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Comparison of dexmedetomidine and propofol infusion on intraoperative haemodynamics during functional endoscopic sinus surgery under general anaesthesia- A randomized controlled trial

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ABSTRACT

Introduction: Functional endoscopic sinus surgery (FESS) is a surgical technique to treat sinonasal diseases. Intraoperative bleeding is one of the major challenges, which hinder the confined area of visibility and prolongs the procedure. Intraoperative induced hypotension can reduce intraoperative bleeding, to provide clear surgical field for dissection and hence decreasing operative time. So, we compared effect of dexmedetomidine and propofol infusion on the intraoperative haemodynamics during functional endoscopic sinus surgery (FESS).

Aims & Objectives: To study the effect of intravenous (IV) dexmedetomidine and propofol infusion on intraoperative haemodynamics under general anaesthesia in functional endoscopic sinus surgery(FESS). Secondary aim was to study estimated blood loss if any.

Materials and Methods: To study the effect of I.V. dexmedetomidine and propofol infusion on intraoperative haemodynamics under general anaesthesia in functional endoscopic sinus surgery (FESS). Patients were divided randomly by sealed envelope method into two groups with 30 patients in each group. Group D patients received dexmedetomidine 1ug/kg as a loading dose over 20 minutes followed by 0.3 ug/kg/hr infusion for maintainence. Group P patients received propofol 2mg/kg as a loading dose followed by 100-200 ug/kg/min infusion for maintenance.

Results: The findings in our study highlights that dexmedetomidine infusion decreases haemodynamic parameters like arterial blood pressure and heart rate more as compared to propofol infusion during FESS. The effect on hemodynamics sustained and consistent without requirement of additional hypotensive agents. So altogether, this lead to better surgical field.

Conclusion: Use of dexmedetomidine is a safe and effective method to control bleeding and improve the quality of surgical field and intraoperative haemodynamics.

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1. Introduction

Functional endoscopic sinus surgery (FESS) is a surgical technique to treat sinonasal diseases. The procedure can take from 1 to 3 hours [1,2] to complete. General anaesthesia is preferred approach as it can provide controlled hypotension, avoid discomfort due to inadequate topical anaesthesia. The purpose of anaesthesia for FESS is to provide bloodless field, protect the airway, adequate post-operative analgesia and ensure early recovery and discharge. Intraoperative bleeding is one of the major challenges. Bleeding during the operation will hinder the confined area of visibility [3] and which prolongs the procedure, with an added risk

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of damage to optic nerve, ocular muscle, intraorbital hemorrhage, intracranial penetration, rhino oral fistula, intracranial hemorrhage, CSF leak, Meningitis.[4–7] Various studies have shown major perioperative bleeding requiring blood transfusion during FESS.[8] Various methods have been used to decrease bleeding intraoperatively and provide optimal operating conditions, decrease incidence of various complications, decrease surgery time, faster postoperative recovery.

Controlled hypotension is a modality to reduce intraoperative bleeding, to provide clear surgical field for dissection and hence decreasing operative time. There are many hypotensive techniques such as controlling venous return by positioning the patient, pharmacological agents (inhalational anesthetics[9], direct-acting[10] beta-adrenergic receptor antagonists[10] alpha 2 adrenergic receptor agonist[11] and calcium channel blockers.

Our study had compared the efficacy of dexmedetomidine and propofol infusion on the quality of surgical field during functional endoscopic sinus surgery (FESS).

2. Aims & Objectives

2.1. Primary aim

To study the effect of intravenous (IV) dexmedetomidine and propofol infusion on intraoperative haemodynamics under general anaesthesia in functional endoscopic sinus surgery(FESS). Secondary aim was to study estimated blood loss if any.

3. Materials and Methods

Sixty patients of either sex of age 18-60 years with ASA I-II were randomly allocated into 2 groups of 30 each were scheduled for FESS under general anaesthesia. Exclusion criteria was Pregnancy, Bleeding disorders, Patients taking medications that may affect surgical hemostasis, Renal, hepatic or cardiovascular dysfunction, Patients with cerebrovascular disease, Postural hypotension, Intraorbital pathologies like tumors, Intracranial pathologies like increased cranial tension, All patients who do not give consent to be a part of the study.

3.1. Anaesthetic technique

Pre-anesthetic checkup was done a day before surgery. Detailed history, physical and systemic examination was done. Routine investigations including complete haemogram, coagulation profile, liver function tests (LFT), renal function tests (RFT), random blood sugar (RBS), electrocardiography (ECG) and chest x-ray were done. Informed written consent was obtained. Patient was kept nil per orally overnight and pre-medicated with tablet etizolam 0.25 mg and tablet pantoprazole 40 mg on the night before surgery and on the morning of surgery. Group D patients received dexmedetomidine 1ug/kg as a loading dose over 20 minutes followed by 0.3 ug/kg/hr infusion for maintainence. Group P patients received propofol 2mg/kg as a loading dose followed by 100-200 ug/kg/min infusion for maintenance.

After shifting the patient to the operation table, routine multipara monitors were attached. Two IV lines were secured. Patients in both the groups were induced with inj. fentanyl l-2 ug/kg IV, inj. propofol 2 mg/kg and tracheal intubation facilitated by vecuronium 0.1 mg/kg intravenously. Then patients were put on intermittent positive pressure ventilation (IPPV) and anaesthesia was maintained with oxygen, nitrous oxide, vecuronium 0.02mg/kg and IV infusion of dexmedetomidine in group D and propofol infusion in group P.

Group D received dexmedetomidine infusion of 1 ug/kg as a loading dose over 20 min and 0.3ug/kg/hr infusion for maintainence. Infusion stopped 15 min before the end of procedure. Group P received Propofol infusion at the rate of 100-200 ug/kg/min for maintainence and was stopped 5 min before the end of surgery.

HR and MAP were measured at baseline, before induction of anaesthesia and every 5 min after induction of anaesthesia for two hours. Surgical field was assessed by surgeon according to category scale adopted from Fromme's Scale. Total blood loss was measured and compared between 2 groups. Requirement of hypotensive agents was also compared between 2 groups.

In both groups, any episode of hypotension (mean arterial pressure < 60 mmHg) was treated with phenylephrine 1.5 ug/kg i.v bolus. Heart rate less than 40/ minute was treated with inj. Atropine 10-20 ug/kg IV stat. Extubation was done after giving reversal (Inj. neostigmine 0.05 mg/kg intravenously and inj. Glycopyrolate 0.01 mg/kg), when Hersimran Kaurpatient was conscious and obeying commands.

3.2. Stastical analysis

Continous variables were analyzed by using unpaired t-test and mann-whitney test. Catagorical variables were analyzed using chi square test. Results were considered statistically significant, if P value < 0.05 and statistically insignificant if P value > 0.05.

4. Results

Patient's demographic characteristics were comparable amongst both the groups (P value>0.05). [Tables 1, 2 and 3]. The mean duration of anaesthesia was 81.17 ± 15.90 in dexmedetomidine group and 79.17 ± 13.00 minutes in propofol group. The difference between two groups was statistically insignificant (P=0.596). [Table 4] Baseline HR was comparable in both groups (P=0.515). During

hypotensive anaesthesia, heart rate was significantly lower in group D as compared to group P (P<0.05). [Figure 1]. Baseline systolic blood pressures were comparable in both groups (P>0.05). Systolic blood pressure was significantly lower in group D in comparison to systolic blood pressure in group P throughout the surgery (P<0.05). [Figure 2]. Mean diastolic pressure was comparable in both the groups throughout the surgery (P>0.05). [Figure 3]. Baseline mean blood pressure (MBP) was comparable in both the groups. MBP was significantly lower in group D when compared to group P throughout the surgery (P<0.05). [Figure 4]. There was significant statistical difference seen in Fromme's Scores between patients in dexmedetomidine and propofol group (P<0.05). [Figure 5]. There was significant statistical difference seen in total blood loss among both groups (p= 0.001). Total blood loss is less in dexmedetomidine group (85.10 ml) as compared to propofol group (93.67 ml). [Figure 6]. No significant difference was seen in phenylephrine use in both the groups (p>0.05). [Figure 7].

Table 1: Comparison of both groups with respect to age and weight

	Group D		Group P		p-value
	Mean	SD	Mean	SD	
Age	30.93	9.98	29.70	9.89	0.632
Weight	53.77	15.35	55.50	17.56	0.685

Table 2: Comparison of both groups with respect to gender

		Group D	Group Group P	Total	p-value
Sex	F	14	16	30	0.606
	M	16	14	30	

Table 3: ASA grading distribution between both groups

		Group				p-value
		Group D	Group D	Group P	Group P	
ASA	I	25	83%	23	77%	0.519
	II	5	17%	7	23%	

Table 4: Duration of surgery.

	Group D		Group P		p-value
	Mean	SD	Mean	SD	
Surgery duration	81.17	15.90	79.17	13.00	0.596

5. Discussion

FESS is a popular technique for the treatment of sinus disease by providing excellent illumination and

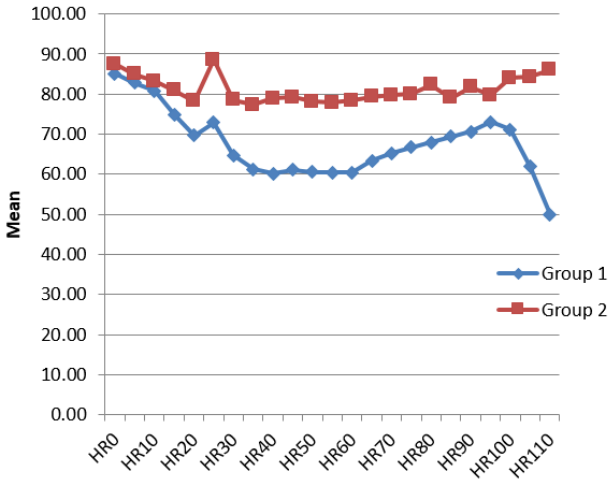

Figure 1: Comparison of intraoperative heart rate between both groups.

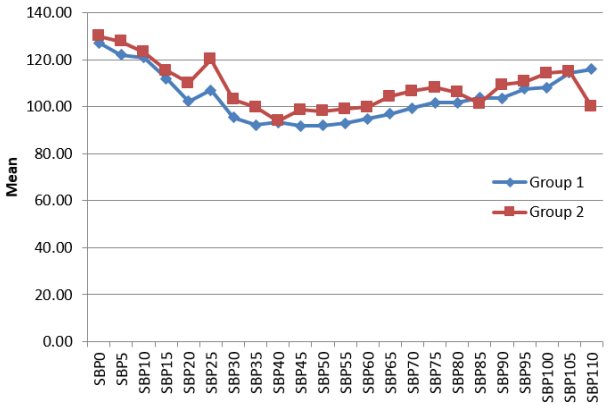

Figure 2: Comparison of systolic blood pressure(mmHg) between both groups.

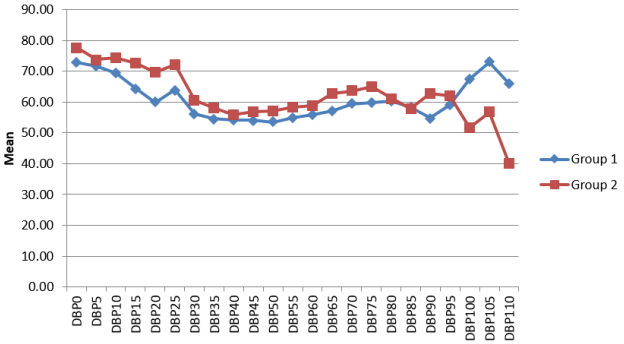

Figure 3: Comparison of diastolic blood pressure (mmHg)between both groups.

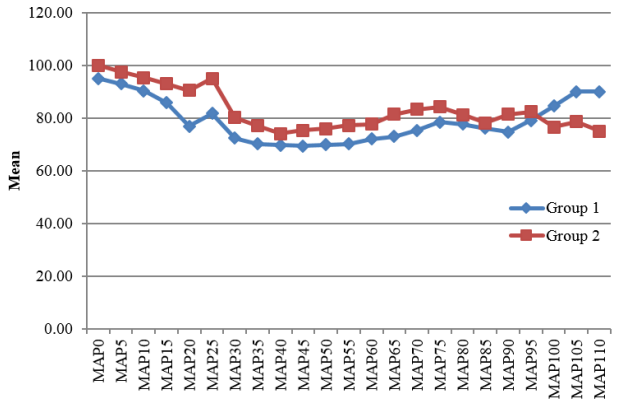

Figure 4: Comparisonof mean arterial blood pressure (mmhg) between both groups.

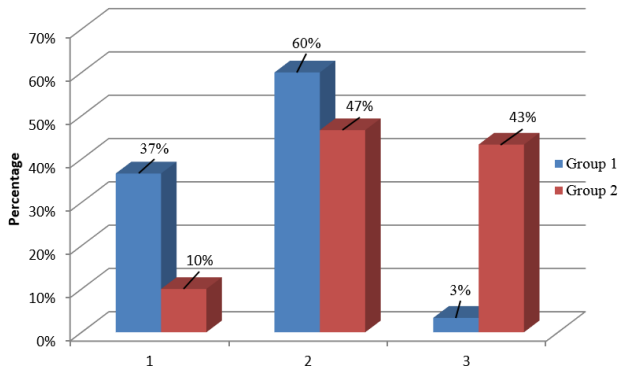

Figure 5: Comparison of fromme's score between both the groups.

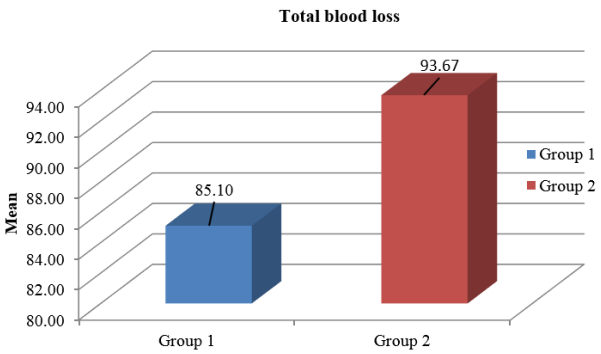

Figure 6: Comparison of total blood loss between both the groups.

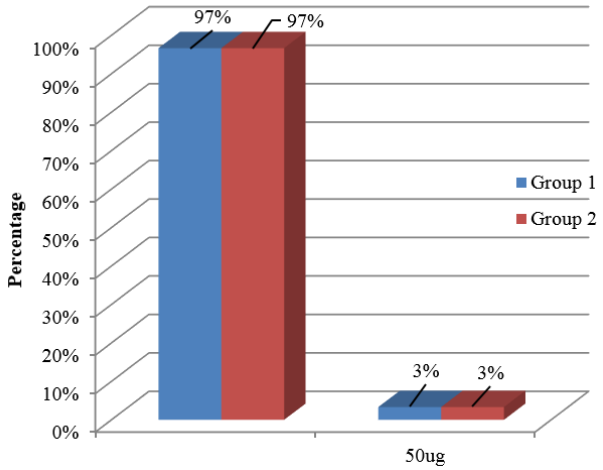

Figure 7: Use of phenylephrine for treatment of hypotensive episodes in both groups.

visualization. FESS is widely performed surgery nowadays. However, complications like optic nerve damage, damage to the duramater and meningitis can occur because of poor visibility due to excessive bleeding during surgery. In order to avoid these problems, hypotensive anaesthesia is usually employed during FESS. Various drugs are used for this purpose including sodium nitroprusside, nitroglycerine, B blockers like esmolol, metoprolol, atenolol and high dose of inhalational agents like halothane and isoflurane. Besides this, reverse Trendelberg position and local vasoconstrictors are also employed to reduce venous congestion. So, we conducted this trial to compare effect of dexmedetomidine and propofol infusion on intraoperative haemodynamics in FESS under general anaesthesia.

The mean amount of hypotensive drugs used in propofol group was 2.20 ± 0.81 mg of metoprolol. Patients in dexmedetomidine group did not require the use of hypotensive agents. Toivenen et al[12] evaluated the effect of clonidine on requirement of hypotensive agents in middle ear surgery. They found that clonidine premedication reduced requirements of hypotensive agents used for controlled intraoperative hypotension. In addition, they also found that clonidine prevents rebound hypertension by preventing increase in plasma catecholamine levels.[12] In a similar study, Woodcock et al demonstrated that clonidine premedication decreased the requirement of isoflurane to maintain a MAP of 60 mm Hg from 3-2 %.[13]

In our study, we found that quality of surgical field was better in patients of group D as compared to group P. In a similar study, Durmus et al[14] evaluated the efficacy of dexmedetomidine on intraoperative bleeding, anesthetic drugs requirement and postoperative pain and concluded that dexmedetomidine is a useful adjuvant to decrease bleeding when a bloodless surgical field is required. Marchal et al[15] also found similar results where clonidine

was used, surgical field quality and recovery times were better in the clonidine group.

Dexmedetomidine decreases MAP by decreasing sympathetic outflow and circulating catecholamine levels.[16,17] Its central action reduces BP and causes peripheral vasoconstriction by alpha 2 agonist action, which altogether improves surgical field. The findings in our study highlights the effect of dexmedetomidine infusion in decreasing arterial pressure and heart rate during FESS. The effect on hemodynamics sustained and consistent without requirement of additional hypotensive agents. So altogether, this lead to better surgical field. Durmus et al[14] also demonstrated that in patients undergoing tympanoplasty or septorhinoplasty, dexmedetomidine reduces bleeding and intraoperative anesthetic requirements. It also provides more stable hemodynamic responses to anaesthesia and surgery.

6. Conclusions

Use of dexmedetomidine is a safe and effective method to reduce bleeding and hence improve surgical field. Dexmedetomidine causes delay in emergence from anaesthesia probably through its central effects on locus ceruleus. This can be prevented by using lower doses for maintainence infusion and stopping the infusion at least 20 min before the end of surgery.

7. Limitations of Study

1. In our study, bleeding during the surgery was assessed using Fromme's score, which is a qualitative score and is subjected to error of judgment. Quantitative assessment of bleeding by measuring the amount of blood loss will probably minimize the errors of judgment.
2. The difference in hemodynamic parameters and hence the difference in Fromme's score between the two groups as a function of depth of anaesthesia couldn't be compared as we did not monitor the depth of anaesthesia.

8. Source of Funding

None.

9. Conflict of Interest

None.

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