e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(8); 1496-1504

Original Research Article

Comparative Study of Propofol Versus Dexmedetomidine During Functional Endoscopic Sinus Surgery at Tertiary Care Center

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Received: 10-06-2026 / Revised: 04-07-2026 / Accepted: 02-08-2026
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Conflict of interest: Nil

Abstract

Background: Functional endoscopic sinus surgery (FESS) has emerged as the gold standard surgical approach for the management of chronic rhinosinusitis and other sinonasal pathologies that are refractory to medical treatment.

Objective: To compare the effect of propofol and dexmedetomidine on hemodynamics during FESS surgery.

Methods: A total of 60 patients were randomly allocated into two equal groups of 30 patients each. Group D received dexmedetomidine IV infusion at the rate of 1 mcg/kg/hr as a loading dose over 10 minutes after intubation, followed by a maintenance infusion of 0.4-0.8 mcg/kg/hr while Group P, patients received propofol IV infusion at the rate of 100 mcg/kg/min, started after 10 minutes of intubation. Both the groups were induced with injection propofol 2mg/kg IV.

Result: Group D patients had stable control of hemodynamics and less blood loss over patients in Gr. P thus providing better surgical field visibility but group D patients had more incidence of bradycardia and delayed recovery in terms of postoperative sedation than Gr. P patients.

Conclusion: Dexmedetomidine offers significant advantages over propofol for controlled hypotensive anesthesia during FESS, providing superior hemodynamic control, reduced blood loss, improved surgical field quality, and enhanced patient satisfaction, despite longer recovery times and higher incidence of manageable bradycardia.

Keywords: Propofol, Dexmedetomidine, Functional Endoscopic Sinus Surgery.

DOI: 10.25258/ijcpr.18.8.223

Introduction

Functional endoscopic sinus surgery (FESS) has emerged as the gold standard surgical approach for the management of chronic rhinosinusitis and other sinonasal pathologies that are refractory to medical treatment. Providing a bloodless field in these patients is the topmost priority of anaesthetist as it may give a god surgical field. General anaesthesia causes stressor response leading to raised blood pressure and heart rate if adequate depth of anaesthesia and adequate analgesia is not obtained.

Various drugs have been tried to provide hypotensive anaesthesia in these patients. The present study aims to study the efficacy of dexmedetomidine and propofol in providing hypotensive anaesthesia for FESS surgery.

The optimization of anesthetic technique for FESS continues to evolve, with increasing emphasis on multimodal approaches that combine different pharmacological agents to maximize benefits while minimizing side effects. The combination of propofol or dexmedetomidine with other adjuvants such as remifentanil, esmolol, or magnesium sulfate may provide superior surgical conditions compared to monotherapy. Additionally, non-pharmacological strategies, including reverse Trendelenburg positioning, adequate preoperative preparation with corticosteroids and antibiotics, meticulous local vasoconstriction with topical agents, and use of advanced surgical technologies like microdebriders and powered instrumentation, contribute significantly to the overall quality of the surgical field. The relative contribution of anesthetic technique versus these adjunctive measures remains an area of ongoing investigation.

Despite the growing body of literature comparing various hypotensive techniques for FESS, significant knowledge gaps persist regarding the optimal agent selection for specific patient populations and surgical scenarios. Most existing studies have methodological limitations, including

small sample sizes, heterogeneous patient populations, varying surgical expertise, and inconsistent outcome measures. Furthermore, the majority of investigations have focused primarily on intraoperative conditions, with less attention to postoperative outcomes and patient-reported measures such as quality of recovery and satisfaction. There is a particular paucity of research examining long-term outcomes, including the potential impact of different hypotensive techniques on sinus healing, disease recurrence, and need for revision surgery.

Given these considerations, there is a compelling need for well-designed comparative studies evaluating the efficacy and safety of propofol versus dexmedetomidine for hypotensive anesthesia during FESS. Such investigations should employ standardized surgical and anesthetic protocols, utilize validated assessment tools for surgical field quality, quantify relevant perioperative outcomes, and incorporate patient-centered measures. Special attention should be directed to identifying patient and surgical factors that may influence the relative efficacy of these agents, potentially allowing for more personalized anesthetic approaches. Additionally, economic analyses comparing the cost-effectiveness of different hypotensive techniques would provide valuable information for institutional decision-making and resource allocation.

The present study aims to address these knowledge gaps by conducting a prospective, randomized comparison of propofol versus dexmedetomidine infusion for hypotensive anesthesia during FESS at a tertiary care center. By employing standardized protocols and comprehensive outcome assessments, this investigation seeks to provide robust evidence regarding the relative merits of these agents in the context of contemporary FESS practice. The findings may contribute to the development of evidence-based guidelines for anesthetic management during FESS, ultimately enhancing surgical conditions, improving patient outcomes, and optimizing resource utilization in this common but challenging surgical procedure.

Material and Methods

This Prospective observational study was conducted in Department of Anaesthesia at SRTR Government Medical College, Ambajogai. Study period was from July 2023 to June 2025.

Sample size: The sample size for this study was calculated based on previous similar studies and statistical considerations. Power analysis was performed using a significance level (alpha) of 0.05 and power (1-beta) of 0.8. Considering the primary outcome measure of mean arterial pressure (MAP) difference between the two groups, and assuming a standard deviation of 8 mmHg, a minimum sample size of 30 patients per group was determined to be necessary to detect a clinically significant difference of 6 mmHg between the groups.

The sample size was determined using the formula:

$$S = (Z^2 \times P \times Q) / E^2$$

Where:

- Z = Static corresponding to level of confidence
- P = Expected prevalence
- Q = 100 - P
- E = Precision (corresponding to effect size)

Inclusion Criteria

The following inclusion criteria were applied for patient selection:

1. Patients willing to participate and ready to give consent for the study.
2. Patients with American Society of Anesthesiologists (ASA) physical status I and II.
3. Both female and male patients.
4. Patients between 20-60 years of age.
5. All patients scheduled for functional endoscopic sinus surgery (FESS).

Exclusion Criteria

Patients with any of the following conditions were excluded from the study:

1. Patient's refusal to participate.
2. Patients with age less than 20 years or more than 60 years.
3. Patients with ASA grade III and IV.
4. Patients with known allergy to study drugs (propofol or dexmedetomidine).
5. Pregnant patients.
6. Patients with uncontrolled systemic illnesses such as diabetes mellitus, hypertension, and chronic obstructive pulmonary disease.

Methodology: Prior approval was obtained from the Institutional Ethics Committee. All patients provided written informed consent before participation in the study.

All patients underwent a thorough pre-anesthetic evaluation including detailed history, clinical examination, and relevant laboratory investigations. Patients' demographic profiles were recorded, including age, gender, weight, and height. Baseline vital parameters including blood pressure, heart rate, peripheral oxygen saturation (SpO2), and respiratory rate were documented. Patients were kept nil by mouth for 8 hours prior to surgery.

On the day of surgery, after arrival in the operating theatre, standard monitoring was established with electrocardiogram (ECG), non-invasive blood pressure, pulse oximetry, and capnography.

Baseline recordings of vital parameters such as systolic blood pressure, diastolic blood pressure, mean arterial pressure (MAP), heart rate, and SpO2 were noted. An intravenous line was secured, and Ringer's lactate solution was started.

All patients received premedication with tablet pantoprazole 40 mg and tablet alprazolam 0.25 mg the night before surgery. In the pre-operating room, patients were explained about the procedure and the interpretation of the numeric rating scale. On arrival in the operating room, intravenous access was obtained, and baseline recordings of vital parameters were noted.

Patients were randomly allocated into two groups:

- Group D: Patients receiving dexmedetomidine infusion
- Group P: Patients receiving propofol infusion

All patients were pre-medicated with intravenous glycopyrrolate 0.2 mg. Sedation was provided with intravenous midazolam 0.03 mg/kg and fentanyl citrate 2 mcg/kg after preoxygenation for 3 minutes. Anesthesia was induced with propofol 2 mg/kg and maintained with 50% nitrous oxide in oxygen and isoflurane. Neuromuscular blockade was achieved with vecuronium bromide 0.1 mg/kg to facilitate endotracheal intubation.

In Group D, patients received dexmedetomidine IV infusion at the rate of 1 mcg/kg/hr as a loading dose over 10 minutes after intubation, followed by a maintenance infusion of 0.4-0.8 mcg/kg/hr. In Group P, patients received propofol IV infusion at the rate of 100 mcg/kg/min, started after 10 minutes of intubation.

Deliberate hypotension was maintained by titration of isoflurane (0.5-2%) to maintain the MAP within the target range of 60-65 mmHg. The concentration of isoflurane was recorded in volume percentage every 15 minutes during the surgery. Monitoring included SpO2, heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and ECG. These measurements were recorded preoperatively, post-induction of anesthesia, during the hypotensive stage every 15 minutes throughout the surgery.

When the MAP reached the desired range of 60-65 mmHg, the surgeon assessed the quality of the surgical field using the 6-point scale of Fromme et al., depending on bleeding occurring at the operative site. Ten minutes before the end of surgery, anesthesia, propofol, and dexmedetomidine infusions were discontinued. After surgery, the residual neuromuscular blockade was antagonized with neostigmine 0.05 mg/kg and glycopyrrolate 0.008 mg/kg. Patients were extubated after observing adequate motor recovery and spontaneous breathing efforts.

Patients were transferred to the post-anesthesia care unit for observation of any respiratory depression, hemodynamic changes, nausea, vomiting, muscle stiffness, shivering, or other drug-induced side effects. Side effects such as nausea, vomiting, bradycardia (HR <45/min), and hypotension (MAP <60 mm Hg) were recorded. Bradycardia was treated with intravenous atropine 0.6 mg, while hypotension was managed with intravenous mephenteramine. Hypertension was treated according to standard protocols.

The quality of the surgical field was assessed by the operating surgeon using the Fromme scale, where 0 represented no bleeding, 1 represented slight bleeding without suctioning of blood, 2 represented slight bleeding with occasional suctioning, 3 represented slight bleeding with frequent suctioning, 4 represented moderate bleeding with frequent suctioning, and 5 represented severe bleeding that hindered surgical progress.

Other parameters recorded included the time taken for the procedure, duration of analgesia, timing of the first dose of rescue analgesic, total dose of analgesics required, and any complications encountered during or after the procedure.

Statistical Analysis: Data was entered in excel sheet and analyzed using SPSS version 21. Results were presented in tabular and graphical forms Mean, median, standard deviation and ranges were calculated for quantitative data. Qualitative data were expressed in terms of frequency and percentages. Student t test (Two Tailed) was used to test the significance of mean and P value <0.05 was considered significant.

Results

Total of 60 patients with 30 in each group were considered for the study:

- **Dexmeditomedine group**:30 patients
- **Propofol group**: 30 patients

Following are the results of the study: The mean age was 37.33 ± 12.15 years in the dexmedetomidine group compared to 41.17 ± 10.34 years in the propofol group, with no statistically significant difference (p=0.193). The age categories show that the dexmedetomidine group had more patients in the 20-30 years category (36.7% vs 13.3%), while the propofol group had more patients in the 31-40 years category (33.3% vs 16.7%). However, the overall age distribution was not significantly different between groups (p=0.170), indicating successful randomization.

In the dexmedetomidine group, there were 13 males (43.3%) and 17 females (56.7%), while the propofol group had 16 males (53.3%) and 14 females (46.7%). The difference in gender

distribution was not statistically significant (p=0.438), confirming balanced randomization between the two treatment groups.

Both groups had nearly identical mean BMI values: 22.41 ± 1.98 kg/m² in the dexmedetomidine group and 22.39 ± 2.10 kg/m² in the propofol group (p=0.975). All patients in the dexmedetomidine group (100%) had normal BMI, while 96.7% of the propofol group had normal BMI, with only one patient being overweight. This homogeneity in BMI ensures that body habitus did not confound the study results.

Table 1: ASA Physical Status

ASA Status, n (%)	Dexmedetomidine Group (n=30)	Propofol Group (n=30)	p-value
ASA I	18 (60.0%)	18 (60.0%)	1.000
ASA II	12 (40.0%)	12 (40.0%)	

Both groups had identical distributions with 18 patients (60.0%) classified as ASA I and 12 patients (40.0%) as ASA II in each group (p=1.000). This perfect matching indicates that the baseline health status of patients was equivalent between groups, eliminating this potential confounding variable.

Table 2: Baseline Hemodynamic Parameters

Variable (Mean ± SD)	Dexmedetomidine Group (n=30)	Propofol Group (n=30)	p-value
Baseline HR (bpm)	76.77 ± 6.25	75.33 ± 6.96	0.402
Baseline SBP (mmHg)	120.87 ± 9.01	122.13 ± 7.81	0.565
Baseline DBP (mmHg)	81.90 ± 7.69	81.43 ± 6.96	0.806
Baseline MAP (mmHg)	94.90 ± 6.16	96.90 ± 4.89	0.169
Baseline SpO_2 (%)	98.30 ± 1.26	98.60 ± 1.10	0.331

All baseline measurements were comparable between groups: heart rate (76.77 ± 6.25 vs 75.33 ± 6.96 bpm, p=0.402), systolic blood pressure (120.87 ± 9.01 vs 122.13 ± 7.81 mmHg, p=0.565), diastolic blood pressure (81.90 ± 7.69 vs 81.43 ± 6.96 mmHg, p=0.806), mean arterial pressure (94.90 ± 6.16 vs 96.90 ± 4.89 mmHg, p=0.169), and oxygen saturation (98.30 ± 1.26 vs 98.60 ± 1.10%, p=0.331). These non-significant differences confirm that both groups started with similar cardiovascular status.

The mean duration of surgery was 89.70 ± 23.10 minutes in the Dexmedetomidine group compared to 82.60 ± 24.74 minutes in the propofol group, with no statistically significant difference (p=0.255). The surgical time ranged from 45-120 minutes in both groups, indicating that the complexity and duration of procedures were similar between groups.

Table 3: Intraoperative Hemodynamic Parameters

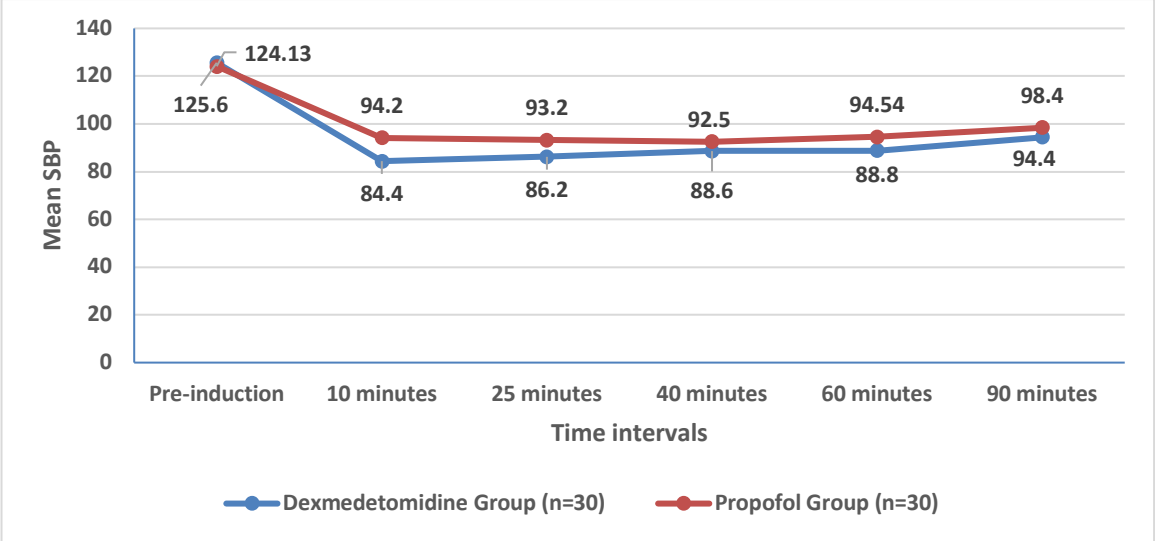
Variable (Mean ± SD)	Dexmedetomidine Group (n=30)	Propofol Group (n=30)	p-value
Average Intraoperative SBP (mmHg)	92.8 ±3.45	95.4±2.52	**0.002***
Average Intraoperative DBP (mmHg)	53.57±3.25	55.9±2.99	**0.005***
Average Intraoperative MAP (mmHg)	66.65±1.51	69.06±1.52	**<0.001***
Average Intraoperative HR (bpm)	64.90 ± 6.31	76.50 ± 8.93	**<0.001***
Average Intraoperative SpO_2 (%)	98.30 ± 1.18	98.23 ± 1.19	0.829

*statistically significant

The Dexmedetomidine group achieved significantly lower average intraoperative values compared to the propofol group: systolic blood pressure (92.8 ± 3.45 vs 95.4 ± 2.52 mmHg, p=0.002), diastolic blood pressure (53.57 ± 3.25 vs 55.9 ± 2.99 mmHg, p=0.005), mean arterial pressure (66.65 ± 1.51 vs 69.06 ± 1.52 mmHg, p<0.001), and heart rate (64.90 ± 6.31 vs 76.50 ± 8.93 bpm, p<0.001). Oxygen saturation remained similar in both groups (98.30 ± 1.18 vs 98.23 ± 1.19%, p=0.829). These results demonstrate that dexmedetomidine provided more effective controlled hypotension.

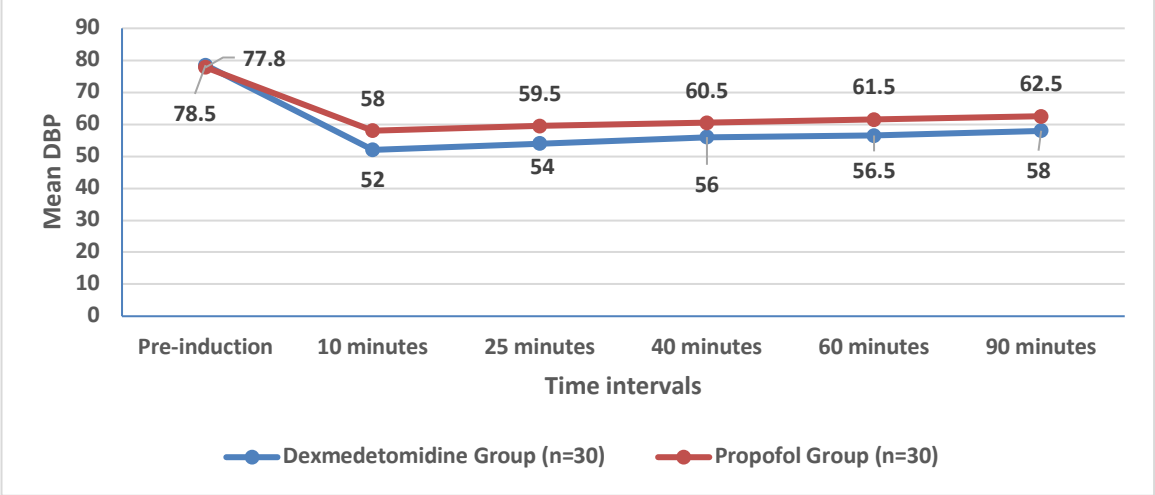
The time to achieve target mean arterial pressure was significantly longer in the dexmedetomidine group (14.87 ± 3.07 minutes) compared to the propofol group (12.40 ± 3.91 minutes, p=0.009). However, the isoflurane concentration required was similar between groups (0.8 ± 0.16% vs 0.8 ± 0.16%, p=0.4), indicating that both agents allowed for comparable anesthetic management once target pressures were achieved.

The mean SBP at pre-induction was comparable in both groups (p > 0.05). A significant fall in SBP was observed at 10 minutes in the Dexmedetomidine group compared to the Propofol group. Thereafter, SBP remained consistently lower in the Dexmedetomidine group at all intraoperative intervals with statistically significant differences.



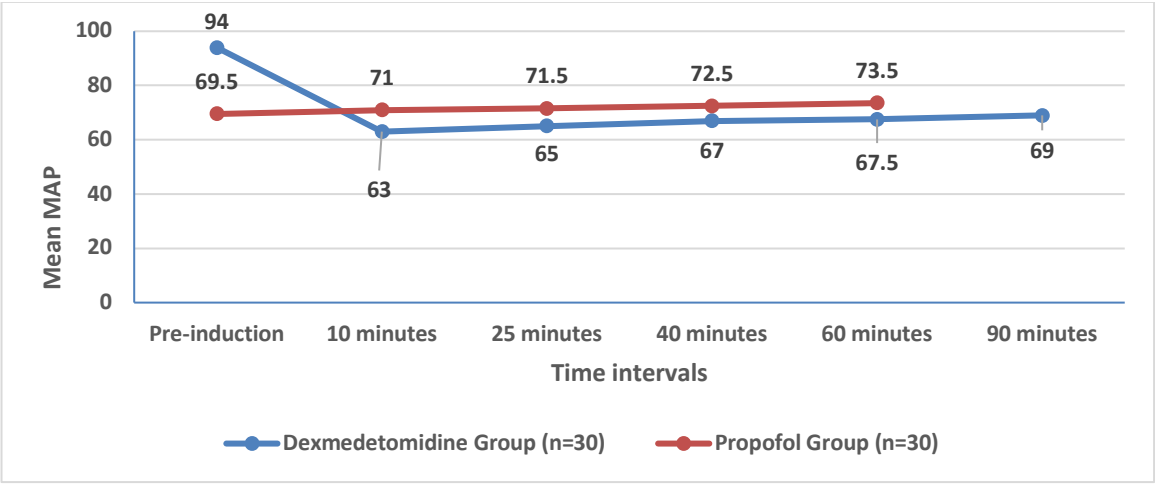
Graph 1: Systolic Blood Pressure (SBP) Over Time (mmHg)

The DBP values at pre-induction were comparable between both groups ($p > 0.05$). However, from 10 minutes onward, Dexmedetomidine produced significantly lower DBP compared to Propofol.



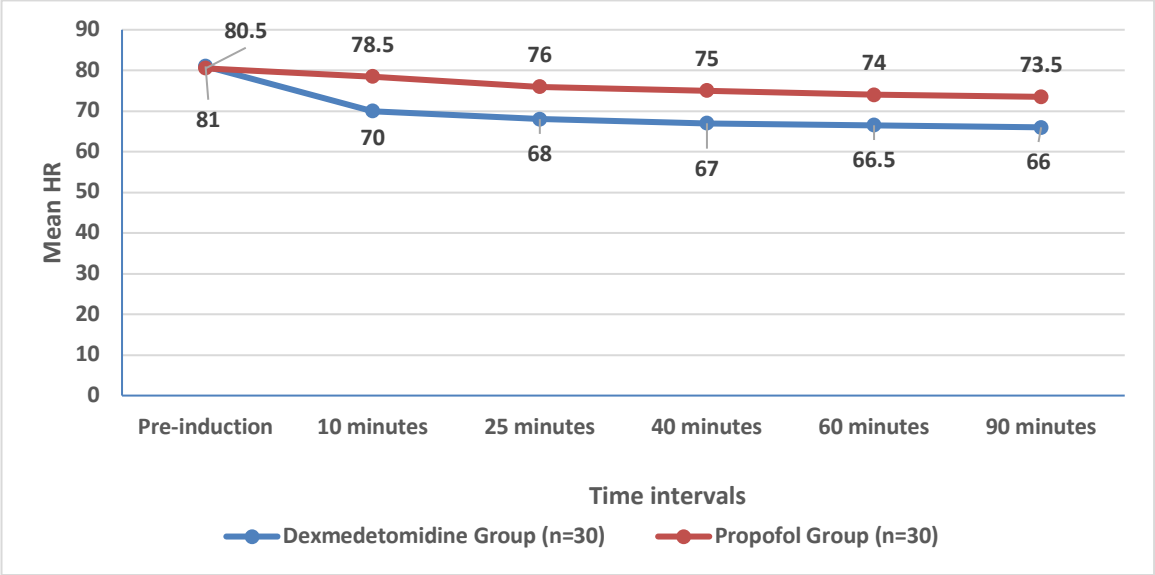
Graph 2: Diastolic Blood Pressure (DBP) Over Time (mmHg)

MAP values were comparable at baseline. Dexmedetomidine showed a significantly lower MAP from 10 minutes onwards compared to Propofol.



Graph 3: Mean Arterial Pressure (MAP) Over Time (mmHg)

HR values were comparable at pre-induction. Dexmedetomidine showed significantly lower HR compared to Propofol at all intraoperative intervals.



Graph 4: Heart Rate (HR) Over Time (beats/min)

Table 4: Surgical Field Quality Assessment

Surgeon's Assessment (Fromme Scale), n (%)	Dexmedetomidine Group (n=30)	Propofol Group (n=30)	p-value
Score 0 (No bleeding)	3 (10.0%)	0 (0.0%)	**<0.001**
Score 1 (Slight bleeding, no suction)	17 (56.7%)	6 (20.0%)	
Score 2 (Slight bleeding, occasional suction)	10 (33.3%)	10 (33.3%)	
Score 3 (Slight bleeding, frequent suction)	0 (0.0%)	14 (46.7%)	

*statistically significant

The dexmedetomidine group demonstrated significantly superior surgical field quality ($p<0.001$). In the dexmedetomidine group, 10.0% of patients had no bleeding (Score 0) and 56.7% had slight bleeding with no suction required (Score 1), while no patients in the propofol group achieved Score 0, and only 20.0% achieved Score 1. Conversely, 46.7% of propofol patients required frequent suction due to bleeding (Score 3) compared to none in the dexmedetomidine group.

Table 4 quantifies intraoperative blood loss, showing significantly less blood loss in the dexmedetomidine group (84.20 ± 18.90 mL) compared to the propofol group (118.00 ± 19.95 mL, $p<0.001$). This 28.6% reduction in blood loss correlates with the improved surgical field quality observed in Table 9 and demonstrates the clinical superiority of dexmedetomidine for achieving effective controlled hypotension.

The dexmedetomidine group had significantly longer recovery time (14.80 ± 3.36 vs 9.23 ± 2.53 minutes, $p<0.001$) and extubation time (8.23 ± 2.92 vs 5.57 ± 2.01 minutes, $p<0.001$) compared to the propofol group. This delayed emergence is a known characteristic of dexmedetomidine but represents a trade-off for the superior intraoperative hemodynamic control.

The majority of patients in both groups experienced no PONV (80.0% in dexmedetomidinevs 93.3% in propofol group). The dexmedetomidine group had slightly more patients with moderate nausea/vomiting (16.7% vs 3.3%), but the overall difference was not statistically significant ($p=0.303$), suggesting both agents have acceptable PONV profiles.

Table 5: Cardiovascular Complications

Variable	Dexmedetomidine Group (n=30)	Propofol Group (n=30)	p-value
Bradycardia (HR <45/min), n (%)	11 (36.7%)	2 (6.7%)	**0.005***
Hypotension requiring intervention, n (%)	1 (3.3%)	3 (10.0%)	0.301
Hypertension episodes, n (%)	1 (3.3%)	1 (3.3%)	1.000

*statistically significant

Bradycardia (heart rate <45/min) occurred significantly more frequently in the dexmedetomidine group (36.7%) compared to the propofol group (6.7%, p=0.005). However, hypotension requiring intervention was actually less common in the dexmedetomidine group (3.3% vs 10.0%, p=0.301), and hypertensive episodes were equally rare in both groups (3.3% each). The higher incidence of bradycardia with dexmedetomidine is expected due to its mechanism of action.

The propofol group had a higher incidence of postoperative shivering (23.3%) compared to the dexmedetomidine group (6.7%), though this difference did not reach statistical significance (p=0.071). This trend suggests that dexmedetomidine may provide better postoperative comfort by reducing shivering.

The time to first analgesic requirement was significantly longer in the dexmedetomidine group (69.43 ± 16.96 minutes) compared to the propofol group (46.77 ± 11.67 minutes, p<0.001). This 48.4% increase in time to first analgesic requirement indicates that dexmedetomidine provides superior postoperative analgesia, likely due to its analgesic properties beyond its sedative effects.

Table 6: PACU Stay Duration

Length of PACU Stay (minutes)	Dexmedetomidine Group (n=30)	Propofol Group (n=30)	p-value
Mean ± SD	42.70 ± 8.71	32.43 ± 10.41	**<0.001**
Range	18-62	18-62	

*statistically significant

Patients in the dexmedetomidine group required significantly longer PACU monitoring (42.70 ± 8.71 minutes) compared to the propofol group (32.43 ± 10.41 minutes, p<0.001). This extended PACU stay of approximately 32% longer is consistent with the delayed emergence characteristics of dexmedetomidine.

Table 7: Patient Satisfaction Scores

Patient Satisfaction Score (1-5), n (%)	Dexmedetomidine Group (n=30)	Propofol Group (n=30)	p-value
Score 3 (Satisfactory)	0 (0.0%)	13 (43.3%)	**<0.001**
Score 4 (Good)	18 (60.0%)	8 (26.7%)	
Score 5 (Excellent)	12 (40.0%)	9 (30.0%)	

*statistically significant

The dexmedetomidine group showed significantly higher satisfaction levels (p<0.001), with 60.0% rating their experience as "Good" (Score 4) and 40.0% as "Excellent" (Score 5), while no patients rated it as merely "Satisfactory" (Score 3). In contrast, the propofol group had 43.3% rating their experience as "Satisfactory," 26.7% as "Good," and 30.0% as "Excellent." This superior patient satisfaction in the dexmedetomidine group likely reflects the better analgesic effect and reduced shivering, despite the longer recovery times.

Discussion

Our study demonstrated excellent matching between the dexmedetomidine and propofol groups regarding demographic variables, anthropometric measurements, and baseline hemodynamic parameters. The mean age distribution (37.33 ± 12.15 years in the dexmedetomidine group vs. 41.17 ± 10.34 years in the propofol group) was comparable to that reported in similar studies. Gupta et al.[2] reported a similar age distribution in their comparative study of 80 patients undergoing FESS, with no significant difference between dexmedetomidine and propofol groups (p = 0.193). The homogeneous patient population in terms of ASA physical status (60% ASA I and 40% ASA II in both groups) ensured that confounding variables related to patient comorbidities were minimized, thereby enhancing the validity of our comparative analysis.

Hemodynamic Stability and Control: One of the most significant findings of our study was the superior hemodynamic control achieved with dexmedetomidine compared to propofol. The dexmedetomidine group demonstrated significantly lower average intraoperative systolic blood pressure (92.8 ± 3.45 mmHg vs. 95.4 ± 2.52 mmHg, p = 0.002), diastolic blood pressure (53.57 ± 3.25 mmHg vs. 55.9 ± 2.99 mmHg, p = 0.005), mean arterial pressure (66.65 ± 1.51 mmHg vs. 69.06 ± 1.52 mmHg, p < 0.001), and heart rate (64.90 ± 6.31 bpm vs. 76.50 ± 8.93 bpm, p < 0.001) throughout the surgical procedure.

These findings are consistent with recent meta-analytical evidence. Warner et al.[3] conducted a systematic review and meta-analysis specifically examining dexmedetomidine's role in surgical field visibility during nasal surgery. Their analysis demonstrated that dexmedetomidine significantly improved surgical field visibility and reduced blood

loss volume compared with placebo and propofol, concluding that dexmedetomidine is a viable and useful agent for controlled hypotension in nasal surgery.

The superior hemodynamic control observed with dexmedetomidine can be attributed to its unique mechanism of action. As a highly selective α2-adrenergic receptor agonist, dexmedetomidine exerts its hypotensive effects through central sympatholysis in the locus coeruleus and peripheral α2B-adrenergic receptors in vascular smooth muscle.[4]

Intraoperative Blood Loss and Surgical Field Quality: Our study demonstrated a statistically significant reduction in intraoperative blood loss in the dexmedetomidine group compared to the propofol group (84.20 ± 18.90 mL vs. 118.00 ± 19.95 mL, $p < 0.001$). This 28.7% reduction in blood loss represents a clinically meaningful improvement that directly translates to enhanced surgical conditions and potentially improved patient outcomes.

The superior surgical field quality achieved with dexmedetomidine was evident in the distribution of Fromme scale scores. The dexmedetomidine group had a significantly higher proportion of patients with minimal bleeding (66.7% with scores 0-1) compared to the propofol group (20.0% with scores 0-1, $p < 0.001$). Conversely, 46.7% of patients in the propofol group required frequent suction (score 3) compared to none in the dexmedetomidine group.

These findings align with several recent studies examining dexmedetomidine's efficacy in FESS. Bafna et al.[5] compared dexmedetomidine with clonidine for induced hypotension during FESS and found that both agents provided effective controlled hypotension, with dexmedetomidine offering superior hemodynamic stability.

Time to Achieve Target Mean Arterial Pressure: Target map for the hypotensive anaesthesia in fess surgery can be achieved by attaining MAP in the range of 60 to 65mmhg. An important finding of our study was that dexmedetomidine required a significantly longer time to achieve target MAP compared to propofol (14.87 ± 3.07 minutes vs. 12.40 ± 3.91 minutes, $p = 0.009$). This finding reflects the pharmacokinetic differences between the two agents and has practical implications for anesthetic management during FESS.

The longer onset time with dexmedetomidine is consistent with its pharmacokinetic profile, characterized by an onset of action of 5-10 minutes when administered intravenously.[6]This contrasts with propofol's rapid onset of action within 30-60 seconds.

Recovery Characteristics and Complications: Our study revealed significant differences in recovery profiles between the two groups. The dexmedetomidine group demonstrated prolonged recovery time (14.80 ± 3.36 minutes vs. 9.23 ± 2.53 minutes, $p < 0.001$) and extubation time (8.23 ± 2.92 minutes vs. 5.57 ± 2.01 minutes, $p < 0.001$) compared to the propofol group. These findings are consistent with the pharmacological properties of dexmedetomidine, particularly its longer elimination half-life of approximately 2-3 hours compared to propofol's rapid redistribution and metabolism.

Similar recovery patterns have been reported in other studies. Lee et al.[7] compared dexmedetomidine with remifentanil for controlled hypotension during endoscopic sinus surgery and found that although both agents enabled effective hypotensive anesthesia, recovery was faster with remifentanil than with dexmedetomidine in the immediate postoperative period. However, they noted that the prolonged recovery with dexmedetomidine was associated with better sedation scores and reduced agitation, which can be advantageous in the postoperative period.

Cardiovascular Complications: The incidence of bradycardia was significantly higher in the dexmedetomidine group (36.7% vs. 6.7%, $p = 0.005$), which aligns with the expected pharmacological effects of α2-adrenergic receptor agonists. This finding is consistent with multiple studies reporting bradycardia as the most common side effect of dexmedetomidine. A large-scale systematic review by Nguyen et al.[8] examining dexmedetomidine versus propofol in cardiac surgery patients found similar patterns, with dexmedetomidine associated with higher rates of bradycardia but shorter extubation times and ICU stays.

Postoperative Analgesia and Patient Comfort: A significant advantage observed with dexmedetomidine was the prolonged time to first analgesic requirement (69.43 ± 16.96 minutes vs. 46.77 ± 11.67 minutes, $p < 0.001$). This finding reflects dexmedetomidine's inherent analgesic properties, which are mediated through activation of α2-adrenergic receptors in the dorsal horn of the spinal cord and supraspinal structures.[9]

Patient Satisfaction: The patient satisfaction scores were significantly higher in the dexmedetomidine group, with 100% of patients reporting either good or excellent satisfaction compared to 56.7% in the propofol group ($p < 0.001$). This superior patient satisfaction can be attributed to multiple factors, including better hemodynamic stability, reduced bleeding, enhanced postoperative analgesia, and potentially reduced emergence agitation.

The correlation between dexmedetomidine use and improved patient satisfaction has been documented in various surgical settings. The anxiolytic properties of dexmedetomidine, combined with its analgesic effects and lack of respiratory depression, contribute to a more comfortable perioperative experience for patients.[10]

In our study we found that dexmedetomidine provided a better control of hemodynamics intraoperatively providing bloodless field and better surgical visualisation. The only concern with dexmedetomidine was bradycardia and prolonged postoperative sedation which could be of concern.

Conclusion

This study establishes dexmedetomidine as the preferred agent for controlled hypotensive anesthesia during FESS, offering superior surgical conditions, enhanced patient safety, and improved satisfaction compared to propofol. The findings support the routine use of dexmedetomidine in patients undergoing FESS, with appropriate monitoring for bradycardia and planning for slightly prolonged recovery times. Future research should focus on optimizing dosing protocols and exploring combination techniques to further enhance the benefits while minimizing the limitations associated with dexmedetomidine use.

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