

Comparison of Efficacy of Dexmedetomidine and Midazolam for Bloodless Surgical Field during Functional Endoscopic Sits Surgery (FESS) under General Anaesthesia

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Abstract

Objective: A comparative study to evaluate the efficacy of dexmedetomidine to provide bloodless surgical field in comparison to midazolam in Functional Endoscopic Sinus Surgery (FESS). **Methods:** 60 patients ASA I or II scheduled for FESS were equally randomly assigned to receive either Inj. Dexmedetomidine in dose of 1 g/kg over 10 min in infusion or Inj. Midazolam 0.02 mg/kg. In both groups, the infusion rate was adjusted to maintain the mean arterial blood pressure (MAP) of 65-70 mmHg. The induction was done using propofol (2.5 mg/kg) and atracurium (0.5 mg/kg). After the intubation, maintenance was achieved with O₂ (50%), N₂O (50%), Inj. Atracurium infusion and Sevoflurane. Intraoperative bleeding was estimated by the surgeon using Boezart's scale for the evaluation of operative field visibility during the surgery. Hemodynamic variables (MAP and HR) were recorded.

Results: Better achievement of MAP control is achieved with Dexmedetomidine compared to Midazolam. Overall intra-operative blood loss was more in Midazolam group compared to Dexmedetomidine group.

Conclusion: Both Dexmedetomidine and Midazolam are safe and effective in FESS for controlled hypotension, though Dexmedetomidine provides excellent surgeon's satisfaction without severe hemodynamic changes.

Keywords : Controlled hypotension, Dexmedetomidine, Functional endoscopic sinus surgery, Surgical field.

Introduction:

Narrowing of passage in the nasal cavities is because of stenosis, stricture or abnormal narrowing of bodily canal, whose diagnosis rests on based on clinical manifestations, endoscopic findings, computed tomography (CT) scans changes.⁽¹⁾ The best approach is endoscopic sinus surgery.⁽²⁾ The most common problem during the sinus endoscopic surgery is bleeding. Chronic breach in nasal sinuses disrupts the field of surgery and increase the possibility of damage to the skull and eye ball cavity.⁽³⁾ Suction and compression of interference of the bleeding during the surgery increase the duration of surgery and if the

bleeding lasts in the postoperative period, it causes delay in discharge of patient from the hospital.⁽⁴⁾

For bleeding impedence, three methods are used:

(1) local injection of vasoconstrictive agents,⁽⁵⁾ (2) antifibrinolytics,⁽⁶⁾ (3) induced hypotension with mean arterial pressure (MAP) less than 60 to 80 mmHg, the method which gives better visibility, greater ease, and less duration of surgery is ideal.⁽⁷⁾ Dexmedetomidine is a highly specific and potent agonist of alpha-2 receptors. It has analgesic, antinociceptive and anti-anaesthetic properties, as well as sympatholytic properties, providing titrated sedation, without respiratory suppression.⁽⁴⁾ The central and peripheral sympathetic activity of dexmedetomidine is carried out by highly selective 2-adrenergic activities which reduce arterial blood pressure and heart rate.

Midazolam is a short-acting benzodiazepine having sedative, anxiolytic, amnestic, hypnotic, muscle

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relaxant and anticonvulsant activities.⁽⁸⁾ Its action is mediated through inhibitory neurotransmitter gamma amino butyric acid (GABA). Benzodiazepines bind to the GABA-A receptors, which potentiates the effects of GABA by increasing the frequency of chloride channel opening.⁽⁸⁾

Objectives:

The current study aimed at investigating the effectiveness of dexmedetomidine and midazolam as adjuvant in preventing bleeding during functional endoscopic sinus surgery (FESS), assessing hemodynamic changes and post operative recovery.

Methods:

The present study is randomized controlled which is approved by the Ethical Committee. Written and informed consent was acquired from all the participants. The present study was conducted on 60 patients aged 20-60 years, ASA grade I/II of either sex who were posted for FESS under GA. The exclusion criteria were pregnant patients, patients with cardiac diseases, cerebrovascular diseases, hepatic and/or renal dysfunction, hypertension, obesity, coagulation defects or using anticoagulants, such as heparin 48 hr before the surgery, and anticipated difficult airway or refusal for procedure. Computer generated randomization was used to assign the patients into two groups: A (Dexmedetomidine) and B (Midazolam).

Before induction, A group (n=30) received Inj. Dexmedetomidine in dose of 1 g/kg over 10 min in infusion. B group received Inj. Midazolam 0.02 mg/kg. In both groups, the infusion rate was adjusted to maintain the mean arterial blood pressure (MAP) of 65-70 mmHg. The induction was done using propofol (2.5 mg/kg) and atracurium (0.5 mg/kg). After the intubation, maintenance was achieved with O₂ (50%), N₂O (50%), Inj. Atracurium infusion and Sevoflurane. After the end of the surgery, the muscle relaxation was reversed by Neostigmine 0.04 mg/kg and Glycopyrrolate 0.4 mg/kg.

During the procedure, several parameters were measured noninvasively and continuously like mean arterial pressure (MAP), heart rate (HR) and S_pO₂ at the intervals of 15, 30, 60, and 90 min. Surgical satisfaction

was evaluated by one surgeon and recorded according to 5-point Likert scale (5: excellent, 4: Good, 3: Satisfactory, 2: Poor, 1: Very poor).

Intraoperative bleeding was estimated by the surgeon using Boezart's scale for the evaluation of operative field visibility during the surgery demonstrated as 0: no bleeding, 1: slight bleeding, in which blood evacuation is not necessary; 2: slight bleeding, in which some blood should be evacuated; 3: light bleeding, in which blood should be frequently evacuated as operative field is visible only briefly after the evacuation; 4: average bleeding, in which blood evacuated as the operative field is visible only immediately after the evacuation; and 5: vigorous bleeding, in which constant blood is evacuated (bleeding often exceeds the evacuation resulting in rendering the surgery nearly impossible).^(9,10)

The operation starting and ending times were written down, and postoperative adverse effects, such as nausea, vomiting, bradycardia, tachycardia, and hypotension, were recorded.

The Chi square test was used to compare the amount of bleeding and level of satisfaction. The independent t-test was employed in both groups to compare the quantitative variables during the surgery, like MAP and HR. P-value of less than 0.05 was considered statistically significant. All the statistical calculations were performed in SPSS software (version. 22.0).

Results:

A total of 60 patients were enrolled in the study with 30 patients in each group. The demographic profile of the participants is shown in Table 1.

There was no statistically significant difference between two groups in context of age, gender, ASA and duration of surgery (P value > 0.05) (Table 1).

There is overall better achievement of MAP control with Dexmedetomidine compared to Midazolam (Table 2) with statistically significant difference (p value 0.018). Overall intra-operative blood loss was more in Midazolam group compared to Dexmedetomidine group (Table 2) with statistically significant difference (p value < 0.0001)

Table 1: Demographic characteristics and operative times between two studied groups

Characteristics	Dexmedetomidine (n=30) Group A	Midazolam (n=30) Group B	P-value
Gender Female: male	13:17	14:16	-
Age(years)	38.39±11.84	42.94±13.46	P=0.169
BMI	31.10± 9.80	30.80± 9.60	P=0.9051
ASA(1/2)	12:18	14:16	-
Duration of surgery(min)	66 ±17.03	70±15.19	P=0.341

(Values are expressed as numbers or mean±SD).

Table 2: Hemodynamic changes between two study group

Hemodynamics	Dexmedetomidine (n=30) Group A	Midazolam (n=30) Group B	P-value
Max. HR	94±11.4	100±12.8	P=0.0601
Min.HR	55±9.6	66±10.4	P=0.0001
Average MAP	76±12	84±13.4	P=0.0179
Bleeding (ml)	116.36±30.44	252.70±50.76	P<0.0001

Table 3: Bleeding scores on basis of Boezart's scale

	Dexmedetomidine (n=30) Group A		Midazolam (n=30) Group B		P-value
	N	%	N	%	
0	0	0	0	0	0.000007355
1	13	43	2	6.6	
2	12	40	4	13.33	
3	3	10	18	60	
4	2	6.6	6	20	
5	0	0	0	0	

Statistical difference was significant in context of Boezart's bleeding scale and Likert's surgeon's satisfaction scale (p value <0.001), signifying superiority of Dexmedetomidine over Midazolam.

Discussion:

FESS is performed to treat chronic rhino-sinusitis, which is impervious to medical therapy. Since nasal

Table 4: Surgeon's satisfaction based on Likert Scale

Likert's scale	Dexmedetomidine (n=30) Group A		Midazolam (n=30) Group B		P-value
Very bad	0	0	0	0	0.000019
Bad	0	0	8	26.66	
Moderate	2	6.66	10	33.33	
Good	18	60	10	33.33	
Very good	10	33.33	2	6.66	

end sinus mucus is very vascular, the major concern is bleeding.

Dexmedetomidine causes a reduction in blood pressure, slowing of HR, sedation and analgesia. The fall in blood pressure is mainly due to inhibition of central sympathetic outflow and due to stimulation of presynaptic α -2 adrenoceptors decreasing nor-epinephrine release. Dexmedetomidine has a very minimal respiratory depressant effect with potent sedative and analgesic effects compared with opioids and other sedatives. The important problem involved in FESS is bleeding from the sinuses. Controlled hypotension has a definitive role in FESS as it reduces bleeding during surgery and improves visibility of the surgical field, which can decrease the duration of surgery and anaesthesia. Dexmedetomidine produced more stable haemodynamics with lower readings of MAP and HR along with more prolonged post-operative analgesia and conscious sedation in comparison to clonidine.⁽¹⁾

Several studies have reported the effectiveness of Dexmedetomidine to provide the better surgery field and thus lowering the bleeding during guarded hypotension in several operations like tympanoplasty and rhinoplasty.⁽¹⁻⁴⁾

In our study, the mean score of bleeding in group A was significantly lower than group B which was comparable to the study done by Arman Parvizi et al.⁽¹¹⁾ The level of surgeon satisfaction in group A was also significantly better than that of group B which was comparable to different studies done by Guven et al,⁽⁴⁾ Goksu et al,⁽¹⁰⁾ and Arman Parvizi et al.⁽¹¹⁾

Arman Parvizi et al⁽¹¹⁾ reported better hemodynamic status, better analgesia, good surgical field with less adverse effects in Dexmedetomidine group as compared to control group in their study, results of which were comparable to our study.

Bajwa et al 2016,⁽¹²⁾ performed study on 150 patients (50 subjects per group) to compare the effects of DEX, esmolol, and nitroglycerin on hypotension control among the patients undergoing FESS, and reported that DEX and esmolol could be more effective in providing better hemodynamic stability and increasing the surgical field vision than nitroglycerin during FESS. They also added that there was postoperative sedation and reduced analgesic requirements for DEX as compared to the other two drugs.

Praveen et al,⁽¹³⁾ found that there was significant reduction in heart rate in Dexmedetomidine group as compared to Nitroglycerine group with reduced requirement of intra-operative opioids. The results are comparable to those of our study and study done by Arman Parvizi et al.⁽¹¹⁾

Das et al,⁽¹⁴⁾ found that Dexmedetomidine was more effective in controlling hypotension and anaesthesia. In the our study, the trend of changes in heart rate Max HR p=0.0601, Min HR p=0.0001 and MAP with p=0.0179 shows superiority of Dexmedetomidine over Midazolam.

Shams et al,⁽¹⁵⁾ found that there was significant decrease in heart rate and MAP after 10 mins of using the loading dose in Dexmedetomidine group. Moshiri et al⁽¹⁶⁾ compared dexmedetomidine with propofol and

found that the desired surgical field was made possible by reducing HR rather than vasoconstriction. In our study, the HR was comparatively lower and less fluctuating in the dexmedetomidine group, which is in favour of more stable haemodynamics and blunting of response to sympathomimetic stimuli by dexmedetomidine. Various available studies reported different results for the effects of dexmedetomidine during FESS; but many studies approved the important effects of this drug on the hemodynamic stability and reduction of other maintenance drugs than other methods of induced hypotension.

Conclusion :

Dexmedetomidine and Midazolam are safe and effective in surgical operations such as FESS in which controlled hypotension is desirable, though Dexmedetomidine provides excellent surgeon's satisfaction and controlled hypotension, without severe hemodynamic changes and adverse effects.

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