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Original Research Article

Effects of Nitroglycerine and Lignocaine Spray on Hemodynamic Responses to Laryngoscopy and Endotracheal Intubation

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Abstract

Laryngoscopy and endotracheal intubation are stressful, violating the protective airway reflexes. They lead to a rise in heart rate and blood pressure. This transient rise in blood pressure and heart rate may be detrimental to the patient, mainly with cardiac and neurosurgical disease. There is a need to explore the possibility of obtunding the pressor responses to laryngoscopy and intubation with use of Lignocaine spray or nebulization and using nitroglycerine. Lignocaine can be sprayed onto the airway mucosa to lessen the discomfort of laryngoscopy and endotracheal intubation.

Lignocaine and nitroglycerine spray are the treatments for the hemodynamic responses. Lignocaine can be applied to the skin by spraying or nebulizing it, among other methods. Lignocaine has been sprayed onto the airway mucosa to lessen the discomfort of laryngoscopy and intubation. Lignocaine becomes a fine mist or aerosol when nebulized, allowing it to get deeper into the airway. Hemodynamic responses mainly refer to hypertension, cardiovascular disease, neuronal disease, etc. Nitroglycerine and lignocaine help to mitigate the effect of these health issues, no matter what age. The effect of the disease on the coronary artery can be mitigated through these treatments.

Keywords: Hemodynamic response, Endotracheal Intubation, Nitroglycerine, Lignocaine, Laryngoscopy, Nebulization, Heart Rate, and Blood Pressure.

Introduction

The hemodynamic response is a rapid delivery of blood to active neuronal tissue. The hemodynamic response is a homeostatic process that replenishes the nutrients used by biological tissues by adjusting blood flow to areas of focal activity. It refers to basic measures of cardiovascular function, such as arterial pressure or cardiac output. Mainly the flow of blood in the body and in the neuronal system can be measured by hemodynamic responses. The primary hemodynamic parameters include Heart rate (HR) and blood pressure (BP). The hemodynamic response to laryngoscopy and intubation is inevitable, transient and mostly well tolerated by healthy adults. It is a reflex phenomenon mediated by vagus (X) and glossopharyngeal nerve (IX) which carry afferent signals from infragloHic region and activate vasomotor centre to cause peripheral sympathoadrenal response leading to tachycardia, hypertension and elevated serum catecholamine. To mitigate and decrease the hemodynamic responses nitroglycerine and lignocaine spray is used.

Objectives

The aim of this study is to compare the effect of nitroglycerine (NTG) versus lignocaine spray in attenuating the hemodynamic responses during direct laryngoscopy and endotracheal intubation in elective patients undergoing general anesthesia.

Literature Review

According to Ray, *et al.* 2019, laryngoscopy and endotracheal intubation have seen a new path in the procedure of anesthesia and introduced the safe process of anesthesia. It is found that there is an association of sympatho-adrenal reflex with the para-pharyngeal and epi-pharyngeal stimulation which results in the secretion of epinephrine and norepinephrine. Nitroglycerin mainly acts as a vasodilator by helping in making the arteries widen. Nitroglycerin dilates the arteries in the peripheral areas by relaxing the smooth muscles of the arteries. Systemic vascular resistance (SVR) and arterial blood pressure (BP) both fall as a result. Nitroglycerin enlarges veins, particularly the blood-conveying capacitance vessels. Nitroglycerin nebulization may improve coronary

blood flow, reduce systemic vascular resistance, and reduce preload generally. As a local anesthetic and antiarrhythmic, lignocaine can also have an effect on hemodynamics. Nebulization with lignocaine is extremely uncommon. Lignocaine can make the myocardium contract less, which can make the heart pump less. Lignocaine can reduce the abnormal electrical action of the heart, including ventricular arrhythmias. Lignocaine nebulization is primarily used during the process of anesthesia. It has the property because of which it can give impact on the respiratory tract.

Lignocaine becomes a fine mist oraerosol when nebulized, allowing it to get deeper into the airway. Nitroglycerine and lignocaine help to mitigate the effects of those pressor responses to laryngoscopy and endotracheal intubation in adult patients undergoing general anesthesia. [15] Comparison of nitroglycerin versus lignocaine spray to attenuate hemodynamic changes in patients undergoing direct laryngoscopy and endotracheal intubation for effective surgery under general anesthesia is done in this study.

According to Ahmed, and Haider, 2019, the effectiveness of sprayed and nebulized lignocaine has been compared in a number of studies, frequently with control groups receiving a placebo or other interventions. These studies typically measure heart rate, blood pressure, and hemodynamic stability. The evaluations and specific outcomes of nebulized and splashed lignocaine may differ depending on the review plan, patient population, dose, and other factors. It is thought to regulate sympathetic activity, halt catecholamine release, and stabilize cardiac cell membranes. Lignocaine can be applied to the skin by spraying or nebulizing it, among other methods. Lignocaine has been sprayed onto the airway mucosa to lessen the discomfort of laryngoscopy and intubation. However, there is disagreement regarding its ability to lessen the cardiovascular response.

One disadvantage of showering is the possibility of inconsistent effects due to inadequate dispersion throughout the respiratory tract. Nebulized lignocaine may be advantageous because it distributes the medication more evenly throughout the respiratory system. Lignocaine becomes a fine mist or aerosol when nebulized, allowing it to get deeper into the airway. Improved contact with the airway mucosa and possibly enhanced cardiovascular response suppression may result from this strategy. Various examinations have analyzed the viability of showered and nebulized lignocaine in decreasing the hemodynamic changes welcomed by laryngoscopy and tracheal intubation.

Materials and Methodology

Materials

The material those are used for this treatment are given below:

Table 1: Materials

Materials	Uses and procedure
Alprazolam tablet (0.5 mg)	Taken orally the night before surgery
Pantoprazole (40 mg)	Taken through sips of water on surgery day.
Lignocaine and Nitroglycerine	The random way in two different groups
Lignocaine nebulization (1.5 mg/kg) of 10% spray one puff	Before the induction
Nitroglycerine nebulization (One puff of 400 microgram spray in the oropharynx)	1 minute Before the induction
Fentanyl (1-2 microgram/kg)	Before induction
Propofol (2 mg/kg)	Induction
Atracurium (0.5 mg/kg)	Facilitate endotracheal intubation
Nitrous oxide (66%)	Use for maintenance

Methodology

To determine the effect of nitroglycerine and lignocaine spray on the treatment of hemodynamic responses there are various methods that can determine the effects. For the data collection process, mainly secondary analysis will have to be done. The data will have to be collected through survey analysis. [3]

The methods are- the trial of randomized control and the trial of “double-blind” and “single-blinded” control. To trial this experiment it is necessary to determine the age range of the participants and also have to determine their medical condition. There are mainly two types of outcomes that the doctor has to be measured before trailing this experiment. At first, the primary heart rate will have to be measured. That means the blood pressure and the heart rate of the participants will have to be measured. Then it is also important to measure all the secondary health issues. [14] That means measuring oxygen saturation, and also other small health issues. Then it is necessary to collect the samples from the participants. Choosing a strategic location is also important for safety that means choosing the hospital or any medical center. The

dosage of nitroglycerine and lignocaine spray should have to be determined on the basis of the age group of the participants. Different age groups have different abilities to inhale the dosage. Then comes the data collection method of the blood pressure and heart rates. The patients in the age group 18-45 are taken for the data collection process (Tenagi, and Gogate, 2021). Through statistical analysis, the data will have to be collected.

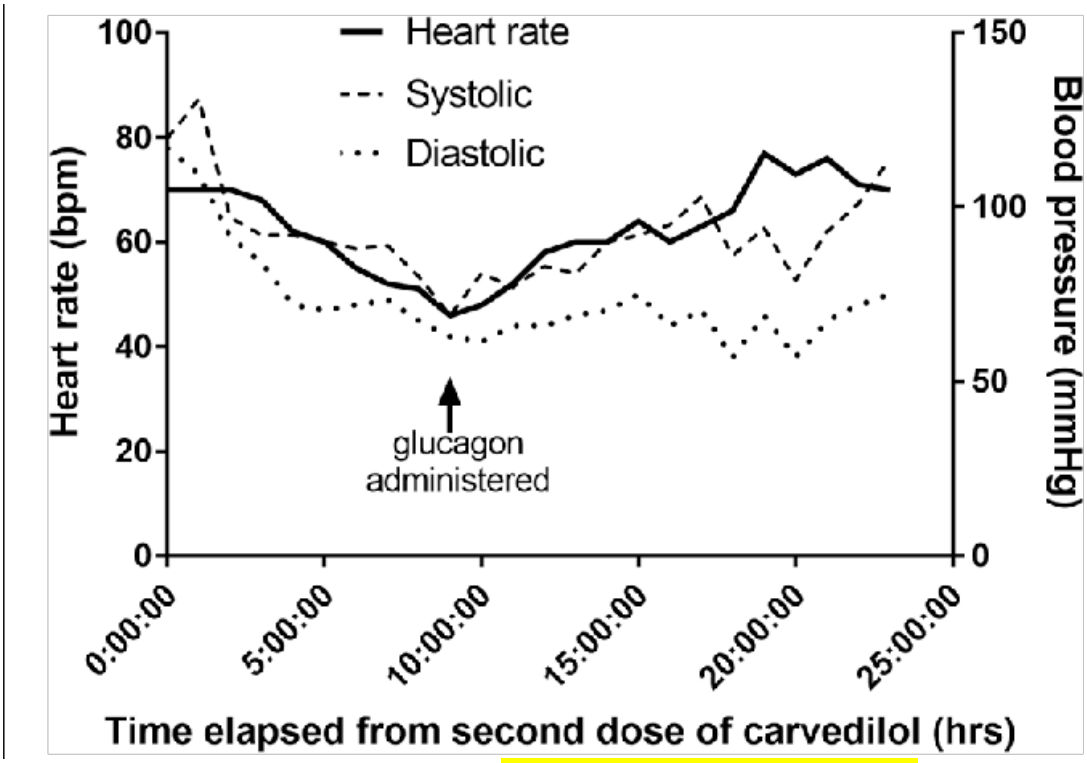

Figure 1: Heart rate graph (Source: https://www.researchgate.net)

The above graph is the heart rate graph of human. The systolic and diastolic rate is given here. The above graph is heart rate vs time graph. The solid graph shows the normal heart rate of a human. The dotted lines are described the systolic blood pressure and diastolic blood pressure. The fluctuation of blood pressures are occurring more than the heart rate. After intubation most of the time patient faces of decreasing of heart rate. It is mainly the side effect of intubation.

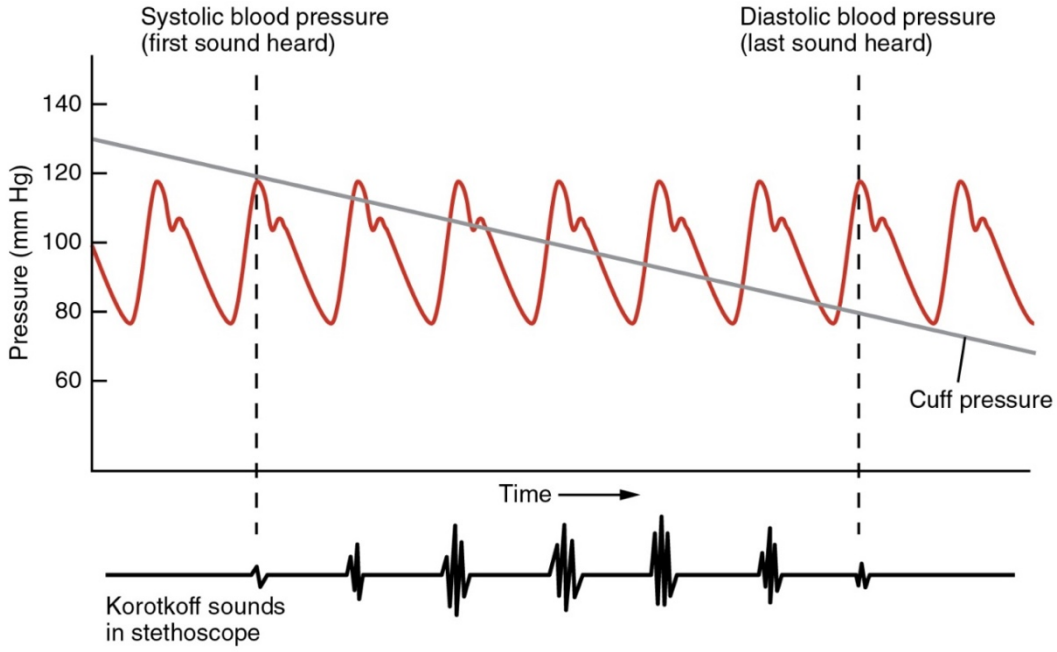

Figure 2: Pressure count time graph (Source: https://athleticheartsf.com)

The above graph is the pressure count time graph vs time graph. Systolic and diastolic blood pressure both are measured by this graph. After intubation patients are facing with the problem of decreasing heart rate. Also, with decreasing heart rate people also facing problem with decreasing of normal blood pressure. Decreasing of blood pressure causes side effect of headache, fatigue and dizziness in the human body. Intubation causes fluctuation in the rate of blood pressure and heart rate. Patient required time to stable with this condition.

Result and Discussion

	Group C (mean ± SD)	Group D (mean ± SD)	P Value
Age (year)	32.53±9.66	32.23±10.07	>0.05
Duration of surgery	106.66±11.33	107±11.64	>0.05
Gender distribution (Male: female ratio)	9:10	10:9	>0.05

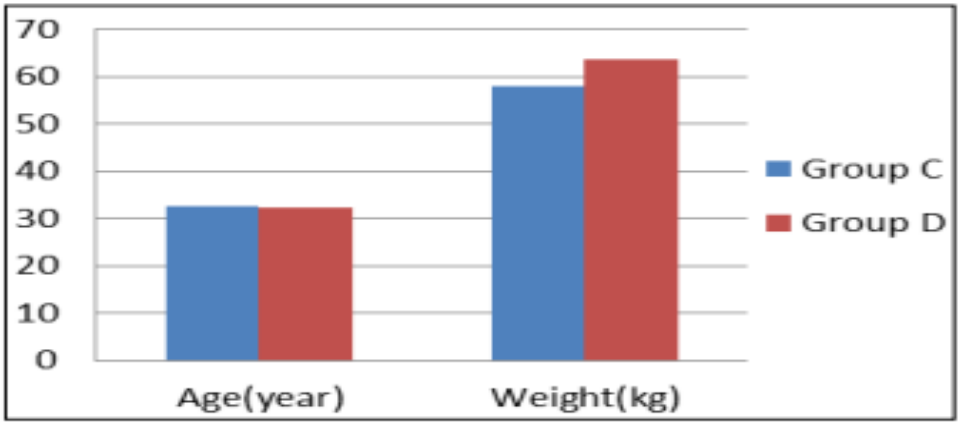

Figure 3: Demographic Distribution [8]

The above figure is the demographic distribution of the participants. It is the demographic observation of the age and weight of the participants of Group C and Group D.

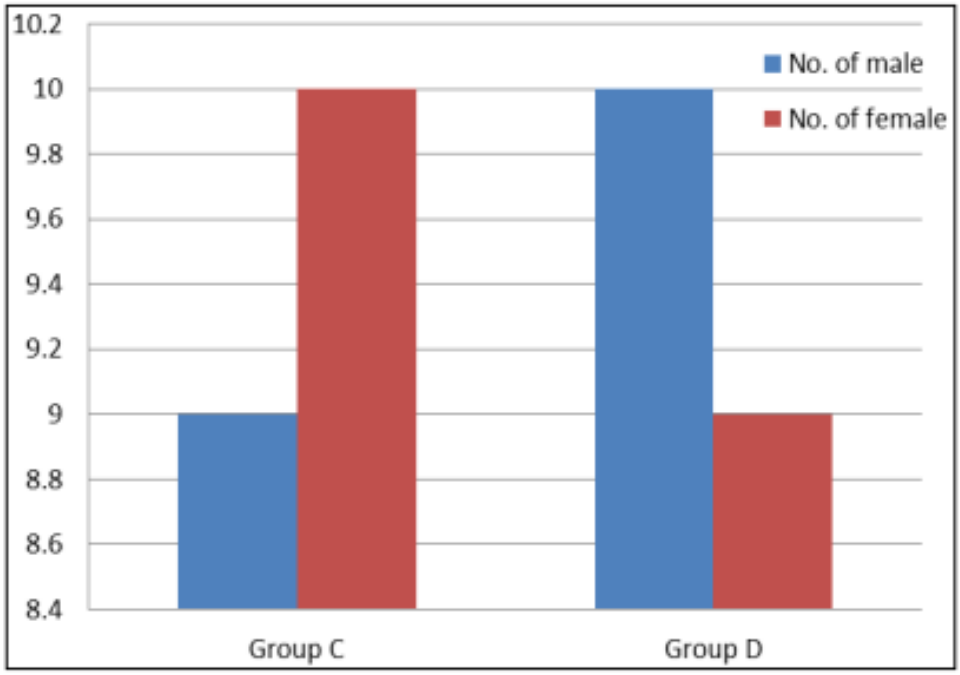

Figure 4: Gender distribution [8]

For Group C the male and female ratio is 9:10, and for Group D the male and female ratio is 10:9. [5] It is also observed that the P value is greater than 0.05 for both the demographic distribution.

Table 2: Sedation score (Ramsay)[8]

	Group C (mean ± SD)	Group D (mean ± SD)	P value
Before premedication	1.37±0.49	1.4±0.49	0.37
45mins after premedication	2.53±0.51	2.86±0.43	0.004

The above table is the sedation score of the participants. The mean value before premedication and 45 mins after the pre-medication are respectively around 1.37 and 2.53. P values for both cases are respectively 0.37 and 0.004.

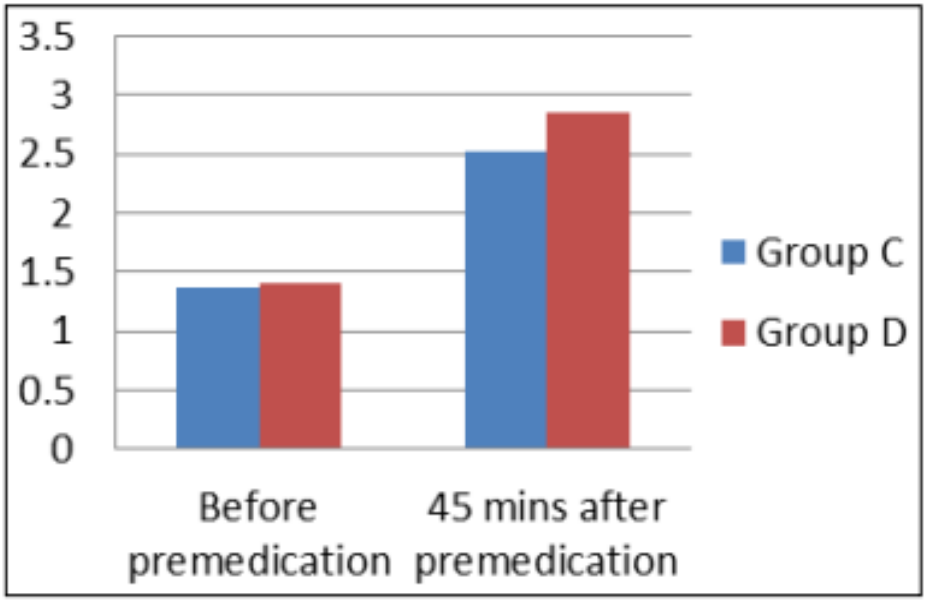

Figure 5: Sedation score [8]

The above figure is the graphical representation of the sedation score of before and after medication of Group C and Group D.

Table 3: Changing of heart rate [8]

Time	Group C		Group D		P value
	Mean	sd	mean	sd	
Baseline	80.52	5.61	81.47	6.35	0.33
10 min	78.73	5.62	78.78	5.98	0.49
20 Min	76.31	5.60	76.31	6.28	0.50
30 min	75.63	6.26	71.57	6.38	0.04
40 min	72.57	5.77	68.68	6.58	0.04
At laryngoscopy and intubation	81.68	6.73	76.63	8.61	0.04
1 min after Intubation	79.26	6.18	75.10	6.31	0.02
3 min after Intubation	76.10	5.92	72.10	6.30	0.02
5 min after Intubation	73.78	5.05	70.05	6.07	0.01
10 min after Intubation	71.94	4.76	67.68	6.06	0.009

The above table is the change rate of heart rate of the participants of Group c and Group D. The baseline mean value for both the groups are respectively 80.52 and 81.47. The baseline P value is 0.33. The respective mean value for both the groups for laryngoscopy and intubation are 81.68 and 76.63.[3] The P value for both groups is 0.04.

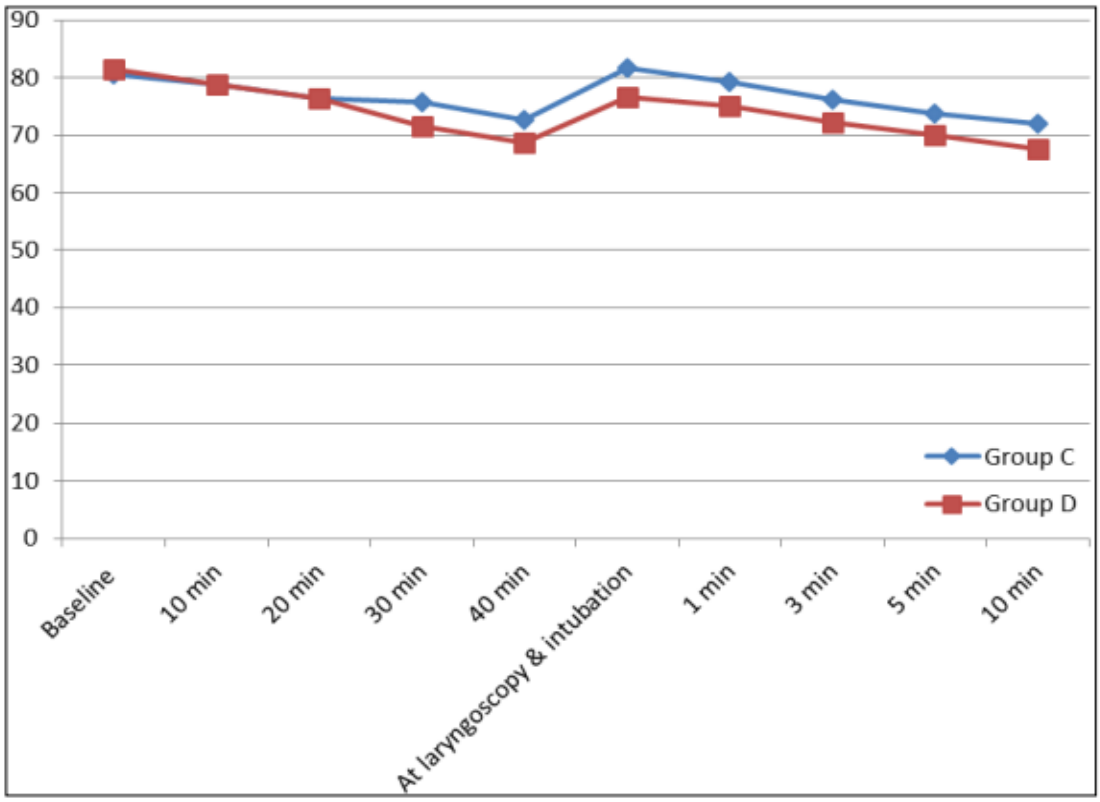

Figure 6: Group proportion [8]

The above figure is the graphical representation of the statistical analysis. For Group C the rate is slightly higher than Group C.

Table 4: MAP (Mean Arterial Pressure) changing [8]

Time	Group C		Group D		P value
	Mean	sd	mean	sd	
Baseline	94.00	4.51	93.67	4.18	0.75
10 min	91.67	4.23	90.23	5.28	0.35
20 min	88.34	4.88	86.30	4.34	0.62
30 min	85.32	4.12	83.00	5.28	0.30
40 min	81.33	4.07	79.03	6.56	0.04
At laryngoscopy and intubation	92.34	4.01	86.67	6.84	0.02
1 min after Intubation	91.65	4.24	83.01	6.98	0.04
3 min after Intubation	88.00	4.72	80.30	5.17	0.70
5 min after Intubation	83.30	4.06	78.28	4.86	0.45
10 min after Intubation	81.65	5.30	76.63	4.74	0.64

The above table is the MAP of the participants of Group C and Group D. The baseline mean value for Group C is 94 and for Group D is 93.67. The rate observed every 10 minutes is nearly about same [1] The mean value for laryngoscopy and intubation for both groups are respectively 92.34 and 86.67.

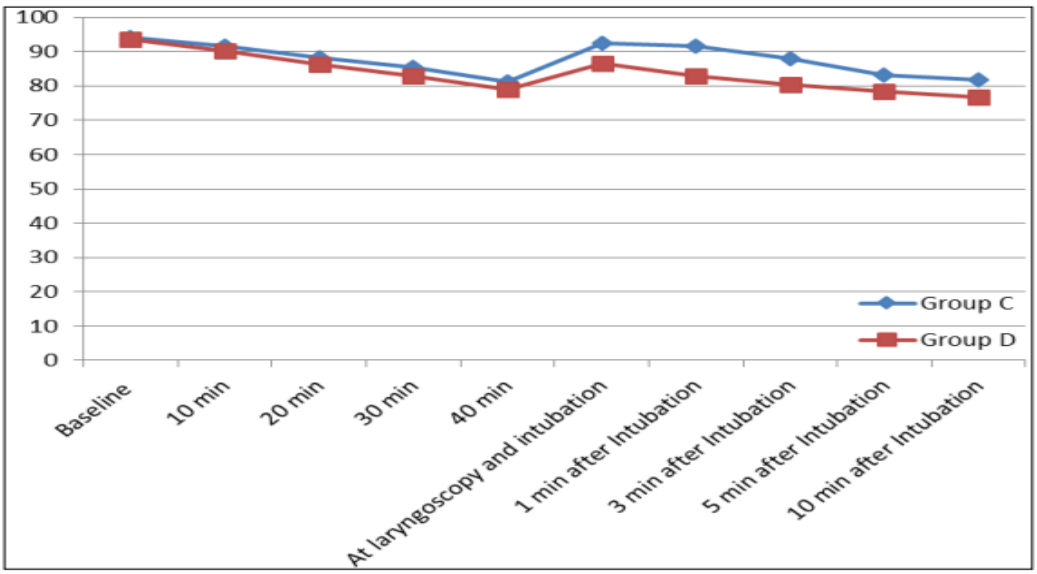

Figure 7: Baseline and intubation [8]

The above figure is the graphical representation of the baseline and intubation of the two groups. For Group C the rate is slightly higher than Group D.

Conclusion and Future Scope

From the research on that topic and after the observation of the result it has been observed that both lignocaine and nitroglycerine spray effectively act during direct laryngoscopy and endotracheal intubation. NTG was more effective than lignocaine in attenuating the hemodynamics pressor response to direct laryngoscopy and endotracheal intubation and maintained equal efficacy in controlling other hemodynamic variables. It has also been observed that lignocaine spray maintains the heart rate of human body. Lignocaine is a local anesthetic which acts by blocking the sodium channels.

For the treatment it will be necessary to take the decision of an anesthesiologist. The dosage of NTG be based on the decision and advice of the anesthesiologist in OT. To increase the future scope of this treatment, it is necessary to improve the visualization techniques. The data collection technique will also have to be improved. The cost price of these treatments will have to decrease to help people to get this treatment.

Recommendation

Proper protocols should have to be followed during the time of treatment. Before treatment, it is necessary to consult with doctors or medical professionals to mitigate the effects of the health issues. It is necessary to proceed with the procedure of preoxygenation before the treatment. [6] This will help to reduce hypoxemia.

Proper pharmacological techniques should have to be used. The agents of the treatment should have to be chosen in a manner thus cardiovascular depression can be minimized. The changes in cardiovascular depression can be minimized with the inclusion of proper analgesics in the body.

In that case, the use of fentanyl will be helpful [7] Patients who are suffering from a high risk of hemodynamic responses can use beta blockers, for example, esmolol. During the time of treatment, the doctors should have to be maintained thus, the depth of anesthesia will not be high. During the anesthesia period, the blood pressure and heart rate of the patients should have to be monitored by the doctors.

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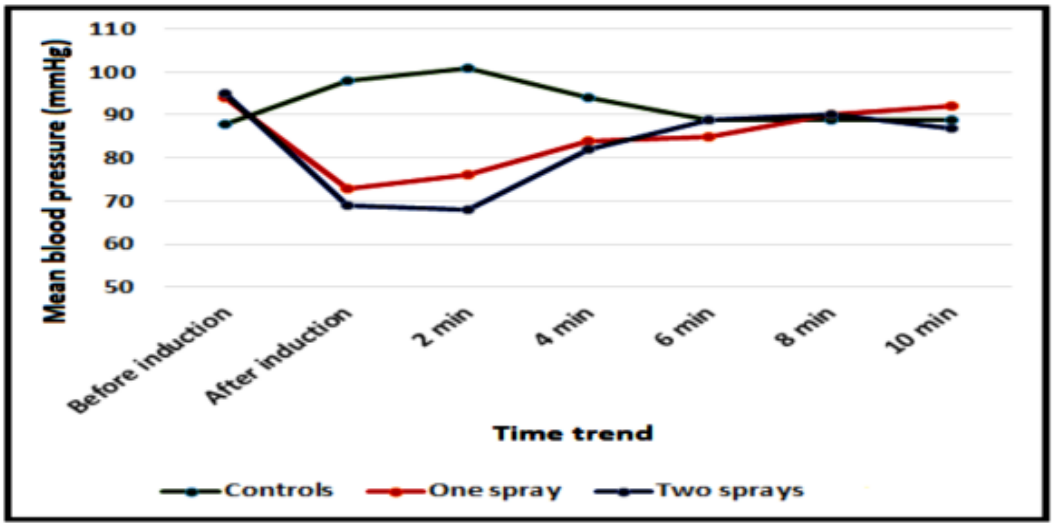
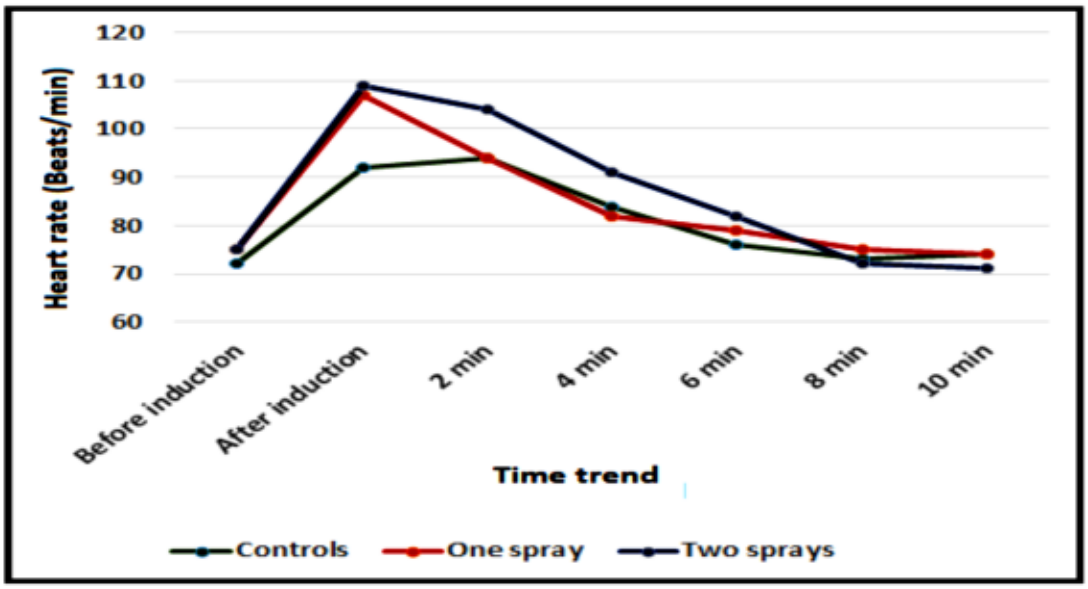
Appendices



Appendix 1: MAP (Mean Blood Pressure) variation of three groups [4]



Appendix 2: HR (Heart Rate) variation of three groups [4]

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