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A Comparative Study of Pressor Response to Laryngoscopy and Intubation with Oral Spray of Nitroglycerine and Oropharyngeal Spray of Lignocaine

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Abstract

Introduction: The objective is to compare the efficacy of oral nitroglycerin spray and oropharyngeal lignocaine spray in attenuating the hemodynamic responses to laryngoscopy and intubation. To evaluate the efficacy of 0.8mg of oral nitroglycerin spray and 100mg of 10% of oropharyngeal spray of lignocaine with their associated side effects. **Methods:** After obtaining ethical committee clearance, 60 patients were divided into two groups of 30 each. Group L - Lignocaine group (n=30) - received oropharyngeal Lignocaine 10% spray 100 mg 3 minutes before induction. Group N – Nitroglycerin group (n=30) - received oral nitroglycerin spray 0.8mg 30 seconds before induction. **Results:** Heart rate, systolic and diastolic blood pressure were recorded at baseline, at induction, 1, 3, 5 and 10 minute intervals after laryngoscopy. NTG spray decreases SBP and DBP more effectively as compared to lignocaine group following laryngoscopy and intubation. The lignocaine group had an increase in mean arterial pressure and the NGT group had a decrease in mean arterial pressure. **Conclusion:** Nitroglycerine oral spray in the dose of 0.8 mg, given 30 seconds before induction can be a better alternative in attenuating the haemodynamic responses to laryngoscopy and intubation.

Key Words: Lignocaine, Nitroglycerin, Haemodynamic Changes, Laryngoscopy.

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INTRODUCTION

In 1950, haemodynamic changes like hypertension and tachycardia in response to the sympathetic stimulation due to direct laryngoscopy and endotracheal intubation have been reported when intubation under light anaesthesia was attempted. The rise in the pulse rate and blood pressure is usually transient, variable and unpredictable. Usually these changes are well tolerated by healthy individuals. But these changes may be fatal in patients with hypertension, coronary artery disease or intracranial hypertension. This is mainly due to reflex sympathetic discharge in response to laryngo-tracheal stimulation which in turn leads to increase in plasma catecholamine concentration and rise in the blood pressure. Intravenous anaesthetic induction agents alone do not adequately suppress the circulatory responses evoked by endotracheal intubation. Therefore prior to initiating laryngoscopy and endotracheal intubation additional pharmacological measures should be taken to obtain these responses. Recommendations for attenuating reflex tachycardia and hypertension are manifold.

The technique besides minimizing cardiovascular responses to anaesthesia for patient at risk must also satisfy the following requirements.

1) It must be applicable regardless of patient's collaboration.
2) It should not affect impairment of cerebral blood flow and avoid arousal of the patient.
3) It should neither be time consuming nor effect the duration or modality of ensuing anaesthesia.

In appropriate doses narcotics like fentanyl control heart rate and blood pressure responses, but requirement of higher doses and sometimes non availability of the drug is the main obstacle in routine use. Inhalational agents also do not have satisfactory effects and may need higher concentrations which may cause serious effects like hypotension, bradycardia and delayed recovery. Lignocaine, by its local surface analgesic property depresses the circulatory response to endotracheal intubation. Lignocaine spray is 10% Aerosol preparation, which delivers 10 mg of lignocaine with every puff. Nitroglycerine is an organic nitrate that acts principally on venous capacitance vessels to produce peripheral pooling of blood and decreased cardiac ventricular wall tension. The present study is undertaken with an objective to compare the attenuation of the haemodynamic responses during laryngoscopy and intubation between Nitroglycerin spray and Lignocaine spray.

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METHODS

A clinical prospective comparative randomized study of attenuation of sympathetic response to laryngoscopy and intubation was done in 60 patients posted for elective surgeries. The study was conducted after an approval from the hospital ethics committee. A written informed consent was taken from the patients. Patients undergoing various Orthopaedic, ENT and general surgical procedures were selected.

Inclusion criteria

- Age range 18-60 of both sex
- ASA grade I and II
- Mallampati class I and II

Exclusion criteria

- Unwilling patients
- Nasotracheal intubation
- Abnormal facial anatomy
- Hypersensitivity to drugs

The study population was randomly divided into two groups with 30 patients in each group. Control group has been omitted as it is

proved that the response in control group is more than the study drugs.

Group L - Lignocaine group (n=30) – received oropharyngeal Lignocaine 10% spray 100 mg 3 minutes before induction. Group N - Nitroglycerin group (n=30) - received oral nitroglycerin spray 0.8mg 30 seconds before induction. Routine investigations were done. On the day of surgery, all patients were adequately premedicated and monitors attached – non invasive SBP, DBP, MAP, EtCO2, heart rate, oxygen saturation and ECG.

Anaesthesia was induced with Inj. Thiopentone 5mg/kg and endotracheal intubation with appropriate size tube was facilitated with Inj. Suxamethonium 1.5mg/kg. Heart rate, systolic and diastolic blood pressure were recorded at baseline, at induction, 1, 3, 5 and 10 minute intervals after laryngoscopy. Anaesthesia maintained with oxygen, nitrous oxide, sevoflurane and non-depolarizing muscle relaxant and IPPV. No surgical or any other stimulus was applied during 10 minutes of study period. At the end of procedure patients were reversed and extubated. Incidences of side effects such as hypertension, hypotension, tachycardia, bradycardia and any dys arrhythmias were recorded in both groups.

RESULTS

- Statistical methods employed
- Descriptive analysis
- Independent sample 't' test and paired sample 't' test
- Contingency table analysis
- p <0.05 was considered as significant and p <0.01 was considered highly significant.

Table 1: age and gender distribution

	Lignocaine Spray	NTG Spray	
Age			
Mean	36.3	32.47	t=0.833
SD	9.22	12.72	p=0.41(ns)
Range	20-60	18-60	
Gender			
Male	07	14	X2=3.59
Female	23	16	p=0.058(ns)

Table 2: ASA grade and type of surgical procedure

ASA Grade				Type of surgical procedure			
	I	II	X2=0.089	ENT	General surgery	Ortho	Yate's X2=5.621
Lignocaine spray	23	07	p=0.765 ()ns	06	21	03	p=0.6017(ns)
NTG spray	22	08	d.f.=1	00	22	08	d.f.=2

Both groups are comparable. (Since one of the values in cell is 00, Yate's correction applied to chi square value).

Comparison of Heart Rate -

In the Lignocaine group, after induction, heart rate increased by 24bpm from pre induction level. The mean heart rate did not come to the pre induction levels even by 10th minute. In the NTG group, heart rate increased by 21bpm after induction. However, even in the NTG group, mean heart rate didn't reach to baseline by 10th minute. Statistical evaluation between the groups showed that the increase in mean HR observed in the lignocaine spray group was not statistically significant when compared to increase in mean heart rate in the NTG spray group at intubation and 1,3,5 and 10 minutes following intubation.

Comparison of Systolic Blood Pressure –

In the Lignocaine spray group, the increase in mean SBP observed at 1,3 minutes after intubation when compared with basal SBP was statistically significant (p<0.05). The systolic blood pressure reached the preinduction levels by 5th minute. In the NTG group, SBP decreases after 1, 3 and 5 minute after intubation compared to baseline SBP, which is clinically significant. Statistical evaluation between the groups showed that the increase in mean SBP observed in the lignocaine spray group was statistically highly significant when compared to increase in mean SBP in the NTG spray group (p<0.01) at 1,3 and not significant at 5 and 10 minutes after intubation.

Table 3: Intergroup comparison of values

	Mean heart rate(bpm)				Mean SBP mmHg				Mean DBP mmHg				Mean arterial pressure in mmHg			
	LS Mean(±SD)	NS Mean(±SD)	T	P			T	P			T	P			T	P
Pre Induction	82.03 (±11.70)	87.40 (±11.74)			127.07 (±12.25)	129.23 (±16.11)			77.07 (±9.05)	77.03 (±9.7)			89.90 (±8.60)	91.03 (±10.62)		
After induction	100.47 (±12.27)	100.73 (±14.26)	0.076	0.94	141.70 (±20.93)	119.97 (±18.43)	2.585	0.01244 (S)	96.73 (±19.73)	7230 (±14.00)	5.531	0.0000 (S)	107.87 (±18.15)	85.03 (±13.95)	5.46	0.000 (S)
1min	106.03 (±11.60)	108.43 (±15.44)	0.6806	0.94	144.17 (±21.27)	121.27 (±21.55)	4.175	0.0001 (S)	94.17 (±15.20)	76.13 (±15.90)	4.492	0.0003 (S)	106.37 (±15.09)	88.10 (±16.04)	4.543	0.000 (S)
3min	104.47 (±14.27)	106.60 (±15.49)	0.553	0.58	134.03 (±20.80)	119.77 (±15.30)	3.024	0.003 (S)	85.80 (±10.80)	74.07 (±13.89)	3.651	0.0005 (S)	97.73 (±12.93)	86.50 (±13.88)	3.2425	0.001 (S)
5min	102.03 (±14.77)	103.63 (±15.19)	0.4136	0.68	124.60 (±17.77)	117.20 (±14.45)	1.769	0.082	81.00 (±10.27)	69.60 (±12.66)	3.830	0.0003 (S)	91.37 (±11.06)	81.53 (±11.85)	3.324	0.001 (S)
10min	96.67 (±14.19)	99.60 (±12.62)	0.845	0.4016	116.80 (±14.88)	108.47 (±14.47)	0.105	0.9163	74.83 (±9.01)	62.67 (±10.39)	4.842	0.00001(S)	84.87 (±9.43)	74.43 (±10.60)	4.0304	0.00001(S)

No significance observed in any of the pre-induction values of both groups which means, both groups were comparable.

Comparison of Diastolic Blood Pressure –

In the Lignocaine spray group, the groups the increase in mean DBP observed at 1,3,5 minutes after intubation when compared with basal DBP was statistically significant. The Diastolic blood pressure reached the pre induction levels by 10th minute. In the NTG spray group, the increase in mean DBP observed at 1 minute after intubation when compared with basal DBP was statistically not significant. Statistical evaluation between the groups showed that the increase in mean DBP observed in the lignocaine spray group was statistically highly significant when compared to increase in mean DBP in the NTG spray group (p<0.01) at 1,3,5 and 10 minute following intubation.

Comparison of Mean Arterial Pressure –

In the lignocaine spray group, the increase in MAP observed at 1,3 minute after intubation when compared with basal MAP was statistically significant (p<0.05). The MAP reached the

preinduction levels by 5th minute whereas in the NTG spray group, the MAP observed at 1 minute after intubation when compared with basal MAP was statistically significant ($p<0.05$) but clinically not significant. Statistical evaluation between the groups showed that the increase in MAP observed in the lignocaine spray group was statistically highly significant when compared to increase in MAP in the NTG spray group ($p<0.01$) at 1,3,5 and 10 minutes following intubation.

DISCUSSION

Laryngoscopy and endotracheal intubation are considered as one of the most critical events during general anaesthesia. They provoke a transient and unpredictable sympathetic response which may not be significant in normal individuals. But in patients with cardiovascular compromise like hypertension , Ischemic heart disease , Cerebrovascular disease and in patients with intracranial aneurysms even these transient changes in haemodynamics can result in potentially harmful effects like left ventricular failure,[1] pulmonary edema, myocardial ischemia,[2] ventricular dysrhythmias and cerebral haemorrhage.[1] Therefore many methods have been tried for attenuation of haemodynamics responses to laryngoscopy and tracheal intubation like, use of inhalational anaesthetic agents,[3-5] opioids,[6-8] calcium channel blockers,[9-11] β-blockers and lidocaine have been tried by various studies for blunting haemodynamic responses to laryngoscopy and intubation.[12-17] But all such maneuvers had their own limitations. For example, with opioids respiratory depression and non availability leads to other alternatives , use of halothane was associated with dysrhythmias , calcium channel blockers produce reflex tachycardia and lignocaine did not give consistent results in blunting the haemodynamic responses to laryngoscopy and intubation. Hence a drug which can blunt sympathetic response to laryngoscopy and intubation, without having any adverse effects like respiratory depression and post operative nausea and vomiting was required for the purpose. NTG spray has been found by various authors to blunt the haemodynamic response to laryngoscopy and intubation. Hence the effects of NTG spray for suppression of haemodynamic response to laryngoscopy and intubation was taken up as the study topic.

Routes of administration of drugs selected:

Lignocaine has been employed in various routes for blunting the cardiovascular response to laryngoscopy and intubation. Richard A Kraut,[18] in 1983 compared intravenous and topical laryngotracheal lignocaine and found that topical laryngotracheal is the preferred way to control MAP than intravenous route to attenuate stress response to laryngoscope and intubation. Robert K. Stoelting,[19] achieved similar results by using 2% lignocaine viscous mouth wash and gargle five minutes before induction concluded that pressor response was attenuated but the increase heartrate in response to tracheal intubation could not be blocked. Lignocaine has been tried as intravenous administration prior to laryngoscopy, mouth gargles in various concentration of sprays. The mechanism of action of lignocaine in blunting pressor response differs according to the method of administration. Local administration like gargles and sprays may be effective due its local anaesthetic property at the base of tongue and pharyngeal walls preventing the receptor stimulation. In view of this, in the present study we employed oropharyngeal lignocaine spray. Nitroglycerine originally used as antianginal agent, was found to reduce the blood pressure by preferentially dilating the venous capacitance vessels in low doses .Nitrates profoundly affects cardiac performances, myocardial oxygen demand and coronary blood flow, thus reduction in myocardial ischaemia, improves myocardial contractility (Kaplan 1993). Nitroglycerine is available for various routes of administration such as intravenous, sublingual tablet, ointment and pen spray. Kalish Chandra Sharma et al.; in 2015,[20] used Nitroglycerine sublingually to attenuate the rise in pulse rate, BP due to laryngoscopy and intubation. Other studies have reported effective attenuation of pressor response to NTG by intra nasally ointment, intravenously as bolus and infusion. Indira Kumara et al.; in 2016,[21] used Nitro-glycerin lingual spray for attenuation of pressor response following intubation. In view of above studies, we employed lingual/ oral spray of Nitroglycerine due to ease of administration.

Dosages of the drugs selected:

In H.G Manjunath et al.;[22] study 10% lignocaine spray was used and in 1999, Mubarak Jain et al.;[23] used 10 puffs of 10% lignocaine spray to attenuate haemodynamic response to laryngoscopy and intubation found significant success compared to normal saline spray. In view of the above studies and safe plasma lignocaine levels we employed 10 puffs of 10% lignocaine oropharyngeally. Oral NTG spray 0.4 mg was employed by J. Rani Manjusha et al.; in 2015,[24] and Seema Gupta et al.; in 2016,[25] successfully. Indra kumari et al.;[21] documented a blunting of pressor response by the lingual spray of NTG in doses of 0.4 and 0.8 mg and there was a trend toward fall inblood pressure in group 0.8 mg; but it was clinically insignificant. In view of this in present study we employed 0.8 mg of oral Nitroglycerine spray. In the present study, lignocaine spray group is comparable with Seema Gupta et al.;[25] and M. Jain et al.;[23] and NTG spray group is comparable with Indira kumari et al.[21] The results obtained in present study were similar to these studies with an increase in heart rate (in both groups). SBP and DBP in Lignocaine spray group increased compared to control group. The study also showed that NTG spray decreases SBP and DBP more effectively as compared to lignocaine group following laryngoscopy and intubation.

Mean Arterial Pressure

In the present study after laryngoscopy and endotracheal intubation, the lignocaine group had an increase in mean arterial pressure and the NGT group had a decrease in mean arterial pressure. So, as per study, NTG spray decreases the MAP more effectively as compared to lignocaine following laryngoscopy and endotracheal intubation. Among the two drugs studied in the present study, NTG spray proved to be the better choice for attenuation of hemodynamic responses to laryngoscopy and endotracheal intubation.

Summary

	Lignocaine spray group-percentage	NTG spray group - percentage
HR(bpm) 1 min after intubation	29.26% increase	24.06% increase
SBP(mmHg)1min after intubation	13.4% increase	6.1% decrease
DBP(mmHg)1minafter intubation	22.18% increase	1.16% decrease
MAP(mmHg) 1 min after intubation	18.32% increase	3.33% decrease

CONCLUSION

From the present study it can be concluded that In Lignocaine spray group patients who received 10 puffs (100 mg) oropharyngeally, 3 minutes before induction, there was a significant rise in the mean heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) occurred one minute following laryngoscopy and intubation.

In Nitroglycerine spray group, who received 2 puffs (0.8 mg) orally 30 seconds before induction, effectively attenuated arterial

pressure response to laryngoscopy and intubation. Hence, it is concluded that Nitroglycerine oral spray in the dose of 0.8 mg, given 30 seconds before induction can be a better alternative in attenuating the haemodynamic responses to laryngoscopy and intubation without adverse effects.

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