EFFICACY OF DEXMEDETOMIDINE VERSUS PROPOFOL INFUSION IN PRODUCING CONTROLLED HYPOTENSION DURING FUNCTIONAL ENDOSCOPIC SINUS SURGERY IN A TERTIARY CARE HOSPITAL

Dr. Balakrishnan[1*], Dr. Subhasan JV[2]
[1*]Professor, Department of Anaesthesiology, Sree Mookambika Institute of Medical Sciences, Kannyakumari, Tamilnadu, India.
[2]Junior Resident, Department of Anaesthesiology, Sree Mookambika Institute of Medical Sciences, Kannyakumari, Tamilnadu, India.
Corresponding Author: Dr. Balakrishnan
Professor, Department of Anaesthesiology, Sree Mookambika Institute of Medical Sciences, Kannyakumari, Tamilnadu, India.

ABSTRACT
Background: Functional Endoscopic Sinus Surgery (FESS) requires a clear and bloodless surgical field for optimal visualization and prevention of intraoperative complications. Controlled hypotension is commonly employed during FESS to reduce blood loss and improve surgical conditions. Dexmedetomidine and Propofol are widely used agents for controlled hypotensive anesthesia. The present study was conducted to compare the efficacy of dexmedetomidine and propofol infusion in achieving controlled hypotension during FESS.
Methodology: This prospective randomized comparative study was conducted in the Department of Anaesthesiology at Sree Mookambika Institute of Medical Sciences from June 2025 to March 2026. A total of 100 patients aged between 18 and 40 years belonging to ASA Grade I and II undergoing elective FESS were included in the study. Patients were randomly allocated into two groups of 50 each. Group D received dexmedetomidine infusion at 0.4–0.8 µg/kg/hr, while Group P received propofol infusion at 75–100 µg/kg/min following induction of general anesthesia. Intraoperative pulse rate, mean arterial pressure, blood loss, quality of surgical field, sedation score, and complications were assessed and compared between the two groups
Results: Baseline demographic and hemodynamic parameters were comparable between the groups. Intraoperative pulse rate and mean arterial pressure were significantly lower in the dexmedetomidine group at various time intervals compared with the propofol group ($p<0.05$). Quality of surgical field and mean blood loss were comparable in both groups. Postoperative Ramsay sedation scores at 30 minutes were significantly higher in the propofol group ($p=0.023$). No major complications were observed in either group.
Conclusion: Both dexmedetomidine and propofol were effective and safe agents for controlled hypotension during FESS. Dexmedetomidine provided superior intraoperative hemodynamic stability with comparable surgical field quality and blood loss, making it a useful alternative to propofol for hypotensive anesthesia in endoscopic sinus surgery.

Keywords: Dexmedetomidine, Propofol, Controlled Hypotension, Functional Endoscopic Sinus Surgery, Fess, Hemodynamic Stability.

INTRODUCTION
(FESS) is one of the most commonly performed surgical procedures for the management of chronic rhinosinusitis, nasal polyposis, and other sinonasal disorders. The procedure has gained wide acceptance because of its minimally invasive nature, better preservation of normal anatomy, reduced postoperative morbidity, and improved patient outcomes.

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However, the surgical field in FESS is relatively narrow and highly vascular, making even minimal bleeding capable of significantly impairing endoscopic visualization. Poor visibility during surgery can prolong operative time and increase the risk of complications involving vital adjacent structures such as the orbit, optic nerve, carotid vessels, and intracranial cavity.[1]
Intraoperative bleeding during FESS is influenced by several factors including mucosal inflammation, increased vascularity, surgical manipulation, and systemic hemodynamic status. Since effective surgical visualization is essential for precision and safety during endoscopic sinus surgery, maintenance of a relatively bloodless field is considered a major objective of anesthetic management. Controlled hypotension is therefore frequently employed during

FESS to reduce blood loss and improve the quality of the operative field. Controlled hypotension refers to the deliberate reduction of systemic arterial blood pressure in a predictable and reversible manner to decrease bleeding during surgery while maintaining adequate organ perfusion.[2,3]

Various pharmacological agents have been utilized for achieving controlled hypotension during surgery. These include inhalational anesthetics, vasodilators such as sodium nitroprusside and nitroglycerin, β-adrenergic blockers, calcium channel blockers, magnesium sulfate, and opioids.[4-6] Although many of these drugs are effective in lowering blood pressure, each agent possesses certain limitations including reflex tachycardia, delayed recovery, excessive hypotension, tachyphylaxis, and adverse cardiovascular effects. Therefore, selection of an ideal hypotensive agent remains an important challenge for anesthesiologists.[7]

is a short-acting intravenous anesthetic agent widely used for induction and maintenance of anesthesia. It acts primarily through modulation of gamma aminobutyric acid-A (GABA-A) receptors and possesses sedative, hypnotic, antiemetic, and sympatholytic properties. Propofol has been extensively used for controlled hypotension because it reduces systemic vascular resistance, myocardial contractility, and preload, thereby decreasing arterial blood pressure. In addition, propofol provides smooth recovery and decreased postoperative nausea and vomiting. However, its use may be associated with respiratory depression and dose-dependent hypotension.[8,9]

is a highly selective α2-adrenergic receptor agonist with sedative, anxiolytic, sympatholytic, and analgesic properties. Dexmedetomidine produces controlled hypotension by reducing sympathetic outflow and decreasing circulating catecholamine levels. Unlike many other sedative agents, dexmedetomidine provides sedation without significant respiratory depression. Additionally, it reduces anesthetic and opioid requirements, maintains hemodynamic stability, and may improve surgical field quality during FESS. These characteristics have made dexmedetomidine an increasingly popular agent for hypotensive anesthesia.[10,11]

Several studies have compared dexmedetomidine and propofol for controlled hypotension during endoscopic sinus surgery, with varying observations regarding surgical field visibility, blood loss, hemodynamic stability, recovery characteristics, and adverse effects. While dexmedetomidine may provide superior hemodynamic control and analgesia, propofol offers rapid onset and faster postoperative recovery. Therefore, comparative evaluation of these agents is essential to identify the most effective and safe anesthetic approach for patients undergoing FESS.[12]

The present study was undertaken to compare dexmedetomidine and propofol infusion for inducing controlled hypotension in patients undergoing functional endoscopic sinus surgery in a tertiary care centre. The study aimed to evaluate intraoperative hemodynamic parameters, quality of surgical field, blood loss, recovery profile, and perioperative complications associated with both agents.

Aim

To compare the effectiveness of Dexmedetomidine and Propofol infusion in inducing controlled hypotension during Functional Endoscopic Sinus Surgery (FESS).

Objectives

1. To compare the intraoperative hemodynamic parameters between dexmedetomidine and propofol infusion during FESS.
2. To evaluate the effectiveness of both agents in achieving controlled hypotension.
3. To compare the quality of the surgical field and intraoperative blood loss between the two study groups.

METHODOLOGY

This prospective randomized comparative study was conducted in the Department of Anaesthesiology at Sree Mookambika Institute of Medical Sciences over a study period from June 2025 to March 2026. The study was carried out after obtaining approval from the Institutional Ethics Committee and written informed consent from all participating patients. The study included patients posted for elective Functional Endoscopic Sinus Surgery (FESS) under general anesthesia.

Patients aged between 18 and 40 years belonging to American Society of Anesthesiologists (ASA) physical status Grade I and II were included in the study. Patients with known hypersensitivity or allergy to Dexmedetomidine or Propofol, patients unwilling to participate in the study, and those who did not provide valid informed consent were excluded from the study.

A total of 100 patients were enrolled and randomly allocated into two groups comprising 50 patients each using a computer-generated randomization method. Group D patients received dexmedetomidine infusion for induction of controlled hypotension, whereas Group P patients received propofol infusion. All patients underwent detailed pre-anesthetic evaluation including history taking, general physical examination, airway assessment, and routine laboratory investigations. Patients were kept nil per oral for at least 8 hours prior to surgery.

Upon arrival in the operation theatre, standard monitoring including electrocardiography (ECG), non-invasive blood pressure (NIBP), end-tidal carbon dioxide ($ETCO_2$), and pulse oximetry were instituted and baseline vital parameters were recorded. An 18-gauge intravenous cannula was secured in all patients and intravenous fluids were started. All patients received intravenous midazolam 0.05 mg/kg as premedication prior to induction of anesthesia.

General anesthesia was induced using standard anesthetic protocol. Following induction, patients in Group D received dexmedetomidine infusion at a dose ranging from 0.4–0.8 µg/kg/hour diluted in 500 ml of 0.9% normal saline. Patients in Group P received propofol infusion at a dose of 75–100 µg/kg/minute diluted in 500 ml of 0.9% normal saline. The infusion rates were adjusted according to the hemodynamic response to maintain controlled hypotension throughout the procedure.

To minimize local bleeding and improve surgical visualization, the nasal mucosa of all patients was infiltrated with 4 ml of 2% xylocaine with adrenaline in a concentration of 1:200,000 prior to commencement of surgery. Controlled hypotension was achieved by maintaining the target mean arterial pressure (MAP) between 60 and 70 mmHg during the intraoperative period. Hemodynamic parameters including heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, oxygen saturation, and end-tidal carbon dioxide were continuously monitored and recorded at regular intervals throughout the surgery.

Intraoperative blood loss, quality of the surgical field, surgeon satisfaction, duration of surgery, recovery profile, postoperative sedation, and adverse events such as bradycardia, hypotension, nausea, vomiting, and delayed recovery were assessed and compared between the two groups. Appropriate management was provided whenever significant hemodynamic instability or complications occurred during the procedure.

All collected data were entered into Microsoft Excel and analyzed statistically using appropriate software. Quantitative variables were expressed as mean ± standard deviation, whereas qualitative variables were represented as frequency and percentage. Comparison between the two study groups was performed using Student's t-test for continuous variables and Chi-square test for categorical variables. A p-value less than 0.05 was considered statistically significant.

RESULTS

Table 1: Distribution by patients characteristics

Parameters	Sub- group	Group D	Group P	P value
Age (years) Mean±SD		30.16±8.834	29.34±10.440	0.673
Weight (Kg) Mean±SD		61.02±4.578	61.46±6.606	0.700
Diabetes Mellitus (n/%)	Present	7(14%)	8(16%)	0.779
	Absent	43(86%)	42(84%)	
Hypertension (n/%)	Present	11(22%)	12(24%)	0.836
	Absent	39(78%)	(3876%)	
ASA (n/%)	Grade 1	39(78%)	38(76%)	0.812
	Grade 2	11(22%)	12(24%)	

Table 2: Distribution by baseline vital parameters

Group	Group D	Group P	P Value
	Mean±S. D		
PR	79.58±7.359	77.86±7.497	P= 0.250
SBP	124.14±10.091	123.86±9.659	P=0.888
DBP	77.98±7.069	79.06±6.952	P=0.443
MAP	93.36±4.783	93.99±5.24	P=0.534
SPO2 (%)	99.46±0.503	99.44±0.501	P= 0.843

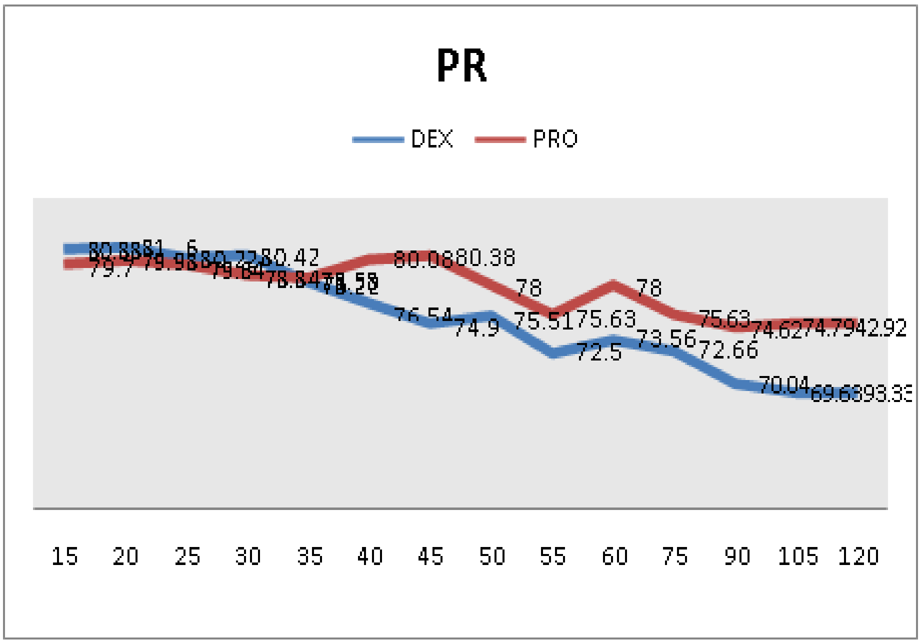

Figure 1: Comparison of Pulse rate between the groups intraoperatively

Mean arterial pressure was higher in group P patients compare to group D. But this association was statistically significant from 30 to 45 min & 90-120min. [Figure 2]

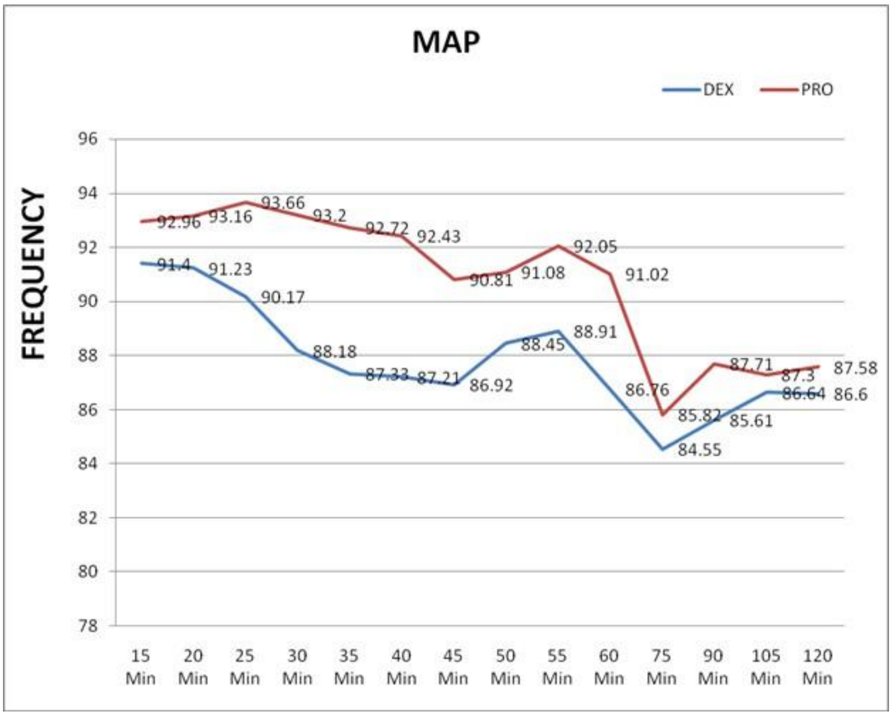

Figure 2: Comparison of mean arterial pressure between the two groups intraoperatively

As per average category scale, score given by surgeon was grade 2 in 92% and 90% of patients respectively in group D and group P and grade 3 in 8% and 10% of patients in group D and group P respectively, which means both drugs have similar effects on quality of surgical fields. [Table 3]

Table 3: Quality of surgical field - averge category scale

Average category scale grade	Group D	Group P	Total
Grade 2	46(92%)	45(90%)	91(91%)
Grade 3	4(8%)	5(10%)	9(9%)
Total	50	50	100

Average blood loss in both groups was comparable. There is no significant association between two groups. Comparison between two groups showed that there is statistically significant differences in sedation score at 30 min (P value=0.02) after surgery. Sedation scores were statistically higher in Propofol group than Dexmedetomedine group. No complications were detected in any of the patients. [Table 4]

Table 4: Mean blood loss, sedation score and complication rates in Group D versus Group P

Variables	Subcategory	Group D N=50	Group P N=50	P Value
Mean blood loss		98.72±0.671	99.12±0.773	P=0.702
Ramsay sedation score	15 min	2.44±0.535	2.62±0.532	0.093
	30 min	2.22±0.44	2.42±0.52	0.023
	60 min	2±0.19	2±0.22	1
Complications	Yes	0(0%)	0(0%)	Not applicable
	No	50(100%)	50(100%)	

DISCUSSION

In the present study, both the study groups were comparable with respect to demographic characteristics and baseline clinical parameters. The mean age in Group D was 30.16 ± 8.83 years, whereas in Group P it was 29.34 ± 10.44 years. Mean body weight, prevalence of diabetes mellitus, hypertension, and ASA physical status grading were also statistically comparable between the two groups with no significant difference ($p>0.05$). Similarly, preoperative vital parameters including pulse rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygen saturation did not differ significantly between the groups. These findings indicate homogeneity of the study population and allow accurate comparison of the effects of the two study drugs.[13]

Following induction of controlled hypotension, intraoperative pulse rate was found to be consistently lower in patients receiving Dexmedetomidine compared to those receiving Propofol infusion. The difference became statistically significant at 45, 50, 60, and 120 minutes of surgery ($p<0.05$). Dexmedetomidine produces sympatholysis through stimulation of central α2-adrenoceptors, thereby reducing catecholamine release and heart rate. This property contributes to better hemodynamic stability during surgery. Similar findings were reported by previous investigators comparing dexmedetomidine and propofol in functional endoscopic sinus surgery.[14,15]

Mean arterial pressure was also lower in the dexmedetomidine group compared with the propofol group during several intraoperative intervals. Statistically significant differences were observed between 30–45 minutes and 90–120 minutes intraoperatively. Maintenance of lower and stable mean arterial pressure in the dexmedetomidine group may have contributed to improved surgical conditions by reducing mucosal bleeding. Dexmedetomidine has been shown to provide controlled hypotension with greater hemodynamic stability compared to many conventional hypotensive agents.[16]

Assessment of the quality of the surgical field using the average category scale demonstrated satisfactory surgical conditions in both groups. Grade 2 surgical field quality was observed in 92% of patients in Group D and 90% in Group P, whereas Grade 3 quality was seen in 8% and 10% respectively. There was no statistically significant difference between the two groups, indicating that both dexmedetomidine and propofol were equally effective in providing an acceptable bloodless operative field during Functional Endoscopic Sinus Surgery. Similar observations have been documented in earlier studies evaluating controlled hypotension during endoscopic sinus surgery.[17]

The average blood loss was comparable between the two groups, with no statistically significant difference observed. Mean blood loss was 98.72 ± 0.67 ml in Group D and 99.12 ± 0.77 ml in Group P. Effective reduction of blood loss in both groups may be attributed to adequate maintenance of target mean arterial pressure during surgery. These findings suggest that both dexmedetomidine and propofol are effective agents for controlled hypotensive anesthesia in FESS.[18]

Postoperative sedation scores were evaluated using the Ramsay sedation scale. At 15 minutes postoperatively, sedation scores were slightly higher in the propofol group, although the difference was not statistically significant. However, at 30 minutes, the sedation score was significantly higher in Group P compared with Group D (p=0.023). By 60 minutes, sedation scores were comparable in both groups. Increased sedation in the propofol group during the early postoperative period may be related to the residual sedative effects of continuous propofol infusion. Dexmedetomidine, despite providing adequate sedation intraoperatively, is associated with smoother and more cooperative recovery profiles.[19]

No major complications such as severe bradycardia, hypotension, respiratory depression, or delayed recovery were observed in either group. This indicates that both dexmedetomidine and propofol can be used safely for inducing controlled hypotension in patients undergoing FESS under proper monitoring and dose titration.

Overall, the present study demonstrated that dexmedetomidine provided superior intraoperative hemodynamic stability with comparable surgical field quality and blood loss when compared with propofol infusion. Both drugs were found to be effective and safe agents for controlled hypotension during functional endoscopic sinus surgery.

Conclusion

The present study demonstrated that both and infusion were effective and safe agents for inducing controlled hypotension during . Dexmedetomidine provided better intraoperative hemodynamic stability with lower pulse rate and mean arterial pressure compared to propofol. Both groups showed comparable surgical field quality and intraoperative blood loss. Postoperative sedation scores were higher in the propofol group during the early recovery period, while dexmedetomidine offered smoother recovery with adequate sedation and stable vital parameters. Hence, dexmedetomidine can be considered an effective alternative to propofol for controlled hypotensive anesthesia in FESS with favorable hemodynamic and recovery characteristics.

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