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ORIGINAL ARTICLE

Dexmedetomidine versus Esmolol Efficacy for Bloodless Field and Outcome during Functional Endoscopic Sinus Surgery: A Prospective Randomized Trial

Eslam Elbayoumi*, Ashraf Eskandr, Ayman Rady, Wafiya Mahdy

Anesthesiology, Intensive Care and Pain Management Department, Faculty of Medicine, Menoufia University, Shebin El-Kom, Egypt

*Corresponding author:

Eslam Elbayoumi

Email:

essooo2689@gmail.com

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ABSTRACT

Background: Functional Endoscopic Sinus Surgery (FESS) is commonly performed to treat chronic rhinosinusitis, where a clear, bloodless surgical field is essential for optimal visualization and surgical accuracy. This study aimed to compare Dexmedetomidine and Esmolol in achieving optimal surgical field visibility during FESS as the primary outcome, and to evaluate secondary outcomes, including intraoperative hemodynamics, postoperative sedation, analgesia, and surgeon satisfaction

Methods: Between September 2023 and December 2024, a prospective, triple-blind, randomized trial was conducted at Menoufia University Hospitals. Adult patients (ASA I–II, ages 18–65) scheduled for elective FESS were enrolled. Participants were randomly assigned to receive either dexmedetomidine (Group D) or esmolol (Group E) to maintain surgical field visibility. Intraoperative and postoperative parameters, including hemodynamics, analgesic requirements, recovery scores, time to emergence, and surgical field quality, were recorded and analyzed

Results: Out of 69 screened patients, 52 were enrolled and evenly divided between the two groups. Demographic characteristics, anesthesia duration, and blood loss were comparable. However, Group D exhibited significantly lower heart rates and mean arterial pressures at various intra- and postoperative intervals, indicating superior hemodynamic stability ($P < 0.05$).

Conclusion: Dexmedetomidine proved more effective than esmolol in achieving and maintaining surgical field visibility during FESS. It improved hemodynamic stability, surgeon satisfaction, sedation, and pain management, while slightly prolonging recovery time. Overall, dexmedetomidine offered a smoother and equally safe perioperative profile, supporting its use for enhanced surgical and patient outcomes in FESS.

Keywords: Surgical field visibility, Dexmedetomidine, Esmolol, Functional Endoscopic Sinus Surgery, Hemodynamic Stability.

INTRODUCTION

FESS, or functional endoscopic sinus surgery, is now a common procedure. Since its introduction, surgical dissection has undergone significant improvements due to advancements in illumination and vision. Intraoperative bleeding remains a significant challenge, often affecting both operative time and outcomes. Pharmacologic agents such as dexmedetomidine and esmolol are frequently used to increase surgical field visibility by inducing controlled hypotension. However, severe bleeding can cause reduced eyesight, leading to serious problems [1].

In addition to making an operation more difficult to observe, small bleeding areas might spread to neighboring structures. Deliberate hypotension that lowers the mean arterial pressure (MAP) in individuals with normal blood pressure between 55 and 65 mmHg while under general anesthesia with a variety of pharmaceutical medications reduces blood loss during various procedures [2].

Intraoperative hypotension, also referred to as profound, induced, permissive, or deliberate hypotension, is characterized by the deliberate lowering of systolic blood pressure (SBP) to

80–90 mmHg or mean arterial pressure (MAP) to 55–65 mmHg in patients with normal baseline blood pressure. There is ongoing debate regarding the safe and acceptable degree of BP reduction, particularly in patients with preexisting hypertension, for whom a drop of approximately 30% from baseline has been suggested [3].

Many of the commonly used hypotensive agents are associated with undesirable side effects, such as atrioventricular blocks, rebound hypertension, tachyphylaxis, sedation, delayed postoperative recovery, and excessive vasodilation, as seen with halogenated anesthetics, nitrates, and beta-blockers. This highlights the need to explore alternative hypotensive medications that can avoid these limitations. [4].

Esmolol, an ultrashort-acting β 1-selective adrenergic blocker, reduces both heart rate and blood pressure by lowering cardiac output ⁽¹⁾. When administered via intravenous bolus or continuous infusion, it acts rapidly. Following the cessation of infusion, arterial pressure gradually returns to baseline without causing rebound hypertension. This property allows for a controlled and stable hypotensive state, which can improve blood conservation and facilitate surgical procedures [5].

Dexmedetomidine is a selective α 2-agonist that sedates, relieves pain, reduces anesthetic needs, and lowers blood pressure, heart rate, and sympathetic activity in a dose-dependent manner. [6]. In prior research on tympanoplasty, septoplasty, and maxillofacial surgery, DEX was found to be effective in improving surgical results and minimizing blood loss under managed hypotension. Due to its sedative, analgesic, and anxiolytic properties, it has also been widely accepted for induced hypotension [7].

This study aims primarily to compare Dexmedetomidine and Esmolol regarding surgical field visibility during FESS, assessed using the Fromme-Boezaart grading system. Secondary outcomes include intraoperative hemodynamic stability (heart rate and mean arterial pressure), surgeon satisfaction, postoperative sedation (Ramsay Sedation Scale), pain scores (VAS), emergence time,

recovery (Aldrete score), and incidence of complications.

METHODS

A prospective, randomized, triple-blind clinical trial was carried out at Menoufia University Hospitals between September 2023 and December 2024. All participants provided written informed permission after ethics approval (IRB 6/2023ANET50).

Adult patients of either sex between the ages of 18 and 65 who were receiving elective FESS and had an ASA physical status of I or II were taken into consideration. Recurrent sinus surgery, severe cardiac, renal, hepatic, or neurological disease, coagulopathy, or a history of allergy to the study medication were among the exclusion criteria.

Randomization and Allocation

Concealment:

To ensure proper randomization and allocation concealment, a computer-generated random sequence was used to assign patients to either Group D (dexmedetomidine) or Group E (esmolol). Allocation was concealed using sequentially numbered, sealed opaque envelopes, which were opened only after patient enrollment. The trial was triple-blinded: patients, outcome assessors, and the anesthesiologist administering the study drug were all blinded to group assignments. To maintain blinding, the study medication was prepared by a nonclinical pharmacist who was not involved in patient care or data collection.

Primary outcome:

The primary outcome of this study was surgical field visibility during FESS, assessed using the Fromme-Boezaart grading system.

Secondary outcomes: Secondary outcomes included intraoperative hemodynamic stability (heart rate and mean arterial pressure), estimated blood loss, surgeon satisfaction, emergence time, postoperative sedation measured by the Ramsay Sedation Scale, pain scores measured by the Visual Analog Scale (VAS), recovery assessed by Aldrete score, and the incidence of postoperative complications (hypotension, bradycardia, nausea, and vomiting).

Intervention and protocol

Group D got dexmedetomidine (1 µg/kg load, then 0.4–0.8 µg/kg/h), Group E got esmolol (1 mg/kg bolus, then 0.4–0.8 mg/kg/h), both titrated to MAP 55–65 mmHg; nitroglycerin was added if the target MAP wasn't achieved.

Every patient underwent standard preoperative evaluations, which included regular laboratory testing, physical examinations, and medical histories. In accordance with normal anesthesia guidelines, fast regulations were implemented. ECG, pulse oximetry, temperature probes, non-invasive blood pressure monitors, and arterial catheterization for invasive blood pressure and blood gas investigations were used to monitor each patient throughout the procedure.

Before the operation, patients received intravenous midazolam at a dose of 0.05 µg/kg to reduce anxiety. Induction of anesthesia was achieved with propofol (2 µg/kg) together with fentanyl (2 µg/kg). Atracurium at 0.5 mg/kg was administered to facilitate endotracheal intubation. Anesthesia was sustained using sevoflurane concentrations ranging from 1% to 4%, while mechanical ventilation was delivered with a 60% mixture of air and oxygen, adjusted to maintain normal carbon dioxide levels. To optimize venous return, the surgical position was adjusted to a 15° reverse Trendelenburg tilt. According to protocol, hemodynamic instability was controlled. Atropine (10 µg/kg) was used to treat bradycardia (HR <50 bpm), and a 50% decrease in the study medication infusion rate caused hypotension (MAP <55 mmHg). Ephedrine was used to treat refractory hypotension (5–10 mg bolus IV). If the MAP was higher than 70 mmHg, nitroglycerine (0.5 µg/kg/min) was given.

Five minutes before the anticipated end of the surgery, esmolol or dexmedetomidine infusions were discontinued. After reversing neuromuscular blockade and stopping sevoflurane, the patient was ready to be extubated and taken to the Post-Anesthetic Care Unit (PACU).

Patients' vital signs, breathing condition, and level of awareness were tracked in the PACU. The Visual Analogue Scale (VAS) was used to measure pain⁽⁸⁾. Every eight hours, 30 mg of

IV ketorolac and 1 g of IV paracetamol were given as part of a multimodal analgesic regimen. If VAS ≥4, rescue analgesia was given via IV morphine at a dose of 0.05–0.1 mg/kg.

Data collection and outcome measurements timing

Demographic information such as age, sex, BMI, and ASA physical status was among the data gathered. Intraoperative information, such as the duration of anesthesia (minutes) and the injection of atropine or nitroglycerine.

At baseline, following the loading dose of the study drug, after induction, after intubation, five minutes after intubation, at an intraoperative interval of five minutes (average intraoperatively), after reversal, after extubation, five minutes after extubation, at PACU, two, four, and six hours postoperatively, hemodynamic parameters such as MAP and heart rate were measured.

The Fromme-Boezaart grading system was used to evaluate the surgical field's quality (0 = no bleeding to 5 = unmanageable hemorrhage)⁽⁹⁾. On a 4-point scale⁽¹⁰⁾, the surgeon's happiness with surgical visibility was likewise rated from poor (1) to outstanding (4). A measurement of the estimated blood loss (ml) was made. [10],

Recovery information, like the time it took to emerge from anesthesia to extubation and PACU discharge preparedness, was measured. For 60 minutes, an anesthetist who was "blind" to the patient groups evaluated recovery using the Aldrete score every 15 minutes⁽¹¹⁾. Muscle activity, respiration, circulation, awareness, and oxygen saturation are the five main parameters that are assessed; each is given a score between 0 and 2. Generally speaking, a total score of 9 or 10 denotes discharge readiness.

Additionally, patients were monitored at regular intervals during the first postoperative hour, specifically at 15, 30, and 60 minutes after extubation. The Ramsay Sedation Scale was used to measure sedation, grading patient alertness from 1 (restless and agitated) to 6 (unresponsive to voice commands). [12],

Immediately following surgery, as well as 2, 4, 6, 12, and 24 hours later, postoperative pain

was measured using the VAS at the PACU. The duration until the initial request for an analgesic was noted, and the total amount of morphine consumed was evaluated to determine the efficacy of the painkiller. Bradycardia, nausea, vomiting, and hypotension were among the postoperative complications that were assessed.

Sample Size Calculation

Based on earlier research Shams et al., showing a 30% decrease in MAP when dexmedetomidine and esmolol were administered for elective FESS, the sample size was determined. 52 patients in total (26 in each group) were found to offer 80% statistical power with a 95% confidence level ($\alpha = 0.05$) using the Statistics and Sample Size Pro tool version 6. [1],

Statistical Analysis:

Data were analyzed using SPSS v27. Normality was assessed with Shapiro-Wilk's test and histograms. Parametric data were expressed as mean $\pm$ SD and compared with unpaired t-tests, while non-parametric data were reported as median (IQR) and compared using the Mann-Whitney test. Categorical variables were presented as frequencies (%) and analyzed with Chi-square or Fisher's exact tests. A two-tailed $P \leq 0.05$ indicated statistical significance.

RESULTS:

69 patients were evaluated for eligibility in this study. Eight patients declined to participate, and nine patients did not fit the requirements. Two equal groups of 26 patients each were randomly selected from the remaining patients. Every patient who was assigned was tracked down and subjected to statistical analysis (**Figure 1**).

Age, sex, BMI, and ASA status did not significantly differ between groups D and E, which were similar in all baseline and intraoperative parameters. The usage of atropine and nitroglycerin varied slightly, but these changes were not statistically significant. (**Table 1**).

HR and MAP between Group D and Group E at several perioperative time points. Both groups started with similar baseline HR and MAP. After the loading dose, Group D showed

significantly lower HR and MAP, indicating a stronger hemodynamic depressant effect. This difference remained throughout anesthesia induction, intubation, intraoperative, and early postoperative periods. Group D's consistently lower HR and MAP suggest better intraoperative stability and prolonged effects of the intervention on hemodynamics (**Table 2**).

The mean estimated blood loss was 127.12 ± 29.49 ml in Group D (Dexmedetomidine) and 134.12 ± 31 ml in Group E (Esmolol). Although Group D showed slightly lower blood loss, the difference was not statistically significant ($P = 0.408$), indicating that both agents were comparable in achieving controlled intraoperative bleeding. Bleeding severity and estimated blood loss were comparable between groups D and E, with no significant differences. Surgeon satisfaction was significantly higher in group D, with more cases rated as excellent compared to group E ($p = 0.011$). Overall, group D showed better surgical satisfaction despite similar bleeding outcomes. (**Table 3**).

Group D (Dexmedetomidine) demonstrated significantly longer emergence times compared to Group E (Esmolol), with mean times of 8.69 ± 1.12 minutes versus 5.04 ± 0.77 minutes, respectively ($P < 0.001$). Similarly, the time required to reach an Aldrete score ≥ 9 was also significantly longer in Group D (9.35 ± 0.69 minutes) compared to Group E (6.96 ± 1.46 minutes) ($P < 0.001$), indicating a more prolonged recovery period in Group D. Regarding sedation levels assessed by the Ramsay Sedation Scale, significant differences were observed at all measured time points post-surgery. At 15 minutes, a higher proportion of patients in Group D had deeper sedation levels (score 4: 65.38%) compared to Group E (19.23%) ($P = 0.009$). This trend persisted at 30 minutes, where scores indicating moderate sedation (scores 3 and 4) were more frequent in Group D (80.77%) than in Group E (38.46%) ($P = 0.013$). By 60 minutes, Group D still exhibited higher sedation scores (score 4: 15.38%) compared to none in Group E, while lighter

sedation levels (scores 1 and 2) were more prevalent in Group E ($P = 0.033$) (Table 4).

Group D showed significantly lower median VAS scores at 2, 4, and 6 hours postoperatively compared to Group E ($p =$

0.016, 0.024, and 0.007, respectively). In contrast, VAS scores at PACU, 12, and 24 hours were not significantly different. (Figure 2).

Table 1: Demographic data and operational data of the studied groups

		Group D (n=26)	Group E (n=26)	P value
Age (years)	Mean $\pm$ SD	43.04 $\pm$ 13.23	44.12 $\pm$ 13.76	0.775 ^t
	Range	18 - 65	18 - 65	
Sex	Male	11 (42.31%)	14 (53.85%)	0.579 ^{X2}
	Female	15 (57.69%)	12 (46.15%)	
BMI (kg/m ²)	Mean $\pm$ SD	27.66 $\pm$ 3.94	27.97 $\pm$ 4.97	0.803 ^t
	Range	21 - 36.8	20.5 - 36.4	
ASA physical status	I	16 (61.54%)	18 (69.23%)	0.560 ^{X2}
	II	10 (38.46%)	8 (30.77%)	
Nitroglycerin use		2 (7.69%)	4 (15.38%)	0.668 ^{FE}
Atropine use		3 (11.54%)	2 (7.69%)	1 ^{FE}

Group D: Dexmedetomidine, Group E: Esmolol, SD: Standard deviation, Data expressed as mean $\pm$ SD in age: Unpaired student t-test, X²: Chi-square. FE: Fisher exact.

Table 2: Heart Rate (beats/min) and Mean Arterial Pressure (mmHg) Measurements in the Studied Groups

Time Point	Group D HR (n=26)	Group E HR (n=26)	P value (HR)	Group D MAP (n=26)	Group E MAP (n=26)	P value (MAP)
Baseline	75.27 $\pm$ 6.45	77.12 $\pm$ 5.05	0.256	84.88 $\pm$ 9.03	89.62 $\pm$ 10.25	0.084
After loading dose	67.5 $\pm$ 7.43	73.12 $\pm$ 5.72	0.004*	63.77 $\pm$ 3.48	75.15 $\pm$ 10.82	<0.001*
After induction of anesthesia	67.77 $\pm$ 6.12	71.08 $\pm$ 5.38	0.044*	61.92 $\pm$ 4.44	71.27 $\pm$ 11.27	<0.001*
After intubation	70.85 $\pm$ 6.37	74.88 $\pm$ 5.24	0.016*	64.19 $\pm$ 3.98	69.88 $\pm$ 10.58	0.013*
5 min after intubation	68.77 $\pm$ 6.57	72.46 $\pm$ 5.22	0.029*	59.19 $\pm$ 3.85	67.27 $\pm$ 9.97	<0.001*
Average intraoperatively	61.38 $\pm$ 1.39	63.23 $\pm$ 1.77	<0.001*	58.27 $\pm$ 3.8	64.58 $\pm$ 9.76	0.003*
After the reversal of muscle relaxant	71.88 $\pm$ 6.75	76.81 $\pm$ 3.61	0.002*	67.54 $\pm$ 4.34	72.73 $\pm$ 9.47	0.014*
After extubation	74.19 $\pm$ 7.19	78.12 $\pm$ 3.1	0.014*	73.23 $\pm$ 4.97	77.96 $\pm$ 9.05	0.024*
5 min after extubation	70.5 $\pm$ 6.59	73.5 $\pm$ 2.58	0.036*	70.12 $\pm$ 5.6	74.88 $\pm$ 9.37	0.03*
At PACU	71.65 $\pm$ 6.77	75.81 $\pm$ 3.09	0.006*	71.38 $\pm$ 6.73	76.62 $\pm$ 8.96	0.021*
2 h postoperatively	72.85 $\pm$ 6.6	77.12 $\pm$ 6.19	0.02*	72.69 $\pm$ 7.73	80.85 $\pm$ 10.95	0.003*
4 h postoperatively	73.92 $\pm$ 6.46	79.65 $\pm$ 6.46	0.002*	73.46 $\pm$ 7.08	82.69 $\pm$ 11.2	0.001*
6 h postoperatively	76.46 $\pm$ 7.72	82.04 $\pm$ 6.56	0.007*	76.38 $\pm$ 7.52	85.46 $\pm$ 9.18	<0.001*

*Group D: Dexmedetomidine, Group E: Esmolol. Data are presented as mean $\pm$ SD. t: Unpaired Student t-test. $P \leq 0.05$ is significant

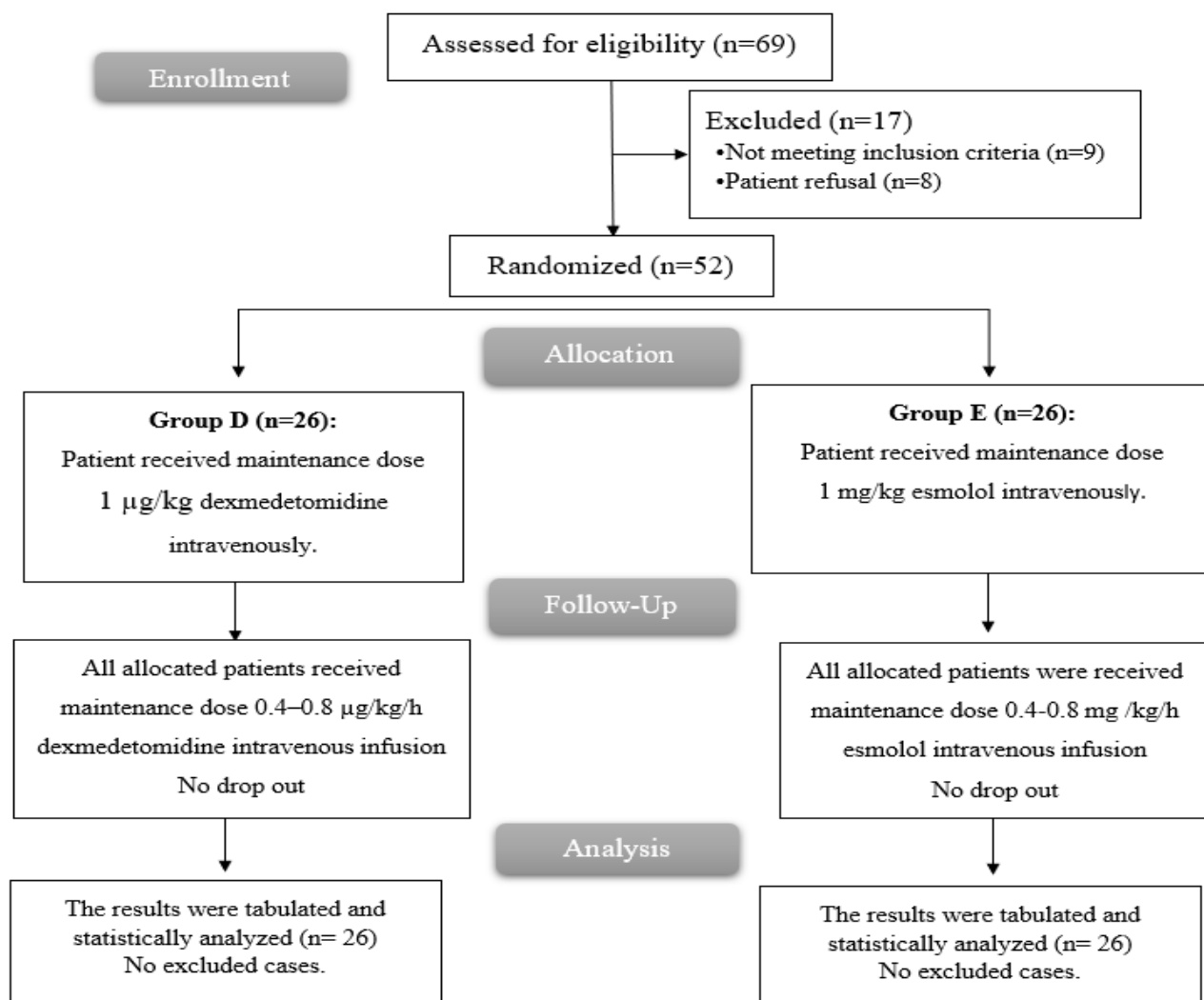
Table 3: Surgical field quality assessment of the studied groups

		Group D (n=26)	Group E (n=26)	P value
Estimated blood loss (ml)	Mean $\pm$ SD	127.12 $\pm$ 29.49	134.12 $\pm$ 31	0.408 ^t
	Range	82 - 175	80 - 183	
Average category scale	No bleeding	0 (0%)	0 (0%)	0.231 ^{X²}
	Slight bleeding	19 (73.08%)	13 (50%)	
	Slight bleeding with suction required	5 (19.23%)	9 (34.62%)	
	Moderate bleeding	2 (7.69%)	4 (15.38%)	
	Severe bleeding	0 (0%)	0 (0%)	
	Uncontrolled bleeding	0 (0%)	0 (0%)	
Surgeon satisfaction score	Bad	2 (7.69%)	4 (15.38%)	0.011* ^{X²}
	Moderate	2 (7.69%)	11 (42.31%)	
	Good	5 (19.23%)	4 (15.38%)	
	Excellent	17 (65.38%)	7 (26.92%)	

Group D: Dexmedetomidine, Group E: Esmolol, Data expressed as frequency (%) in average category scale and surgeon satisfaction score. Data expressed as mean $\pm$ SD in estimated blood loss. X²: Chi-square. t: Unpaired student t-test

Table 4: Comparison of Emergence Time, Aldrete Score Recovery, and Ramsay Sedation Scale Between Groups D and E

Parameter	Group D (n=26)	Group E (n=26)	P value
Emergence time (min)	Mean $\pm$ SD: 8.69 $\pm$ 1.12	Mean $\pm$ SD: 5.04 $\pm$ 0.77	<0.001*
	Range: 7 - 10	Range: 4 - 6	
Time to reach Aldrete score $\geq$ 9 (min)	Mean $\pm$ SD: 9.35 $\pm$ 0.69	Mean $\pm$ SD: 6.96 $\pm$ 1.46	<0.001*
	Range: 8 - 10	Range: 5 - 9	
Ramsay Sedation Scale 15 min after surgery			0.009*
- Score 1	1 (3.85%)	2 (7.69%)	
- Score 2	3 (11.54%)	6 (23.08%)	
- Score 3	4 (15.38%)	13 (50%)	
- Score 4	17 (65.38%)	5 (19.23%)	
- Score 5	1 (3.85%)	0 (0%)	
- Score 6	0 (0%)	0 (0%)	
Ramsay Sedation Scale 30 min after surgery			0.013*
- Score 1	2 (7.69%)	4 (15.38%)	
- Score 2	3 (11.54%)	12 (46.15%)	
- Score 3	11 (42.31%)	7 (26.92%)	
- Score 4	10 (38.46%)	3 (11.54%)	
- Score 5	0 (0%)	0 (0%)	
- Score 6	0 (0%)	0 (0%)	
Ramsay Sedation Scale 60 min after surgery			0.033*
- Score 1	4 (15.38%)	10 (38.46%)	
- Score 2	8 (30.77%)	11 (42.31%)	
- Score 3	10 (38.46%)	5 (19.23%)	
- Score 4	4 (15.38%)	0 (0%)	
- Score 5	0 (0%)	0 (0%)	
- Score 6	0 (0%)	0 (0%)	



DISCUSSION

Functional Endoscopic Sinus Surgery (FESS) is a procedure that demands a clear surgical field, which can be significantly compromised by intraoperative bleeding. To minimize blood loss, surgical field visibility is commonly employed, aiming to maintain a mean arterial pressure (MAP) between 55–65 mmHg in normotensive patients. However, the safety and feasibility of this technique, particularly in hypertensive individuals, remain subjects of debate [13, 14]. Traditional pharmacologic agents used for inducing hypotension may cause adverse effects, prompting growing interest in alternative agents like dexmedetomidine and esmolol. [15].

The present randomized controlled trial compared DEX with esmolol in 52 patients undergoing FESS, analyzing their influence on

surgical field visibility, hemodynamics, surgeon satisfaction, emergence time, sedation, analgesia, and complications. The groups were demographically comparable, ensuring a fair pharmacologic comparison.

Group D (DEX) had considerably lower intraoperative and postoperative heart rates at nearly all time intervals, confirming its potent and sustained bradycardic effect through central sympatholysis. These findings are in agreement with those of Kumar et al. [16], Valecha et al. [17], and Bansal et al. [18], who all had sustained heart rate suppression with DEX compared to esmolol's short-lasting effect. Sahu et al. [19] further observed quicker hemodynamic rebound with esmolol. Some studies, such as those by Lobna et al. [13] and Amin et al. [20], observed that the values of MAP were invariably lower in

Group D at all points, suggesting more sustained and lasting hypotension. This finding was supported by Kumar et al. [16] and Valecha et al. [17], who reported significantly decreased MAPs intra- and post-operatively following DEX administration. Bansal et al. [18] documented lower infusion doses needed to reach the target MAP on DEX, indicating greater potency. However, some studies like Lobna et al. [3] and Amin et al. [20] also found similar MAPs in both groups, demonstrating effective hypotension on either drug.

Though bleeding scores were similar between groups, surgeon satisfaction was significantly higher with the DEX group, and more surgeons described the field as "excellent." Kumar et al. [16] repeated this and experienced increased satisfaction and lower bleeding scores with DEX. Sahu et al. [19] found trends towards better visibility with DEX, though differences did not reach significance. In contrast, other studies [13,18] did not note a difference in the quality of the surgical field. Trends do indicate that DEX can deliver improved surgical conditions.

Recovery was retarded to a large extent in the DEX group, which was reflected in longer times of emergence and a reduced rate of attaining Modified Aldrete Score ≥ 9 . This is because of the central sedative effect of DEX. The same reason was again and again brought forward by Valecha et al. [17], Bansal et al. [18], Sahu et al. [19], Joshi et al. [21], Richa et al. [22], and Kol et al. [23]. Lobna et al. [13] also demonstrated faster emergence with esmolol. While delayed emergence is not what one would want in high-turnover settings, DEX's improved recovery profile can be beneficial if agitation or hemodynamic instability must be avoided.

DEX provided higher Ramsay Sedation Scores at 15, 30, and 60 minutes after the operation, which indicates higher early postoperative sedation. This also conforms with Lobna et al. [13], Valecha et al. [17], Bansal et al. [18], and Joshi et al. [21], who all reported enhanced early sedation with DEX that normalized to 60 minutes. Sedative action could prevent

agitation after an operation, but may delay early mobilization in certain cases.

DEX showed much reduced postoperative pain measurements (VAS) at 2, 4, and 6 hours. A delay in time to the demand for the first dose of analgesic was seen, and morphine consumption was less in Group D, demonstrating greater opioid-sparing and analgesic effects. These results are consistent with those of Lobna et al. [13], Amin et al. [20], Valecha et al. [17], Bansal et al. [18], Sahu et al. [19], Joshi et al. [21], and Kumar et al. [16].

Although there was a mild rise in hypotension, bradycardia, and nausea/vomiting in the DEX group, these were not significantly different, i.e., both drugs were equally safe. This is in concordance with Lobna et al. [13], Valecha et al. [17], and Bansal et al. [18], who found no significant postoperative complications in both groups. Although Sahu et al. [19] documented higher blood transfusion requirements in the esmolol group, possibly due to less controlled hemorrhage, they did not find any significant complications in either of the groups.

CONCLUSION

The current research demonstrated that dexmedetomidine was better than esmolol for the induction and maintenance of surgical field visibility during FESS. Dexmedetomidine provided better intraoperative hemodynamic stability, improved surgeon satisfaction, improved postoperative sedation, and more effective pain control with minimal opioid consumption. Although dexmedetomidine prolonged the emergence time and recovery slightly, it provided a smoother recovery profile. Both drugs were equally safe, with no statistically significant difference in complication rates. Dexmedetomidine was an overall good agent for surgical field visibility in FESS, associating intraoperative efficacy with enhanced postoperative comfort.

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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