(International Print/Online Journal)

SJIF IMPACT FACTOR: 6.829
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 9, Issue 4, Page No: 307-316
July-August 2026

IJMSCR

Comparision Of The Effects Of Remifentanil Versus Dexmedetomidine On Hemodynamic Stability & Surgeon's Satisfaction During Ent Surgeries

Rahul M. Fultariya[1], Mahima Lakhanpal[2], Anshul Gaur[3]
[1]PG Resident, [2]Professor, [3]Assistant Professor,
[1,2,3]Department of Anaesthesiology, Santosh Medical College and Hospital,
Santosh Deemed to be University, Ghaziabad, Uttar Pradesh 201001, India

***Corresponding Author:**
Dr. Rahul M. Fultariya
PG Resident, Department of Anaesthesiology, Santosh Medical College and Hospital,
Santosh Deemed to be University, Ghaziabad, Uttar Pradesh 201001, India

Type of Publication: Original Research Paper
Conflicts of Interest: Nil

Abstract

Background: Controlled hypotension is an essential anesthetic technique in ENT surgeries to reduce intraoperative bleeding and improve surgical field visibility. Dexmedetomidine, an α_2-adrenergic agonist, and remifentanil, an ultra-short-acting μ-opioid agonist, are commonly used agents for achieving hemodynamic stability. However, comparative evidence in the Indian population remains limited.

Aim: To compare the effects of dexmedetomidine and remifentanil on hemodynamic stability and surgeon's satisfaction during ENT surgeries.

Methods: This prospective comparative study included patients undergoing elective ENT surgeries under general anesthesia. Participants were randomly allocated into two groups: Group D received dexmedetomidine infusion, and Group R received remifentanil infusion. Hemodynamic parameters (heart rate, systolic, diastolic, and mean arterial pressure) were recorded at baseline, after induction, intubation, intraoperatively at predefined intervals, and post-extubation. Surgical field quality and surgeon satisfaction were assessed using standardized scoring systems. Secondary outcomes included intraoperative blood loss, postoperative pain using the Visual Analogue Scale (VAS), and sedation levels using the Richmond Agitation-Sedation Scale (RASS).

Results: Both drugs demonstrated similar hemodynamic stability with smoother heart rate control, while remifentanil allowed rapid titration and recovery. Surgical field quality and surgeon satisfaction scores were comparable between groups, with dexmedetomidine showing improved postoperative analgesia and sedation profiles.

Conclusion: Both dexmedetomidine and remifentanil are effective agents for controlled hypotension in ENT surgeries. Choice of agent should be individualized based on clinical priorities.

Keywords: Dexmedetomidine, Remifentanil, Hemodynamics, Surgeon's satisfaction, ENT surgeries.

Introduction

Controlled hypotension is an established anaesthetic technique that plays a critical role in improving surgical field visibility and reducing intraoperative bleeding, particularly in otorhinolaryngology procedures where the operative space is narrow and richly vascular.1 Even minimal bleeding can obscure the surgeon's view during procedures such as functional endoscopic sinus surgery, septoplasty, tympanoplasty, or middle ear interventions, increasing the difficulty of dissection and prolonging operative time. By deliberately lowering mean arterial pressure to a safe and controlled extent, anaesthesiologists can minimise blood loss while ensuring adequate perfusion of vital organs. The success of controlled

hypotension depends on the selection of pharmacological agents that can reliably achieve blood pressure reduction without compromising hemodynamic stability.2

The challenge for anaesthesiologists lies in achieving a controlled and predictable reduction in blood pressure without causing end-organ hypoperfusion.3 Over the years, many pharmacological agents have been used to facilitate controlled hypotension, including vasodilators, beta-blockers, calcium channel blockers, and volatile anaesthetics. However, these agents may be limited by side effects such as reflex tachycardia, myocardial depression, delayed recovery, and unpredictable hemodynamic responses, making them less ideal for surgeries involving delicate anatomical areas. This has led to growing interest in drugs such as dexmedetomidine and remifentanil, which offer favourable pharmacokinetic profiles, rapid titratability, and improved safety margins.4

Dexmedetomidine, a selective alpha-2 adrenergic agonist, has gained prominence due to its ability to produce sedation, analgesia, and sympatholysis while maintaining respiratory stability.5 Remifentanil, an ultra-short-acting synthetic opioid, has also become widely used in controlled hypotension protocols because of its rapid onset and extremely short context-sensitive half-life. As a potent mu-opioid receptor agonist, remifentanil suppresses sympathetic responses to surgical stimuli, reliably reducing heart rate and blood pressure.6 Dexmedetomidine, through its sympatholytic and anti-nociceptive effects, may reduce mucosal engorgement and bleeding, contributing to enhanced visualisation. In contrast, remifentanil provides immediate hemodynamic suppression in response to surgical stimulation, but its shorter duration of effect may result in transient fluctuations if infusion rates are not adjusted promptly. From a surgical perspective, the stability offered by dexmedetomidine may be advantageous, whereas from an anaesthetic standpoint, remifentanil's predictability and responsiveness may be preferred. Therefore, surgeon feedback and objective assessment of bleeding are essential to determine the relative effectiveness of the two agents.7 Intraoperative bleeding significantly impacts operative conditions in ENT surgeries, where narrow anatomical corridors limit the surgeon's working space.

Controlled hypotension reduces mean arterial pressure, thereby reducing blood flow to the surgical site and improving visibility. Dexmedetomidine may reduce bleeding by decreasing heart rate and sympathetic activity, leading to less vascular engorgement. Remifentanil also reduces bleeding but may produce bradycardia or hypotension that requires intervention, complicating intraoperative management.8

This study aims to compare Dexmedetomidine with Remifentanil and provide clinically relevant evidence to guide the choice of anaesthetic agent in procedures where visualisation is crucial. The findings are expected to contribute to improved operative efficiency, enhanced patient safety, and more informed anaesthetic decision-making in ENT surgical practice.

Materials And Methods

The present study was conducted in our hospital from January 2024 to January 2026.

Sample size: 71 patients per group

Inclusion Criteria

1. All Genders.
2. 18-55 years.
3. American Society of Anaesthesiologists (ASA) Grade 1 and 2.
4. Patients undergoing ENT surgeries (Bilateral Fess, Cortical Mastoidectomy and tympanoplasty).
5. Patient giving informed and written consent.

Exclusion Criteria

1. Consent Refusal.
2. Allergy or Hypersensitivity to drugs used in study (Dexmedetomidine or Remifentanil)
3. Renal or Hepatic Impairment.
4. Hypotensive or Bradycardia patients.
5. BMI > 30kg/m2
6. American society of anaesthesiologists (ASA) Grade 3 and 4.
7. Pregnant Females.

Methodology

Patients admitted to the hospital for otorhinolaryngology surgeries were enrolled in the study and were offered anaesthetic management. The purpose and protocol of the study were explained to the patients, and informed written consent was

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obtained. Following admission, routine blood investigations and pre-anaesthetic check-up were performed.

142 patients were randomly divided into two groups (Group D and Group R) with 71 patients in each group. Group D received dexmedetomidine, and Group R received remifentanil. Randomization was carried out using computer-based selection.

All patients were kept nil per oral for 8 hours (fatty meals) prior to surgery and were premedicated with oral ranitidine 150 mg and alprazolam 0.25 mg on the night before and 2 hours prior to surgery. On the day of surgery, patients were reviewed and shifted to the operating theatre.

Standard monitoring was applied, and baseline parameters including systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), 3-lead ECG, and SpO_2 were documented. Intravenous fluids (Ringer Lactate/ Normal Saline) were initiated.

Preparation of dexmedetomidine infusion was done:

Ampule containing Dexmedetomidine 200mcg in 2ml (100mcg/ml vial was used)

Dilution: 2ml (200mcg) of dexmedetomidine from the ampoule was withdrawn and added to 48 mL of normal saline. It was added to 48ml of normal saline to make up the total volume upto 50ml and a final concentration of 4mcg/ml

Preparation of Remifentanil infusion:

Available vial: Remifentanil 1mg (1000mcg) powder form

Reconstitution: Add 1 ml of sterile water for injection to the vial followed by gently swirling to dissolve the powder and the resulting concentration was made as 1mg/ml (1000mcg/ml)

Dilution (most common method): Withdraw 1 mL (1000 µg) of reconstituted remifentanil. Add to 49 mL normal saline (0.9% NS) to make the total volume = 50 mL and final concentration as 20 µg/mL.

Patients in Group D received an intravenous bolus of dexmedetomidine 1mcg/kg in 100 mL ns over 15 minutes before induction, followed by an infusion of 0.6 µg/kg/hour. Patients in Group R received a bolus of remifentanil 1mcg/kg in 100 mL ns over 15 min followed by an infusion at 0.2 µg/kg/min. Infusions of both drugs were started immediately after giving bolus.

Injection ondansetron 0.15 mg/kg and injection glycopyrrolate 0.01 mg/kg were administered, followed by pre-oxygenation with 100% oxygen. Patients were then induced with injection fentanyl 2 µg/kg, injection propofol 2 mg/kg, and injection vecuronium 0.1 mg/kg. Bag-and-mask ventilation with 100% oxygen was performed for 3 minutes, after which endotracheal intubation was carried out.

General anaesthesia was maintained with 50% nitrous oxide and 50% oxygen along with isoflurane to achieve a minimum alveolar concentration (MAC) of 1. Infusions of both study drugs were discontinued at the end of surgery, defined as placement of the last suture by the surgeon. Patients of both the groups were given intravenous injection diclofenac sodium 75mg, 30 minutes before extubation.

After completion of surgery, patients were reversed with injection neostigmine (0.05 mg/kg) with glycopyrrolate (0.01 mg/kg) body weight and extubated after the return of spontaneous respiration and adequate awakening (eye opening, follow commands, sustained head lifts, intact gag/ cough reflex)

Post extubation patients were shifted to post operative room where patient was observed for postoperative pain for 60 mins.

Outcome assessment:

Vital parameters including SBP, DBP, MAP, and heart rate were recorded after administration of the study drug bolus, after induction, immediately after intubation, every 15 minutes until the end of surgery, and after extubation.

Intraoperative bleeding was measured using suction volume and blood-soaked gauzes.

Surgeon satisfaction with surgical field quality was assessed using a five-point scoring system (Likert scale),

Ø Score 1 (very poor): Uncontrollable bleeding.

Ø Score 2 (poor): Severe bleeding requiring repeated suctioning, with the quality of the field collapsing immediately after suctioning.

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Ø Score 3 (satisfactory): Moderate bleeding requiring intermittent suctioning.

Ø Score 4 (good): Partial bleeding, sometimes requiring suctioning; the quality of the surgical field was good.

Ø Score 5 (excellent): No bleeding/bloodless field; the surgery field was excellent.

Post extubation Pain assessment was done every 15 mins till 60 mins using Visual analog scale (VAS). On this scale, 0 was indicative of no pain and 10 was indicative of worst pain.

Richmond Agitation Sedation Scale (RASS) was done for every 15 mins till 60 mins to assess the level of Sedation postoperatively.

Score	Term
+4	Combative
+3	Very agitated
+2	Agitated
+1	Restless
0	Alert and calm
-1	Drowsy
-2	Light sedation
-3	Moderate sedation
-4	Deep sedation
-5	Unarousable

Statistical analysis:

The collected data were entered into Microsoft Excel and analysed. Quantitative data were expressed as mean with standard deviation or median with interquartile range depending on data distribution. Differences between the means of the two groups were analysed using the unpaired t-test or Mann–Whitney U test. Qualitative data were expressed as percentages, and differences between proportions were analysed using the chi-square test or Fisher's exact test. A p value less than 0.05 was considered statistically significant.

Results

A total of 142 patients were enrolled in the study and randomly allocated into two equal groups: Group D (n = 71) and Group R (n = 71). All patients completed the study protocol and were included in the final analysis.

The demographic profiles of both groups were comparable. The mean age was 37.72 ± 8.61 years in Group D and 37.04 ± 6.22 years in Group R, with no statistically significant difference between the groups ($p = 0.59$) (Table 1). Gender distribution was also similar, with 36 males and 35 females in Group D and 38 males and 33 females in Group R ($\chi^2 = 0.226$, $p = 0.63$). The majority of participants in both groups belonged to the 31–40 and 41–50 year age categories (Table 1).

The types of surgeries performed were comparable between the two groups (Table 2). Bilateral functional endoscopic sinus surgery (B/L FESS) was the most common procedure in both groups (37 in Group D vs. 33 in Group R), followed by cortical mastoidectomy and tympanoplasty. No statistically significant difference was observed in the distribution of surgical procedures ($p = 0.44$). The mean duration of surgery was also similar between the groups (119.79 ± 8.92 minutes in Group D vs. 119.58 ± 9.36 minutes in Group R; $p = 0.89$) (Table 2).

Baseline systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and heart rate (HR) were comparable between the two groups ($p > 0.05$) (Table 3). Following bolus administration and after induction, no statistically significant differences were observed in any hemodynamic parameter between Group D and Group R (Table 3). Hemodynamic responses during direct laryngoscopy were also similar in both groups ($p > 0.05$).

Intraoperative hemodynamic parameters recorded at multiple time intervals (5, 20, 35, 50, 65, 80, 95, and 110 minutes after intubation) showed comparable values between Group D and Group R (Table 4). Although minor fluctuations were observed at certain time points, none of these differences reached statistical significance ($p > 0.05$). Overall, both groups maintained comparable hemodynamic stability throughout the intraoperative period.

Post-Extubation Hemodynamics and Blood Loss

Post-extubation SBP, DBP, MAP, and HR were similar between the two groups ($p > 0.05$) (Table 5). Mean intraoperative blood loss was slightly higher in Group D (112.75 ± 16.81 mL) compared to Group R

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(109.93 ± 17.94 mL); however, this difference was not statistically significant (p = 0.34).

Surgeon visual satisfaction scores were comparable between the groups (p = 0.26) (Table 6). The majority of procedures in both groups were rated as "good," followed by "excellent," with no procedures rated as poor.

Postoperative pain assessment using the Visual Analogue Scale (VAS) demonstrated significantly lower pain scores in Group D compared to Group R at 15, 30, and 60 minutes after extubation (p < 0.01 at all time points) (Table 6). Immediately after extubation, both groups reported no pain. However, Group R exhibited progressively higher pain scores over the first postoperative hour, whereas Group D maintained significantly lower VAS scores.

Sedation levels assessed using the Richmond Agitation–Sedation Scale (RASS) were comparable between the groups (Table 6). Both groups demonstrated light sedation (RASS −1) immediately and at 15 minutes post-extubation. Group D maintained light sedation at 30 minutes, whereas Group R reached an alert state (RASS 0). By 60 minutes, both groups were fully alert.

TABLE 1: Baseline Demographic Characteristics

Variable	Group D (n=71)	Group R (n=71)	Test Value	p value
Mean Age (years)	37.72 ± 8.61	37.04 ± 6.22	–	0.59
Males [n (%)]	36 (50.7%)	38 (53.5%)	$\chi^2 = 0.226$	0.63
Females [n (%)]	35 (49.3%)	33 (46.5%)		

TABLE 2: Surgical Characteristics

Variable	Group D	Group R	χ^2 / Test	p value
B/L FESS	37	33	$\chi^2 = 1.628$	0.44
Cortical Mastoidectomy	24	24		
Tympanoplasty	10	14		
Duration of Surgery (min)	119.79 ± 8.92	119.58 ± 9.36	–	0.89

TABLE 3: Hemodynamic Parameters at Major Time Points (Mean ± SD)

Time Point	Parameter	Group D	Group R	p value
Baseline	SBP	130.79 ± 5.46	132.31 ± 6.93	0.15
	DBP	78.41 ± 6.62	79.03 ± 6.93	0.59
	MAP	95.87 ± 5.29	96.79 ± 6.05	0.34
	HR	78.10 ± 5.31	77.18 ± 5.35	0.64
After Bolus	SBP	108.28 ± 5.14	107.11 ± 5.49	0.19
	MAP	85.95 ± 4.03	84.62 ± 4.09	0.05
After Induction	SBP	105.21 ± 4.93	106.55 ± 9.06	0.28

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	HR	75.65 ± 5.29	77.03 ± 5.06	0.11
During Laryngoscopy	SBP	129.73 ± 6.01	129.54 ± 6.42	0.85
	HR	82.87 ± 3.82	82.97 ± 4.06	0.88

TABLE 4: Intraoperative Hemodynamic Parameters at Different Time Intervals After Intubation (Mean ± SD)

Time (Minutes)	Parameter	Group D (Mean ± SD)	Group R (Mean ± SD)	p value
5 min	SBP (mmHg)	103.93 ± 7.16	104.85 ± 6.37	0.42
	DBP (mmHg)	68.77 ± 5.05	68.65 ± 4.81	0.88
	MAP (mmHg)	80.49 ± 5.37	80.71 ± 4.91	0.8
	HR (beats/min)	75.76 ± 0.84	75.89 ± 0.82	0.36
20 min	SBP (mmHg)	96.23 ± 5.18	99.58 ± 5.34	0.06
	DBP (mmHg)	65.72 ± 4.12	66.75 ± 2.41	0.07
	MAP (mmHg)	75.89 ± 4.17	77.69 ± 2.43	0.08
	HR (beats/min)	68.01 ± 1.99	67.93 ± 1.93	0.8
35 min	SBP (mmHg)	85.00 ± 3.04	88.35 ± 2.68	0.3
	DBP (mmHg)	62.44 ± 4.26	62.63 ± 4.03	0.4
	MAP (mmHg)	71.62 ± 3.08	71.21 ± 3.36	0.45
	HR (beats/min)	65.90 ± 3.02	62.06 ± 3.26	0.23
50 min	SBP (mmHg)	88.14 ± 4.70	85.35 ± 2.68	0.45
	DBP (mmHg)	66.31 ± 5.11	63.80 ± 3.66	0.23
	MAP (mmHg)	71.92 ± 4.34	70.99 ± 2.77	0.3
	HR (beats/min)	65.32 ± 4.33	62.61 ± 4.05	0.06
65 min	SBP (mmHg)	85.15 ± 4.32	82.15 ± 4.32	0.25
	DBP (mmHg)	65.83 ± 2.08	64.63 ± 3.67	0.056
	MAP (mmHg)	72.27 ± 2.11	70.47 ± 2.77	0.23
	HR (beats/min)	61.52 ± 4.14	59.85 ± 4.01	0.1
80 min	SBP (mmHg)	90.24 ± 7.25	92.10 ± 4.92	0.08
	DBP (mmHg)	66.85 ± 3.61	67.13 ± 4.37	0.68
	MAP (mmHg)	74.64 ± 3.87	75.45 ± 3.49	0.19
	HR (beats/min)	65.27 ± 7.03	66.92 ± 6.75	0.16
95 min	SBP (mmHg)	94.73 ± 2.77	94.89 ± 2.98	0.75
	DBP (mmHg)	66.41 ± 2.78	66.24 ± 2.78	0.72

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	MAP (mmHg)	75.85 ± 2.28	75.79 ± 2.41	0.88
	HR (beats/min)	69.99 ± 5.10	71.63 ± 5.39	0.06
110 min	SBP (mmHg)	100.52 ± 8.16	97.83 ± 9.08	0.07
	DBP (mmHg)	68.13 ± 4.95	67.37 ± 4.77	0.35
	MAP (mmHg)	78.92 ± 5.39	77.52 ± 4.82	0.1
	HR (beats/min)	74.01 ± 5.34	74.61 ± 5.19	0.5

TABLE 5: Post-Extubation Outcomes

Variable	Group D	Group R	p value
SBP	115.75 ± 5.01	116.59 ± 6.07	0.37
MAP	88.14 ± 2.92	89.00 ± 3.22	0.1
HR	74.99 ± 5.21	74.32 ± 4.25	0.41
Blood Loss (mL)	112.75 ± 16.81	109.93 ± 17.94	0.34

TABLE 6: Postoperative Analgesia, Sedation & Satisfaction

		Group D	Group R	p value
Surgeon Satisfaction	Satisfactory	10	8	0.26
	Good	46	52	
	Excellent	15	11	
VAS scores	15 min	0	1.65 ± 0.66	<0.01
	30 min	0.80 ± 0.76	2.70 ± 0.56	<0.01
	60 min	1.38 ± 0.49	3.93 ± 0.66	<0.01
Sedation (RASS)	Immediately	-1	-1	_
	30 min	-1	0	
	60 min	0	0	

Discussion:

The current hospital-based comparative study entitled to compare the effects of dexmedetomidine and remifentanil on intraoperative haemodynamic, surgical field quality, and postoperative recovery in patients undergoing elective ENT surgeries was performed in the department of anaesthesia at Santosh medical college and hospital. The primary objectives included assessment on Hemodynamic stability and surgeon's satisfaction with surgical field visualization,

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while secondary objectives were evaluation of Intraoperative bleeding, postoperative pain, and sedation levels. The findings of the present study are discussed in relation to its aims and objectives and are compared with available literature to place the results in appropriate clinical context.

The demographic analysis revealed no statistically significant differences between Group D and Group R concerning age-wise distribution, gender-wise distribution, mean age, types of ENT surgeries performed, or duration of surgery. In a study by **Jouybar et al. (2022)** [9] and **Breazu et al. (2025)[10]** reported similar findings.

Before administering the drugs, the heart and blood pressure measurements were almost the same in both groups as was also published by **Jouybar et al. (2022) [9]**, **Janipour et al. (2024)[11]** and **Kousalya et al. (2025)[12].**

Intraoperative hemodynamic stability showed similar patterns between the two groups over different time points (5, 20, 35, 50, 65, 80, 95, 110 mins), that were statistically insignificant. Menshawi and Fahim (2020)[13], Jouybar et al. (2022) [9] and Kousalya et al. (2025)[12] findings corroborate the sympatholytic and sedative effect of dexmedetomidine in mitigating hemodynamic fluctuations, while remifentanil provides effective hypotension with slightly greater intraoperative variability.

In the present study following extubation, the hemodynamic parameters (SBP, DBP, MAP, HR) and blood loss were comparable and similar findings were reported by Javaherforooshzadeh et al. (2018)[14], Xu et al. (2023)[15] and Gülbol-Duran et al. (2025)[16].

In the present study we found the Surgeon visual satisfaction scores to be similar between both groups, with a p value of more than 0.05. No surgeons reported very poor or poor satisfaction score in either group. Xu et al. (2023)[15] performed a systematic review and meta-analysis of nine randomized controlled trials including 543 patients to compare dexmedetomidine and remifentanil for controlled hypotension under general anaesthesia. Analysis of surgical field quality showed no significant difference between the two agents indicating comparable surgeon satisfaction. Breazu et al. (2025)[10] also published results similar to our study.

Post extubation, the pain scoring was done using visual analogue scale (VAS).we observed lower vas score in dexmedetomidine group(group D) as compared to remifentanil group (group R) at 15, 30, and 60 minutes post extubation ($p < 0.01$) suggesting that dexmedetomidine provides superior postoperative analgesia compared to remifentanil. After extubation, sedation was checked using the Richmond Agitation-Sedation Scale (RASS score). Both groups had similar sedation levels just after extubation and at 15 minutes, with a RASS score of −1. At 30 minutes, in dexmedetomidine group patients werw still drowsy with RASS score of −1, while in the remifentanil group patients were alert and calm s with a score of 0. By 60 minutes, both groups had a RASS score of 0. This shows that dexmedetomidine kept patients sedated for a longer time after surgery. **Lee et al. (2013)**[17], **Grape et al. (2019)**[18] and **Fan et al. (2022)[19]** also reported similar findings.

Conclusion

The present study demonstrates that both dexmedetomidine and remifentanil are effective and safe agents for achieving controlled hypotension and maintaining hemodynamic stability during ENT surgeries, while providing satisfactory surgical field conditions and high surgeon satisfaction. Baseline characteristics, intraoperative hemodynamic responses, blood loss, and post-extubation cardiovascular parameters were comparable between the two groups, indicating that either agent can be reliably used for controlled hypotensive anesthesia without compromising patient safety or operative conditions. However, dexmedetomidine showed a clear advantage in the postoperative period by providing significantly better early analgesia, as evidenced by lower VAS pain scores, along with a smooth and acceptable sedation profile without prolonged recovery. These findings suggest that while both agents are suitable for controlled hypotension in ENT procedures, dexmedetomidine may be preferred when improved postoperative pain control and a smoother recovery are prioritized, thereby contributing to enhanced patient comfort and overall perioperative outcomes.

Ethical Approval: Obtained

Consent: Written consent secured.

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