Original Research Article

Indian Journal of Anesthesia and Analgesia
2018; 5(8): 1275-1279
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.5818.4

Comparision of Nitroglycerine and Clonidine to Attenuate the Pressor Response to Laryngoscopy and Intubation

Ajai Vikram Singh

Associate Professor, Department of Anaesthesiology & Critical Care, Veer Chandra Singh Garhwali Government Institute Of Medical Science and Research (VCSGGMSRI), Srinagar, Garhwal, Uttarakhand 246174, India.

Abstract

This study was carried out to compare the effectiveness of I.V. nitroglycerine and clonidine for controlling the pressor response to laryngoscopy and endotracheal intubaltion during general anaesthesia. This study was done on 90 adult patients of either sex belonging to ASA grade-1, aged 20-50 years and were randomly allocated into three groups according to the agents to be used before induction of anaesthesia, comprising of 30 patients each. Group-1 : control group (not receiving any pre-medication), Group-2 : IV nitroglycerine, Group-3 : IV clonidine. All the patients were prepared with adequate pre operative fasting. Tablet alprazolam 0.5mg given orally night before surgery for quiet and calm sleep. After checking the patient's blood pressure, H.R. and ECG at basal stage, pre-treatment was started. Group-2 patients were pre-medicated with 200μg/min slow intravenous Nitroglycerine is given till the systolic blood pressure fell down by 20-30% of the basal. Group-3 patients were pre-treated with 0.3 mg of clonidine IV. Systolic arterial pressure, diastolic arterial pressure,mean arterial pressure, heart rate were measured at base line(3 min before induction), just before laryngoscopy and post intubation at 1, 3, 5, 10 and 15 min after laryngoscopy and intubation. Anaesthesia was maintained on nitrous oxide, oxygen, 0.5% isoflurane and a long acting muscle relaxant. While comparing inter-group comparison, it was observed that there was significant increase in heart rate in Group-1 and Group-2, but heart rate remains controlled and stable in group 3. Hence, it was found that nitroglycerine had no role in controlling the heart rate during intubation, whereas there was significant change in blood pressure in Group-2 and Group-3 as compared to Group-1. This suggests that nitroglycerine and clonidine effectively attenuates hypertensive response to laryngoscopy and intubation. ECG changes were observed in all the groups for sinus tachycardia.

Keywords: Clonidine; Nitroglycerine; Laryngoscopy; Endotracheal Intubation; Pressor Response.

How to cite this article:

Ajai Vikram Singh. Comparision of Nitroglycerine and Clonidine to Attenuate the Pressor Response to Laryngoscopy and Intubation. Indian J Anesth Analg. 2018;5(8):1275-79.

Introduction

Laryngoscopy and endotracheal intubation are found as potent noxious stimuli in increasing heart rate and blood pressure (pressor response). These are produced due to sympathetic reflex provoked by stimulation of epipharynx and laryngopharynx (Tomori and Widdicombe, 1969). Reid and Brace (1940) first described the effect of endotracheal intubation on ECG which were of the nature of premature ventricular beat, nodal rhythm, sinus bradycardia, etc. (Burstein, et al., 1950). The sensitive receptor area of epiglottis when mechanically stimulated by instrumentation evokes reflex response (Reid and Brace, 1940; King, et al., 1951). Measurements of the plasma catecholamine have

Corresponding Author: Ajai Vikram Singh, Associate Professor, Department of Anaesthesiology & Critical Care, Veer Chandra Singh Garhwali Government Institute Of Medical Science and Research (VCSGGMSRI), Srinagar, Garhwal, Uttarakhand 246174, India.
E-mail: ajaivikramsingh872@gmail.com

Received on 21.05.2018, **Accepted on** 09.06.2018

demonstrated an increase in noradrenaline following laryngoscopy and thus confirmed sympathetic mediation to this response. The increase in blood pressure is usually transitory, variable and unpredictable and can be life threatening if left unattended. The pressor response is undesirable and can be deleterious in susceptible patients, especially in patients with systemic hypertension, coronary artery disease and intracranial aneurysm.

These changes are at their peak 30-45 sec after laryngoscopy (Stoelting, 1977). Complications of the pressor response following laryngoscopy and tracheal intubation include left ventricular failure (Masson, 1964), myocardial ischaemia, increase in intracranial pressure, intracranial haemorrhage and convulsions may be precipitated in pre-eclamptic patients. These complications may be serious in hypertensive patients. Thus it has always been a challenge to control the increased heart rate and blood pressure during laryngoscopy and numerous techniques have been employed to modify the pressor response with varying success. A wide variety of pharamacological agents were used to attenuate the hemodynamic responses to laryngoscopy and intubation like lignocaine, fentanyl, alfentanyl, nifedipine, beta-blockers, magnesium sulphate, verapamil, diltiazem with varying results.

Regional and Topical analgesia have been used to block different impulses, intravenous lidocaine and deeper inhalational anaesthesia have been used to modify response at CNS level. Nitroglycerine relaxes vascular smooth muscles with venous dilatation predominantly over arterial dilatation. Nitroglycerine had been administerd parenterally as a bolus or intranasally or infusion to attenuate hemodynamic responses during laryngoscopy and intubation.

Material and Method

This study evaluated 90 adult patients of either sex belonging to ASA grade 1, aged 20-50 years undergoing elective surgery under general anaesthesia were randomly allocated into 3 groups. All the patients were subjected to a detailed pre-anaesthetic evaluation to rule out any anatomical or systemic disorders. All normotensive patients were considered for the study. The anaesthetic procedure was explained to the patients and informed consent was taken from each patient, history of past prolonged illness and drug therapy was elicited. Routine and relevant special investigations were carried out.

All patients in the study received a standard general anaesthesia technique followed by endotracheal intubation. On the night before surgery tablet alprazolam 0.5 mg was given to alleviate anxiety. After securing a peripheral intravenous line, infusion of crystalloid solution was started. Patients were premedicated with glycopyrrolate 0.2mg, diazepam 10mg and pentazocine 30mg intravenously.

Patients were preoxygenated for 3-5 min and anaesthesia was induced with propofol 2mg/kg, intubated with succinylcholine 1.5mg/kg and patients were intubated without any undue delay with an appropriate sized cuffed endotracheal tube. Nitroglycerine 200µg and clonidine 0.3mg was given IV in the respective groups 5 min before induction of anaesthesia. During laryngoscopy and intubation, vitals of the patients were again checked.

This stage of recording was termed intubation stage. For the next 15 min these recordings were again taken after every 5 min and maintained on $N_2O + O_2$ and vecuronium 0.8mg/kg. Patients were kept on intermittent positive pressure ventilation using closed circuit.

Patients were observed for any allergic reaction or hypotension during intraoperative period. 12 hour post operative observation was done and the occurrence of hypotension, palpitation, dizziness, nausea and vomiting were recorded.

Exclusion Criteria

- Hypertension
- Cardio-vascular disorders
- Atrio-ventricular conduction block
- Congestive heart failiure
- Increased intra-cranial pressure
- Respiratory disorder
- Increased intra-ocular pressure
- Marked anaemia
- Bronchial asthma
- Neurological disorders
- Anticipated difficult airway
- Severe obesity

Observations

S. No.		Group 1 (Control Group)	Group 2 (Nitroglycerine)	Group 3 (Clonidine)
1	Age	32.78 ± 8.23	32.12 ± 7.18	37.37 ± 11.58
2	Weight	56.86 ± 8.8	58.68 ± 8.37	57.39 ± 8.97
3	Heart Rate			
	Basal	82.12 ± 6.8	82.16 ± 5.4	80.38 ± 6.2
	During Intubation	116 ± 11.4	121 ± 6.8	86.92 ± 8.7
		Highly Significant	Highly Significant	Not Significant
	5 Min after intubation	106 ± 7.34	106.32 ± 6.24	85.39 ± 7.56
		Highly Significant	Highly Significant	Not Significant
	10 Min after intubation	84.19 ± 3.31	92.04 ± 8.32	83.21 ± 6.1
		Not Significant	Not Significant	Not Significant
	15 Min after intubation	81.84 ± 2.82	85.76 ± 7.6	80.3 ± 5.57
		Not Significant	Not Significant	Not Significant
4	Systolic Blood Pressure			
	Basal	119.52 ± 5.98	120 ± 8.16	122.32 ± 6.1
	During Intubation	155 ± 18.58	124.96 ± 9.91	121.18 ± 8.34
		Highly Significant	Not Significant	Not Significant
	5 Min after intubation	130.81 ± 9.78	120.46 ± 8.16	117.04 ± 7.86
		Highly Significant	Not Significant	Not Significant
	10 Min after intubation	120.4 ± 6.34	115.43 ± 11.7	113.3 ± 9.69
	15 Min after intubation	118.02 ± 6	104 ± 12.72	102.9 ± 9.7
5	Diastolic Blood Pressure			
	Basal	80.26 ± 4.24	80.68 ± 8.42	81.49 ± 7.67
	During Intubation	100.37 ± 8.2	82.47 ± 8.03	82.63 ± 8.18
		Highly Significant	Not Significant	Not Significant
	5 Min after intubation	88.86 ± 5.57	79.68 ± 8.43	80.04 ± 8.35
		Highly Significant	Not Significant	Not Significant
	10 Min after intubation	82 ± 3.61	77.28 ± 9.78	77 ± 9.8
		Highly Significant	Not Significant	Not Significant
	15 Min after intubation	79.6 ± 4.34	75.6 ± 9.29	76.1 ± 9.54
		Highly Significant	Not Significant	Not Significant

Discussion

Laryngoscopy and intubation caused sympathetic stimulation leading to pressor response characterised by approximately 10-20% rise in heart rate and 20-30% rise in blood pressure which can be tolerated by normal patients but may cause deleterious effects in patients with hypertension or any cardiovascular disease. The magnitude of pressor response can be assessed by observing the rise in heart rate, systolic, diastolic and mean arterial pressure. We observed that nitroglycerine in Group-2 does not attenuate the rise in heart rate but controls the blood pressure, whereas clonidine in Group-3 attenuates the heart rate and blood pressure both. It has been documented in previous studies that nitroglycerine does not attenuate the rise in heart rate after intubation which can be attributed to reflex sympathetic response to the mechanical stimulation of larynx and trachea. Significant increase in serum levels of epinephrine and norepinephrine following laryngoscopy with and without tracheal intubation.

Various anaesthetic methods and drugs are used to control haemodynamic response to laryngoscopy and intubation. The technique or drug of choice depends on the necessity and duration of surgery, choice of anaesthetic technique, route of administration and medical condition of the patient.

The effect of clonidine on attenuation of pressor response to the laryngoscopy and tracheal intubation has been reported previously in many studies. Previous studies showed that a dose of

300μg clonidine decreases sympathetic activity. The Metot et al. study shows that in patients undergoing laryngoscopic or bronchoscopic procedures under general anaesthesia, premedication with clonidine attenuates haemodynamic responses. In this study, premedication with clonidine 0.3mg administered prior to surgery significantly reduces heart rate, systolic, diastolic and mean arterial pressure.

This study confirmed the results of previous studies who demonstrated clonidine to be beneficial in blunting the pressor response associated with laryngoscopy and intubation. This study showed that hypotension may be expected. This hypotensive effect has been described in other studies in which clonidine was used in a dose of 4-5mg/kg. The prefered dose of clonidine in this study was kept low in respect to other studies because previous studies showed that larger doses were not more effective to blunt catecholamine release during intubation.

Some mechanisms by which clonidine attenuates the heart rate and blood pressure response to instrumentation of the airway have been proposed. Activation of central α_2 adrenoceptors, which causes both a decrease in peripheral sympathetic tone and an increase in vagally induced reflex bradicardia, an stimulation of peripheral presynaptic α-adrenoceptors, which leads to diminished release of norepinephrine from the nerve endings towards the vasculature and to a reduction in peripheral sympathetic tone. The advantages of using nitroglycerine and clonidine premedication for attenuation of cardiovascular responses to laryngoscopy are easy to administer, no significant side effects and availability with low price. Clonidine have antinociceptive effects that is beneficial for controlling post operative pain.

Conclusion

This study showed that nitroglycerine had no role in bringing down increased heart rate during intubation and does not alter cardiac rhythm but effectively attenuates hypertensive response to laryngoscopy and tracheal intubation. Clonidine comparably blunted the pressor response to laryngoscopy and tracheal intubation by attenuating both heart rate and blood pressure. In addition it has nociceptive effects which was helpful for controlling post operative pain.

References

1. Brustein (1950-51), electrocardiographic studies during endotracheal intubation. (a) effects during usual routine techniques. Anaesthesiology (1950a) (b) effects during general anaesthesia and intravenous diethylaminoethanol. Anaesthesiology, 1951.
2. Nishikawa T, Taguchi M, Kimura T, Taguchi N, Sato Y, Dai M. Effects of clonidine premedication upon hemodynamic changes associated with laryngoscopy and tracheal intubation. Masui. 1991;40(7):1083–8.
3. Stoelting RK. Circulatory changes during direct laryngoscopy and tracheal intubation: influence of duration of laryngoscopy with or without prior lidocaine. Anesthesiology. 1977;47(4):381–4.
4. Bruder N, Ortega D, Granthil C. Consequences and prevention methods of hemodynamic changes during laryngoscopy and intratracheal intubation. Ann Fr Anesth Reanim. 1992;11(1):57–71.
5. Matot I, Sichel JY, Yofe V, Gozal Y. The effect of clonidine premedication on hemodynamic responses to microlaryngoscopy and rigid bronchoscopy. Anesth Analg. 2000;91(4):828–33.
6. Zalunardo MP, Zollinger A, Spahn DR, Seifert B, Radjaipour M, Gautschi K, et al. Effects of intravenous and oral clonidine on hemodynamic and plasma-catecholamine response due to endotracheal intubation. J Clin Anesth.1997;9(2):143–7.
7. Mikawa K, Maekawa N, Nishina K, Takao Y, Yaku H, Obara H. Efficacy of oral clonidine premedication in children. Anesthesiology. 1993;79(5):926–31.
8. Ghignone M, Calvillo O, Quintin L. Anesthesia and hypertension: the effect of clonidine on perioperative hemodynamics and isoflurane requirements. Anesthesiology. 1987;67(1):3–10.
9. Filos KS, Patroni O, Goudas LC, Bosas O, Kassaras A, Gartaganis S. A dose-response study of orally administered clonidine as premedication in the elderly: evaluating hemodynamic safety. Anesth Analg. 1993; 77(6):1185–92.
10. Carabine UA, Wright PM, Moore J. Preanaesthetic medication with clonidine: a dose-response study. Br J Anaesth. 1991;67(1):79–83.
11. Brustein. (1950-51), Electrocardiographic studies during endotracheal intubation. 1. Effects during usual routine techniques. Anaesthesiology (1950a). 2. Effects during general anaesthesia and intravenous procaine. Anaesthesiology (1950b). 3. Effects during general anaesthesia and intravenous diethylaminoethanol. Anaesthesiology, 1951.
12. Forbee, Dally acute hypertension during induction of anaesthesia and endotracheal intubation in normotensive man. Br. J. Anaesth, 1970.
13. Hood. Using of nitroglycerine in preventing the hypertensive response to tracheal intubation in severe pre eclampsia. Anaesthesiology, 1963.

14. King, Harris. Reflex circulatory responses to direct laryngoscopy and tracheal intubation performed during general anaesthesia. Anaesthesiology, 1951.
15. Prys-Roberts. Studies of anaesthesia in relation to hypertension. Haemodynamic consequences of induction and endotracheal intubation. Br. J Anaesth. 1971.
16. Reid, Brace. Irritation of respiratory tract and its reflex effect upon heart. Surg. Gynaec. Obstet, 1940.
17. Stoelting Circulatory changes during direct laryngoscopy and tracheal intubation: Influence duration of laryngoscopy with or without prior lidocaine. Anaesthesiology, 1977.
18. Takeshima. Cardiovascular response to rapid anaesthesia induction and endotracheal intubation. Anaesth. Analg, 1964.
19. Tomori, Widdicombe. Muscular bronchomotor and cardiovascular reflexes elicited by mechanical stimulation of the respiratory tract. J. Physiol. Lond, 1969.
20. Wycof endotracheal intubation, effects on blood pressure and pulse rate. Anaesthesiology, 1960.
21. I. Kumari et al. Attenuation of pressor response following intubation: efficacy of nitroglycerine lingual spray. 2016.