The Attenuation of Cardiovascular Responses to Tracheal Extubation with Lignocaine as Compared with Propofol

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ABSTRACT

Introduction: With the introduction of endotracheal anaesthesia by Ivan W Magill, the father of endotracheal anaesthesia (1914-1920) and the advent of balanced anaesthesia by John Lundy 1925, the use of controlled ventilation technique has almost become universal. The study was conducted to know the Attenuation of Cardiovascular responses to Tracheal Extubation with Lignocaine as compared with Propofol at deccan college of medical sciences, Kanchanbagh, Hyderabad.

Material and Methods: 75 patients belonging to ASA-1 and 2 of both the sexes (each group 25 patients n =25) undergoing surgery under general anaesthesia were randomly selected for the study. Patients of either sex with ASA grade 1 and 2 **and** the patients age ranged between 25 to 50 years were taken into study. Patients with history of respiratory problems, angina, palpitation, baseline systolic BP<100, coronary artery disease were excluded.

Results: The pulse rate in test group showed a slight increase at 20 minutes followed by a insignificant decrease during the subsequent one hour period. But in control group the pulse rate decreased to about 12% below the preoperative level showing a statistically very highly significant change. Systolic blood pressure in test group fell by a maximum of 7.29% when compared to control group where it fell to a maximum of 19.18% and diastolic blood pressure in test group fell by a maximum of 3.69% as compared to control group where the decrease was 12.28%. Thus the difference was statistically very highly significant.

Conclusion: It establishes the usefulness of an IV bolus dose of propofol 0.5 mg/Kg to attenuate the haemodynamic response to extubation. Propofol 0.5 mg / Kg is too superior to lignocaine 1 mg / Kg in prophylaxis of extubation response. When propofol and lignocaine were used in the study group by attenuation of cardiovascular responses to tracheal extubation no adverse side effects were encountered.

Keywords: Propofol; Lignocaine; Endotracheal Intubation; Extubation; Blood Pressure

INTRODUCTION

General anaesthesia procedures involve many stressful events at various stages. There are certain more stressful situations for the patient under general anaesthesia as regards induction, intubation and extubation. These periods have to be effectively dealt with, failing which the patient may be at great risk for hypertensive episodes and.

Tracheal intubation and extubation is accompanied by raised sympathoadrenal activity with an increased plasma catecholamine concentration.

Most episodes of myocardial ischemia occur during intubation and extubation. These ischemic events have been proven to have a causal relationship to post operative myocardial infarction, in those patients groups such as hypertensive's, whether treated or untreated, diabetics, atherosclerotics and with arterial aneurysms.

Most attempts have been made to obtund these responses using different agents and techniques. Consistent and reliable protection against rise of heart rate and blood pressure during extubation has been aimed at by using propofol and lignocaine in this study.

Current research aimed to study the attenuation of cardiovascular responses to tracheal extubation with lignocaine as compared with propofol. To compare changes in hemodynamic parameters at extubation with propofol and lignocaine.

MATERIAL AND METHODS

Source of data

75 patients undergoing surgery under general anaesthesia at Princess Esra Hospital and Owaisi Hospital, DCMS, were only included for the study.

The study was approved by the hospital ethics committee.

Inclusion criteria:

Patients of either sex Patients with ASA grade 1 and 2

The patients age ranged between 25 to 50 years.

Patients underwent procedures like Vaginal Hysterectomy, Total Abdominal Hysterectomy, Laparotomy, Appendectomy, Laparoscopic cholecystectomy.

Exclusion criterion

Patients with history of respiratory problems, angina, palpitation, baseline systolic BP<100, coronary artery

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disease were excluded

Mode of selection: Random

Patients were randomly divided into three groups of 25 (n25).

Group-1: Control group received normal saline 5 ml.
Group-2: Lignocaine group received 1mg/kg of lignocaine.
Group-3: Propofol group received 0.5 mg/kg of propofol.
Patients were pre-medicated with 0.2mg of glycopyrolate IM, midazolam 1mg IM 30 mm before surgery in preoperative room anaesthesia was induced with thiopentone sodium 5mg/kg and tracheal intubation was facilitated with 2mg/kg suxamethonium, anesthesia was maintained with O_2 33%, N_2O 67%, vecuronium as muscle relaxant, fentanyl 1microgram/kg as analgesic. The non invasive blood pressure, the pulse rate, ECG was monitored.
At the end of surgery N_2O was discontinued and residual muscle relaxation was reversed with Neostigmine 0.05mg/Kg and atropine 0.02mg/Kg IV. One minute later saline, propofol or lignocaine were given IV in respective groups.
The trachea was extubated 2 minutes after the study drug was given after fulfilling the recovery /extubation criteria. Pharyngeal suction was done just prior to extubation.
After extubation 100% 02 by face mask was given for 5 minutes.

	Saline (n=25)	Lignocaine (n=25)	Propofol (n=25)
Age (yrs.) 25-50	34.60	36.44	34.80
Weight (kgs) 45-80	58.36	59.20	62.73
Duration of Surgery (Minutes)	67	71	88
The above table shows age, weight and duration of surgery in the three groups. The ranges for ages was 25-50 yrs. The ranges for weight was 45-80 kgs.			
Table–1:			

	Saline	Lignocaine	Propofol
Systolic blood pressure	117	118.58	116
Diastolic blood pressure	76.68	78.79	77.21
Mean arterial pressure	92.32	90.62	89.65
Pulse rate (HR)	88.2	87.37	87.84
The above ranges shows haemodynamic parameters recorded at pre-anaesthetic evaluation and it shows mean values. There were no statistically significant difference in the three groups. Tests of significance were done by students " t " test.			
Table–2: Pre-Operative			

	Saline	Lignocaine	Propofol
Systolic blood pressure	123	123	120
Diastolic blood pressure	78	81	79
Mean arterial pressure	95	95	93
Pulse rate (HR)	92	92	90
The above table shows mean values at induction no statistical difference seen.			
Table–3: Induction			

RESULTS

75 ASA 1 and 2 patients were included in the study.
For the study conducted the following observations were made. Systolic and diastolic blood pressure, mean arterial pressure and pulse rate recorded at following events.
At Pre-Operative Assessment
At induction
At end of surgery
At injection of study drug
Two minutes after injection of study drug
At extubation
One minute after extubation
Two minutes after extubation
Five minutes after extubation
Statistical differences were not found between any of the three groups for age, weight, sex and duration of surgery.
is no statistical differences in SBP, DBP, MBP and HR at pre-operation, induction, end of surgery and study drug administration for all the three groups.
A 2 min after study drug ($p<0.001$), at extubation ($p<0.0001$), 1 min & 2 min after extubation ($p<0.001$) there was significant decrease in haemodynamic variables with propofol when compared with control. After 5 min values are similar to control.
The rise haemodynamic variables with lignocaine are comparatively less with control group but not statistically significant.
The statistically analysis was done by students " t " test.
The values taken are mean.

	Saline		Lignocaine		Propofol	
	End of Surgery	Study rug	End of Surgery	Study Drug	End of Surgery	Study Drug
Systolic blood pressure	129	130	133	134	133	135
Diastolic blood pressure	85	86	89	90	89	90
Mean arterial pressure	100	101	104	104	103	105
Pulse rate (HR)	95	98	97	96	97	98
The above ranges shows Haemodynamic parameters in control (Saline) and study groups (Propofol, Lignocaine) at the end of surgery and at study drug. The values shown are mean. There was no statistically significant different in the three groups. The values at the end of the surgery has taken as basal values. Parameters recorded at pre-anaesthetic evaluation and its shows mean values. There are no statistically significant difference in the three groups. Tests of significance were done by students " t " test.						
Table–4:						

	Saline		Lignocaine		Propofol	
	End of Surgery	2 mts after Study Drug	End of Surgery	2 mts after Study Drug	End of Surgery	2 mts after Study Drug
Systolic blood pressure	129	138	133	130	133	126
Diastolic blood pressure	85	92	98	89	89	84
Mean arterial pressure	100	108	104	103	103	98
Pulse rate (HR)	95	104	97	98	97	96

The above table show haemodynamic parameters in control (Saline) and study groups (Propofol, Lignocaine) at the end of surgery and two minutes later at injection of study drug. The values shown are mean, after administration of study drug after 2 minutes haemodynamic values decreased significantly with propofol group ($p<0.0001$) no statistical changes seen with lignocaine group

Table–5:

	Saline	Lignocaine	Propofol
Systolic blood pressure	143	141	128
Diastolic blood pressure	94	94	81
Mean arterial pressure	110	109	96
Pulse rate (HR)	116	108	97

The above table show the mean values at extubation. The rise in haemodynamic values is significantly less in propofol group ($p <0.001$) when compared with control group. Where as raised haemodynamic parameters in lignocaine group are slightly less than control group but not statistically significant. The test of significance is carried out by student's "t" test

Table–6:

DISCUSSION

Extubation of trachea in deep planes can achieve with inhalational, IV anaesthetic agent, opioids analgesics or both to avoid cardiac stimulation but however such action may produce depression of respiratory and cardiovascular system and result in difficulty of managing upper airway, risk of aspiration of gastric contents.

Lignocaine has been used not only to suppress the cardiovascular responses during extubation but also the coughing associated with endotracheal tube by earlier studies. The advantage of propofol in this study is fast action, short duration of action and smooth emergence.

Studies by BIdwai (1978), Wohlnor (1979) have demonstrated that there is a rise in haemodynamic parameters during extubation. Extubation is associated with an increased catecholamine release.[2]

These increased haemodynamic variables cause an increase in the oxygen consumption of the myocardium (Braunwald). In those patients with a compromised coronary circulation these changes may proved deleterious. A note of importance should be added to the fact that the increase in rate is much more detrimental than an increase in pressure.

All the indices that determine the delicate balance that exists between myocardial oxygen consumption of oxygen supply such as the double pressure product, the triple pressure product, the rate pressure co-efficient include the common variable determinants of heart rate and blood pressure (myocardial ischemia and tracheal extubation).

In patients with an increased intracranial pressure sympathetic stimulation must be avoided.

Bidwal AV. Bidwal VA, Rogers CR (1979) observed that there was an extubation response which could be attenuated successfully with lignocaine 1 mg / Kg 2 minutes before extubation.[2]

Present study is consistent with the above studies in the role of attenuation of haemodynamic responses by intravenous lignocaine 1 mg / Kg and propofol 0.5 mg / Kg given 2 minutes before extubation.

This study concludes that propofol 0.5 mg / Kg is a better prophylactic than lignocaine 1 mg /kg. It was noted that rise in haemodynamic variables is much lesser with propofol compared to control group.

The effectiveness of propofol in attenuating these haemodynamic changes is related to its vasodilating effect and negative inotropic properties. While the ability of propofol to obtund laryngeal reflexes accounts for smooth emergence from general anaesthesia. It has a rapid onset of action and short duration.

Lignocaine is a membrane stabilizer, class I b antiarrhythmic which has effects on the cardiovascular system. Previous studies have analyzed the role of lidocaine in attenuating these responses to extubation.[2,6,7,11]

Anaesthesiologists are most worried about problems associated with extubation, recovery and emergence as these are more common than problems at intubation and many aspects are controversial with no clear guidelines or protocols.Respiratory complications after tracheal extubation are three times more common than complications occurring during tracheal intubation and induction of anaesthesia.

Hemodynamic changes during and after tracheal extubation can be exaggerated. T hesechanges can be tolerated by normotensive patients but in patients with cardiovascular disease they may be dangerous. Cough is a simple mechanism of airway protection, but after extubation, cough and bucking can be harmful.

Lignocaine can suppress not only hemodynamic changes but also the coughing associated with tracheal extubation.

Lignocaine attenuates the hemodynamic response to tracheal extubation by its direct myocardial depressant effect, central stimulant effect, and peripheral vasodilatory effect and finally it suppresses the cough reflex.

Lignocaine when administered i.v has an onset of action within 15-30 seconds with peak effectat 1-2min. Mikawa et al reported that IV lignocaine two minutes prior to tracheal extubation attenuates increases HR, SBP, DBP and the cough reflex.

CONCLUSION

It establishes the usefulness of an IV bolus dose of propofol 0.5 mg/Kg to attenuate the haemodynamic response to extubation. Propofol 0.5 mg / Kg is too superior to lignocaine 1 mg kg in prophylaxis of extubation response. Fall in systolic blood pressure, diastolic blood pressure, heart rate, mean arterial pressure was more in propofol in comparison of lignocaine.

When propofol and lignocaine were used in the study group by attenuation of cardiovascular responses to tracheal extubation no adverse side effects were encountered.

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