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A COMPARISION BETWEEN SUBLINGUAL NITROGLYCERIN SPRAY AND I.V LIGNOCAINE IN ATTENUATION OF HEMODYNAMIC RESPONSES TO INTUBATION AND DIRECT LARYNGOSOPY

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Abstract

Background: Laryngoscopy and tracheal intubation is associated with a reflex sympathetic pressor response which results in increased heart rate and blood pressures. This may prove detrimental in high-risk patients. Objective of this study is to compare the effects of intravenous lignocaine and oral nitroglycerin spray in attenuation of this response. **Methods:** 90 ASA I and II status normotensive patients scheduled for elective surgical procedures were selected randomly and divided into three groups of 30 each. All patients received premedication, the first group was control group, in this group no drug was administered for attenuating sympathetic response to laryngoscopy and intubation, the second group received 2mg/kg lignocaine i.v. bolus and the third group received 0.4mg/1 spray of sublingual nitroglycerin, 3 minutes before laryngoscopy and intubation. HR, systolic, diastolic blood pressure were recorded noninvasively before induction, postinduction, 1,3,5, 7 and 10 minutes from the onset of laryngoscopy.‘ ANOVA’ test was used for statistical analysis. **Results:** Post intubation incidence of tachycardia (HR>100/min) was significantly higher in control and nitroglycerin group ($p<0.05$) than in lignocaine group. Rise in SBP and DBP were also statistically significant in control and nitroglycerin group than in lignocaine group ($p<0.05$) **Interpretation and Conclusion:** Attenuation of pressor response is seen both with lignocaine and nitroglycerin. Of the two drugs lignocaine 2mg/kg i.v. bolus provides a consistent, reliable and effective attenuation as compared to sublingual nitroglycerin spray 0.4mg.

Key words: Attenuation of pressor response, laryngoscopy, intubation, lignocaine, nitroglycerin.

Introduction

The induction of anaesthesia, laryngoscopy, tracheal intubation and surgical stimulation often evoke cardiovascular responses characterised by alteration in systemic arterial blood pressure, heart rate and cardiac rhythm. The response following laryngoscopy and intubation peaks at 1 to 2 minutes and return to baseline within 5 to 10 minutes. Though the sympathoadrenal responses are probably of little consequence in healthy patients, it is

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hazardous to those patients with hypertension, coronary heart disease, cerebrovascular disease, intracranial pathology and hyperactive airways. In such cases, reflex circulatory responses such as an increase in heart rate, systemic arterial pressure and disturbances in cardiac rhythm need to be suppressed.

Prof. King *et al.* [1], documented myocardial ischemic changes due to reflex sympathoadrenal responses immediately following laryngoscopy and intubation with a mean increase in systolic pressure of 40mmHg even in normotensive individuals. Pyrs Roberts *et al.* [2], showed exaggerated form of this response in hypertensive patients.

Various systemic as well as topical agents have been used to reduce these untoward hemodynamic responses during laryngoscopy. When compared to systemic agents, administration of local anaesthetic solutions is likely to be of limited value. The commonest strategies adopted are narcotics, vasodilators, β-blockers, calcium channel blockers, lignocaine, clonidine and other sympatholytics. In our study, we have compared intravenous lignocaine, oral nitroglycerin spray, and placebo in suppressing stress responses to laryngoscopy and intubation.

Since intravenous lignocaine, oral nitroglycerin spray have been known to blunt sympathetic responses to intubation, their efficacy has been compared with control (placebo) in the Department of Anaesthesiology, JJMMC, DAVANGERE.

Aim of the Study

For the safe conduct of anaesthesia, the hemodynamic responses to laryngoscopy and intubation should be abolished or at least attenuated to balance the myocardial oxygen supply and demand. This study was done to compare the efficacy of intravenous lignocaine, oral nitroglycerin spray and placebo in attenuating the hemodynamic stress responses to laryngoscopy and intubation.

Materials And Methods

90 patients of ASA physical status 1 or 2 undergoing elective surgical procedure under general anaesthesia with endotracheal intubation were included in this study. Patients belonging to age group 20 and 50 years of both the sexes were included. It is a prospective single blinded randomized controlled study. The study was approved by our institution ethical committee and after obtaining written, informed consent from the patient, this study was conducted. The study was done during the period from May 2022 to March 2024 in the Department of Anaesthesiology, JJMMC.

Inclusion criteria: 1) ASA 1 or 2 2) Patients with airway with modified mallampatti grade class 1 or 2 3) Age group 20 to 50 years of both sexes. 4) Patients who are willing and able to give informed written consent

Exclusion criteria: 1) Patients with full stomach 2) Patients posted for emergency surgery 3) Patients with difficult airway 4) Hypertension, diabetes, ischemic heart disease and pregnancy 5) Patients with contraindications to study drugs. 6) Patient refusal

Anaesthetic protocol: Pre-operative visit was done to allay anxiety and good rapport was established with the patients. All the patients were given pre-operative night sedation with tab.alprazolam 0.5mg orally. Interventions: Induction of anaesthesia was standardised for all patients. Monitors used were NIBP, ECG, EtCO2 and pulse oximetry. Method: 90 patients of both the sexes of ASA 1 or 2 undergoing surgical procedure were randomly allocated into three groups. Group A – was control group, in this group no drug was administered for attenuating sympathetic response to laryngoscopy and intubation Group B – receiving oral NTG spray (0.4mg/spray) 3 minutes before laryngoscopy and intubation Group C – receiving

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i.v. lignocaine (2mg/kg) 3 minutes before laryngoscopy and intubation. Their pulse rate, blood pressure and sp02 were recorded. They were premedicated with injection Glycopyrrolate 0.01 mg/kg , injection Midazolam 0.05mg/kg and injection Pentazocine 0.5mg/kg Preoxygenation done with 100% oxygen for 3 minutes.

Administration of study drug: The study drug was given 3minutes before laryngoscopy and intubation. Then vital signs were recorded. Two minutes later, patient was induced with injection propofol 2mg/kg body weight intravenously. The vital signs were recorded. Then, injection succinylcholine 2mg/kg body weight was given. Intubation was performed by the same person for all the cases with appropriate sized endotracheal tubes orotracheally. Anaesthesia was maintained with controlled ventilation with N2O/O2 mixture 3:2, Sevoflurane 1 MAC and injection vecuronium 0.05mg/kg and IPPV. No surgical stimulation was permitted for 10 minutes after intubation. At the end of surgery reversal was done with Inj. Neostigmine 0.05mg/kg and Inj. Glycopyrrolate 0.01mg/kg i.v. Patients were monitored throughout the period from entering into operation theatre till recovery and in the immediate post-operative period by means of automated NIBP, pulse oximetry and ECG in a multichannel monitor. ECG was monitored with particular importance to any alteration in rhythm. All patients were extubated and were shifted to post anaesthetic care unit for a follow up for 24 hours.

RESULTS

TABLE 1: AGE DISTRUBUTION

Variables	Groups	N	Mean	Std. Dev	F value	p value*
AGE	Control	30	28.10	8.880	1.463	.237
	IV Lignocaine	30	32.07	9.028		
	Oral NTG spray	30	31.43	10.909		
	Total	90	30.53	9.700		

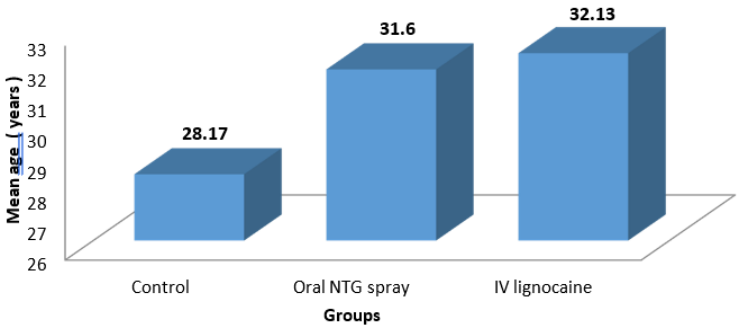

Figure 1

TABLE 2: HEART RATE

Groups	Control			IV Lignocaine			Oral NTG spray			p value*	Control and IV	IV and Oral	Control and Oral
MAP	Mean	SD	MD	Mean	SD	MD	Mean	SD	MD		p value#	p value#	p value#

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Basal	82.03	5.055		79.67	4.693		81.50	4.855	2.5	0.001	.002	.086	.000
Post ind	88.87	5.722	6.84	84.37	4.279	4.700	100.37	6.478	21.37	0.001	0.001	0.001	0.001
1 min	117.57	6.882	35.533	89.30	4.268	9.633	105.13	4.478	16.27	0.001	0.001	0.001	0.001
3 min	119.60	8.050	39.933	92.93	3.051	13.933	92.87	2.897	8.50	0.001	0.001	1	0.001
5 min	108.50	7.986	29.500	92.07	1.818	3.200	84.53	2.921	3.03	0.001	0.001	1	0.001
7 min	96.17	8.150	7.300	85.37	1.426	1.000	80.30	3.109	-37.27	0.001	0.001	0.544	0.001
10 min	88.53	6.157	4.167	78.87	1.833	-2.633	81.50	4.855	2.5	0.001	.002	.086	.000

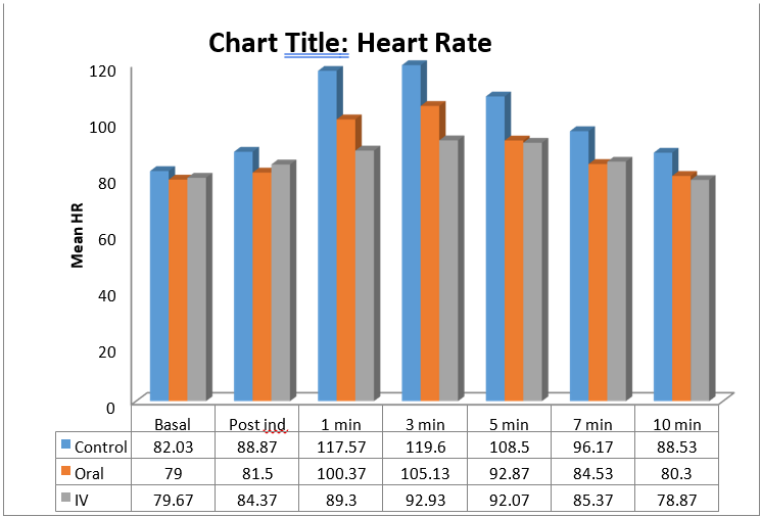

Figure 2

TABLE 3: SYSTOLIC BLOOD PRESSURE

Groups	**Control**			**IV Lignocaine**			**Oral NTG spray**			**p value***	**Control and IV**	**IV and Oral**	**Control and Oral**
MAP	Mean	SD	MD	Mean	SD	MD	Mean	SD	MD		p value#	p value#	p value#
Basal	130.33	17.095		131.17	12.614		131.73	16.484		0.94	1	1	1
Post ind	127.27	16.58	-3.06	124.87	11.325	-6.3	129.67	16.668	-2.06	0.47	1	0.662	1
1	140	8.5	10.	132	17.	1.8	139	15.	7.3	0.0	0.12	0.3	1

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min	.67	35	34	.97	713		.1	473	7	98	6	11	
3 min	143 .17	15. 024	12. 84	125 .37	17. 893	- 5.8	130 .9	18. 252	- 0.8 3	0	0	0.6 42	0.02
5 min	149 .6	14. 459	19. 27	118 .03	17. 664	- 13. 14	128 .1	18. 153	- 3.6 3	0	0	0.0 69	0
7 min	151 .8	13. 197	21. 47	115 .4	17. 316	- 15. 77	129 .6	17. 745	- 2.1 3	0	0	0.0 03	0
10 min	131 .73	14. 617	1.4	129 .53	10. 082	- 1.6 4	131	17. 654	- 0.7 3	0.8 35	1	1	1

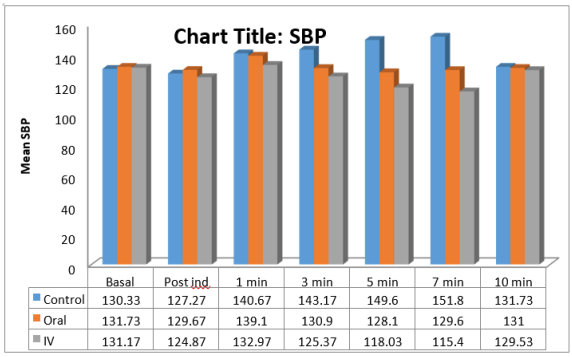

Figure 3

TABLE 4: DIASTOLIC BLOOD PRESSURE

Groups	**Control**			**IV Lignocaine**			**Oral NTG spray**			**p value***	**Control and IV**	**IV and Oral**	**Control and Oral**
MAP	Mean	SD	MD	Mean	SD	MD	Mean	SD	MD		p value#	p value#	p value#
Basal	75.5	8.1		80.6	5.3		78.8	6.7		0.015	0.013	0.9	0.2
Post ind	74.47	6.761	-1.03	76.3	4.9	-4.3	75.9	6	-2.9	0.453	0.707	1	1
1 min	86.5	4.431	11	80.83	4.843	0.23	83.7	9.374	4.9	0.006	0.004	0.289	0.313
3 min	87.63	10.053	12.13	77.4	9.874	-3.2	81.7	11.117	2.9	0.001	0.001	0.335	0.088
5 min	89.8	9.106	14.3	73.2	8.907	-7.4	79.67	10.981	0.87	0.001	0	0.035	0
7 min	89.83	8.453	14.33	71.37	8.798	-9.23	80.67	10.61	1.87	0.001	0	0.001	0.001

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10 min	77.97	4.657	2.47	75.97	6.009	-4.63	78.4	6.76	-0.4	0.237	0.572	0.337	1

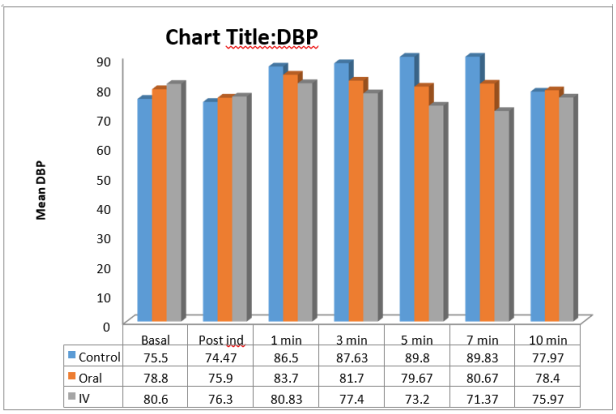

Figure 4

TABLE 5: MEAN ARTERIAL BLOOD PRESSURE

Groups		**Control**			**IV**			**Oral**		**p value***	**Control and IV**	**IV and Oral**	**Control and Oral**
MAP	Mean	SD	MD	Mean	SD	MD	Mean	SD	MD		p value#	p value#	p value#
Basal	93.7	10.2		97.7	7.4		96.4	9.3		0.233	0.286	1	0.768
Post ind	92.07	8.975	-1.63	93	7	-4.7	94.3	8.4	-2.1	0.58	1	1	0.899
1 min	104.37	4.723	10.67	98.2	8.372	0.5	102.77	9.86	6.37	0.01	0.01	0.086	1
3 min	106.4	9.729	12.7	93.37	11.845	-4.33	98.17	12.785	1.77	0.001	0	0.331	0.021
5 min	109.73	9.27	16.03	88.13	11.206	-9.57	95.87	12.566	-0.53	0.001	0	0.025	0
7 min	110.6	8.257	16.9	86	11.095	-11.7	97	12.216	0.6	0.001	0	0	0
10 min	95.9	6.915	2.2	93.77	6.841	-3.93	95.9	9.546	-0.5	0.482	0.89	0.89	1

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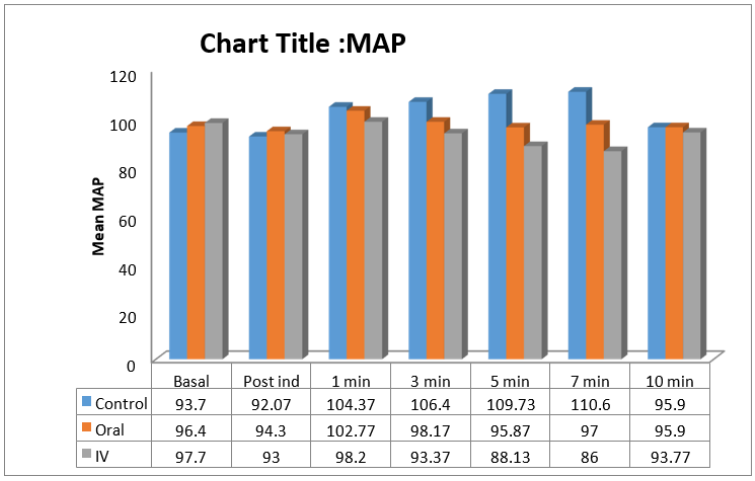

	Basal	Post ind	1 min	3 min	5 min	7 min	10 min
Control	93.7	92.07	104.37	106.4	109.73	110.6	95.9
Oral	96.4	94.3	102.77	98.17	95.87	97	95.9
IV	97.7	93	98.2	93.37	88.13	86	93.77

Figure 5

Discussion

The sequence of induction anaesthesia, laryngoscopy and tracheal intubation are associated with marked haemodynamic changes and autonomic reflex activity which may be a cause of concern in many high-risk patients.[3]

Laryngoscopy and intubation is associated with increase in heart rate, blood pressure and cardiac arrhythmias. These changes disappear within 5 minutes of laryngoscopy.[4] Although these responses of blood pressure and heart rate are transient, they may be detrimental in high risk patients especially in patients with cardiovascular disease and increased intracranial pressure.[5]

Multiple factors influence the cardiovascular changes associated with laryngoscopy and intubation. Age, drugs, duration and type of procedures, depth of anaesthesia, hypoxia, hypercarbia etc., influence the pressor response. Heart rate changes decrease with increasing age, young patients show more changes. Prominent changes in haemodynamic responses are often seen in geriatric patients.[6]

In our study we selected the age range of 20 to 50 years. Patients who are on antihypertensive drugs may show decrease in pressor response and so, we excluded the patients on antihypertensive medications from our study.

the combination of drugs used for premedication, induction, and maintenance of anaesthesia can alter the sympathetic response to laryngoscopy and intubation.

Midazolam at a dose of 0.2mg/kg/i.v decreases the blood pressure and increases the heart rate. However, premedication with 0.05mg/kg i.m. of midazolam has no effect on sympathetic response to laryngoscopy and intubation.[7] Pentazocine an opioid agonist antagonist may increase the blood pressure, heart rate and catecholamine levels. Glycopyrrolate premedication can moderately increase the heart rate. Succinyl choline has negative inotropic and chronotropic effect. It acts on the muscarinic receptors of SA node. A marked noradrenergic response was noted when intubation was performed under succinylcholine.[8] Nitrous oxide may increase the tone of sympathetic nervous system. The direct action of nitrous oxide is negative inotropism which is offset by increased sympathetic tone.

In a study conducted by Singh S and Smith JE[9], nasotracheal intubation comprises of three distinct phases a) nasopharyngeal intubation b) direct laryngoscopy to identify the vocal cords and c) Passage of tracheal tube into the trachea. Nasopharyngeal intubation causes significant pressor response. This response is exaggerated by the passage of tracheal tube in

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the larynx and trachea. Direct laryngoscopy did not increase the response significantly. In our study we included only direct laryngoscopy and orotracheal intubation.

Stanley Tam *et al.* [10] studied that the optimal time of injection of lignocaine before tracheal intubation for effective attenuation of circulatory response to intubation. Lignocaine 1.5mg/kg i.v. was administered 1,2,3, and 5 minutes before intubation in different groups of nonhypertensive patients belonging to ASA I or II. Lignocaine i.v given 3 minutes before intubation was found effective.

Miller CD and Warren SJ [11] studied the effectiveness of lignocaine to attenuate cardiovascular response to laryngoscopy and tracheal intubation. Patients were allocated into groups to receive lignocaine 1.5mg/kg i.v 1,2, and 3 minutes before laryngoscopy and failed to show any significant differences between any of these groups.

Wilson IG *et al.*[12] studied that the varying time of prior doses of lignocaine 1.5mg/kg i.v on the cardiovascular response to tracheal intubation. There was significant rise in mean arterial pressure in all the groups. However Placebo showed rise in mean arterial pressure of 19.1% compared to lignoacaine group.

Robert K. Stoelting *et al.*[13 ,in his study concluded that a short duration of direct laryngoscopy combined with laryngotracheal lidocaine administered just before intubation minimises pressor responses.

Inadae, Cullen DJ Nemeskar AR [14] compared the efficacy of labetalol 10mg and lidocaine 2mg/kg intravenous injection just before the induction of anaesthesia and found lidocaine is a safe and cost effective mean of preventing tachycardia but not hypertension in response to laryngoscopy and intubation.

Madhuri Gopal, Sangitha[15] in a comparative study of pressor response to laryngoscopy and intubation with oral spray of nitroglycerine and oropharyngeal spray of lignocaine concluded that Nitroglycerine oral spray in the dose of 0.8mg given 30 seconds before induction can be a better alternative in attenuating hemodynamic responses to laryngoscopy and intubation.

Binod Pegu *et al.*[16] studied that the attenuation of stress response to laryngoscopy and intubation: sublingual nitroglycerin spray v/s intravenous fentanyl and sublingual nitroglycerin spray and concluded that combination of intravenous Fentanyl plus Nitroglycerin spray is more effective than NTG alone in attenuating the stress response following laryngoscopy and intubation.

Many strategies have been recommended which include minimising the duration of laryngoscopy to less than 20 seconds, topical application of local anaesthetics[17], iv Beta-blockers, calcium channel blockers, clonidine, Sodium Nitroprusside, lignocaine. No single drug or technique is satisfactory[18]. Each technique has its advantages and disadvantages, the most obvious being that the prevention often outlasts the stimulus.

Attenuation of diastolic blood pressure is very significant in both lignocaine and Nitroglycerin groups as compared to control group until the end of 7 minutes ($p<0.05$). Among the two study groups lignocaine showed a better attenuation of diastolic blood pressure compared to nitroglycerin. Similarly mean arterial pressure was increased by 16.03% in control group while it increased by 6.37% in nitroglycerin group and only by 0.5% in lignocaine group compared to preinduction values by 1 minute post laryngoscopy. Attenuation of mean arterial pressure is significant in lignocaine group as compared to both nitroglycerin and control group ($p>0.05$). The efficiency of intravenous lignocaine over oral nitroglycerin spray in attenuation of cardiovascular responses has been verified.

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Conclusion

Based on present clinical comparative study the following conclusions can be made. Oral nitroglycerin spray significantly attenuates the sympathetic responses to laryngoscopy and tracheal intubation but Intravenous lignocaine is more efficient than oral nitroglycerin spray in attenuating the sympathetic responses to laryngoscopy and intubation. Intravenous lignocaine at a bolus dose of 2mg/kg administered 3 minutes before laryngoscopy and intubation can be recommended to attenuate the sympathetic response to laryngoscopy and intubation.

Bibliography

1. King, B.D. Harris L.C. jr. Creifenskin. F.E Elder. J.D and Dripps R.D (1951) Circulatory responses to direct laryngoscopy and tracheal intubation – BJA 65: 216-219.
2. Prys – Roberts, C.Green, L.T. Melochel and Foe.P. (1971) – Hemodynamic responses to laryngoscopy and intubation. BJA – 43: 531
3. Black TE, Kay B and Healy TEJ. Reducing the hemodynamic responses to laryngoscopy and intubation. Anaesthesia 1984: 39:883-887
4. Onkar Singh P, Swarn Kaur. Attenuation of the pressor response to laryngoscopy and tracheal intubation: comparision of beta blockers and calcium channel blockers. Ind J Anaesth 1993:41:320-324
5. Pernerstorfer T, Krafft F, Fitzgerald RP, Krenn C G, Chiari A, Wagner O, *et al.* Stress response to tracheal intubation: direct laryngoscopy compared with blind oral intubation.
6. Bucx MJL, Van Geel RTM, Scheck PAE and Stijnen. T Cardiovascular effects of forces applied during laryngoscopy. Anaesthesia 1995:50:17-22
7. Samuelson PN, Reves JG, Kouchoukos NT, Smith LR, Dole KM. Hemodynamic responses to anesthetic induction with midazolam or diazepam in patients with ischemic heart disease. Anesth Analg. 1981 Nov;60(11):802-9. PMID: 7197492
8. Stoelting RK, Peterson C. Heart-rate slowing and junctional rhythm following intravenous succinylcholine with and without intramuscular atropine preanesthetic medication. Anesth Analg. 1975 Nov-Dec;54(6):705-9. doi: 10.1213/00000539-197511000-00007. PMID: 1239204.
9. Singh S, and Smith JE. Cardiovascular changes after three stages of nasotracheal intubation. Br J Anaesth 2003:91:667-71
10. Tam S, Chung S and Campbell M. Intravenous lignocaine: optimal time for injection before tracheal intubation. Anaesth Analg1987:66:1036-38
11. Miller CD and Warren SJ. IV lignocaine fails to attenuate the cardiovascular responses to laryngoscopy and tracheal intubation. BrJ Anaesth 1990:65:216-219)
12. Wilson IG, Meikle john BH and G Smith. Intravenous lignocaine and sympathoadrenal responses to laryngoscopy and intubation. The effect of varying time of injection. Anaesthesia 1991:46:177-180
13. Robert K. Stoelting M.D. (1978) – Blood pressure and heart rate changes during short duration laryngoscopy for tracheal intubation: Influence of viscous or intravenous lidocaine. Anaesth.analg 1978, 41
14. Inada E, Cullen D.J, Nermeskal AR. Teplick R (1989) – Effect of labetolol or lidocaine on the hemodynamic responses to intubation, a controlled randomized doubleblind study. J. clin.Anaesth.1989 (3); 207-13
15. A Comparative Study of Pressor Response to Laryngoscopy and Intubation with Oral Spray of Nitroglycerine and Oropharyngeal Spray of Lignocaine V. Madhuri Gopal , Sangitha ISSN (O): 2347-3398; ISSN (P): 2277-7253.
16. Pegu B *et al.* Int J Basic Clin Pharmacol. 2017 Jun;6(6):1414-1419

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 05, 2024

17. Hamill, J.F., Bedford, R.F., Weaver, D.C. and COLOHAN, A.R., 1981. Lidocaine before endotracheal intubation: intravenous or laryngotracheal?. The Journal of the American Society of Anesthesiologists, 55(5), pp.578-580.
18. Vincent J Collins Principles of anaesthesiology. General and regional anaesthesia , 3rd Edn. Vol I and II Philadelphia: Lea and Fabiger 1993.