

# A Prospective Randomized Study of Efficacy of Clonidine in Attenuating Haemodynamic Response to Laryngoscopy and Tracheal Intubation.

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## ABSTRACT

**Background:** Laryngoscopy and endotracheal intubation is often associated with hypertension and tachycardia because of sympatho-adrenal stimulation. In patients with cardiovascular and cerebrovascular disease, this sudden rise in heart rate and blood pressure can produce myocardial ischemia, pulmonary oedema and cerebral haemorrhage. Many drugs have been tried to blunt this hemodynamic response but none is ideal. Our aim was to study the efficacy of 3µg/kg clonidine intravenously, given 15 minutes before laryngoscopy and intubation in obtunding the hemodynamic response. **Methods:** One hundred patients were assigned randomly into two groups. Group I (n=50) received 10 ml of normal saline and group II (n=50) received injection Clonidine 3µg/kg diluted to 10 ml normal saline intravenously over 120 seconds, 15 minutes prior to laryngoscopy and intubation. After premedication anaesthesia was induced with thiopentone till loss of eye lash reflex and dose of thiopentone required was recorded. HR, SBP, DBP and MAP were recorded at various time intervals before and after intubation. **Results:** In group I, following laryngoscopy and intubation, the rise in heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP) were found to be more compared to group II which was statistically significant (p<0.01). In addition Clonidine reduced the requirement of thiopentone and produced arousable sedation after extubation without any side effects like bradycardia and hypotension. **Conclusion:** Clonidine in the dose of 3µg/kg body weight given intravenously 15 minutes before laryngoscopy and intubation was seen to effectively attenuate the hemodynamic response to laryngoscopy and intubation without any side effects.

**Keywords:** Laryngoscopy, Intubation, Hemodynamic, Clonidine.

## INTRODUCTION

Laryngoscopy and tracheal intubation are commonly accompanied by increases in arterial blood pressure and heart rate.<sup>[1]</sup> To date, the exact mechanism of this hemodynamic response to laryngoscopy and intubation has not been clarified. The principle mechanism in hypertension and tachycardia is the sympathetic response which may be the result of increase in catecholamine activity. But it may be hazardous to those with hypertension, myocardial insufficiency or cerebrovascular diseases.<sup>[2]</sup>

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Intravenous anaesthetic induction agents do not adequately or predictably suppress the circulatory responses evolved by endotracheal intubation. So prior to laryngoscopy, additional pharmacological measures like use of volatile anaesthetics, topical

and intravenous lidocaine, opioids, vasodilators—SNP, NTG, Calcium channel blockers and β-blockers have been tried but none was found ideal.<sup>[3,4]</sup> Clonidine, a central α-2 agonist has sedative, analgesic and antihypertensive actions.<sup>[5]</sup> Hence, there is a need to study the effects of intravenous clonidine for attenuation of hemodynamic stress response to laryngoscopy and intubation. Primary objective of study was to evaluate the efficacy of intravenous clonidine in the dose of 3µg/kg body weight in attenuating the hemodynamic response to laryngoscopy and endotracheal intubation. Secondary objectives of the study were to study the effects of clonidine on the dose requirement of thiopentone for induction of anaesthesia and to study any adverse effects associated with clonidine administration such as sedation, prolonged recovery, hypotension and bradycardia.

## MATERIALS AND METHODS

The study was undertaken in MKCG Medical

College & hospital, Berhampur during the period December 2014 to July 2015. The study was undertaken after obtaining ethical committee clearance as well as informed consent from all patients. One hundred patients, scheduled for various elective surgical procedures belonging to ASA class I and II were included in the study. Adult patients aged between 18 and 60 years of both the sex and Mallampatti grade I and II posted for surgeries under general anaesthesia were included in the study. Patients with hypertension, cardiac, coronary, renal, hepatic, cerebral diseases and peripheral vascular diseases were excluded from study. The study population was randomly divided into two groups with 50 patients in each group. Group I-Control group (n=50) - received 10 ml of normal saline intravenously over 120 seconds, 15 minutes prior to laryngoscopy and intubation. Group II-Clonidine group (n=50) - received injection Clonidine 3µg/kg diluted to 10 ml normal saline intravenously over 120 seconds, 15 minutes prior to laryngoscopy and intubation. Pre-anaesthetic evaluation was done on the day before surgery. A routine pre-anaesthetic examination was conducted assessing the general condition of the patient, airway, cardiovascular and respiratory system. The investigations were analyzed in all patients. All patients included in the study were pre-medicated with tab alprazolam 0.5 mg and tab ranitidine 150 mg orally at bed time. They were kept nil orally for at least 6hrs. On arrival of the patient in the operating room, an 18-gauge intravenous cannula was inserted and an infusion of ringers lactate was started. The baseline systolic and diastolic blood pressure, mean arterial pressure and heart rate were recorded along with ECG and SpO<sub>2</sub>. After recording the baseline reading, patients in group II were given clonidine 3µg/kg diluted in 10ml normal saline intravenously and in control group 10ml normal saline given intravenously over 120 seconds, 15min before intubation. The study drug was prepared by the senior anaesthesiologist who was not involved with the study and observer was blinded for the study. All the patients were pre-medicated with injection glycopyrrolate 0.2mg, injection midazolam 0.05mg/kg and injection nalbuphine hydrochloride 10mg IV before preoxygenation. Then patients were pre-oxygenated for 3 minutes.

Anaesthesia was induced with thiopentone as a 2.5% solution till loss of eye lash reflex and dose of thiopentone required for loss of eye lash reflex was recorded. Endotracheal intubation was facilitated with 2 mg kg<sup>-1</sup> IV succinylcholine and laryngoscopy and intubation was performed.

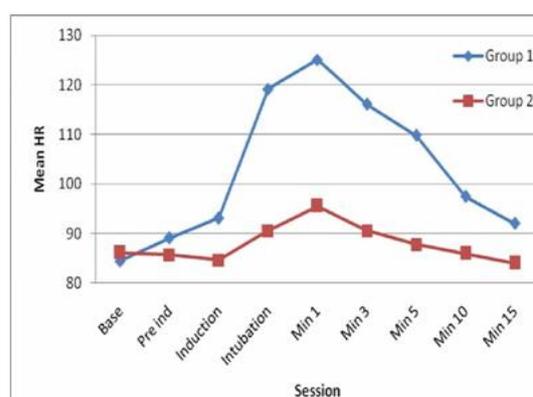
Anaesthesia was maintained using 66% nitrous oxide and 33% of oxygen with vecuronium and isoflurane. At the end of the procedure patients were reversed with neostigmine 0.05 mg kg<sup>-1</sup> IV and atropine 0.02 mg kg<sup>-1</sup> IV. The cardiovascular parameters like heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure

were recorded before giving study drug and before giving premedication and then at induction, at intubation, at one minute, three minute, five minutes and ten minutes after laryngoscopy and intubation.

Side effects like hypotension, hypertension, tachycardia, bradycardia and postop sedation were monitored. Sedation scoring was done as per Ramsay sedation scale. Descriptive statistics was measured as mean and standard deviation. Independent sample 't' test was done to measure difference between two groups and paired sample 't' test was done to measure difference within the group  $p < 0.05$  was considered as significant and  $p < 0.01$  was considered as highly significant.

## RESULTS

Both the groups were comparable with regards to mean age, weight, sex and ASA status. In the Group I (control) the mean heart rate did not come to the basal levels even by 10<sup>th</sup> minute. The increase in mean HR during intubation and 1, 3, 5 and 10 minutes after intubation compared to basal HR was statistically highly significant ( $p < 0.01$ ). In Group II (clonidine), the increase in the mean HR at during intubation and 1, 3, 5 and 10 minutes after intubation was statistically not significant compared to basal value ( $p > 0.05$ ) [Figure 1].



**Figure 1: Changes in mean Heart rate at various time intervals.**

Statistical evaluation between the groups showed that the increase in mean HR observed in group I was statistically highly significant when compared to increase in mean HR in the group II ( $p < 0.01$ ) at intubation and 1, 3, 5 and 10 minutes following intubation. In group I the increase in mean SBP, DBP and MAP observed at intubation and 1, 3 and 5 minutes after intubation when compared with basal value which was statistically highly significant ( $p < 0.01$ ). In the group II (clonidine), the increase in the mean systolic blood pressure during intubation and at 1, 3 and 5 minute after intubation compared to basal SBP was statistically not significant [Figure 2,3,4].

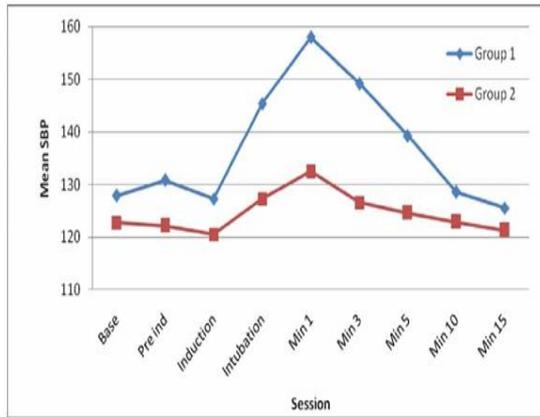


Figure 2: Changes in systolic blood pressure (mmHg) at various time intervals

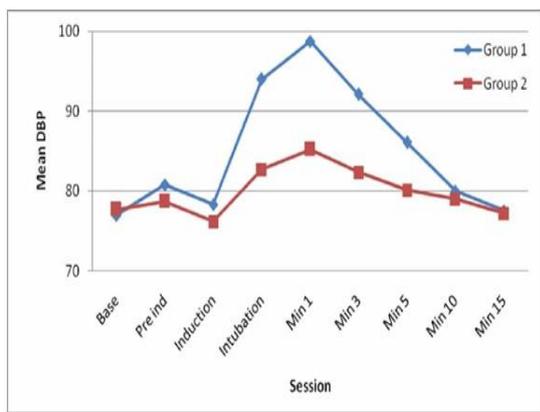


Figure 3: Graph showing changes in diastolic blood pressure (mmHg) at various time intervals

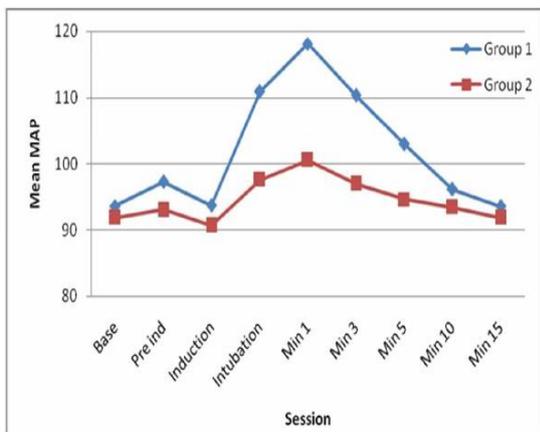


Figure 4: Graph showing changes in mean arterial pressure (mmHg) at various intervals

Table 1: Showing the dose of thiopentone required for induction in control and clonidine group

	Mean Dose of thiopentone required for induction(mg)
Group I	284.00 ± 26
Group II	242.50 ± 27
p value	0.015

(p<0.05) – Statistically significant

In group I mean dose of thiopentone required for loss of eye lash reflex is 284.00 ± 26 mg (5.06 mg/kg) and in group II mean dose is 242.50 ± 27mg (4.37 mg/kg). Statistical evaluation between the groups showed that the statistically significant reduction in dose of thiopentone required for induction in group II (p<0.05) [Table 1].

Table 2: Showing the sedation score between control and clonidine group

	Sedation score
Group I	2.0 ± 0.4
Group II	2.74 ± 0.5
p value	0.022

(p<0.05) – Statistically significant

In group I sedation score is 2.0 ± 0.4 (Cooperative, orientated and tranquil) and in group II sedation score is 2.74 ± 0.5 (responding to commands). Statistical evaluation between the groups showed that the patients in clonidine group are more sedated than the patients in control group which is statistically significant (p < 0.05). There was no SPO<sub>2</sub> changes observed in both the groups throughout the study period. Side effects attributed to study drug like nausea, vomiting, hypotension, bradycardia were not noticed in the clonidine group patients and also in control group.

## DISCUSSION

Laryngoscopy and tracheal intubation are considered as the most critical events during administration of general anaesthesia as they provoke transient but marked sympathoadrenal response manifesting as hypertension and tachycardia. Hence a drug which can blunt stress response of laryngoscopy and intubation, without having any adverse effects like respiratory depression and post operative nausea and vomiting, was required for the purpose. The present study was undertaken to know the severity and duration of haemodynamic responses to laryngoscopy and intubation in normotensive individuals and to study the efficacy of clonidine in blunting these haemodynamic response to laryngoscopy and intubation. In the present study, following laryngoscopy and intubation at 1 minute mean HR increased by 40.6 /min in the control group and by 9.46/min in the clonidine group which is statistically highly significant (p<0.01). Also following laryngoscopy and intubation at 1 min after intubation in the control group MAP increased by 24.5 mmHg and in the clonidine group MAP increased by 8.7 mmHg and this is statistically highly significant (p<0.01). Various authors have found a similar response to I.V. clonidine at 1 min after intubation. Zalunardo MP et al Studied clonidine at a dose of 3 µg/kg noted that following

laryngoscopy and intubation at 1 min HR increased by 23/min in control group and by only 6 /min in the clonidine pre-treated group and MAP rose by 37 mmHg in the control group and only 5 mmHg in the clonidine pre-treated group<sup>[6]</sup>. Altan A et al studied clonidine at a dose at 3 µg/kg noted that, following laryngoscopy and intubation, HR rose by 10 /min in the control group, whereas in the clonidine group, HR decreased by 10 /min, which is statistically highly significant ( $p<0.01$ )<sup>[7]</sup>. Ray M. et al Evaluated clonidine at a dose of 3 µg/kg noted that following laryngoscopy and intubation, HR at 1 min rose by 19 bpm in control group and only 1 bpm in clonidine group, the difference being statistically significant<sup>[8]</sup>. Tripathi et al in has studied that Clonidine, 2 µg/ kg intravenously, 30 min before induction is safe and effective in preventing the hemodynamic stress response during laparoscopic cholecystectomy<sup>[9]</sup>.

Sameena kousar et al compared effect of Fentanyl and Clonidine for attenuation of the haemodynamic response to laryngocopy and endotracheal intubation and found that Clonidine showed better attenuation of the sympathetic response<sup>[10]</sup>.

Routray et al in his study compared Fentanyl–Clonidine and Fentanyl–Lidocaine combine on attenuation of haemodynamic stress response to laryngoscopy and tracheal intubation in hypertensive patients and found that both fentanyl – clonidine and fentanyl–lidocaine combine effectively decreased the stress response to endotracheal intubation.<sup>[11]</sup>

Sarkar et al in his study compared the efficacy of intravenous clonidine and dexmedetomidine for blunting pressor response during laryngoscopy and tracheal intubation. He found that attenuating response to hemodynamic changes were observed with both dexmedetomidine and clonidine (3µg/kg) IV infusion which was similar to our findings. We studied the total dose of thiopentone required for induction in each group. In control group dose of thiopentone required for induction was 284mg (5.06mg/kg) and in clonidine group dose required was 242.50mg (4.37mg/kg) showing reduction of 13.63%. This is statistically and clinically significant ( $p<0.05$ )<sup>[12]</sup>. Various authors have studied the effect of clonidine on thiopentone requirement for induction of anaesthesia. Leslie K et al studied the effect of intravenous clonidine on the dose of thiopental required to induce anaesthesia. In this study the dose of thiopentone required for induction in control group was 5.50 mg/kg and in the clonidine group the dose of thiopental required to induce anaesthesia with 2.5µg/kg clonidine is 4.15 mg/kg and with 5µg/kg clonidine is 3.48 mg/kg showing reduction of 25% and 36% respectively compared to control ( $p<0.05$ )<sup>[13]</sup>. Marinangeli F et al studied the haemodynamic effects of intravenous clonidine on thiopental induction. In this study the dose of thiopentone required for induction in control group was 5.80 mg/kg and in clonidine group with

3µg/kg clonidine was 3.8 mg/kg showing reduction of 34% compared to control ( $p<0.05$ )<sup>[14]</sup>. Above authors have found statistically significant reduction of thiopentone dose required for induction in the clonidine group ( $p<0.05$ ), which concurs with our study. The anaesthetic sparing effect of clonidine is due to decrease in central noradrenergic transmission and also  $\alpha$ -2 receptor itself may mediate an anaesthetic response. Statistical evaluation between the groups showed that the patients in clonidine group are more sedated than the patients in control group which is statistically significant ( $p < 0.05$ ). Clonidine is known to produce arousable sedation by its action on locus coeruleus nucleus without producing any respiratory depression. No patient in our study in the clonidine group had any post operative respiratory depression.

## CONCLUSION

Clonidine in the dose of 3µg /kg IV, given 15 minutes before intubation, effectively attenuated the heart rate response and also arterial pressure response to laryngoscopy and intubation. There was a significant reduction in thiopentone dose requirement in clonidine group compared to control group. Side effects like hypotension and bradycardia were not observed in any of the clonidine group patients. Hence it can be concluded that clonidine in the dose of 3µg/kg IV, given 15 minutes before laryngoscopy and intubation can be safely employed to attenuate the haemodynamic response to laryngoscopy and intubation without any side effects.

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