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Role of Ephedrine on the Onset Time Neuromuscular Blockade Produced By Rocuronium

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Abstract: *Patient is at risk of hypoxia and pulmonary aspiration the time betweenlosses of consciousness to tracheal intubation. It is usually desirable to use a muscle relaxant with a shortonset time. The onset time is partly determined by the speed with which these drugs reach the neuromuscular junction, a factor that appears to be proportional to cardiac output and muscle blood flow. Since ephedrine can increase these variables our hypothesis was that it could reduce the onset time of muscle relaxants.Rocuronium is the currently preferred non-depolarizing neuromuscular blocking agent used as an alternative to succinylcholine for rapid tracheal intubation.*

Use of ephedrine during the induction of general anesthesia has been describedto accelerate the onset of action of rocuronium andimprove the intubating conditions.

The aim of this study was to evaluate the effects of a single dose of ephedrine, given at the moment of induction, on the onset time of rocuronium and on blood pressure and heart rate evolution during the induction sequence.

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I. Introduction

Patient is at risk of hypoxia and pulmonary aspiration the time between losses of consciousness to tracheal intubation. It is usually desirable to use a muscle relaxant with a short onset time. The onset time is partly determined by the speed with which these drugs reach the neuromuscular junction, a factor that appears to be proportional to cardiac output and muscle blood flow. Since ephedrine can increase these variables our hypothesis was that it could reduce the onset time of muscle relaxants.Rocuronium is the currently preferred non-depolarizing neuromuscular blocking agent used as an alternative to succinylcholine for rapid tracheal intubation.

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II. Materials &Methods

This study was done in RIMS, Ranchi, Jharkhand, India during 2008-2010.After obtaining informed consent, we studied 50 ASA physical status I-II patients, aged 18-60 year, scheduled for elective general surgery and gynecologic procedures under general anesthesia were included. Patients were divided in 2 groups:Group I(n= 25):Ephedrine Group, Group II(n =25):control Group. Exclusion criteria included anticipated difficult endotrachealintubation (Mallampati class III—IV), any cardiovascular or neuromuscular disease, intake of drugs known to interact with the neuromuscular junction or ephedrine, increased risk of pulmonary aspiration. After premedication monitors were used like NIBP,ECG,Pulse Oximeter and TOF watch. Anesthesia was induced through an intravenous line, in group I ephedrine 70mcg/kg diluted in 5ml normal saline given and in group II patients received same amount of saline only.

After loss of the eyelid reflex and confirmation thatventilation via a facemask was possible, rocuronium0.6 mg/kg was administered in 5 s. When maximumneuromuscular blockade was achieved, trachealintubation was performed. Only oxygen was givenbetween fentanyl administration and tracheal intubation,and anesthesia was then continued with isoflurane0.5% and Nitrous oxide 66%.

Onsettime was defined as the time from the end of injectionof rocuronium to maximum neuromuscular blockade (complete disappearance of TOF response).

Heart rate and non-invasive blood pressure were measured immediately before the administrationof each of the drugs used in the inductionsequence, just after, 1 min &2 min after trachealintubation.

The presence of arrhythmias on theelectrocardiograph ECG monitor was noted.

Statistical comparisons were made with Student's t-test for demographicdata.P value lessthan 0.05 was considered significant.

III. Result

The onset time of rocuronium was significantly shorter after E compared with placebo (P<0.05)
There were no statistically significant differences between the heart rates and mean blood pressure of both groups.

Table 1: General data

	Group I(n=25)	Group II(n=30)
Age(year)	34.12(+/-10.63)	34.76(+/-9.83)
Weight(kg)	55.2(+/-7.11)	55.88(+/-5.76)
Sex(M/F)	15/10	14/11
ASA(I/II)	25/5	26/4
Onset time of rocuronium	72.68(+/-5.37)	97.8(+/-8.68)

Table 2: Mean arterial pressure and heart rate in the two groups.

Time	Ephedrine		Placebo	
	HR	NIBP	HR	NIBP
Before induction	81.68_7.54	97.64_4.14	82.72_7.76	99.68_5.58
after induction	82.16_7.50	96.44_5.37	85.44_7.96	97.76_5.36
1min after induction	100.16_7.19	104.27_8.83	103.96_5.35	109.4_5.82
2min after induction	91.4_5.89	99.0_8.06	91.56_5.67	102.96_6.39

Ephedrine, a weak, indirect and direct-acting sympathomimeticagent, produces venoconstriction to a greater degree than arterial constriction, causing a redistribution of blood centrally, improving venous return, increasing CO and restoring uterine perfusion. Clinical studies have shown that Ephedrine reaches its peak effectin 2—5 min and exerts its effect on blood pressurein less than 2 min after administration.
We used propofol 2mg/kg for muscle relaxation duringinduction.

IV. Discussion

The main finding of this study is that a small dose of ephedrine administered at the moment of induction reduced the onset time of rocuronium by 26% without significant adverse effects in this group of patients. The rate of onset of neuromuscular blockade in any one individual depends only on the rate at which a pharmacologically effective concentration is achieved in the biophase, in this case, the neuromuscular junctionalcleft. This rate, in turn, is influenced by several factors, such as the potency of the drug, the dose administered, and the cardiovascular status, including cardiac output and muscle blood flow.

We found that ephedrine reduced the onset time of rocuronium by almost 30 seconds, a fact that we believe is clinically relevant, especially when this was accomplished with a low dose of ephedrine without importantadverse effects, at least in relatively healthy patients.

Although we expected to find significant differencesin the hemodynamic profile of both groups after theinjection of ephedrine, which suggests a difference incardiac output (e.g., higher heart rate or blood pressurein the group receiving ephedrine), this was not the case.

Although we did not find adverse effects after the administration of ephedrine-such as tachycardia, hypertension, and arrhythmias- it must be considered that in a sample of 30 patients having an incidence of adverse effects equal to zero, the upper limit of the 95% confidence interval is estimated in 10%. Also, their incidence might be higher in patients with cardiovascular disease or with a different induction technique.

Finally, one additional effect of ephedrine was observed.

This is the reduction of the variability in the onset time of rocuronium, a fact that has been regarded as one of the disadvantages of this drug (and the other nondepolarizing neuromuscular blocking drugs) when compared with succinylcholine.

V. Conclusion

Ephedrine reduced the onset time of rocuronium without significant adverse effects in a group of relatively healthy patients. This combination can be valuable when succinylcholine is contraindicated and the shortest possible time from loss of consciousness to tracheal intubation is desirable.However, it is not effective in preventing the hypotension which follows induction of anesthesia.

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