Attenuation of haemodynamic response to intubation with oral clonidine and oral atenolol

Vijaya Rekha Koti[1,*], Sharat Babu Chevuri[2], Sunil Pulla[3], Varunchander G[4]

[1,2]Associate Professor, [3,4]PG Student, Dept. of Anaesthesiology, Deccan College of Medical Sciences, Hyderabad

***Corresponding Author:**
Email: drvrekha_koti@yahoo.com

Abstract

A comparative study is done between oral Atenolol and oral Clonidine in the attenuation of cardiovascular response during laryngoscopy and intubation. 50 adult patients undergoing various elective surgeries of ASA grade 1, Mallampatigrade 1 were selected and informed consent was taken for all the cases. Patients were of both sexes and age ranging from 18 to 60 years. The study was done in two groups. Group 1 consisted of 25 patients where atenolol 0.75mg per kg body wt was given orally 3 hrs before the scheduled time of the surgery. Group 2 consisted of 25 patients where clonidine 3 micrograms per kg body wt was orally given 90min before schedules time of surgery. The drugs given in premedication were inj.glycopyrollate 10mcg/kg, inj. midazolam 40mcg/kg and inj.ondansetron 0.08mg/kg. Induction of anesthesia was achieved by inj. thiopentone in a dose of 5mg/kg iv. Tracheal intubation was facilitated with inj. suxamethonium 2 mg/kg iv.Hemodynamic parameters(BP, HR, MAP) were recorded at the intervals of Pre induction, After induction, During laryngoscopy and intubation, 1 min, 3 min, 5 min after intubation. Data was compared between the two groups of patients.

Group 1 did not show a significant increase in various hemodynamic parameters. Group 2 showed higher increase in hemodynamic parameters compared to oral atenolol. Hemodynamic parameters returned to the baseline at the end of 5 min in the atenolol group whereas it took more than 5 min to return to the basal value and it has less effect on the heart rate in clonidine group compared to atenolol group. The following conclusion can be drawn from our study. Oral atenolol attenuates the increase in heart rate to laryngoscopy and intubation more effectively than oral clonidine. Oral atenolol blunts the increase in systolic, diastolic and mean arterial pressure effectively and values returned to basal value within 5 min of intubation compared to oral clonidine. No side effects were noted in atenolol and clonidine groups in our study. Hence oral atenolol in a dose of 0.75 mg/kg given 3 hrs before induction of anaesthesia is effective in attenuating hemodynamic response to laryngoscopy and endotracheal intubation when compared to oral clonidine.

Keywords: Oral clonidine, Oral atenolol, Intubation response, Laryngoscopy.

Access this article online	
Quick Response Code:	**Website:** www.innovativepublication.com
	DOI: 10.5958/2394-4994.2016.00046.9

Introduction

Laryngoscopy and endotracheal intubation is one of the most commonly performed procedures**.** Endotracheal intubation is the placement of endotracheal tube into trachea via nose or mouth. Laryngoscopy and intubation violate the patients protective reflexes and lead to physiological changes involving various systems of the body. There is considerable increase in heart rate and blood pressure due to sympathetic discharge caused by stimulation of pharynx and larynx causing increase in the levels of catecholamines, especially noradrenaline and activation of alpha and beta receptors. The increase in the heart rate and blood pressure are transitory, variable and unpredictable.(1) Failure to blunt these responses may cause disastrous complications in patients with hypertension, CAD, aneurysmal vascular disease, raised ICP etc. Various methods to attenuate the sympathetic response to laryngoscopy have been studied as topical anaesthesia of pharynx, superior laryngeal nerve block, lidocainespry, IV lidocaine, beta blockers, nifidipine, sodium nitroprusside, increased dose of thiopentone, NTG (intranasal, ointment, IV), narcotics, alpha2 adrenoceptor agonists, beta blockers.

Clonidine is a selective alpha2 agonist with a selectivity ratio of 200:1 for alpha receptors. Clonidine inhibits norepinephrine release from peripheral prejunctional nerve endings and causes bradycardia. It causes hypotension due to centrally mediated reduction in sympathetic outflow. Peak effect occurs in 60-90 minutes after oral administration.(2),(3),(4),(5),(6)

Atenolol is a beta1 selective beta adrenergic receptor blocking agent without membrane stabilizing or intrinsic sympathomimetic activities, used as antihypertensive agent. Peak effect occurs in 2-4 hours after oral administration.

Material and Methods

Study of oral Atenolol and oral clonidine was done to compare the attenuation of cardiovascular response during laryngoscopy and intubation in 50 adult patients undergoing surgery on the general anaesthesia.

Patients of Asa grade 1 and Mallampati grade 1 were selected and informed consent was taken for all the cases. The patients were of both sexes, age ranging from 18 to 60 years. Patients undergoing various elective surgical procedures under general anaesthesia were taken for study.

This study was taken into 2 groups. Group1 consisted of 25 patients where oral Atenolol 75 milligram per kg body weight was given 3 hours before scheduled time of Surgery.

Group2 consisted of 25 patients where oral Clonidine 3 microgram per kg body weight was given 90 minutes before scheduled time of Surgery. All the patients were assessed clinically and investigated to rule out any problems.

Exclusion criteria

1. History of respiratory problems.
2. History of heart block (atrioventricular conduction block) greater than first-degree, congestive heart failure, cardiac arrhythmias, history of angina ,CAD,diabetes mellitus, hypertension and other major medical problems.
3. Baseline heart rate less than 60 per minute
4. Baseline systolic blood pressure is less than 100 per minute
5. Treatment with beta blockers or Calcium channel blockers
6. Hepatic and renal problems
7. Predicted difficult intubation

The following investigations were carried out before surgery in the patient's namely complete haemogram, urine analysis, blood chemistry, electrocardiogram and x-ray chest.

Premedication – No sedation was given on the night before surgery. premedication was limited to inj glycopyrrolate 0.01 milligram per kg body weight and inj midazolam 0.04 milligram per kg body weight and inj ondansetron 0.08 milligram per kg body weight given intravenously.

Venous cannulation and monitors – intravenous cannulation with 18G cannula was inserted and the drip was started with the ringers lactate solution non-invasive blood pressure monitor and Pulse oximeter and electrocardiographic leads were connected to the patient prior to induction of anaesthesia.

Anaesthetic technique – All the patients were preoygenated for 3 minutes with hundred percent oxygen before induction of anaesthesia. Induction was achieved with injection thiopentone sodium - 5 milligram per kg body weight. Intubation was facilitated by using injection suxamethonium 2 milligram per kg body weight. The lungs were ventilated with hundred percent oxygen for 45 to 60 seconds. Intubation was carried out by the aid of Macintosh laryngoscope. Oral endotracheal tube of appropriate size was used. Time taken for intubation did not exceed 15 seconds, anaesthesia was maintained with Vecuronium Bromide and intermittent positive pressure ventilation using closed circuit system. Heart rate, ecg tracing, systolic, diastolic and mean arterial pressure were recorded before induction, after induction, during laryngoscopy and intubation and 1,3,5 minutes after intubation. Surgery was not allowed to commence till this study was completed. At the end of surgery patients were reversed with injection neostigmine 0.05 milligram per kg body weight and atropine 0.02 to 0.04 milligram per kg body weight.

Monitoring: NIBP, HR, Oxygen saturation, Endtidal CO2, ECG.

Aim of the study

To compare the Attenuation of hemodynamic response to laryngoscopy and endotracheal intubation using oral Atenolol and oral Clonidine. To observe if there are any untoward effects of such premedication.

Observation and Results

From the study conducted following observations regarding systolic, diastolic, mean arterial pressure, heart rate and ECG were made at:

1. Preinduction
2. After induction
3. During laryngoscopy and intubation
4. 1 min after intubation
5. 3 min after intubation
6. 5 min after intubation

The following tables show mean and standard deviation in various hemodynamic parameters between the two drugs at various intervals:

Table 1: Showing mean age, weight and sex in atenolol and clonidine groups

	Atenolol	Clonidine
Mean age	30.5	30.2
Mean weight	53.5	52.56
Male	8	10
Female	17	15

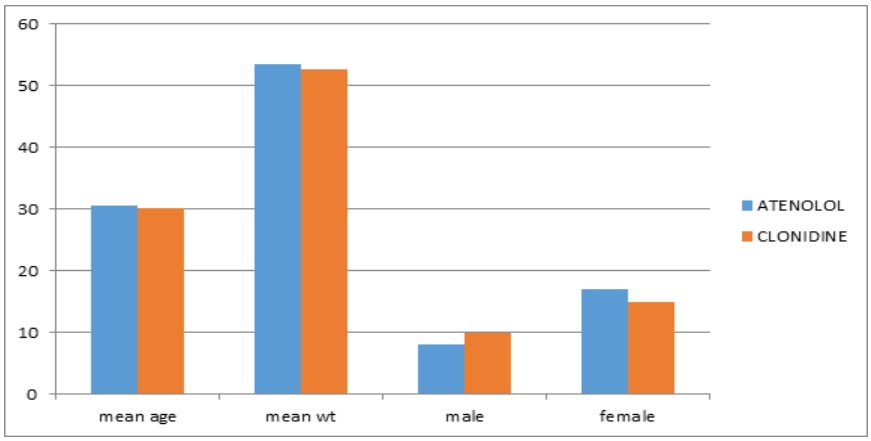


Fig. 1

The above table shows age, weight and sex distribution in both atenolol and clonidine groups. The clonidine group comprises of 10 males and 15 females and atenolol group comprises 8n males and 17 females. The age range for atenolol and clonidine groups is from 18 to 60 yrs. The difference between clonidine and atenolol groups is not statistically significant with regard to weight, age, sex(P>0.05).

Table 2: Showing hemodynamic parameters at pre-induction period

	Atenolol		Clonidine	
	Mean	**SD**	**Mean**	**SD**
Heart rate	83.32	+/-8.56	82.20	+/-10.16
Systolic blood pressure	119.76	+/-11.13	120.48	+/-10.55
Diastolic blood pressure	76.76	+/-8.15	74.88	+/-6.64
Mean arterial pressure	91.09	+/-8.39	90.08	+/-6.94
Electrocardiographic changes	WNL	WNL	WNL	WNL

The above table shows hemodynamic parameters in atenolol and clonidine groups recorded during pre-induction time indicate that the difference is not statistically significant(P>0.05).
Pre induction recordings were taken as basal values.

Table 3: Showing parameters after induction

Haemodynamic parameters	Atenolol		Clonidine	
	Mean	**SD**	**Mean**	**SD**
Heart rate	84.72	±8.10	83.56	±9.96
Systolic blood pressure	119.24	±12.24	121.04	±11.37
Diastolic blood pressure	74.16	±7.83	74.68	±7.11
Mean arterial pressure	89.19	±7.43	90.13	±7.81
Electrocardiographic changes	WNL	WNL	WNL	WNL

The above table shows hemodynamic parameters of both atenolol and clonidine groups following induction. In both the groups there is a slight increase in heart rate. There is a slight fall in atenolol group and a slight increase in clonidine group in systolic blood pressure, fall in diastolic arterial pressure in both the groups. There is a slight fall in atenolol group and a slight increase in clonidine group in mean arterial pressure. These changes are not statistically significant(P>0.05).

Electrocardiographic changes were found to be with in normal limits in both the groups.

Table 4: Showing hemodynamic parameters during laryngoscopy and intubation

Haemodynamic parameters	Atenolol		Clonidine	
	Mean	**SD**	**Mean**	**SD**
Heart rate	87.36	±11.81	97.60	±14.01
Systolic blood pressure	120.36	±15.90	133.96	±14.36
Diastolic blood pressure	73.72	±9.64	80.96	±11.15
Mean arterial pressure	89.27	±10.83	98.63	±11.72
Electrocardiographic changes	WNL	WNL	WNL	WNL

The above table shows the values of hemodynamic parameters at laryngoscopy and intubation. There was an increase in parameters in both atenolol and clonidine groups.

The increase is statistically significant in clonidine group(P<0.05)

Electrocardiographic changes were found to be within normal limits in both the groups.

Table 5: Showing hemodynamic parameters 1 min after intubation

Hemodynamic parameters	Atenolol		Clonidine	
	Mean	SD	Mean	SD
Heart rate	84.88	±11.81	97.40	±16.33
Systolic blood pressure	117.28	±16.69	130.56	±14.32
Diastolic blood pressure	74.24	±10.20	80.48	±11.39
Mean arterial pressure	85.59	±11.59	97.17	±11.99
Electrocardiographic changes	WNL	WNL	WNL	WNL

The above table shows values of hemodynamic parameters one minute after laryngoscopy and intubation. In both the groups there was a increase in heart rate, but there was a decrease in atenolol group and increase in clonidine group in systolic, diastolic and mean pressures compared to basal value(pre induction value).

However the increase was statistically significant in clonidine group(P<0.05)

Electrocardiographic changes were found to be within normal limits in both the groups

Table 6: Showing hemodynamic parameters 3min after intubation

Hemodynamic parameters	Atenolol		Clonidine	
	Mean	SD	Mean	SD
Heart rate	83.72	±12.51	96.52	±16.64
Systolic blood pressure	114.40	±15.15	127.72	±13.59
Diastolic blood pressure	72.64	±10.26	79.84	±9.88
Mean arterial pressure	86.56	±11.31	95.80	±10.73
Electrocardiographic changes	WNL	WNL	WNL	WNL

The above table shows the hemodynamic parameters 3 min after laryngoscopy and intubation. In both the groups there was an increase in the heart rate but there was a decrease in atenolol group and increase in clonidine group in systolic and mean arterial pressure compared to the basal value (preinduction)

Electrocardiocardio changes were found to be within normal limits in both the groups.

Table 7: Showing hemodynamic parameters 5 minutes after intubation

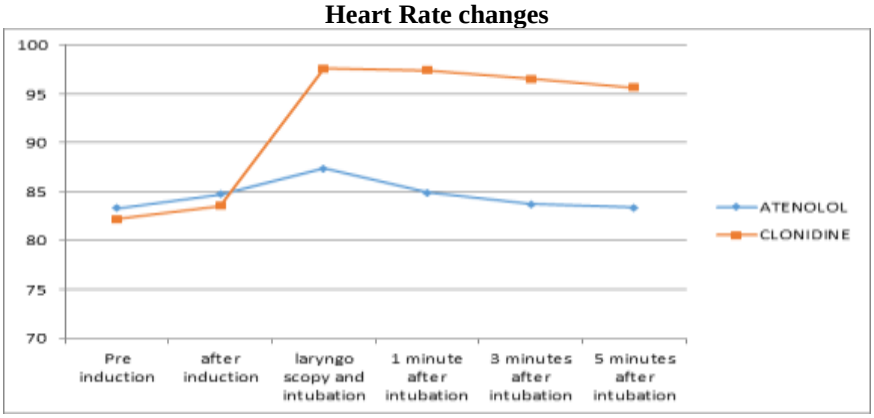
Hemodynamic parameters	Atenolol		Clonidine	
	Mean	SD	Mean	SD
Heart rate	83.36	±11.94	95.68	±16.72
Systolic blood pressure	114.96	±14.08	127.72	±12.42
Diastolic blood pressure	74.16	±9.66	79.84	±9.28
Mean arterial pressure	87.76	±10.32	95.80	±9.70
Electrocardiographic changes	WNL	WNL	WNL	WNL

The above table shows values of hemodynamic parameters five minutes after laryngoscopy and intubation in atenolol group heart rate, systolic, diastolic, and mean arterial pressure were almost equal to basal value(preinduction value), but in clonidine group there is a increase in parameters.

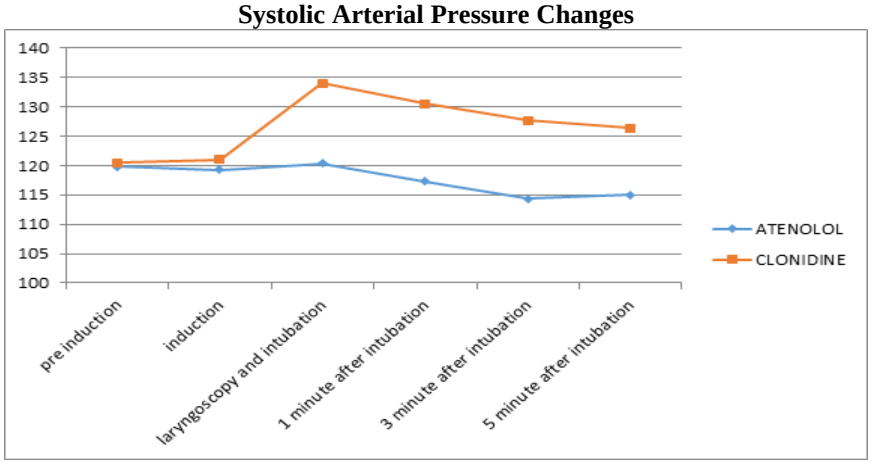
However the increase was statistically significant in clonidine group(p<0.05).

Electro cardiographic changes bwere found to be within normal limits in both the groups.

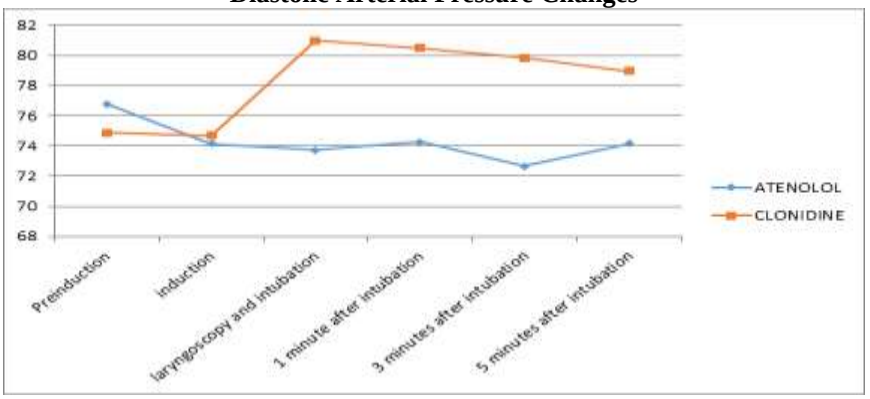
Heart Rate changes



Systolic Arterial Pressure Changes



Diastolic Arterial Pressure Changes



Discussion

Attenuation of haemodynamic response to laryngoscopy and endotracheal intubation is of great importance in prevention of morbidity and mortality. The reflex changes in the cardiovascular system after laryngoscopy and intubation are the most marked. They manifest themselves in the form of tachycardia, hypertension, cardiac arrhythmias and ectopics. Reid and Brace(1940) reported haemodynamic disturbances following laryngoscopy and endotracheal intubation with traditionally described anaesthetic techniques. Pressor response was described by King et al in 1951. The cardiovascular changes and catecholamine discharge seen during laryngoscopy and intubation appear in two phases. Phase1 with laryngoscopy and phase 2 with endotracheal tube placement in trachea. [TY] Mean arterial pressure increases by 36% to 40TY% and heart rate by 20% with intubation in contrast to laryngoscopy. In hypertensive patients the response is exaggerated. The plasma catecholamines increase to their maximum at 1 minute after laryngoscopy[10] and comes down by 3-5 minutes.

Various methods to attenuate the sympathetic response to laryngoscopy have been studied. A comparision between oral Clonidine and oral Atenolol was done.

Clonidine is a selective alpha2 agonist with a selectivity ratio of 200:1 for alpha receptors. Clonidine inhibits norepinephrine release from peripheral prejunctional nerve endings and causes bradycardia. It causes hypotension due to centrally mediated reduction in sympathetic outflow. Peak effect occurs in 60-90 minutes after oral administration.[7],[8]

Oral clonidine blunts the response to brief but not prolonged laryngoscopy.[11]

Atenolol is a beta1 selective beta adrenergic receptor blocking agent without membrane stabilizing or intrinsic sympathomimmetic activities. Peak effect occurs in 2-4 hours after oral administration and persist for at least 24 hours.[9]

In this study haemodynamic response with oral clonidine and oral atenolol are compared. The rise of haemodynamic parameters from pre induction were both clinically and statistically significant in clonidine group compared to atenolol group. Atenolol showed a better response in attenuating haemodynamic parameters(heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure) during laryngoscopy and intubation when compared to clonidine group both clinically and statistically($p<0.05$)[12]. The haemodynamic parameters returned to basal value at the end of 5 minutes in Atenolol group where as it was more than 5 minutes in clonidine group.

No untoward effects are observed.

Conclusion

The following conclusion can be drawn from our study Oral atenolol attenuates the increase in heart rate to laryngoscopy and intubation more effectively than oral clonidine.

Oral atenolol blunts the increase in systolic, diastolic and mean arterial pressure effectively and values returned to basal value within 5 min of intubation compared to oral clonidine.

Hence oral atenolol in a dose of 0.75 mg/kg given 3 hrs before induction of anesthesia is effective in attenuating haemodynamic response to laryngoscopy and endotracheal intubation when compared to oral clonidine.

Conflict of interest: None declared

References

1. Russel W J, Morris R. G etal Changes in plasma catecholamine concentrations during endotracheal intubation. British Journal of Anaesthesia, 1981;53:837-839.
2. Aantaa.R, Schienm M et al- Alpha 2 adrenergic agents in anesthesia. Acta Anaesthesiol – Scand, 1993, Jul;37(5):433-48.
3. Eisenach J C, Tong C. Site of hemodynamic effect of alpha-2 agonists. Anaesthesiology,1991;74:766-771.
4. Anvekar S N. Jarrott B, et al.- Pharmacokinetics and Pharmacodynamics studies of oral clonidine in normotensive subject. Euro J Clin pharmacol 1982,23(1):1-5.
5. Das AK, Rudra R- Clinical efficacy of oral clonidine as a premedicant Indian journal of anesthesia,1995;43;133-139.
6. Hayashi Y, Maze M. Alpha-2 agonists in anaesthesia British Journal of Anaesthesia 1993;71:108-118.
7. Dr. Dipak L. Raval Dr. Malini K Mehta-- Oral clonidine premedication for attenuation of haemodynamic response to laryngoscopy and intubation—IJA No A49/2k-12-3-2000.
8. Carabine U.A Wright P.M.C. and Moore J. Pre anaesthetic medication with clonidine. A dose response study-British journal of Anaesthesia1991,67:79-83.
9. R A Alberry- Pre-operative beta blockade for patients undergoing craniotomy,-a compression between prapranalol and atenolol-Canadian journal of anaes.1990-May:37(4pt1):448-51.
10. Derbyshire A, Smith G et al. Plasmacatecholamine response to tracheal intubation. British journal of Anaesthesia,1983;55:858-859.
11. Laurito CE Baughman V. L. Becher G.L Cunningham F. Payon B. Hand Citron G.M –Oral clonidine blunts haemodynamic response to brief but not prolonged laryngoscopy—Journal Clin Anaesth 1993;Jan-Feb;5(1);54-7.
12. Yamakage et al.Oral atenolol inhibits haemodynamic changes caused due to laryngoscopy and endotracheal intubation. J. Anaesth 2004;18;93:185-9.