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INTUBATING CONDITIONS AND CLINICAL ASSESSMENT OF CARDIOVASCULAR EFFECTS BY ANAESTHETIC DRUGS

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ABSTRACT

Background: Endotracheal intubation requires the use of medications that are safer than suxamethonium and have the following benefits: early onset, extended duration, steady hemodynamic parameter, minimal adverse effects, and favourable intubating circumstances are necessary to achieve muscle relaxation.

Aim: The purpose of this study was to compare the intubating circumstances and cardiovascular effects of rocuronium to those of vecuronium and suxamethonium.

Methods: Based on the muscle relaxant used during intubation—Group I received 0.6 mg/kg rocuronium, Group II received 1.5 mg/kg suxamethonium, and Group III received 0.08 mg/kg vecuronium—a total of 120 participants were randomly assigned to 3 groups, each consisting of 40 subjects. 0.2 mg of glycopyrrolate was administered as a premedication, and 4-5 mg/kg of thiopentone sodium 2.5% was utilised as an anaesthetic agent. Vecuronium was also injected intermittently. Fasciculations, cardiovascular reaction, limb movement, coughing, vocal cord movement and position, jaw relaxation, and apnea start were among the parameters evaluated.

Results: Group I saw a longer onset than Group II, but a lower one than Group III. Group II had fasciculation while Group I and III did not. Group III had better intubating circumstances. No subject from any group had any complications.

Conclusion: The current investigation suggests that, in situations of tracheal intubation involving people who do not require a quick spontaneous breathing return, rocuronium is a safe and effective substitute for suxamethonium. As a result, it can serve as a bridge between suxamethonium and non-depolarizing neuromuscular blocking drugs, making it the perfect neuromuscular agent.

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Keywords: Anaesthesia, Endotracheal Intubation, Rocuronium, Suxamenthonium, Vecuronium

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INTRODUCTION

About fifty years ago, anaesthesia was far less advanced than it is now. The anaesthetists often used volatile, intravenous, and local infiltration agents in addition to a few nerve blocks. Prior to neuroblocking drugs making intubation challenging, tracheal intubation was uncommon. Tracheal intubation has become essential since the development of neuromuscular blocking drugs in anaesthesia. Its frequent usage in modern anaesthesia practice has gained favour and it has the benefit of properly preserving airway.[1]

Thesleff and Foldes introduced succinylcholine in 1952, which completely changed anaesthesia by causing a neuromuscular block that was both quick to start and highly successful at preventing tracheal intubation. However, there are a few negative effects of suxamethonium, such as hyperkalemia, post-operative myalgia, muscular fasciculations, and elevated intracranial, intragastric, and intraocular pressures. Asystole and cardiac arrhythmias are among its other cardiovascular side effects. Although suxamethonium acts quickly to relax muscles, prolonged apnea can also occur in individuals with atypical pseudo-cholinesterase, which can result in fatal diseases including myoglobinuria and malignant hyperthermia. For these reasons, suxamethonium is not the best drug for muscle relaxation. This highlights the necessity of having a quick-acting, non-depolarizing neuromuscular blocking drug in place of suxamethonium.[2]

High potency, pharmacologically inactive metabolites, reversibility by cholinesterase inhibitors, lack of histamine release, lack of cardiovascular effect, non-cumulative effect, quick recovery, brief duration of action, quick onset, and non-depolarizing mechanism of action are all desirable characteristics of an ideal neuromuscular blocking agent. Due to the demand for these characteristics, nondepolarizing neuromuscular blocking medications with an intermediate half-life have recently been created.[3]

Among them are vecuronium and atracurium, which are mainly immune to the negative effects of suxamethonium. Though their protracted persistence is still problematic and undesired, their sluggish start can be minimised with a large initial bolus dosage. Rocuronium bromide, a more recent addition to this category, is practically optimal because to its quick onset, few side effects, and intermediate duration of action.[4]

When administered at a dosage of 0.6 mg/kg with an onset time of 60-90 seconds, rocuronium has proven to be almost perfect; a dose of 0.6-1.2 mg/kg is thought to be excellent for tracheal intubation. This novel drug exhibits a steady hemodynamic profile and cardiovascular profile, no histamine release, no autonomic ganglia action, and fewer side effects than suxamethonium. When taking into account the benefits and drawbacks of other neuromuscular blocking drugs as well as their effectiveness during tracheal intubation in patients for whom suxamethonium is contraindicated, rocuronium may be a good substitute.[5]

Therefore, the goal of the current study was to evaluate and contrast the intubating circumstances and cardiovascular effects of rocuronium with those of vecuronium and suxamethonium.

MATERIALS AND METHODS

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The goal of the current study was to evaluate and contrast the intubating circumstances and cardiovascular effects of rocuronium, vecuronium, and suxamethonium. After receiving approval from the relevant ethical committee, the study was conducted in the Golden Heart Hospital, Jabalpur, Madhya Pradesh, India. The individuals scheduled for elective surgical operations under general anaesthesia and attending the Institute's Department of Anesthesiology made up the study population. There were 120 individuals in the research, ranging in age from 20 to 62 years, with ASA I and ASA II grades. The subjects were of both genders. Subjects with neuromuscular problems, paralysis, other systemic illnesses, cardiovascular disease, and compromised liver or kidney functions were excluded from the research.

Following final inclusion, a thorough history was taken, including a general, systemic, and pre-anaesthetic evaluation. Routine investigations and, if necessary, specialty investigations were then conducted. Both verbal and written informed consent was obtained. Group I received 0.6 mg/kg of rocuronium, Group II received 1.5 mg/kg of suxamethonium, and Group III received 0.08 mg/kg of vecuronium. Each group of patients consisted of 40 individuals. Vitals were tracked and evaluated throughout the duration of the trial. Before inducing anaesthesia, all participants received 0.2 mg of glycopyrrolate as a premedication, and they were given 100% oxygen for three minutes. Thiopentone sodium 2.5% combined with the rocuronium injection given intermittently.

I.V. muscle relaxant was administered when the eyelash reaction vanished, and the duration between the relaxant's delivery and the beginning of apnea was noted. Subsequently, laryngoscopy was performed to evaluate intubating circumstances using the 'Copenhagen consensus conference rating scale'. After that, positive pressure breathing and an endotracheal tube with a suitable-sized cuff were used for intubation. Vital signs were taken immediately following the subsequent ventilation, with a routine examination conducted every ten minutes. The length of the relaxant's action was recorded for the initial respiratory excursions in the reservoir bag and the apnoea return of the first respiratory excursion.

All individuals were kept at a combination of 33.3% and 66.6% oxygen and nitrous oxide, with vecuronium injections given sporadically. Analgesics and halothane were administered as needed. It was provided via the Bain circuit. Following surgery, glycopyrrolate and neostigmine were used for reversal. Following a sufficient restoration of breathing and a spontaneous opening of the eyes with upper airway reflexes, the patient was extubated. After that, the subjects were moved to the recuperation area.

During the perioperative phase, parameters such as the beginning of action by apnoea onset and the intubation circumstances (vocal cord movement, vocal cord position, and jaw relaxation) are evaluated. The intubation reaction was assessed in terms of Coughing Limb Movement and the cardiovascular response measured 10 minutes after the intubation and in terms of blood pressure, pulse rate, and oxygen saturation (Sp02). The length of time from the start of apnoea to the restoration of the first breathing attempt indicated a fasciculation-like duration of action.

The Copenhagen Consensus Rating Scale was used to rate the intubation circumstances, assigning scores of excellent, good, and bad. Using the "Copenhagen Consensus Rating Scale," laryngoscopy was rated as easy, fair, or tough.

RESULTS

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The goal of the current study was to evaluate and contrast the intubating circumstances and cardiovascular effects of rocuronium, vecuronium, and suxamethonium. Group I received 0.6 mg/kg of rocuronium, Group II received 1.5 mg/kg of suxamethonium, and Group III received 0.08 mg/kg of vecuronium. Each group of patients consisted of 40 individuals. Vitals were tracked and evaluated throughout the duration of the trial. Before inducing anaesthesia, all participants received 0.2 mg of glycopyrrolate as a premedication, and they were given 100% oxygen for three minutes. Thiopentone sodium 2.5% combined with the sporadically administered injection of rocuronium veculash.

Following the disappearance of eyelash reflex, i.v muscle relaxant was given and the time was recorded along with the time from relaxant administration to apnoea onset

For Group I, onset was longer compared to Group II, however, it was lesser than Group III. No fasciculation was seen in Group I and III but was seen in Group II. Better intubating conditions were seen in Group III. No complication was seen in any subject from any group.

The mean heart rate is shown in figure 1, in two groups. T0 – Before shifting the patient to OT table (baseline data); T1– Immediate after vecuronium administration; T2 – 1 min after vecuronium administration; T3– After inflation of the cuff following intubation; T4 – 1 min after intubation; T5– 3 min after intubation; T6– 5 min after intubation. Error bars are showing standard deviations of the data.

The mean arterial pressure is explained in two groups as shown in figure 2. T0– Before shifting the patient to OT table (baseline data); T1– Immediate after vecuronium administration; T2– 1 min after vecuronium administration; T3 – After inflation of the cuff following intubation; T4– 1 min after intubation; T5– 3 min after intubation; T6 – 5 min after intubation. Error bars are showing standard deviations of the data.

DISCUSSION

The present study was conducted to assess and compare cardiovascular effects and intubating conditions of rocuronium to vecuronium and suxamethonium. The subjects were divided into 3 groups of 40 subjects each where Group I with 0.6 mg/kg rocuronium, Group II with 1.5 mg/kg suxamethonium, and Group III with 0.08 mg/kg vecuronium. Vitals were assessed and monitored during the whole study period. Premedication was done with 0.2 mg glycopyrrolate in all the subjects. The study included 120 subjects from both genders and within the age range of 20 years to 62 years with ASA I and ASA II grades and was scheduled for elective surgical procedures under general anaesthesia. Table 1 lists the demographic features. The majority of the individuals fell into the 20–40 age range and the 40–50 kg weight range.

Most research participants required tonsillectomy and other ENT-related operations, which were followed by gynaecologic surgical procedures. The mean pulse rate variation was observed immediately after intubation and 10 minutes later. There was a substantial increase immediately after intubation and a non-significant rise 10 minutes later. after all 3 groups, the mean pulse rate recovered to baseline after 10 minutes. The presser reaction during laryngoscopy and intubation can be attributable to these typical alterations rather than the medicines. SpO2 remained constant during the whole process.

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These findings were comparable to the studies by Levy et al[7] 1994 and W.M. Schramm, K. Strasser et al[8] in 1996 where authors concluded no significant change in blood pressure and heart rate following vecuronium and rocuronium.

The mean time to action utilising apnoea onset was 55.13±8.53 sec for Group I, 48.43±6.97 sec for Group II, and 131.43±21.43 sec for Group III. Group II experienced the development of apnea earlier than Group I and Group III. Compared to Groups I and II, Group III saw a slightly greater incidence of apnea start. The results aligned with the research conducted by R. Cooper et al. in 1992 and Sunila Sharma et al. in 2001. Compared to vecuronium and other medications, rocuronium developed neuromuscular block and action onset action more quickly because it is 6–8 times more powerful.

While suxamethonium has the smallest onset time and is comparable to Roopa Sharma in 2002 and Toni Magorian et al. in 1993, rocuronium has a shorter onset time overall. The length of action for the medications employed was from the start of apnea until the return of the first respiratory excursion. Group I, Group II, and Group III had mean action durations of 21.32±5.03, 4.79±1.07, and 22.67±4.78, respectively. There was no statistical significance for these values. This was likewise similar to the reported length of 24.2±6.6 from Stoddart12 in 1998 and Fuchs-Buder13 in 1996.

CONCLUSION

Within the constraints of the research, rocuronium was found to be a good substitute for suxamethonium in tracheal intubation situations when a prompt and spontaneous return to breathing was not required. Thus, the current study makes suxamethonium an appropriate neuromuscular blocking drug by bridging the gap left by other neuromuscular blocking medications. Due to a few constraints, including a limited sample size, a brief monitoring time, a single institutional research, and a narrow geographic focus, the study was unable to provide a comprehensive picture. It is necessary to conduct more prospective clinical studies with bigger sample numbers and longer follow-up times.

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TABLES

Age Groups	Group I		Group II		Group III	
	n	%	n	%	N	%
20-30	20	50	26	65	19	47.5
31-40	8	20	6	15	13	33.5
41-50	10	25	5	12.5	8	20
51-62	2	5	3	7.5		
Total	40		40		40	
Mean	32.7		32.6		32.9	

Table 1: Demographic characteristics of the study subjects

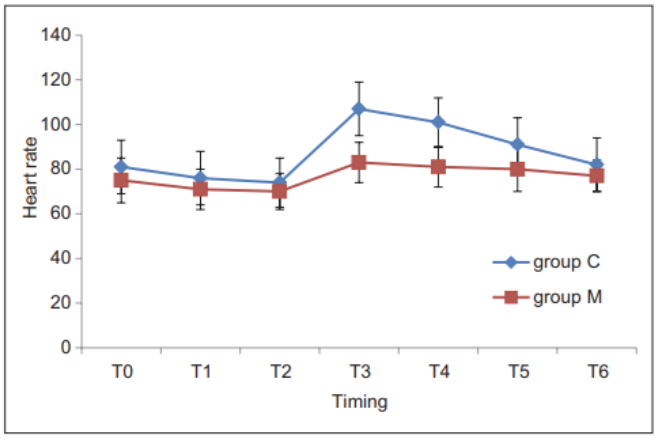

Figure 1: The mean heart rate in the two groups.

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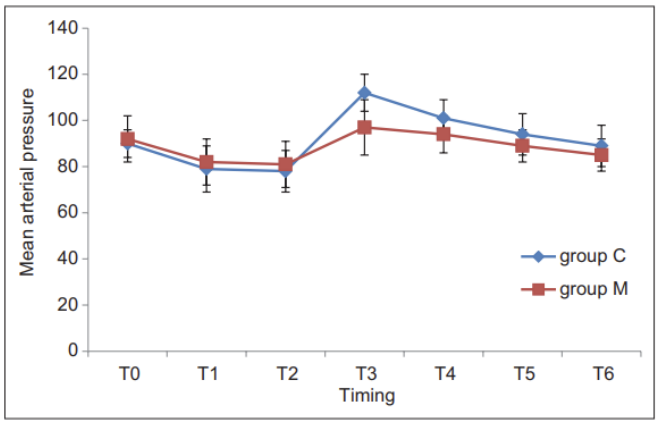

Figure 2: The mean arterial pressure in the two groups.