obtained. Total 90 ASA grade I and II near term patients who were to undergo elective caesarean section were included. Patients of foetal distress, known case of intrauterine foetal death or congenital anomalies, multiple gestations, patients with difficult airway or obesity (weight > 100kg), ASA grade III or more and patients on drugs like anticonvulsant, polypeptide antibiotics etc were excluded from study. Selected patients were randomly divided in to 3 groups

consisting 30 patients in each. Group I patients received suxamethonium and patients of groups II and III received rocuronium as follows.

Group I (S60): Suxamethonium 1.5 mg/kg with intubation attempted at 60 seconds;

Group II (R60): Rocuronium 0.6 mg/kg with intubation attempted at 60 seconds;

Group III (R90): Rocuronium 0.6 mg/kg with intubation attempted at 90 seconds.

All minimum necessary investigations were performed before commencing study. All the patients received tablet famotidine 40 mg orally at 10 pm. on the night before surgery and fasted overnight. On the day of surgery baseline pulse rate, blood pressure, body weigh were recorded.

Intramuscular premedication in the form of injection glycopyrrolate 0.2 mg was given 30 minutes prior to induction of anaesthesia. Pre-oxygenation was carried out with 100% O<sub>2</sub> for 3 minutes. Anaesthesia was induced with injection thiopentone 5 mg/kg/IV. Abolition of eyelid and eyelash confirmed induction in all cases. Immediately after induction muscle relaxants were administered intravenously according to their dose in specified groups and time onset of apnoea noted.

Laryngoscopy and intubation was attempted as specified for the groups i.e. at 60 seconds after the injection of suxamethonium of 1.5 mg/kg in group I (S60) and at 60 and 90 seconds after injection of rocuronium of 0.6 mg/kg in group II (R60) and group III (R90) respectively.

Intubation conditions were assessed according to three point scales (0-2) and if the score were in between 5 to 8 and 0 to 4 were labelled it as acceptable and unacceptable intubating conditions respectively (Table 1). If the patients having difficult intubating condition were managed according to difficult airway management protocol.

At the end of surgery residual neuromuscular blockage was reversed with injection neostigmine 0.05 mg/kg and atropine 0.02 mg/kg or glycopyrrolate 10µg/kg. Vitals were recorded before and after induction, 1 and 5 minutes after intubation and thereafter every 10 minutes throughout the surgical procedure in all the groups. Side effects and complication noted if any. Every neonate was evaluated by paediatrician and Apgar scores at 1 and 5 minutes were noted.

#### *Data Analysis*

Data coding and entry was done in Microsoft Excel spread sheets and descriptive and inferential statistical analysis was done by using SPSS version

21 (Statistical Package for Social Sciences) software. One way ANOVA, Tukey Kramer multiple comparison test, Un-paired 't' test, mean, standard deviation used and differences were considered to be significant if p value was < 0.05.

## Results

In present study total 90 full term parturients, scheduled to undergo elective caesarean section were divided in equally in three groups. On one way

ANOVA the difference of the age groups and weight groups in between three groups found statistically non significant. (Table 2 A & B). The mean time of apnoea onset of suxamethonium group I (S60) was  $25.06 \pm 6.89$ , for group II (R60) and group III (R90) it was  $29.76 \pm 10.21$  and  $32.83 \pm 8.63$  respectively. Statistically significant difference was observed in between mean apnoea onset time of all three groups (S60, R60 and R90) but non-significant difference was seen in between two rocuronium groups. i.e. R60 and R90 (Table 3).

**Table 1:** Assessment of intubation conditions

| Sr. No | Variables              | Conditions    |                   |                     |
|--------|------------------------|---------------|-------------------|---------------------|
| 1      | Jaw relaxation         | Good          | Incomplete        | Poor                |
| 2      | Vocal cord position    | Full abducted | Slightly abducted | Moderately abducted |
| 3      | Reaction to intubation | None          | Bucking           | Gross movement      |
|        | Score                  | 2             | 1                 | 0                   |
|        | Interpretations        |               |                   |                     |
|        | Excellent (7 to 8)     | Acceptable    | Fair (2 to 4)     | Unacceptable        |
|        | Good (5 to 6)          |               | Poor (to 1)       |                     |

**Table 2A:** Age wise distribution of patients

| Sr. No | Age groups (yrs) | No of patients   |                  |                  |
|--------|------------------|------------------|------------------|------------------|
|        |                  | Group I (S60)    | Group II (R60)   | Group III (R90)  |
| 1.     | 20-25            | 23               | 19               | 18               |
| 2.     | 26-30            | 06               | 10               | 09               |
| 3.     | 31-35            | 01               | 01               | 03               |
|        | Total            | 30               | 30               | 30               |
|        | Mean $\pm$ Sd.   | $23.86 \pm 2.94$ | $24.46 \pm 3.81$ | $25.73 \pm 4.09$ |

One way ANOVA  $F=2.057$ ,  $p=0.13$  Non significant

**Table 2B:** Weight wise distribution of patients

| Sr. No | Weight groups (Kg) | No of patients |                  |                 |
|--------|--------------------|----------------|------------------|-----------------|
|        |                    | Group I (S60)  | Group II (R60)   | Group III (R90) |
| 1.     | 40-55              | 17             | 17               | 18              |
| 2.     | 56-70              | 11             | 10               | 11              |
| 3.     | $\geq 71$          | 02             | 03               | 01              |
|        | Total              | 30             | 30               | 30              |
|        | Mean $\pm$ Sd.     | $54 \pm 9.04$  | $57.26 \pm 9.46$ | $54.7 \pm 7.89$ |

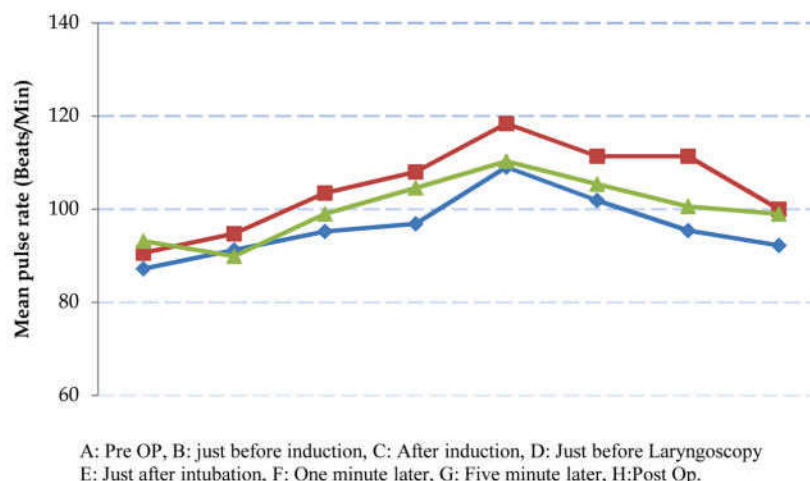
One way ANOVA  $F=1.135$ ,  $p=0.32$  Non significant

**Table 3:** Distribution according to mean apnoea onset time

|                 | Mean apnoea time (Mean $\pm$ SD) |
|-----------------|----------------------------------|
| Group I (S60)   | $25.06 \pm 6.89$ *               |
| Group II (R60)  | $29.76 \pm 10.21$ * #            |
| Group III (R90) | $32.83 \pm 8.63$ * #             |

\* One way ANOVA:  $F=6.094$   $p=0.003$  Significant

# Un paired t test: 1.258 d.f.=58,  $p=0.21$  Non significant



Graph 1: Mean pulse pressure at various stages

Table 4: Intubating conditions and acceptability

| Groups          | Acceptable |      | Unacceptable |      | Total |
|-----------------|------------|------|--------------|------|-------|
|                 | Excellent  | Good | Fair         | Poor |       |
| Group I (S60)   | 30         | 00   | 00           | 00   | 30    |
| Group II (R60)  | 15         | 11   | 03           | 01   | 30    |
| Group III (R90) | 30         | 00   | 00           | 00   | 30    |

Table 5: Intubating conditions

| Groups          | Intubating scores (Mean $\pm$ SD) |
|-----------------|-----------------------------------|
| Group I (S60)   | 7.8 $\pm$ 0.4 * @ \$              |
| Group II (R60)  | 6.06 $\pm$ 1.55 * # \$            |
| Group III (R90) | 7.5 $\pm$ 0.5 # @ \$              |

\*Tukey Kramer test: p=0.001 Significant #Tukey Kramer test: p=0.001 Significant @Tukey Kramer test: p=0.001 Significant \$One way ANOVA: F= 27.686 p= <0.0001 Significant

Table 6: Distribution according to mean pulse rate

| Study group    | Pre-Op.             | Just before IND'N  | After IND'N        | Just before L'SCOPY   | Just after Intubation | 1 Min later        | 5 Min. later       | Post Op.          |
|----------------|---------------------|--------------------|--------------------|-----------------------|-----------------------|--------------------|--------------------|-------------------|
| Group I (S60)  | 87.3 $\pm$ 8.16 *   | 91.22 $\pm$ 9.54   | 95.2 $\pm$ 9.20    | 96.83 $\pm$ 8.82 *    | 109.03 $\pm$ 11.20 *  | 101.86 $\pm$ 9.92  | 95.4 $\pm$ 10.21   | 92.2 $\pm$ 8.83   |
| Group II(R60)  | 90.58 $\pm$ 10.59\$ | 94.7 $\pm$ 10.93   | 103.46 $\pm$ 11.14 | 108.00 $\pm$ 11.14 \$ | 118.36 $\pm$ 10.86 \$ | 111.36 $\pm$ 12.41 | 111.36 $\pm$ 12.41 | 99.96 $\pm$ 11.35 |
| Group III(R90) | 93.13 $\pm$ 8.83 @  | 89.87 $\pm$ 16.91@ | 98.96 $\pm$ 10.51  | 104.53 $\pm$ 14.05 @  | 110.23 $\pm$ 14.30    | 105.36 $\pm$ 13.92 | 100.53 $\pm$ 11.33 | 98.96 $\pm$ 9.96  |

\*One way ANOVA: F=39.574, p<0.001 Significant, \$One way ANOVA: F=50.080, p<0.001 Significant, @One way ANOVA: F=14.218, p<0.001 Significant

Table 7: Distribution according to systolic blood pressure

| Study group    | Pre-Op.             | Just before IND'N  | After IND'N        | Just before L'SCOPY | Just after Intubation | 1Min. later        | 5Min. later        | Post Op.           |
|----------------|---------------------|--------------------|--------------------|---------------------|-----------------------|--------------------|--------------------|--------------------|
| Group I (S60)  | 126.86 $\pm$ 13.19@ | 125.33 $\pm$ 15.86 | 114.6 $\pm$ 15.70  | 116.33 $\pm$ 13.95  | 139.93 $\pm$ 14.24@   | 122.13 $\pm$ 11.23 | 114.13 $\pm$ 11.28 | 125.6 $\pm$ 11.73  |
| Group II(R60)  | 121.33 $\pm$ 10.87# | 121.66 $\pm$ 9.67  | 113.53 $\pm$ 11.25 | 112.86 $\pm$ 8.44   | 135.2 $\pm$ 13.72#    | 118.4 $\pm$ 11.72  | 113.06 $\pm$ 11.35 | 119.66 $\pm$ 8.68  |
| Group III(R90) | 120.93 $\pm$ 11.09* | 115.12 $\pm$ 21.81 | 111.46 $\pm$ 12.09 | 114.26 $\pm$ 13.88  | 132.53 $\pm$ 12.39*   | 119.6 $\pm$ 14.58  | 112.8 $\pm$ 8.89   | 123.26 $\pm$ 11.99 |

@Unpaired 't' test: t=3.668 d.f=58, p=0.0005 Significant, #Unpaired 't' test: t=4.340 d.f=58, p=0.0001 Significant, \*Unpaired 't' test: t=3.821 d.f=58, p=0.0002 Significant

The intubating conditions were acceptable in all the patients belonging to group I (S60) and group III (R90), while 26 patients in group II (R60) had acceptable conditions and remaining 4 patients had unacceptable intubating conditions (Table 4). On statistical analysis the significant difference was observed in the mean intubating score of group I and group II, group II and group III and All three groups except group I and group III (Table 5).

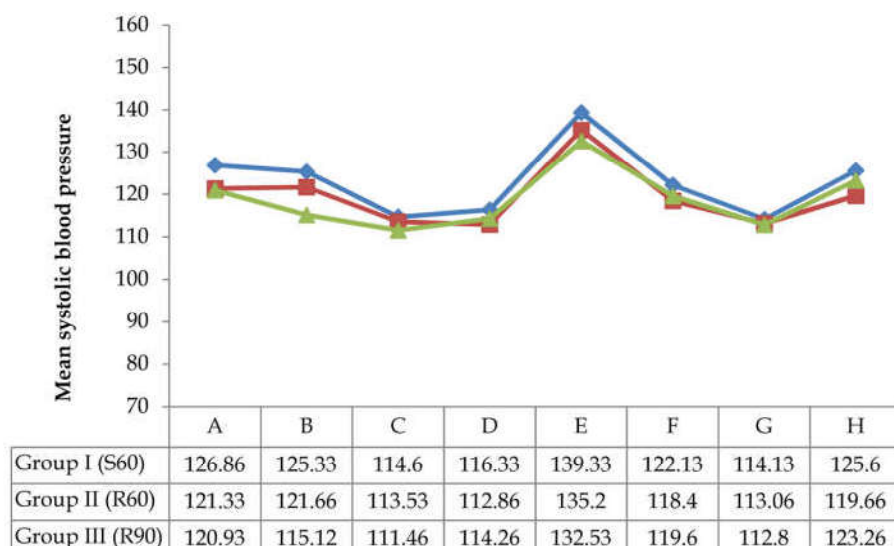
In all three groups mean pulse found to be increased after giving muscle relaxant i.e. just before laryngoscopy and just after induction as compared pre operative reading (Graph 1). The difference found to be significant groups in all (Table 6).

The mean systolic blood pressure rose just after intubation as compared to basal reading. The difference between basal mean systolic blood pressure and mean blood pressure just after the intubation

found to be statistical significant in all three study groups (Table 7). The mean systolic blood pressure started decreasing immediately after intubation and it fell below basal level at one minute after intubation (Graph 2).

The mean clinical duration of action of intubating dose of group I (S60), group II (R60) and group III (R90) were  $7.8 \pm 0.4$ ,  $24.83 \pm 3.62$  and  $25.86 \pm 6.87$  respectively. The duration of action of both rocuronium groups was more than that of suxamethonium and in these three group's difference was found statistically significant ( $P < 0.0001$ ) but was not significant in group II (R60) and group III (R90). ( $P 0.47$ ) (Table 8).

The mean Apgar score at 1 min was  $6.96 \pm 0.78$ ,  $7.1 \pm 0.907$  and  $6.96 \pm 0.795$  of group I (S60), group (R60) and group III (R90) respectively. Similarly the mean Apgar score at 5 min was  $9.16 \pm 0.778$ ,  $9.1 \pm 1.04$



Graph 2: Systolic blood pressure at various stages

Table 8: Mean duration of action of intubating dose of relaxant

|                  | Group I (S60)   | Group II (R60)        | Group III (R90)    |
|------------------|---|-----------------------|--------------------|
| Mean $\pm$ SD    | $7.8 \pm 0.4$ \$ #  | $24.83 \pm 3.62$ \$ # | $25.86 \pm 6.87$ # |
| Statistical test | \$ Unpaired 't' test: $t=0.72$ d.f:58, $P 0.47$ Non-significant<br># One way ANOVA: $F=153.13$ , $P=0.0001$ Significant |                       |                    |

Table 9: Distribution according to Apgar score

|                  | Group I (S60)  | Apgar score at 1 Min<br>Group II (R60) | Group III (R90) |
|------------------|--|--|-----------------|
| Mean $\pm$ SD    | $6.96 \pm 0.71$                                      | $7.1 \pm 0.90$                         | $6.96 \pm 0.79$ |
| Statistical test | One way ANOVA: $F=0.298$ , $P=0.747$ Non significant |  |                 |
|                  | Group I (S60)  | Apgar score at 5 Min<br>Group II (R60) | Group III (R90) |
| Mean $\pm$ SD    | $9.16 \pm 0.77$                                      | $9.1 \pm 1.04$                         | $9.03 \pm 0.80$ |
| Statistical test | One way ANOVA: $F=0.163$ , $P=0.84$ Non significant  |  |                 |

and  $9.03 \pm 0.80$  of group I (S60), group II (R60) and group III (R90) respectively.

No statistical difference was observed of Apgar score of 1 min and 5 min among three groups (Table 9). No side effects or complications were encountered in present study also there was no incidence of regurgitation or aspiration of gastric content.

## Discussion

The goal of tracheal intubation is to secure the patients airway quickly and smoothly with minimum chances of hypoxia, regurgitation and aspiration of gastric contents. Pregnant patients have delayed gastric emptying, so they are more risk of gastric contents aspiration. Traditionally suxamethonium has long been choice of muscle relaxant however it falls short of the qualities of an ideal 'muscle' relaxant due to its side effects. Keeping this objective in mind the present study undertook to evaluate the properties of alternate muscle relaxant like rocuronium that has the same advantages of rapid onset and good to excellent intubating conditions as suxamethonium, but fewer side effects.

In present study total 90 pregnant women included randomly who were scheduled for elective caesarean section. The mean age of patients was  $23.86 \pm 2.94$  years in group I (S60),  $24.46 \pm 3.81$  years in group II (R60) and  $25.73 \pm 4.09$  in group III (R90). On other hand the mean body weight in group I (S60), group II (R60) and group III (R90) were  $54 \pm 9.04$ ,  $57.26 \pm 9.46$  and  $54.7 \pm 7.89$  kg respectively. The mean age and weight in all age groups were comparable i.e. no statistical significant difference was observed.

Apnoea onset time is defined as the time interval between injection of muscle relaxant and complete cessation of spontaneous respiration. In this study apnoea time was clinically evaluated. Huizinga et. al. [4] used relaxograph to measured apnoea time. Abouleish et. al. [5] considered disappearance of T1 as tie of onset of action of rocuronium in the patients undergoing caesarean section. Baraka et. al. [6] measured the time from injection of rocuronium to maximum neuromuscular block by stimulating ulnar nerve at wrist and measuring TOF response at adductor pollicis; and considered it as onset time. In this study apnoea mean apnoea onset time was faster in suxamethonium group than in both rocuronium groups. The difference was statistical significant while mean apnoea onset time showed no statistical difference in between two rocuronium groups.

Intubating conditions were acceptable in all patients of group I (S60) and group III (R90) while out of 30 patients of group II (R60), 26 and 4 patients had acceptable and unacceptable conditions respectively. In a study conducted by Wierda et. al. [7] in adult found that intubating conditions were excellent at 1 minute and they also found that the mean time to 75% block was faster in rocuronium group compared to vecuronium. Abouleish et. al. [5] found that excellent intubating conditions could be achieved in 90% of caesarean section patients with patients with rocuronium 0.6 mg/kg when combined with 6 mg/kg of thiopentone and waiting time of 80 seconds after injection. Similarly comparable results were obtained in other studies like Cooper et. al. [8], Huizinga et. al. [4] and Sehgal et. al. [9].

Stability of vital parameters like pulse and blood pressure are highly desirable during anaesthetic management. In present study pulse rate and systolic blood pressure were recorded at various stages. In this study mean pulse rate was found to be increased after giving relaxant as compared to pre operative values. The difference between basal mean systolic blood pressure and mean blood pressure just after the intubation found to be statistical significant in all three study groups ( $P < 0.001$ ). Even after decreased in pulse rate 1 minute after intubation it remains high to basal values comparatively. Booth et. al. [10] showed transient to moderate increased heart rate at a dose of 0.6 mg/kg of rocuronium. In a study conducted by Cooper R et. al. [8] no significant change in heart rate was found with rocuronium 0.6 mg/kg.

This study showed raised in mean systolic blood pressure just after intubation in all three groups and it was statistically significant as compared to basal values. The mean systolic blood pressure decreased at 1 minute after intubation and remained nearly same as basal level in all three groups. Cooper R et. al. [8] reported no significant change in blood pressure.

The clinical duration of action of muscle relaxant was defined as the time interval between injection of muscle relaxant and initiation of spontaneous diaphragmatic activity with increased resistance felt during ventilation. In present study mean clinical duration of action was more in both rocuronium groups as compared to suxamethonium group and difference was found statistically significant ( $P < 0.0001$ ) similar results were observed by Cooper et. al. [8], Huizinga et. al. [4], Magorian et. al. [11] and Baraka et. al. [6] etc.

In present study regarding Apgar score, no statistically significant difference was observed at 1 minute and 5 minute among three study groups. No adverse neonatal outcome and side effects or

complications were reported during study. Abouleish et. al. [5] and Kelly MC et. al. [12] and Baraka et. al. [6] reported similar comparable results with the present study. McCourt et. al. [13] reported erythema in 6 and 17 patients given suxamethonium 1mg/kg and rocuronium 0.6 mg/kg respectively.

## Conclusion

Rocuronium provides acceptable intubating conditions in patients undergoing elective caesarean section with no incidence of side effects or complication.

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