RESEARCH ARTICLE

DOI: 10.5935/0946-5448.20230024

International Tinnitus Journal. 2023;27(2):154-159

The effect of dexmedetomidine, remifentanil and metoral in reducing patient bleeding during rhinoplasty surgery

Alireza Kamali[1],
Narges Naseri[2],
Farzad Zamani[3],
Narges Anosheh[4],
Siamak Rakei[5]*

ABSTRACT

Introduction: Rhinoplasty is one of the most common surgeries in the ENT department. Rhinoplasty hemorrhage is one of the complications that different strategies have been used to reduce it. Reduction of bleeding reduces the risk of complications such as hemolytic and non-hemolytic reactions, acute lung damage, viral and bacterial infections, hypothermia and coagulation disorders. Therefore, the aim of this study was to compare the effect of dexmedetomidine, remifentanil and metoral in reducing patient bleeding during rhinoplasty surgery.

Materials and Methods: This randomized, double-blind trial was performed on rhinoplasty patients. Rhinoplasty candidates who had the inclusion and exclusion criteria were divided into three groups of remifentanil, metoral and dexmedetomidine according to the random number table. Then 0.5 mg/kg/h of dexmedetomidine in the first group was administered, followed by 100-150 kg/h remifentanil in the second group and 50 mg metoral in the third group. Mean blood pressure, heart rate, mean bleeding and surgeon satisfaction were recorded in designed form. Data were analyzed by Spss-22 software.

Results: The mean blood pressure of patients in remifentanil group was lower than the other two groups ($P = 0.03$). In all three times during surgery, recovery and overall time, the amount of bleeding in the remifentanil group was found to be less than the other two groups. Furthermore, the rate of bleeding in the dexmedetomidine group was found to be less than the metoral group ($P = 0.03$, $P = 0.02$). The surgeon's satisfaction score in the remifentanil group was higher than the other two groups. Satisfaction score was higher in dexmedetomidine group than metoral group ($P = 0.03$). The recovery time in the metoral group was shorter than the other two groups ($P = 0.02$).

Conclusion: Remifentanil caused a good and appropriate reduction of blood pressure in rhinoplasty surgery, causing less bleeding and higher satisfaction.

Keywords: Dexmedetomidine, Remifentanil, Metoral, Rhinoplasty surgery.

[1]Department of Anesthesiology and Critical Care, Arak University of Medical Sciences, Arak, Iran
[2]Department of Otorhinolaryngology, Arak University of Medical Sciences, Arak, Iran
[3]Department of ENT, Arak University of Medical Sciences, Arak, Iran
[4]Department of Anesthesiology and Student Research Committee, Arak University of Medical Sciences, Arak, Iran
[5]Department of Surgery, Arak University of Medical Sciences, Arak, Iran

***Send correspondence to**
Siamak Rakei
Department of Surgery, Arak University of Medical Sciences, Arak, Iran, E-mail: dr.siamakrakei@gmail.com

Paper submitted on October 27, 2023; and Accepted on November 17, 2023

INTRODUCTION

Rhinoplasty is one of the most complex and common surgeries[1]. Bleeding during rhinoplasty reduces the surgeon's vision during surgery. There is a special sensitivity in rhinoplasty due to its proximity to the eye, the base of the brain, blood vessels and nerves, so the surgeon needs a proper view. The presence of bleeding in these patients, in addition to reducing the surgeon's vision, leads to a prolongation of the surgical process and an increase in the severity of postoperative complications such as bleeding, ecchymosis and edema[2] and prolonged postoperative recovery period, which causes anxiety and apprehension[3].

On the other hand, reducing bleeding in these patients reduces the need for blood transfusion and the risk of complications such as coagulation disorders, fever and infection[4]. To this end, physicians use controlled hypotension to reduce intraoperative bleeding and improve surgical progress and reduce the rate of cauterization and ligation, i.e., lowering systolic pressure to less than 80-90 mm/Hg or reducing mean arterial pressure to 50-70 mm /Hg or a 30% reduction of baseline mean arterial pressure[5].

Controlled hypotension is possible in two ways: physiological and pharmacological. In the physiological method, by positioning the body such as elevating the limb and changing the permeability of the arteries (e.g., the use of vasodilators), it creates a significant drop in blood pressure during surgery[6]. However, in the pharmacological method, various drugs are used to induce controlled hypotension, such as sodium nitroprusside, calcium channel blockers, and anesthetic drugs[7]. Remifentanil is one of the drugs used in controlled hypotension. Remifentanil is an ultra-short acting selective mu-opioid receptor agonist that suppresses the vasomotor system, lowers blood pressure, and causes bradycardia[5, 8]. It provides better hemodynamic stability than other narcotics, which reduces changes in cerebral blood flow. Its side effects include decreased diastolic blood pressure, nausea and vomiting[6].

Another drug used is dexmedetomidine, an alpha-2 adrenergic receptor agonist that has sympatholytic effects. This drug causes hypotension, decreases heart rate and consequently reduces cardiac output. It also causes sedation, forgetfulness, numbness, decreased shivering, reduced postoperative nausea and vomiting[9-11].

Metoral or metoprolol is also a drug from the beta-blocker family that reduces bleeding during surgery. By inhibiting beta-adrenergic receptors, it increases renin activity in plasma and decreases the rate of lipolysis[6], reducing the rate of myocardial contraction and lowering blood pressure. Metoral also prevents the sudden increase of catecholamines during surgery and bleeding due to its anti-cytotoxic effect[2]. Controlled hypotension and its various applications are of great importance. Increasing the satisfaction of surgeons during rhinoplasty and reducing the severity of subsequent complications as well as reducing patients' anxiety should be considered.

Therefore, we compared the effects of dexmedetomidine, remifentanil, and metoral on reducing patient bleeding and increasing surgeon satisfaction during rhinoplasty surgery to select the best drug with the fewest side effects.

MATERIAL AND METHODS

This randomized, double-blind trial was performed on rhinoplasty patients referred to Amirkabir Hospital in Arak, Iran. Rhinoplasty candidates who had the inclusion and exclusion criteria were divided into three groups of remifentanil, metoral and dexmedetomidine according to the random number table.

Inclusion criteria

1- All rhinoplasty patients referred to the hospital, 2- Age 18 to 50 years, 3- ASA I and II, 4- Surgery of patients by a surgeon, 5- Operating time between 90 to 180 minutes, and lack of allergy to dexmedetomidine, remifentanil and metoral

Exclusion criteria

1- Surgeries more than 180 minutes, and 2- Specific cardiac complication or even cardiorespiratory arrest

Sample size

The sample size was calculated 75 patients based on reference ([12]).

$$n = \frac{(z1-\alpha/2 + z1-\beta)^2 (\delta1+\delta2)^2}{(\mu1-\mu2)^2}$$

$z1\text{-}{}^{\alpha}/_{2} = 1.96$

$z1\text{-}\beta = 1.28$

$\delta1 = 73.1\ \mu1{:}130.2$

$\mu2 = 57.7\ \delta2{:}39$

n=25

N= 75

Procedure

All patients were monitored for HR, PR, BP, SPO2, temperature, capnography and ECG after obtaining informed consent and upon entering the operating room.

Then, 3-5 cc/kg of crystalloid fluid was placed as a CVE for the patients. After that, all patients were given 1 mg of midazolam with 1-2 cc of fentanyl as premed and then a line was inserted from the non-dominant hand radial artery as arterial line to accurately record blood pressure. Then the patients were prepared for anesthesia and all the mentioned patients in 3 groups were anesthetized with fentanyl 3-5 /kg, midazolam 0.2 mg/kg, atracurium 0.5 μg and propofol 2-3 mg/kg. After anesthesia induction, the patients were intubated and ventilated. Then the prep and drop were done and they were ready for rhinoplasty. Then 0.5 mg/kg/h of dexmedetomidine in the first group was administered, followed by 100-150 kg/h remifentanil

in the second group and 50 mg metoral in the third group.

In order to observe blinding, the volume of infusion drug in all 3 groups was equal to 50 cc (i.e., the volume of syringes for infusion was increased to 50 cc). The appearance and volume of the infusion were the same for all three groups. Furthermore, the drugs required for infusion were prepared by an anesthesiologist and all three groups were provided with 50 cc syringes of the same shape.

Therefore, the colleague and intern responsible for completing the questionnaire was not aware of the type of study group. Syringes containing infusion solutions for the mentioned patients were labeled A, B and C and were given to the design colleague. For all the mentioned patients in the 3 study groups, a designed questionnaire including questions based on demographic information as well as data based on MAP, PR, mean bleeding score and surgeon's satisfaction was completed.

Data analysis

The data obtained from the completed questionnaires were statistically analyzed using Spss statistical software version 22, and T-test and ANOVA test were used.

Ethical considerations

The Declaration of Helsink and ethical principles of Research Ethics Committee of the University of Medical Sciences were observed. The study was approved with the ethics code, IR.ARAKMU.REC.1398.039.

RESULTS

In this study, age and sex of patients were compared in three groups. According to Table 1, no significant difference was found between the three groups in terms of mean age and sexual frequency (P = 0.6, P = 0.4) and the mean age of all three groups was 24.5 years. Furthermore, the frequency of female patients in the two groups was approximately 77%.

Comparison of mean blood pressure and heart rate of rhinoplasty patients in three groups of dexmedetomidine, remifentanil and metoral was evaluated before surgery. Mean blood pressure 15 minutes before surgery was determined in the dexmedetomidine (90.1 ± 4.6), remifentanil (89.6± 5.3) and metoral groups (89.9 ± 6.3) per mmHg. Preoperative heart rate was also determined in the groups of dexmedetomidine (92.6 ± 5.9), remifentanil (93.8 ± 6.2) and metoral (93.5± 4.6). According to the results obtained, no significant difference was found between the mean blood pressure and mean heart rate between the three groups before surgery (P = 0.6).

A significant difference was found between the three groups in terms of mean blood pressure of patients in all minutes (after surgery) and the mean blood pressure Table 2. The mean blood pressure of patients in remifentanil group was significantly lower than dexmedetomidine and metoral groups and also the mean blood pressure of patients in dexmedetomidine group was lower than metoral group, so better blood pressure drop was observed in remifentanil group (P = 0.03).

No significant difference was found between the three groups in terms of patients 'mean heart rate. There was no difference in heart rate between the three groups (dexmedetomidine, remifentanil and metoral) in terms of patients' heart rate (P = 0.4; Table 3).

A significant difference was found between the three groups in terms of bleeding at different times (Table 4 and Figure 1), so that in all three times during surgery, recovery and overall bleeding in the remifentanil group was less than the other two groups. Furthermore, the rate of bleeding in the dexmedetomidine group was found to be less than the metoral group (P = 0.03, P = 0.02).

Table 1: Age and sex of rhinoplasty patients in three groups.

Group	Dexmedetomidine group		Remifentanil group	Metoral group	P-value
Age mean	23.9±5.7		24.6±4.2	24.8±4.9	P= 0.6
Sex frequency	Male	22.60%	23.10%	21.70%	P= 0.4
	Female	77.40%	76.90%	78.30%	

T- test, $\times^2$

Table 2: Comparison of mean blood pressure of rhinoplasty patients.

Group Mean MAP	Dexmedetomidine group	Remifentanil group	Metoral group	P-value
MAP 5 minutes after the start of the operation	75.9±6.4	77.1±8.2	76.2±9.2	
MAP 15 minutes after the start of the operation	64.3±4.2	59.7±7.2	69.5±6.6	
MAP 30 minutes after the start of the operation	64.2±7.2	57.9±6.3	68.9±4.9	
MAP 45 minutes after the start of the operation	63.3±6.9	57.2±6.4	66.6±7.2	P= 0.03
MAP 60 minutes after the start of the operation	64.3±9.3	59.1±4.6	70.1±7.9	
MAP75 minutes after the start of the operation	66.7±4.6	61.6±8.2	70.8±8.8	
MAP 90 minutes after the start of the operation	69.9±8.4	63.8±6.8	71.2±8.2	
MAP recovery	84.3±7.6	79.5±4.7	89.7±6.4	

T-test

Table 3: Comparison of mean heart rate of rhinoplasty patients.

Group Mean heart rate	dexmedetomidine	remifentanil	metoral	P-value
Heart rate 5 minutes after surgery	78.8±8.3	77.9±6.4	79.6±6.3	
Heart rate 15 minutes after surgery	80.2±9.2	71.9±6.4	75.8±6.4	
Heart rate 30 minutes after surgery	68.8±6.2	67.7±9.3	69.9±8.2	
Heart rate 45 minutes after surgery	66.6±7.3	65.8±8.3	64.5±7.9	P= 0.4
Heart rate 60 minutes after surgery	63.4±8.2	65.2±7.1	61.2±6.6	
Heart rate 75 minutes after surgery	62.7±6.4	66.3±6.3	61.3±5.6	
Heart rate 90 minutes after surgery	65.6±4.9	68.1±5.4	64.4±6.4	
Heart rate recovery	72.1±6.5	74.3±4.9	75.2±5.6	

T-test

Table 4: Comparison of mean bleeding of rhinoplasty candidates in three groups of dexmedetomidine, remifentanil and metoral (in cc).

Group Average bleeding	dexmedetomidine	remifentanil	metoral	P-value
surgery	58.7±7.6	41.1±6.9	67.2±6.9	P= 0.02
recovery	57.1±8.4	46.9±9.4	65.7±7.5	P= 0.03
total	115.8±9.4	88.3±8.9	132.9±10.1	P= 0.02

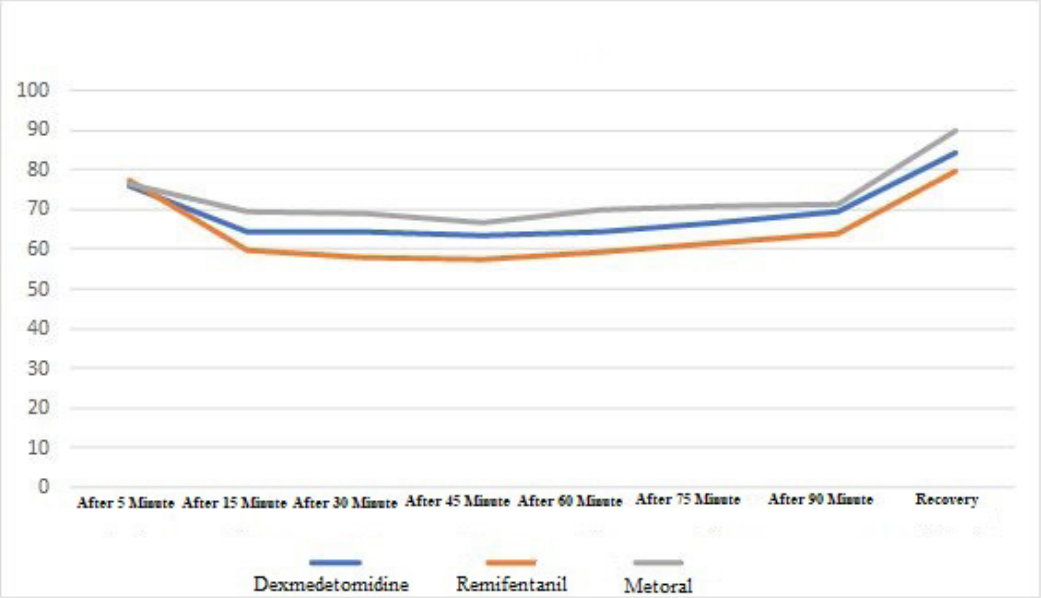

Figure 1: Comparison of mean blood pressure of rhinoplasty patients.

Table 5: Mean surgeon satisfaction score and recovery time of rhinoplasty candidates in three groups.

Group Average score	dexmedetomidine	remifentanil	metoral	P-value
Average Satisfaction Score	2.4±0.98	3.3±0.78	1.9±0.89	P= 0.03
Average recovery time	49.9±7.4	36.6±5.3	30.7±8.6	P= 0.02

There was a significant difference between the three groups in terms of surgeon satisfaction and the surgeon satisfaction score in the remifentanil group was higher than the other two groups Table 5. Also, the satisfaction score in the dexmedetomidine group was found to be higher than the metoral group (P = 0.03). This is while the recovery time in the metoral group was shorter than the other two groups (P = 0.02).

DISCUSSION

Rhinoplasty is one of the most common surgeries in the ENT department. Rhinoplasty hemorrhage is one of the complications that different strategies have been used to reduce it. Reduction of bleeding reduces the risk of complications such as hemolytic and non-hemolytic reactions, acute lung damage, viral and bacterial infections, hypothermia and coagulation disorders[13].

Therefore, the aim of this study was to compare the effect of dexmedetomidine, remifentanil and metoral in reducing patient bleeding during rhinoplasty surgery.

In the present study, the mean age of all three groups was 24.5 years and the frequency of female patients in both groups was approximately 77%. There was no significant difference between their mean heart rate between the three groups before surgery (P = 0.4). The mean blood pressure of patients in remifentanil group was significantly lower than dexmedetomidine and metoral groups. Also, the mean blood pressure of patients in the dexmedetomidine group was lower than the metoral group and therefore we saw a better reduction in blood pressure in the remifentanil group (P = 0.03). In all three times during surgery, recovery and total bleeding in the remifentanil group was less than the other two groups. Also, the bleeding rate in the dexmedetomidine group was less than the metoral group (P = 0.03, P = 0.02). The surgeon satisfaction score in the remifentanil group was higher than the other two groups and also the satisfaction score in the dexmedetomidine group was higher than the metoral group (P = 0.03). This was while the recovery time in the metoral group was shorter than the other two groups (P = 0.02).

Various studies have been conducted in this regard. Khamestan et al. evaluated remifentanil infusion by administering a single dose of hydralazine and propranolol in controlling low blood pressure in patients undergoing rhinoplasty as a clinical and prospective trial on 80 patients. The two groups were divided into 40. A single dose of hydralazine and propranolol was used in group A and remifentanil infusion was applied in group B during anesthesia. Their data showed that anesthesia using remifentanil infusion could reduce bleeding and increase surgeon satisfaction in surgery and this effect was significantly greater than using single-dose of hydralazine and propranolol[5].

Sadeghi et al. (2011) compared hemodynamic changes induced by remifentanil plus isoflurane administration in comparison with propofol plus remifentanil in patients undergoing sinus surgery. In this study, 96 patients were divided into 2 equal groups. The results of this study showed that remifentanil and propofol maintained more hemodynamic stability than the opposite group ([14]). These results were similar to our study in which remifentalin reduced blood pressure and bleeding. In the study by Koşucu et al., "The effects of intraoperative remifentanil injection with control hypotension on postoperative bleeding and postoperative edema and ecchymosis during rhinoplasty" were investigated. This study was performed on 52 patients and the results showed that MAP decreased during the surgery and 30 minutes after surgery in the remifentanil group. Intraoperative bleeding also decreased in this group[2], which was in line with our study.

Aksu et al. examined the efficacy of dexmedetomidine versus fentanyl on airway reflex and hemodynamic response to trachealextubation during rhinoplasty. "From January 2007 to June 2007, 40 patients were divided into 2 equal groups. 5 minutes before, patients received 0.5 μg/kg dexmedetomidine in 100 ml isotone saline and the opposite group received fentanyl 1 μg/kg in 100 mL. The results of this study showed that dexmedetomidine was more effective than fentanyl in attenuating airway reflex responses to tracheal extubation and maintaining hemodynamic stability, and dexmedetomidine did not prolong recovery time as compared with fentanyl 1 μg/kg IV[15].

Overall, it should be noted that the side effects of using remifentanil during anesthesia are much less. It provides better hemodynamic stability than other drugs, which reduces changes in cerebral blood flow. Its side effects include decreased diastolic blood pressure, nausea and vomiting.

CONCLUSION

Remifentanil caused a good and appropriate reduction in blood pressure during rhinoplasty surgery, resulting in less bleeding and higher overall satisfaction.

REFERENCES

1. Momeni A, Gruber RP. Primary open rhinoplasty. Aesthet Surg J. 2016;36(9):983-92.
2. Kosucu M, Ömür S, Besir A, Uraloglu M, Topbas M, Livaoglu M. Effects of perioperative remifentanil with controlled hypotension on intraoperative bleeding and postoperative edema and ecchymosis in open rhinoplasty. Arch Craniofac Surg. 2014;25(2):471-5.
3. Berenjian S, Hassani V, Farhadi M, Zaman B, Alimian M. Comparing the effect of Tranexamic acid and Dexmedetomidine on bleeding during Rhinoplasty. Anesth Pain Med. 2017;7(4):36-43.
4. Yun SH, Kim JH, Kim HJ. Comparison of the hemodynamic effects of nitroprusside and remifentanil for controlled hypotension during endoscopic sinus surgery. J Anesth. 2015;29:35-9.
5. Khamestan M, Sadeghi Se, Samadi K, Forouzan M. Evaluating the effect of remifentanil infusion vs. single dose intravenous hydralazine plus propranolol to provide controlled hypotension in patients undergoing rhinoplasty in Khalili Hospital of Shiraz.2016
6. Rokhtabnak F, Motlagh SD, Ghodraty M, Pournajafian A, Delarestaghi MM, Banihashemi AT, et al. Controlled hypotension during rhinoplasty: A comparison of dexmedetomidine with magnesium sulfate. Anesth Pain Med. 2017;7(6).
7. Berenjian S, Hassani V, Farhadi M, Zaman B, Alimian M. Comparing the effect of tranexamic acid and dexmedetomidine on bleeding during rhinoplasty. Anesth Pain Med. 2017;7(4):36-43.
8. Akhavanakbari G, Entezariasl M, Ojagi H, Isazadehfar K. Comparison of the effects of remifentanil and alfentanil on intraocular pressure in cataract surgery. Saudi J Anaesth. 2013;7(2):160.

9. Zamani F, Naseri N, Farmani F, Kamali A. Comparison of the effect of dexmedetomidine and remifentanil on controlled hypotension During rhinoplasty: A clinical trial study. Int Tinnitus J. 2020;24(2):60-4.

10. Huang PC, Liu YC, Chen KB, Tseng YL, Li CY. Dexmedetomidine enhances adenosine diphosphate-induced platelet aggregation and P-selectin expression: 6AP6–5. Eur J Anaesthesiol. 2010;27(47):115.

11. Dogan R, Erbek S, Gonencer HH, Erbek HS, Isbilen C, Arslan G. Comparison of local anaesthesia with dexmedetomidine sedation and general anaesthesia during septoplasty. Eur J Anaesthesiol. 2010;27(11):560-964.

12. Ayoglu H, Yapakci O, Ugur MB, Uzun L, Altunkaya H, Ozer Y, et al. Effectiveness of dexmedetomidine in reducing bleeding during septoplasty and tympanoplasty operations. J Clin Anesth. 2008;20(6):437-41.

13. Berenjian S, Hassani V, Farhadi M, Zaman B, Alimian M. Comparing the effect of tranexamic acid and dexmedetomidine on bleeding during rhinoplasty. Anesth Pain Med. 2017;7(4):36-43.

14. Sadeghi SM, Seyedmehdi SA, Zamanabadi MN, Sadeghi SA. Comparing hemodynamic changes during endoscopic sinus surgery: Remifentanil/isofluran versus remifentanil/propofol. Tehran Univ Med J. 2011;68(12).

15. Aksu R, Akin A, Biçer C, Esmaoğlu A, Tosun Z, Boyaci A. Comparison of the effects of dexmedetomidine versus fentanyl on airway reflexes and hemodynamic responses to tracheal extubation during rhinoplasty: A double-blind, randomized, controlled study. Curr Ther Res. 2009;70(3):209-20.