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# A comparative study between Dexmedetomidine infusion and Propofol infusion for maintenance in patients undergoing Functional Endoscopic Sinus Surgery under General Anaesthesia

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***Abstract :*** *Functional Endoscopic sinus surgery (FESS), visibility is often affected by intra-nasal bleeding, which can be influenced by various anaesthetics. We conducted a prospective randomized controlled study in 60 ASA I and ASA II patients between 18-60 years of age undergoing functional endoscopic sinus surgery under general anesthesia.*

*Aim: To study and compare hemodynamics, blood loss and operative field visibility between Dexmedetomidine infusion and Propofol infusion when used for maintenance in FESS surgeries.*

*Material and Method: Institutional ethics committee approval and informed written consent were taken. Patients were randomly divided into Group D (Dexmedetomidine) and Group P(Propofol) with 30 patients each. Group D received 0.5mcg/kg/hr Dexmedetomidine and Group P received 100mcg/kg/hr Propofol.for maintenance introperatively. Patients hemodynamics, blood loss were assessed and operatively filed visibility were assessed using a 6 point scale given by Fromme et al and Boezart et al.*

*Results: Demographically both groups were comparable. Hemodynamics in both the groups were comparable with better control on heart rate in Group D. Blood loss was less in Group D as compared to Group P. The operative field visibility was also better in Group D.*

*Conclusion: Dexmedetomidine and Propofol both provide stable intraoperative hemodynamics. However Dexmedetomidine gives better operative filed visibility and decreases the blood loss.*

***Keywords*** *–Dexmedetomidine, FESS, Propofol*

## I. Introduction

Objective of functional endoscopic sinus surgery (FESS) is to restore drainage and aeration of paranasal sinuses and seeks to preserve the normal anatomical structures and function.[1] FESS, can be achieved with use of local anaesthesia with topically applied vasoconstrictors or general anaesthesia with controlled hypotension. Intraoperative bleeding is most common factor that diminishes visibility resulting in an increased incidence of complications.[2] Improvement of intraoperative visibility is an important task for anesthesiologists during FESS.

Controlled hypotension is commonly used to achieve a bloodless and dry operative field. Most frequently, peripheral vasodilators, beta blockers and volatile anesthetics are used to cause controlled hypotension and recently combinations of several medications are used.[3] Propofol is the anaesthetic most commonly recommended for FESS. Recently it has been shown that dexmedetomidine is also effective in FESS for maintenance under general anesthesia.

Propofol is used for induction and maintenance of anaesthesia and for sedation. Hypnotic action is mediated by enhancing GABA induced chloride current by binding to GABAA receptor. Propofol, with slight influence on the myocardium, exerts similar effects to nitroglycerine: dilating veins hence facilitating the outflow of blood from the surgical field.[4]It decreases cardiac output by limiting the venous return, thereby reducing the inflow of blood to the surgical field. Propofol anaesthesia results in decreased density of capillaries within the oral mucous membranes.[4]

Dexmedetomidine is a selective α2-adrenergic receptor agonist which is known to produce sedation, analgesia[5], and also has sympatholytic, anaesthetic sparing[6] and hemodynamic stabilising properties without significant respiratory depression. Its sympatholytic[7] effect decreases mean arterial pressure and heart rate by reducing norepinephrine release and hence improves hemodynamic stability. It has also been documented to decrease post-operative nausea and vomiting.[8]

## II. Material And Methods

In our study, we compared the effect of dexmedetomidine infusion and propofol infusion on hemodynamics, operative field visibility and intraoperative bleeding in patients undergoing FESS.Institutional Ethics Committee approval and informed consent was obtained. The study was a prospective randomized controlled study. 60 ASA I and II patients were divided into two groups Group D and Group P based on

computer generated random number table. Patients with cardiovascular diseases, cerebrovascular insufficiency, poorly controlled arterial hypertension, coagulation defects were excluded from the study. For topical vasoconstriction and local anaesthesia, 1/1000 epinephrine was applied via nasal cavity for 5 to 10 minutes with cotton-wool pledgets. Later, the medial and lateral concha nasal walls were equally anesthetized with lignocaine hydrochloride (40mg per 2ml).

All patients were premedicated with intramuscular 0.2mg of Inj. Glycopyrrolate.The agents used for induction and maintenance of anaesthesia, perioperative and postoperative intravenous fluids, and analgesics were the same for all the patients. Sedation was given with Inj.Midazolam 0.03mg/kg and Inj.Fentanyl Citrate 2µg/kg. Anaesthesia was induced with Inj.Propofol 2mg/kg and Inj. Vecuronium Bromide 0.1mg/kg. Anaesthesia was maintained with nitrous oxide 50% in oxygen and Inj. Dexmedetomidine infusion at the rate of 0.5mg/kg/hr in Group D and Group P received nitrous oxide 50% in oxygen and Inj. Propofol infusion at the rate of 100µg/kg/min. Dexmedetomidine and Propofol infusions were started immediately post induction.

Monitoring included pulse oxymetry, electrocardiogram, noninvasive arterial pressure (BP), and carbon dioxide analysis. Haemoglobin oxygen saturation(SpO2), heart rate(HR), systolic blood pressure(SBP), diastolic blood pressure,(DBP), mean arterial pressure(MAP), ECG, measurements were recorded preoperatively, post induction of anaesthesia every 30 seconds for first 2 minutes, then every 1 minute for next 8 minutes, then every 30 minutes throughout the surgery.

Intraoperative blood loss was determined using suction volumes and gauze counting. In addition, the operative field visibility was rated according to a 6-point scale by Fromme et al and Boezart et al depending on the bleeding occurring at the operative site, where 0 = no bleeding; 1 = slight bleeding, blood evacuation not necessary; 2 = slight bleeding, some blood must be evacuated; 3 = low bleeding, blood must be evacuated frequently as operative field is visible only briefly after evacuation; 4 = average bleeding, blood must be evacuated often, as operative field is visible only immediately after evacuation; 5 = heavy bleeding, constant blood evacuation needed, as bleeding often exceeds evacuation, rendering surgery nearly impossible. The operation starting and ending times were noted. Side effects such as nausea, vomiting, bradycardia (HR<45), hypotension (MAP<60), hypertension were to be recorded. Hypotension was treated with fluid replacement, and when this therapy was inadequate, a vasoconstrictor was added. Bradycardia was treated with 0.6mg atropine intravenously.

## III. Results

Results of the study were observed and analyzed statistically.Data was tested for normality and analyzed using Students Unpaired t test for numerical data and Chi Square test for categorical data. Statistical difference was considered significant if $p<0.05$. The mean age of the patients was 33.85 + 11.46 years in Group D and 36.37 + 8.64 years in Group P with a p value of 0.34. Proportion of male to female was comparable in both the groups.There was equal distribution of ASA I and II patients in both the groups.The baseline heart rate in Group D was 78 + 10.2 and in Group P was 82 + 7.43 with a p value of 0.064. Introperatively heart rate was lower in both the groups as compared to baseline and the heart rate was lower in the group D at all times as compared to group P and they were statistically significant from 4th minute onwards after induction. 2 patients in group D had episode of bradycardia(HR<45/min), no such episode was noted in group P.The baseline systolic blood pressure in Group D was 125.1 + 13.5 and in Group P was 126 + 11.08( p value of 0.80). The mean systolic blood pressure was on the lower side in group D than in group P from 2 mins onwards post induction, the difference in mean systolic blood pressure was statistically significant but not clinically significant.The baseline diastolic blood pressure in Group D was 75.06 + 8.30 and in Group P was 78.43 + 9.12 (p value of 0.14). the mean diastolic blood pressure was lower in the Dexmedetomidine group as compared to propofol group but it was statistically significant at 5th ,6th ,7th,9th and 60th minutes, the difference in the mean diastolic blood pressure was not clinically significant. The baseline mean arterial blood pressure in Group D was 91.8 + 9.45 and in Group P was 94.06 + 9.39 ( p value of 0.36).The mean arterial blood pressure in both the groups was comparable till upto 4 minutes post induction with no statistical difference. Thereafter the mean arterial blood pressure were lower in group D than in Group P the difference being statistically significant. 3 patients in Group D and 2 patients in Group P developed hypotension. Mean blood loss in group D was 81.67 + 27.95 ml and that in group P was 100.67 + 32.47 ml, the difference in blood loss was statistically significant with a p value 0.013. Operative field visibility was better in group D as compared to group P and the difference was statistically significant with a p value of 0.011.

## IV. Discussion

Functional Endoscopic Sinus Surgery is associated with bleeding which hampers visibility, hence may cause delay, an improper performance of the operation or even surgical complications. Various pharmacological agents have been studied to decrease the amount of bleeding during the surgery.In 1917, Harvey Cushing was the first to apply hypotension in neural surgery as to reduce bleeding in the operative field. FESS can be done in local as well as general anaesthesia, general anaesthesia is used often so as to reduce bleeding by lowering

intraoperative BP[9]. Intraoperative hypotension provides an improvement in the visualization of the surgical field, thus reducing the rate of complications due tothe surgery, and reduces the need for blood transfusion.Various drugs which can be used to provide controlled hypotension include sodium nitroprusside, nicardipine hydrochloride, nitroglycerin, alpha- and beta-adrenergic antagonists, and high doses of potent inhaled Anesthetics.[3]

Chattopadhyay U et al studied sixty patients, 18-65 years of age, scheduled for laparotomy under general anesthesia and reported that Dexmedetomidine was similar to Propofol in maintaining anaesthesia and produced better control of hemodynamic parameters and BIS value. Thus Dexmedetomidine can be used as the sole agent for maintenance of anaesthesia.[10]Sivaci R et al observed that the average blood loss was calculated as 128.1±37.3 ml in the propofol group and 296.9±97.8 ml in the sevoflurane group which indicates that blood loss was significantly less in the propofol group. They stated that general anesthesia based on propofol infusion may have the advantage of decreased bleeding compared with conventional inhalation agents.Therefore, making endoscopic surgery technically easier and safer by improving endoscopic visualization of the surgical field.[11]Marzban S et al observed that there were meaningful differences between average of blood loss,propofol group was 155ml, and Isoflurane group was 293ml;and the field condition was better in propofol group than the Isoflurane group.[12]Ankichetty S et al observed that mean blood loss propofol group was 109 ml and isoflurane was 132 ml, and both the groups operative field visibility rating was Grade 3 and below.Damla G et al observed, that the heart rate and mean arterial pressure values were lower in the DEX group than in the control group. Only 1 out of 50 patients developed bradycardia. The operative field visibility rating was 1.4 + 1.27 in the Dex group. They concluded that Dexmedetomidine improves surgical visibility, lowers and holds the HR and mean BP at a stable level. Finally, DEX may be relatively safely and effectively used in surgeries in which controlled hypotension is desired, such as FESS, and may be a good alternative to the other agents used for controlled hypotension.[13]Hilal A et al concluded that the heart rate and mean blood pressure were lower in the dexmedetomidine group. The mean blood loss was 52.7 + 39 ml and the operative field visibility rating was 1.7 ± 1.2. Thus concluded that Dexmedetomidine was helpful as an adjuvant agent in improving visibility of the operative field and reducing bleeding, bleeding scores, and intraoperative fentanyl consumption during general anesthesia in septoplasty operations.[9]S Goksu et al showed that SBP, DBP, MAP and HR values were reduced significantly following Dexmedetomidine infusion in the perioperative period. These decreases were significant between 10 and 60 min of infusion in thedexmedetomidine group. 2 patients developed bradycardia (HR < 40 beats min) in the dexmedetomidine group showed that dexmedetomidine provides analgesia, adequate sedation and surgical comfort during FESS under local anaesthesia. Since dexmedetomidine has the potential to attenuate perioperative increases in BPand HR and does not cause respiratory depression, clinical use of dexmedetomidine may be suggested in patients undergoing FESS under local anaesthesia by monitored anaesthesia care.[14]

In this study, we tried to provide controlled hypotensive anaesthesia by lowering Mean BP by using Dexmedetomidine infusion and Propofol infusion as maintenance agents, and compare the hemodynamic parameters, blood loss and operative field visibility. In our study, we observed that both Dexmedetomidine and Propofol decreased the Heart Rate from the baseline value with heart rate being lower in the Dexmedetomidine group. This difference in the heart rate could be attributed to the fact that Dexmedetomidine causes postsynaptic activation of α2-adrenoceptors in the central nervous system (CNS) inhibits sympathetic activity and thus can decrease blood pressure and heart rate. Propofol has no effect on heart rate, it resets or inhibits the baroreceptor reflex mechanism reducing tachycardia response to hypotension.The mean blood pressure was also lower in the Dexmedetomidine group than the Propofol group, this could be due to combined effect of the decreased central sympathetic outflow and also decrease in the plasma norepinephrine levels after Dexmedetomidine infusion.

In the Dexmedetomidine group the mean blood loss was around 81.67 + 27.95 ml with the mean operative field visibility rating of 1.7 + 0.79, the observation is consistent with the studies conducted by Damla G et al, Hilal A et al.In the Propofol group the mean blood loss was around 100.67 + 32.47 ml with the mean operative field visibility rating of 2.26 + 0.86, these results are in accordance with studies conducted by Sivaci R et al, Marzban S et al, Ankichetty S et al.

It is thought that the best surgical conditions in FESS exist at 2-3 points of operative visual field rating by Fromme scale.[15,16]Both provide operative field visibility grading of less than 3 points, Dexmedetomidine is associated with lesser amount of blood loss, as It has been shown that lower intraoperative heart rate is associated with less blood loss.

## V. Conclusion

We conclude that induced hypotension is an important tool during FESS to improve surgical condition. Total intravenous anaesthesia provides an easy method for controlled hypotension, has less side effects and shorter recovery time. Both Dexmedetomidine and Propofol are effective and safe drugs to provide stable haemodynamics, reduce blood loss and improving operative filed visibility in FESS. However,

Dexmedetomidine is better in controlling g heart rate and was associated with lesser amount of blood loss and better operative field visibility.

## FIGURES

Figure 1 – Comparison of heart rate between two groups

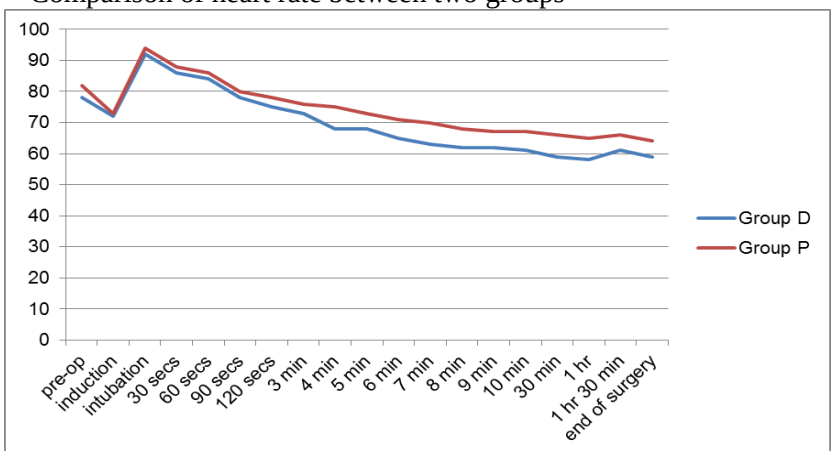



Figure 2 – Comparison of Mean Arterial Pressures between two groups

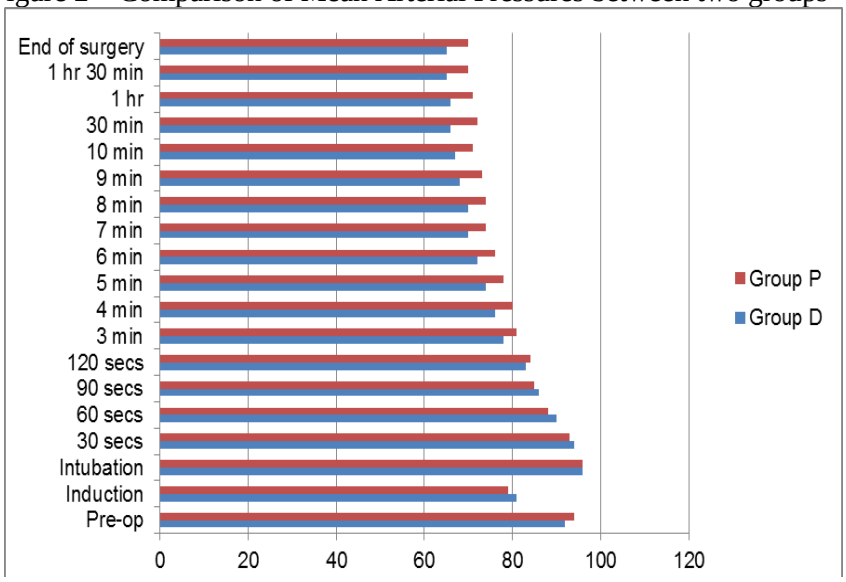



Figure 3 – Comparison of mean blood loss between two groups

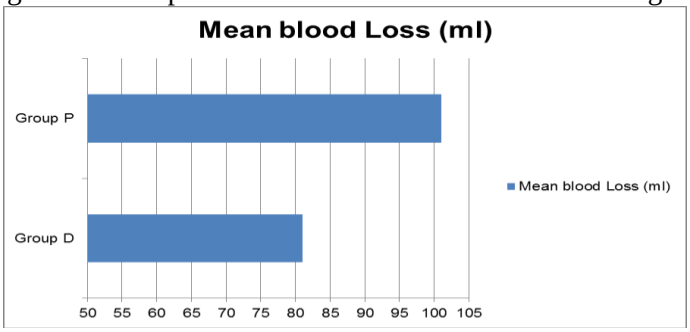
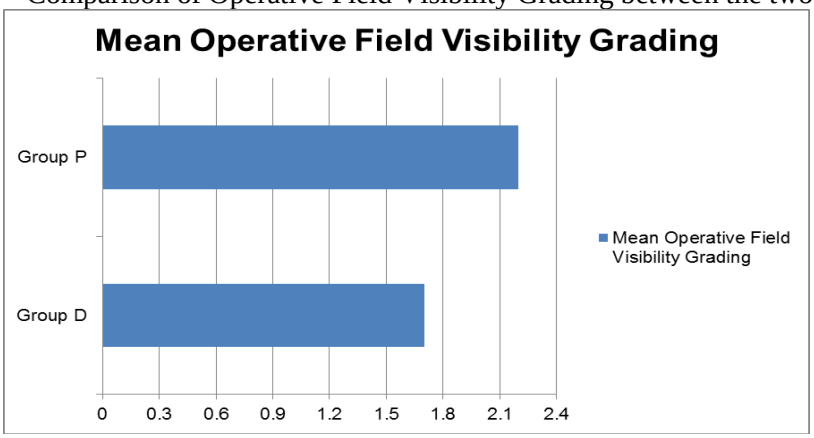


Figure 4 – Comparison of Operative Field Visibility Grading between the two groups

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