Discussion
DISCUSSION

The present study is an attempt to evaluate the intubating condition and cardiovascular profile of rocuronium and compare it with suxamethonium and vecuronium.

Despite the multiple adverse effects of suxamethonium, this drug is often preferred for intubation purpose, because it offers a brief onset time, reliable optimal intubating conditions and a brief duration of action. Provision of muscle relaxation for endotracheal intubation demands a relatively safer drug than suxamethonium, that can provide good intubating conditions as early as possible with minimal side effects and stable haemodynamic profile.

Rocuronium bromide, introduced into practice since early 1990s is the first non-depolarizing muscle relaxant having an onset time and intubating conditions comparable with suxamethonium with less adverse effects.


The results of the above studies have encouraged us to undertake the present study.

Our study was conducted on 120 patients, between 20 – 60 years, of age and belonging to ASA grade I & II who were scheduled for various
AGE DISTRIBUTION
AGE DISTRIBUTION
elective surgeries under general anaesthesia. These patients were randomly allocated into three groups of forty each. All were premedicated with glycopyrrolate and induced by thiopentone. After induction tracheal intubation was facilitated by giving rocuronium 0.6 mg/kg, suxamethonium 1.5 mg/kg and vecuronium 0.08 mg/kg to patients of group A, B & C respectively. Anaesthesia was then maintained on N₂O (66.6%) and O₂ (33.3%) mixture and vecuronium. Analgesics and halothane were given intermittently as required.

**Demographic Profile:**

The demographic data in all the groups were comparable. (Table - Ia & b) Most of the patients in each group were between 20 to 40 years of age. The mean age was 32.2 years in group A, 32.4 in group B and 32.9 in group C.

The male-female ratio in all the three groups were comparable (Table - II) with a ratio (M/F) of 0.81 in group A, 1.1 in group B and 1 in group C. Mean weight (in kg) ranges from 40-50 kg in all the groups.

Patients undergoing ENT surgeries (MRM or Tonsillectomy) and Gynaecological surgery (Abdominal hysterectomy) constituted a major portion of the study (Table - III).

**Cardiovascular Profile:**

The mean pulse rate variation was observed just immediately after intubation and ten minutes later. There was a significant rise in the pulse rate immediately after intubation, but was not significant when compared with values 10 minutes after (Table IV a & b ).
SEX DISTRIBUTION

Group A
- 45% Female
- 55% Male

Group B
- 52% Female
- 48% Male

Group C
- 50% Female
- 50% Male
pressure, which shot up immediately after intubation, only to return slowly to near its basal value within ten minutes in all the three groups (Table Va & b). Since these change were common to all the three groups, it can be inferred that, pressor response during laryngoscopy and intubation was responsible for this transient rise rather than the drugs used. The oxygen saturation (SpO₂) was maintained throughout the procedure.

The results observed above coincide with the findings of W.M. Schramm, K. Strasser et al (1996) which concluded that there was no significant changes in the heart rate and mean arterial pressure after treatment with rocuronium (0.6 mg/kg) and vecuronium (0.1 mg/kg). In doses upto 1.2 mg/kg rocuronium has minimal cardiovascular effects both in healthy patients and those with cardiovascular disease (Levy et al 1994).

**Onset of Action:**

The mean onset of action, as assessed by the onset of apnoea was 55.15±8.51 seconds in group A (0.6 mg/kg, rocuronium), 48.45±6.95 seconds in group B (1.5 mg/kg, suxamethonium) and 131.60±21.41 seconds in group C (0.08 mg/kg, vecuronium) [Table VIII] The onset of apnoea was earliest in group B followed by group A and then group C.

Group B < Group A < Group C

It was inferred statistically that, the onset of apnoea in group C was significantly longer than that of group A and B. Although, onset of apnoea was slightly longer in group A as compare to group B, it was obviously very much shorter than group C. The findings of J.M.K. Wierda et al (1990), R. Cooper et al (1992), Neeraja Bharti and Sunila Sharma, et al (2001) support the above results. In their studies they demonstrated that the
rate of development of neuromuscular block and hence the onset of action was faster with rocuronium than vecuronium or with any other currently available non-depolarizing neuromuscular blocking drugs. The explanation given by them was that rocuronium being six to eight times less potent than vecuronium, accounted for early development of neuromuscular blockade. The low potency of Org 9426, results in a higher molecular load being present at the neuromuscular junction, producing an initial high concentration gradient and transfer of molecules of the drug to the biophase.

Although rocuronium appears to have a short onset time of less than 1 minute, it was found to be significantly longer than suxamethonium which still has the shortest onset time amongst all available muscle relaxant, a finding similar with those of Toni Magorian et al (1993) & Dr. Madhavi Barve and Dr. Roopa Sharma (2002).

**Duration of Action:**

The time interval from the onset of apnoea to the return of the first respiratory excursion gave the clinical duration of action of the respective relaxant used.

The mean duration of action of group A was 21.30±5.01 minutes, group B was 4.79±1.05 minutes and that of group C was 22.65±4.78. (Table - IX) There was no statistical significance in the duration of action of group A and C i.e. they were comparable. But the duration of action in group B was significantly shorter than both groups A and C. In a study conducted by Susan Woelfel, (1992) clinical duration was found to be 26.7±1.9 minutes with rocuronium (0.6 mg/kg). Fuchs-Buder (1996) observed it to be 21±4.0 minutes whereas Stoddart (1998) observed a clinical duration of 24.2±6.6 minutes with same dose.
Similar results were observed in our study, a clinical duration of 21.30 ± 5.01 minutes with 0.6 mg/kg rocuronium.

Clinical duration of action of rocuronium (21.30 ± 5.01 minutes) and that of vecuronium (22.65 ± 4.78 minutes) was found to be comparable in our study. This is supported by the results of R. Cooper et al (1992), Toni Magorian et al (1993), and Neeraja Bharti et al (2001) who reported that the clinical duration of action of rocuronium did not differ appreciably from the equipotent doses of vecuronium or atracurium.

Although duration of action of rocuronium is similar to that of vecuronium, it has a significantly faster onset of action, which is due to its low potency.

The duration of action of suxamethonium (4.79 ± 1.05) minutes was significantly shorter than that of rocuronium (21.30 ± 5.01) minutes. This result is similar with that of Toni Magorian et al (1993), who showed that clinical duration was least in succinylcholine group, as compared to rocuronium and vecuronium groups.

Thus, despite its brief onset of action, rocuronium has a longer duration of action that suxamethonium, hence it must be left to the clinician to decide in each case whether duration of action is an important determinant in the choice of muscle relaxant.

Fasiculations were present in all the patients in group B whereas it was absent in both group A and C. The depolarizing nature of suxamethonium, induces fasiculations in those patient who received it and is more in young healthy muscular adults. Both rocuronium and vecuronium are non-depolarizing blockers so they are devoid of fasiculations.
**Intubating Conditions:**

Intubating conditions can be influenced by the choice of anaesthetic and the use of adjuvant drugs, such as narcotics, sedatives, lidocaine or inhalational agents. Because propofol depress pharyngeal and laryngeal reflexes, we avoided this agent and selected thiopental to minimize the enhancement of muscle relaxation. We did not administer any sedative or analgesic prior to induction and intubation since these agents may act as confounding factors in the evaluation. Although inhalational agents potentiate neuromuscular effects of non-depolarizing muscle relaxants these do not effect the onset time, but the intubating conditions and clinical duration of action maybe significantly affected by the depth and type of anaesthesia. Thus, these agents were avoided during induction of anaesthesia for proper evaluation or correlation between onset times and intubating conditions.

In many previous studies a fixed intubation time was used to assess intubating conditions like 60 secs (Magorian, M.S., Chetty, AJ England) or 90 secs (JMKH Wierda). While in some other sutfides, the intubation was performed when the neuromuscular blockade at wrist exceeded 90% (M. Mayer). They have also used different scoring systems for evaluation of intubating conditions.

A standardized intubation score according to “Copenhagen consensus conference rating scale” has been used for the evaluation of intubating condition during this study. Intubation was attempted, just immediately after the onset of apnoea and certain parameters were assessed. The observer was unaware of the muscle relaxant used.
LARYNGOSCOPY

VOCAL CORDS
The following parameters were observed –

i) ease at laryngoscopy
ii) position and movement of vocal cords
iii) response to intubation, assessed by movement of limbs and coughing.

Accordingly, intubation scores were given as excellent, good or poor.

We observed that all patients in group A and B provides easy laryngoscopy while 67.5% patients showed easy and 32.5% showed fair laryngoscopy in group C (Table - XI).

The position and movement of vocal cords were evaluated (Table – XII a & b). 87.5% (35/40) of the patients in group A, 95% (38/40) in group B and 50% (20/40) in group C showed abducted vocal cords. The vocal cords were in intermediate position in 10% (4/40) of the patients in group A, 5% (2/40) in group B and 40% (16/40) in group C. 10% (4/40) of the patients in group C and 2.5% (1/40) in group A showed closed cords while this was not seen in any of the patients in group B.

Vocal cord movement was absent in 95% (38/40) in group A, 100% (40/40) in group B and only 60% (24/40) in group C. The cords were moving in 5% (2/40) patients in group A and 30% (12/40) in group C. None of the patients in group B showed any movement. The cords were closed in 10% (4/40) patients in group C while this was not seen in any of the patients in group A and B.

There was no movement of limbs in response to intubation in 85%, 95% and 72.5% in group A, B and C respectively. Slight movement was seen in 15%, 5% and 27.5% in group A, B and C respectively. Vigorous
RESPONSE TO INTUBATION

INTUBATING CONDITION
movement of limbs in response to intubation was absent in all the patients (Table – XIII a).

Coughing in response to intubation was absent in 92.5% patients in group A, 97.5% in group B and 67.5% in group C. Slight diaphragmatic movement was observed in 7.5% of patients in group A, 2.5% in group B and 32.5% in group C. None of the patients showed sustained coughing (Table – XIIIb).

Considering the above parameters, intubating conditions were assessed and score were given as excellent, good or poor (Table – XIV). Those patients with excellent or good score provided clinically acceptable intubating conditions. 77.5% (31/40) patients in group A, 82.5% (33/40) in group B and 17.5% (7/40) in group C provided excellent intubating conditions. There was good intubating conditions in 20% (8/40) of the patient in group A, 17.5% (7/40) in group B and 77.5% (31/40) in group C. Only 2.5% (1/40) in group A and 10% (4/40) in group C showed poor intubating condition. None of the patient in group B had poor intubating condition.

In the present study, although the onset time was more with rocuronium than suxamethonium, the quality of neuromuscular block at larynx was comparable. The intubating conditions after administration of rocuronium were clinically acceptable (excellent + good) in more than 95% of patients which was similar to that observed after a commonly use dose of suxamethonium. The reason for a good, rather than excellent score with rocuronium was usually vocal cord movement, which did not allow the passage of endotracheal tube, along with some diaphragmatic movement. Only one patient in the rocuronium group was considered to have poor intubating condition since the vocal cords were closed.
Our results were in agreement with the reports of other workers using Org 9426 which include studies conducted by J.M.K.H. Wierda et al (1990), R. Cooper et al (1992), Aleksandra et al (1998), Neeraja Bharti et al (2001) and Dr. Madhavi Barve and Dr. Roopa Sharma (2002).

After analysis of the above data it can therefore be said that rocuronium, with a non-depolarizing action, devoid of the adverse reaction associated with succinylcholine, and a shorter onset of action than vecuronium may be a suitable alternative to succinylcholine for tracheal intubation. It thus fills the gap between succinylcholine and non-depolarizing agents as far as tracheal intubation is concerned. Thus, rocuronium no doubt has a promising horizon particularly in its use as an agent for tracheal intubation.