

# Clinical Study of Intravenous Clonidine as a Hypotensive Agent in Functional Endoscopic Sinus Surgery: A Prospective Randomized Clinical Trail

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## Abstract

**Background:** Functional endoscopic sinus surgery requires blood less field, controlled hypotension, good analgesia to prevent complications during the procedure. Clonidine promises such conditions as per various studies.

**Aim:** The aim of the study was to evaluation of hypotensive effect of clonidine in functional endoscopic sinus surgery (FESS).

**Objective:** The objective of the study was to (1) assess hypotension, systolic blood pressure, and diastolic blood pressure, mean arterial pressure, (2) Assess requirement of additional dose of fentanyl, metoprolol, and propofol during procedure. (3) Assess complications during surgery.

**Materials and Methods:** Study was carried out in SVRRGG hospital, Tirupati. Patients were included into study after informed written consent from the patients. Patients were randomly allocated into two groups, Group A (clonidine) and Group B (non-clonidine). Each group has 30 patients. Demographic data such as age, sex, and weight of patients were collected. Other parameters such as systolic and diastolic blood pressure, mean arterial blood pressure, blood loss, requirement of additional drugs, and complications were analyzed.

**Results:** Average age of patients was 37 years. There was significant reduction in blood loss during surgery. There was controlled hypotension achieved in clonidine group. There was no requirement of additional dose of fentanyl and metoprolol for control of blood pressure and decreased use of propofol for maintenance of anesthesia. Clonidine administration preoperatively resulted in decreased blood loss. Complications of hypotension, bradycardia, nausea, and vomiting were less in clonidine group. Good sedation was also possible with clonidine.

**Conclusion:** Clonidine is good in controlling blood pressure, cheap and provides blood less field in FESS surgeries.

**Key words:** FESS, Clonidine, Mean arterial pressure, Blood pressure

## INTRODUCTION

Functional endoscopic sinus surgery carried out in nasal polyps and other chronic sinusitis requires blood less field during the procedure. This is because of good vascularity in these areas and any surgery here results in good per operative bleeding. This could result in decreased visibility

and difficulty in carrying out surgery.<sup>[1,2]</sup> Further there are other complications which could occur such as anosmia, nasal synechiae, cerebrospinal fluid leaking meningitis, nasolacrimal duct damage, optic nerve damage, and ocular muscle damage which can be the result from decreased field visibility during functional endoscopic sinus surgery (FESS).<sup>[3]</sup> The synthesis of clonidine was done by Stahle and Associates.<sup>[4,5]</sup> Derivative of imidazoline that exists as a mesomeric compound is a centrally acting alpha agonist agent. The effective dose of clonidine was found to be 4 microgram/Kg bodyweight. Moreover, this dose has no adverse effects.<sup>[6]</sup> It was found that clonidine performed well in controlling systolic and diastolic blood pressure, mean arterial pressure (MAP) on comparison with placebo.<sup>[7]</sup> Clonidine also controlled post-operative

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**Table 1: Various observations in study Groups A and B**

Module	Group A	Group B	Test used	P-value	Significant
Age	37.13±13.253 years	37.73±12.244 years	Chi-square test	P=0.932 P=0.05	Nil significant
Male/female	13/17	11/19	Chi-square test	P=0.598 P>0.05	Nil significant
Weight	60.1±11.9 Kgs	60.77±12.38	t-test	t-value=−0.212 (Significance=−0.832)	Nil significant
Diagnosis (Nasal polyps/ Chronic sinusitis)	22/8	19/11	Fischer test	P=0.405 P>0.005	Nil significant
Achievement of controlled hypotension (Y/N)	18/12	19/11	Chi-square test	Chi-square value=10 P=0.001 P<0.05	Significant
Additional dose of fentanyl requirement (Y/N)	12/18	24/6	Chi-square test	Chi-square value=10 P=0.001 P<0.05	Significant
Additional dose of metoprolol requirement (Y/N)	4/26	21/9	Chi-square test	Chi-square value=19.81 P=0.00001 P<0.05	Significant
Additional requirement of propofol (Y/N)	2/28	4/26	Chi-square test	Chi-square test=0.77 P=0.4 P<0.05	Not significant

shivering. It was found clonidine decreased bleeding during surgery, decrease in dose of analgesia, and use of additive drugs during FESS.<sup>[8]</sup> It was also found that clonidine reduced the dose of propofol and provided good control over hypotension during procedure.<sup>[9,10]</sup>

Some studies showed that dexmedetomidine better than clonidine during the FESS.<sup>[10,11]</sup>

In the presence of these studies, we planned for a study to study the effect of clonidine alone in comparison with normal anesthesia drugs during the FESS.

## MATERIALS AND METHODS

The study was conducted in Department of Anaesthesiology, S.V.R.R.G.G. Hospital, Tirupati. Patients with 60–100 ASA Grades I and II posted for FESS were included into study after fulfilling inclusion and exclusion criteria as follows. A sealed envelope method was used for randomization for allotment of groups. Group A received clonidine, Group B control group. Study population was proposed 30 patients in each group for better comparison.

### Inclusion Criteria

The following criteria were included in the study:

1. Patient in the age range of 20–60 years
2. ASA category I, II
3. No known history of allergy or other forms of sensitivity reactions to anesthetic drugs
4. Patient and relatives are willing to sign informed consent.

### Exclusion Criteria

The following criteria were excluded from the study:

1. Hypertension on treatment other than clonidine
2. Diabetes with autonomic dysfunction
3. Patients on a beta-blocker or with contraindication for beta-blockers
4. Heart block of any degree/bradyarrhythmia
5. Ischemic heart disease
6. Patients on pacemakers
7. Patients taking clonidine/allergic to clonidine
8. Pregnant mothers.

A day before the surgery in the evening, pre anesthesia evaluation of patient was carried out. Patient was kept nil per orally 6 h before surgery. Well informed and written consent were taken from the patient before including into the study. Demographic date age, sex, and mean body weight were recorded.

Before the procedure in operation theater, intravenous line with lignocaine infiltration secured and basal vital signs recorded. These included non-invasive blood pressure for every 5 min, electrocardiogram, pulse oximeter, and consciousness level monitored continuously.

The patients randomized into two groups using block randomization. Patients assigned to the intervention (Clonidine, Group A) group or control (Group B) group. Based on randomization, the patients received 3 micrograms/kg of the drug (Group A) intravenously 30 min before induction of anesthesia. The vital signs, as mentioned previously, are monitored for the next 30 min. General anesthesia induced with intravenous thiopentone

(5 mg/kg) after fentanyl (1.5 mcg/kg). After ensuring the ability to ventilate with oxygen, endotracheal intubation facilitated with succinylcholine (2 mg/kg). Anesthesia maintained with oxygen and sevoflurane. If necessary, further doses of clonidine administered for MAP of 55–65 mmHg, while Group B is control group without clonidine administration. Vital parameters continuously monitored as described till the end of the surgery. Despite the above measures, alternative methods are used for deliberate hypotension if the target MAP not achieved.

If the heart rate is <50/min, atropine (0.02 mg/kg) is given to treat bradycardia. If the MAP <55 mmHg, mephentermine 6 mg in incremental dosage administered to treat hypotension.

After completing the surgery, throat pack removed, and residual paralysis reversed with neostigmine (0.05 mg/kg) and glycopyrrolate (0.02 mg/kg). The patients are extubated when awake and monitored in the recovery room.

Blood loss estimated by measuring the number of gauge pieces soaked in blood during the procedure. Sedation assessed using Brussel's sedation score in the immediate post-operative period. Heart rate, systolic and diastolic blood pressure, and MAP, in both the groups, were recorded at various intervals such as pre and post induction, post intubation, and post extubation. Average heart rate, systolic and diastolic blood pressure, and MAP were calculated during the procedure. No of patient with achieved controlled hypotension in both groups was calculated. Other parameters such as blood less field of surgery and intraoperative blood loss in ml were calculated. Patients were monitored for complications such as hypotension, bradycardia, nausea, sedation, and vomiting.

#### Statistical Analysis

Various tests such as Chi-square, Fischer, and student t test are used for analysis of observations.

## OBSERVATIONS AND RESULTS

We included in 30 patients in each group. They were randomly allocated into two groups. Each patient included in the study had equal possibility of getting into clonidine and non-clonidine groups. Average age of patient in the study was  $37.43 \pm 12.654$  years. Average weight of patient is  $60.77 \pm 12.384$  kgs Table 1.

In our study, we found that controlled hypotension in Group A (clonidine) on comparison with Group B which was significant. We found 60% (18 patients) in clonidine group had good controlled hypotension when compared

to 20% (6 patients) in non-clonidine group. Patient in Group B required additional dose of fentanyl for blood pressure control. Non-clonidine group required additional dose of metoprolol and propofol during general anesthesia for FESS.

Mean blood loss was found to be 90 ml in clonidine group than 200 ml in non-clonidine group, which was significant. Moreover, VAS score was much less in clonidine group.

## DISCUSSION

FESS has been advised for patients with acute and chronic Sino nasal disease, not responding to conventional treatment. FESS has been advised for patients with sinusitis and nasal polyps. These tiny nasal structures have good vasculature, and surgeons do require good visibility during the procedure. Any surgery involving nasal mucosa results in severe sympathetic response resulting in tachycardia and hypertension. This can result in severe bleeding during surgery. Even a small amount of bleeding of the area results decreased visibility resulting complications.<sup>[12,13]</sup> Controlled hypotension is required to perform the procedure which not only decreases blood pressure and bleeding in surgical field area.<sup>[12,13]</sup>

Clonidine, an alpha two agonist used for premedication in adult and pediatric patients. This stimulates pre and post alpha two agonists in central nervous system resulting in analgesia, sedation, and sympathetic tone reduction.<sup>[10]</sup> A single pre-operative dose of clonidine can help in reducing the blood loss, in turn, reducing the surgical time and prevents surgical complications.<sup>[14]</sup>

Majority of patients in our study were having bilateral Sino-nasal polyp followed by chronic sinusitis. A similar observation was observed in Jiwanmall *et al.* study.<sup>[8]</sup>

We had lower MAP in clonidine group when compared Group B (non-clonidine). This has resulted in blood less field. There was significant lower MAP in clonidine group on comparison with placebo group as observations by Rajkumar *et al.* They also had significantly lower heart rate and MAP during and after recovery postoperatively in clonidine group.<sup>[15]</sup>

We had to use additional dose of fentanyl to decrease or to attain target blood pressure during surgery in non-clonidine group. Clonidine effectively helped in reaching target blood pressure during surgery. Clonidine was good in reduction of dose of fentanyl, isoflurane, and beta-blockers during anesthesia in the Hackmann *et al.* study.<sup>[3]</sup>

**Table 2: Various complications observed during study in various groups**

Complications	Group A	Group B
Hypotension	8	11
Bradycardia	2	0
Sedation	4	2
Nausea	2	7
Vomiting	1	4

Administration of metoprolol was required in non-clonidine group on comparison with clonidine group in various studies such as Jiwanmall *et al.* and Lee *et al.*<sup>[8,16]</sup> We also had similar findings. In our study, we had add metoprolol in four patients (clonidine group) when compared to 24 patients (non-clonidine group). This was statistically significant.

Addition of propofol during procedure was required in two and four patients in Groups A and B, respectively. This addition was required to control blood pressure, which was not controlled by fentanyl and metoprolol. There was no statistical significance between both groups. In Jiwanmall *et al.* study, they gave additional propofol in majority of non-clonidine group, where fentanyl and metoprolol failed to control blood pressure.<sup>[8]</sup>

There was 47% of reduction of blood loss during procedure in Rajkumar *et al.* study.<sup>[15]</sup> Jiwanmall *et al.* reported 33% reduction in blood loss.<sup>[8]</sup> we had 90 ml of blood loss in Group A when compared with 200 ml in Group B.

Pain score was very much reduced postoperatively in clonidine group in our study. Per- and post-operative analgesic effect was good in clonidine group in other studies.<sup>[2]</sup>

We had few complications reported such as hypotension, bradycardia, nausea, and vomiting as presented in [Table 2]. Jiwanmall *et al.* and Rajkumar *et al.*<sup>[14]</sup> also had complications of hypotension and bradycardia in their studies.<sup>[2,8]</sup>

## CONCLUSION

Clonidine effectively achieves controlled hypotension as a single bolus dose when used with balanced anesthesia in FESS and reduces the intraoperative requirement of additional fentanyl and metoprolol. It effectively reduces intraoperative blood loss and provides a dry operating field.

Clonidine also provides adequate analgesia without any significant side effects such as sedation, hypotension, and bradycardia. Use of clonidine for controlled hypotension is simple, safe, and cheap, making economic sense for developing and developed countries.

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