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A Comparative Study of Attenuation of Hemodynamic Responses to Laryngoscopy and Intubation with and without Oral Clonidine

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Abstract

Introduction: Endotracheal intubation is the translaryngeal placement of endotracheal tube into the trachea. Hypertension and tachycardia, usually accompany larynogoscopy and tracheal intubation. *Aims:* A comparative study of attenuation of hemodynamic responses to laryngoscopy and intubation with and without oral clonidine. *Materials and Methods:* This study was done in Fifty patients were selected for the study with the age group ranging between 20–60 years belonging to ASA Group-I. Patients undergoing elective surgical procedures were included in the study. The fifty patients were randomly divided into Two Groups: Control Group and Study Group. Each Group consisted of 25 patients. *Results:* Preinduction and postinduction hemodynamic values were significantly lower in study (clonidine) group, when compared with those of control (without clonidine) group. The difference was statistically significant. *Conclusions:* The stability of heart rate and blood pressure could be achieved by using clonidine 5 ug/kg as a premedicantly useful in management and can prevent instances of 'alpine anesthesia'(attempt to delineate the role of intraoperative hypotension and blood pressure variability).

Keywords: Ultrasonography; Difficult airway; Direct laryngoscopy.

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Introduction

Endotracheal intubation is the translaryngeal placement of endotracheal tube into the trachea. Rapid and dramatic hemoldynamic changes, which may adversely affect the patient, may occur during the perioperative period. Hypertension and tachycardia, usually accompany larynogoscopy and tracheal intubation. Failure to blunt the response to intubation may have disastrous consequences in certain patient population like coronary artery disease, systemic arterial hypertension, aneurysmal vascular disease and increased intracranial compliance.

Strategies to circumvent these changes have included minimizing the duration of laryngoscopy

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to less than 15 seconds, the use of intravenous narcotics, the use of intravenous Lidocaine, vasodilators, long acting beta-blockers and alpha 2 agonist agents. Each technique has both advantages and disadvantages. The prevention often outlasts the stimulus. Clonidine is an alpha 2 agonist agent used as a premedicant, as well as to maintain the hemodynamic stability preoperatively and intraoperatively.[1,2] The aim of the study is the attenuation of hemodynamic response to laryngoscopy and intubation.

Materials and Methods

This prospective study was done at VRK Medical college in Department of Anesthesiology. Fifty patients were selected for the study with the age group ranging between 20–60 years belonging to ASA-I. Both the sexes were included in the study. Study was done after taking informed consent. Patients undergoing elective surgical procedures were included in the study. After preoperative assessment (history, clinical examination and investigations), patients with airway problems and systemic diseases were excluded from this study.

The fifty patients were randomly divided into Two Groups: Control Group and Study Group. Each Group consisted of 25 patients.

All the patients were given tab, diazepam 5 mg orally night before surgery. Patients in study group were given 200–300 μg (5 mg/kg) tablets of clonidine orally ninety minutes before surgery. The control group was given two tablets of antacid (placebo) ninety minutes before surgery. All the patients were premedicated with inj. Tramadol hydrochloride 1 mg/kg plus promethazine 0.5 mg/kg intramuscularly forty-five minutes before induction.

The patients were preoxygenated with 100% oxygen for five minutes. Pulse Rate (PR) systolic and diastolic blood pressures were recorded. All the patients were monitored with pulse oximeter and electrocardiogram. Induction was done with Thiopentone sodium 2.5% (5 mg/kg body weight) and intubated with Suxamenthonium (2 mg/kg body weight). Maintenance of anesthesia was done with nitrous oxide 66% and oxygen 33% and Pancuronium bromide (0.1 mg/kg) using intermittent positive pressure ventilation.

At the end of the surgery patients were reversed with Neostigmine (0.05 mg/kg) and Atropine (0.02 mg/kg).

Parameters observed were Pulse rate, systolic, diastolic, mean arterial blood pressures and rate pressure product at different intervals as Preinduction, Postinduction, at laryngoscopy and intubation, 1, 2, 5 minute after intubation. The changes in pulse rate and blood pressures were continuously monitored during intraoperative period and postoperatively, patients were observed for six hours.

Rate Pressure Product (RPP) = Heart Rate (HR) * Systolic Blood Pressure (SBP)

With the units for the Heart Rate being beats per minute and for the Blood Pressure mm Hg.

Results

Total 50 patients participated in study with 25 in each group, (Table 1).

The control group comprised of fourteen males and eleven females and study group comprised of sixteen males and nine female patients. Age range was between 20–60 years and 21–60 years in control and study groups respectively. The weight range was between 44–66 kilograms and 43–63 kilograms in control and study groups respectively. There was no statistically significant difference. There was no statistically significant difference in the parameters

Table 1: Demographic details in study

	Control (n = 25)	Study (n = 25)	p - Value
Age (years)	41.7 (20–60 years)	43.0 (21–60Y)	> 0.05
Male/Female	14/11	16/9	> 0.05
Weight (kg)	53.0 (44–66)	54.0 (43–63)	> 0.05
HR (Beats/min)	90.68	92.33	> 0.05
SBP (mm Hg)	120.12	118.40	> 0.05
DBP (mm Hg)	85.28	83.25	> 0.05

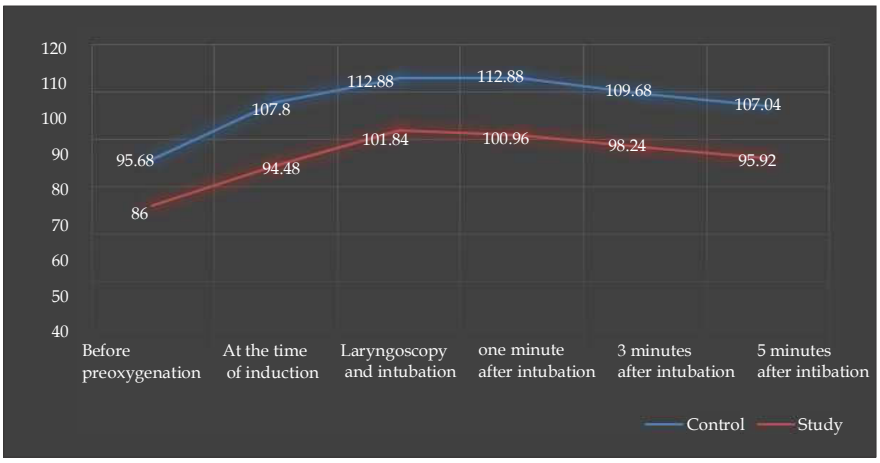

Fig.1: Heart rate in present study on various periods.

between the Two Groups (*p* less than 0.05), (Fig. 1).

Heart rate is significantly lower in study group than in control group, (*p* greater than 0.05), (Fig. 2).

Systolic blood pressure in Study group is significantly lower when compared to control group, (Fig. 3).

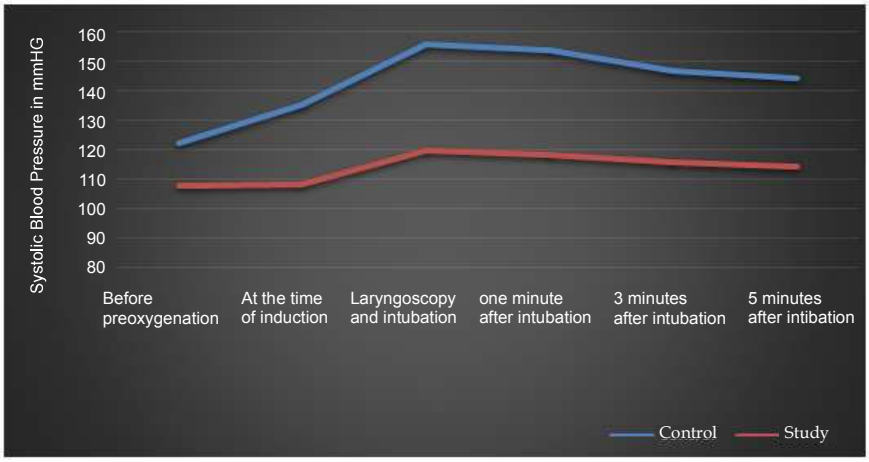

Fig. 2: Systolic blood pressure in present study on various periods.

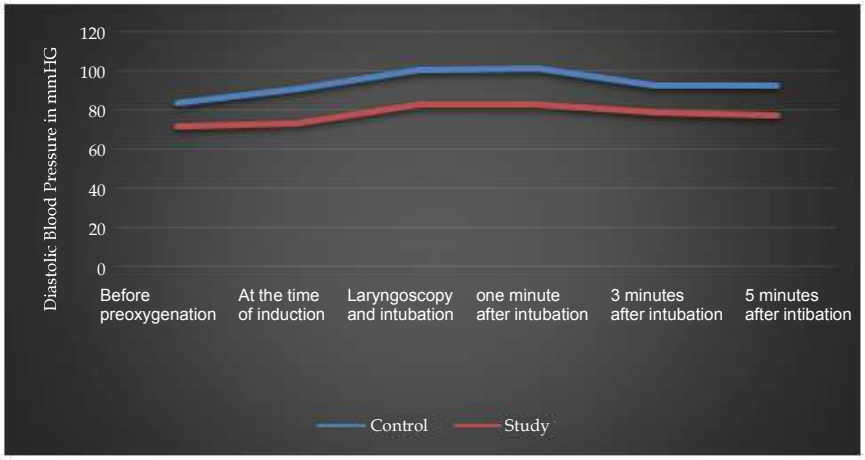

Fig. 3: Diastolic blood pressure in present study on various periods

Diastolic blood pressure in Study group is significantly lower when compared to control group. (p greater than 0.05), (Table 2).

All the parameters of study group significantly lower than when compared to control group.

Table 2: Mean arterial blood pressure and Rate pressure product in present study

Mean Arterial pressure in mm Hg	Mean Value in control group	Mean Value in study group	p - Value
Before preoxygenation	96.17	84.48	< 0.05
At the time of induction	106.37	84.92	< 0.05
Laryngoscopy and intubation	118.56	94.65	< 0.05
one minute after intubation	118.54	94.82	< 0.05
3 minutes after intubation	113.21	91.36	< 0.05
5 minutes after intubation	109.78	89.86	< 0.05
Rate pressure product in mm Hg*bpm			
Before preoxygenation	11750.88	9,322.72.	< 0.05
At the time of induction	13,610.40	10,213.60	< 0.05
Laryngoscopy and intubation	16,927.66	12,201.28.	< 0.05
One minute after intubation	17,351.20	11,985.28	< 0.05
3 minutes after intubation	16.128	11,434.88	< 0.05
5 minutes after intubation	15,487.20	11,053.28	< 0.05

Discussion

Laryngoscopy and endotracheal intubation may provoke a marked hemodynamic response. This may have insignificant effect in young healthy individuals but may have disastrous consequences in certain patient populations including those with coronary artery disease, systemic arterial hypertension, aneurysmal vascular disease and increased intracranial pressure.

Strategies to blunt marked hemodynamic responses to laryngoscopy and intubation while minimizing the duration of laryngoscopy to less than fifteen seconds can avoid these disastrous consequences. Intravenous lidocaine, vasodilators, narcotics, beta-blockers and alpha 2 adrenoceptor agonists have been used to attenuate the hemodynamic responses to laryngoscopy and intubation. Each technique has both advantages and disadvantages.

Clonidine is an alpha 2 agonist with several desirable properties. As a premedicant it is an effective anxiolytic, sedative and anti-sialogogue. Oral clonidine in a single dose used as a premedicant produces cardiovascular stability. In our study, single dose of oral clonidine 5 μg/ kg body weight given preoperatively produced significant and sustained reduction of preoperative systolic and diastolic blood pressures and heart rate and attenuated cardiovascular response to laryngoscopy and endotracheal intubation.[3]

Preinduction and postinduction hemodynamic values were significantly lower in study (clonidine) group, when compared with those of control (without clonidine) group. The difference was statistically significant. Tracheal intubation initiates significant increase in arterial pressures and has been suggested that clonidine modified this response. Similar increases in arterial pressures were recorded in the clonidine group and control (without clonidine) groups, but the lower postintubation values in clonidine group were a reflection of the preexisting hypotension.

Clonidine reduced heart rate and this was observed in our study. The central adrenergic system modulates pain sensation and the alpha 2 adrenergic agonists have been shown either to provide analgesia or to enhance the analgesic effectiveness of opioids. This is possibly one explanation for the observation of more stable hemodynamics in the study group. Three major published studies had addressed the influences of oral preoperative administration of clonidine on course of anesthesia with particular reference to hemodynamic response to laryngoscopy, intubation and surgery.[4]

Recent studies oral clonidine premedication could attenuate the hemodynamic changes associated with laryngoscopy and endotracheal intubation.[5] Study group patient received oral clonidine 5 ug/kg ninety minutes before surgery and control group did not receive clonidine. They found that the increase in mean blood pressures from baseline value following laryngoscopy and intubation in clonidine group was significantly smaller as compared with that of the control group. (20± *vs* 31± 4 mm Hg mean±SD, *p* less than 0.05). There was significant differences between the two groups in the incidence of systolic blood pressure increase above 180 mm Hg following laryngoscopy and intubation (0% *vs* 26%, *p* less than 0.05%). They concluded that oral clonidine of 5 ug/kg as a premedicant could attenuate the pressor response associated with laryngoscopy and endotracheal intubation.

Laurito CE et al. used clonidine 200 μg as premedicant ninety minutes before surgery to attenuate the hemodynamic response to laryngoscopy and intubation.[6] Clonidine 0.2 mg decreased systolic, mean and diastolic blood pressures, but not heart rates. Clonidine 0.2 mg also blunted the increase in systolic blood pressure accompanied laryngoscopy.

The attenuating effect of clonidine has previously been documented by many studies.[7] Control patients showed a significant increase in heart rate and blood pressure. They were significantly lower in patients who were treated with clonidine, immediately after intubation (*p* less than 0.001). The study concluded that oral clonidine 5 μg/kg. ninety minutes before surgery can attenuate hemodynamic response to laryngoscopy and intubation.

Raval DL *et al*. observed reductions in SBP and DBP following premedication with oral clonidine 0.2 mg by 7.63%.[8] In postintubation period, SBP and DBP remained below baseline value producing significant attenuation of rise in SBP due to laryngoscopy and intubation. These findings may be favorably compared with the findings of the present study. Singh S et al. also showed that premedication oral clonidine 150 μg resulted in better hemodynamic stability and less anesthetic requirement.[9] The attenuating effect of clonidine on hemodynamic responses to airway manipulation has previously been documented by many studies. Talebi H et al.[10] have documented that orally administered clonidine in preanesthetic period attenuates the stress response to laryngoscopy and intubation. The findings of the present study are well correlated with studies done by workers like Yokota S et al.,[4] and Singh S et al.[9] Results of our study using clonidine as premedicant consistent with the above studies in attenuation hemodynamic responses to laryngoscopy and intubation.

Conclusion

Oral clonidine as a dose of 5 μg/kg, administered ninety minutes before surgery, attenuated hemodynamic responses to laryngoscopy and endotracheal intubation. Preinduction and postinduction hemodynamic values were significantly lower in study group, when compared with those of control group. The difference was statistically significant. No patient from the study group had severe bradycardia (heart rate less than 50 beats/min), severe hypotension or a combination of the two in the perioperative period. No rebound hypertension was observed in any patient in the study group. Therefore, we conclude that a single premedication dose never resulted in rebound hypertension. By extrapolating our results to hypertensive patients, we suggest that oral clonidine may be particularly useful in management and can prevent instances of 'alpine anesthesia'.

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