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Research Article

The Effect of Dexmedetomidine on Recovery Indicators after Rhinoplasty Surgery

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ABSTRACT

Introduction: Postoperative complications are a major problem in rhinoplasty surgery. The purpose of this study is the evaluation of the effects of dexmedetomidine with different doses on various complications after surgery.
Methods: Patients (N=60) were randomly divided into 3 groups; in the first group, 1 mg/kg of dexmedetomidine was prescribed before the end of the operation, and then 0.5 mg/kg of infusion was given in recovery. In the second group, 1 mg/kg of dexmedetomidine was received, then a 0.7 mg/kg infusion, and in the third group, an equal volume infusion of normal saline and then was administered as an infusion. Finally, demographic data and the duration of surgery, anesthesia, and hospitalization in the recovery room were analyzed. Also, complications caused by surgery were evaluated.
Results: It was found that dexmedetomidine in both doses of 0.5 and 0.7 mg/kg can reduce the incidence of pain at different times in the recovery room. Also, the amount of pain medication in the dexmedetomidine groups was significantly lower compared to the N/S group (P value $\leq$ 0.05), and this drug caused a significant decrease in systolic and diastolic blood pressure as well as an incidence of nausea and vomiting in the dexmedetomidine groups compared to the control group (P value $\leq$ 0.05).
Conclusion: Administration of dexmedetomidine infusion in patients undergoing surgery can be effective in improving hemodynamic parameters and reducing pain and nausea and vomiting. Also, dexmedetomidine had an effective role in reducing the use of analgesics after surgery.

Introduction

Surgeries due to the use of anesthesia can cause wide complications in patients. These complications result in low patient satisfaction in the postoperative period, and they may even increase postoperative nausea and vomiting, pain, and time spent in the recovery room [1-2]. So, using of a suitable strategy can help promote postsurgical recovery [3]. In fact, control of more serious complications such as hemodynamic parameters and duration of hospitalization is necessary in enhanced recovery protocols after surgery [4-5].

There are a wide range of opioids in the improvement of different postoperative complications, such as pain, sedation, and nausea and vomiting [6]. However, the presence of high side effects following opioid administration led to the replacement of better options for controlling postoperative complications [7-8].

As an effective, multipurpose alpha-2 agonist, dexmedetomidine can relax, calm, calm the sympathetic nervous system, and help you sleep [9-10]. It proved that dexmedetomidine administration can provide an optimal

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surgery for patient and this medicine has few side effect [11-12]. In addition to, dexmedetomidine may play positive effect on respiratory and hemodynamic parameters during surgery and after surgery [13].
According to no study that has been done so far with 0.5 and 0.7 μg/kg concentrations of dexmedetomidine, the aim of this study was to assess the analgesic, sedative, and hemodynamic effects of dexmedetomidine and to compare its different concentrations on various postoperative complications following rhinoplasty.

Methods

Study design

The Isfahan University of Medical Sciences' Ethics Committee approved this study (IR.MUI.MED.REC.1400.166) code: IRCT20200825048515N57). This randomized clinical trial was a triple-blind comparative study conducted at Al-Zahra Medical Center, Isfahan, in 1401 year.

This study enrolled sixty patients undergoing rhinoplasty surgery. All the patients were fasted from the previous day. After receiving general anesthesia, the patient's oxygen saturation, blood pressure, respiratory rate, and heart rate were monitored in the operation room.

Inclusion criteria

Age patients between 18 and 65 years, American Society of Anesthesiologists physical status Class I or II, and rhinoplasty surgery under general anesthesia were included in this study.

Exclusion criteria

Body mass index (BMI) ≥ 30, previous allergy to dexmedetomidine, addiction, change of anesthesia method, consumption of analgesics, and excessive bleeding that requires blood transfusion.

All participants wrote informed consents, and they were randomly based on a random allocation technique divided into 3 groups (n= 20 in each group): 1) Administration of a 1 μg/kg bolus dose of dexmedetomidine in 0.5 h before the end of surgery and then a 0.5 μg/kg infusion until 30 minutes after recovery (group D1). 2) Administration of 1 μg/kg bolus dose of dexmedetomidine in 0.5 h before the end of surgery and then 0.7 μg/kg infusion until 30 minutes after recovery (group D2). 3) Receiving equal volume infusion of normal saline in 0.5 h before the end of surgery and then its infusion during 30 min after recovery (N/S group). All patients were operated on by the same surgeon, and a similar surgical procedure was done.

The profiles, including the anesthesia time (time interval from the injection of anesthetic until its end), surgery time (duration of surgery from the first incision to the last suture), and recovery time (hospitalization period in the recovery room), were recorded. All patients were extubated, transferred to the recovery room, and monitored for hemodynamics, analgesia, sedation, and postoperative side effects during hospitalization in the recovery room. Postoperative pain intensity was assessed using a 10-point visual analogue scale (VAS) on which 0 indicated no pain while 10 points related to the most intense pain. The total amount of opium and sedative consumption for pain control was evaluated in different groups were 0.5 mg of pethidine was administered in VAS> 4. The occurrence of nausea and vomiting was assessed after surgery in groups.

Statistical analysis

The data were presented as mean ± standard deviation, and statistical analysis was performed using one-way analysis of variance (ANOVA) and Tukey's post hoc test by SPSS 26 software (SPSS Inc., Chicago, IL, USA). P value < 0.05 was considered statistically significant.

Results

In this study, first, 72 adult patients who underwent rhinoplasty surgery were chosen, and 12 patients were excluded from the research for different reasons. Were divided the Patients into 3 groups (n=20) (Figure 1).

The demographic and clinical characteristics of the patients are presented in (Table 1). There was no significant difference in terms of age, body weight, gender, type of operation, duration of anesthesia, operation, and time of recovery room (P ≤ 0.05).

We evaluated the diastolic and systolic blood pressure in different groups at baseline and after surgery. The blood pressure was similar at baseline (time: 0), and the use of dexmedetomidine significantly decreased diastolic blood pressure compared with the NS group after anesthesia, 15, 30, 75, and 90 minutes after operation (P value ≥ 0.05) (Table 2).

Also, the reduction was significantly observed in systolic blood pressure in the presence of dexmedetomidine administration after anesthesia, 15, 60, and 75 minutes after operation (P value ≥ 0.05) (Table 3).

The rate of arterial blood oxygen was measured in different groups (Table 4). There was no significant difference in the mean of arterial blood oxygen with dexmedetomidine administration compared with the NS group at different times of postoperation (P value ≥ 0.05). There were no significant differences in the vomiting rate among 3 groups (P value ≥ 0.05) (Table 5).

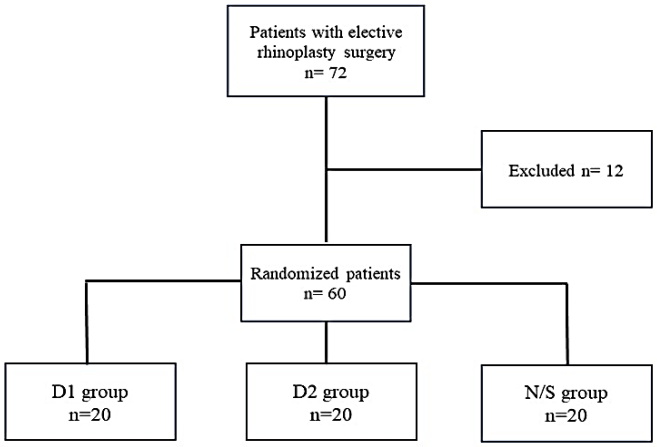

Figure 1- Flow diagram of randomized patients

Table 1- demographic and clinical characteristic of patients in different groups

variable	D1	D2	N/S	P
Age	37±5.6	36.9±5.7	35.4±5.2	0.093
Weight	71.1±7.4	68.8±3.96	66.6±6.68	0.17
Gender (F/M)	12/8	16/4	13/7	0.11
Anesthesia time (hour)	4.28±0.57	4.25±0.62	5±0.52	0.091
Operation time (hour)	4.39±0.53	4.36±0.56	4.34±0.59	0.12
Time of recovery room (hour)	1.48±0.26	2.05±0.43	2.07±0.4	0.098

D1: 1 µg/kg bolus dose of dexmedetomidine in surgery and then 0.5 µg/kg infusion until 30 minutes after recovery; D2: 1 µg/kg bolus dose of dexmedetomidine in surgery and then 0.7 µg/kg infusion until 30 minutes after recovery; N/S: receiving equal volume infusion of normal saline surgery and then its infusion during 30 min after recovery.

Table 2- The mean of diastolic blood pressure in different times in 3 groups

Diastolic BP /time	D1	D2	NS	P1	P2
Baseline	5±12.3/94	7±12.4/93	21±11.5/92	0.38	0.41
After anesthesia	2±9.1/78**	9±10.2/78*	8±15.5/83	0.08	0.042
15 min	5±10.9/75**	9±9.6/74*	8±16.2/80	0.008	0.02
30 min	2±11.4/76**	12±12.4/75*	23±13.7/80	0.056	0.041
45 min	3±12/77	9±14.4/77	2±12.7/81	0.08	0.093
60 min	5±11.9/80	3±12.6/79	8±15.3/83	0.008	0.047
75 min	5±9.12/81**	9±9.6/80*	8±12.11/86	0.072	0.047
90 min	9±10.2/82**	8±6.9/81*	1±15.2/86	0.069	0.084

Table 3- The mean of systolic blood pressure in 3 groups in various times

Systolic BP/time	D1	D2	NS	P_1	P_2
Baseline	7±17.41/130	5±8.4/127	1±14.27/132	0.38	0.41
After anesthesia	4±17.2/119	6±23.2/112*	2±15.8/121	0.08	0.042
15 min	2±15.9/109**	1±15.2/108*	8±12.9/116	0.008	0.02
30 min	4±10.2/113	1±12.34/111	117±14.2	0.056	0.041
45 min	11±12.5/115	13±9.26/114	9±11.21/118	0.08	0.093
60 min	9±14.6/112**	1±12.5/112*	4±14.23/119	0.008	0.047
75 min	4±12.9/115	15±10.2/110*	4±11.3/118	0.072	0.047
90 min	118±12.1	5±10.8/115	16±12.34/120	0.069	0.084

Table 4- The mean of arterial blood oxygen saturation (Sao2) in different times in 3 groups

Sao2/time	D1	D2	NS	P
Baseline	1.72±97.2	98.2±0.92	1.1±98.2	0.45
After anesthesia	0.77±98	0.7±98.9	1±98.1	0.19
15 min	0.91±98.4	0.9±98.7	1.2±98.3	0.48
30 min	1.2±97.9	0.87±98.2	1.3±97.1	0.511

45 min	1.07±98.2	1±98.3	1.67±97	0.18
60 min	0.94±98.1	0.87±98.2	1.4±96.8	0.311
75 min	0.94±97.9	0.87±98.2	1.66±97.2	0.21
90 min	1.1±97.6	0.94±97.9	1.35±97.4	0.61

Table 5- The percentage of shivering, nausea and vomiting after surgery in different groups

Groups/ variable	D1	D2	NS	P_1
Nausea	30%	30%	65%*	0.021
Vomiting	15%	20%	25%	0.09

After the operation, we compared the incidence and intensity of pain in the three patient groups using the VAS scale (Figure 2). In this study, the highest level of pain intensity was reported in the N/S group with a score of 8 in the first 30 minutes of hospitalization in recovery, while the highest level was a 6 score in groups receiving dexmedetomidine. Moreover, there was a significant difference between the normal saline group and the dexmedetomidine group at all times, except for the first 15 minutes after anesthesia (P value ≤ 0.05). Table 6 displays the rate of analgesic requests in each group following surgery. In fact, dexmedetomidine significantly decreased postoperative analgesic requirements in patients compared with the N/S group (P value ≤ 0.05). Also, the use of dexmedetomidine decreased time to the first postoperative analgesic request.

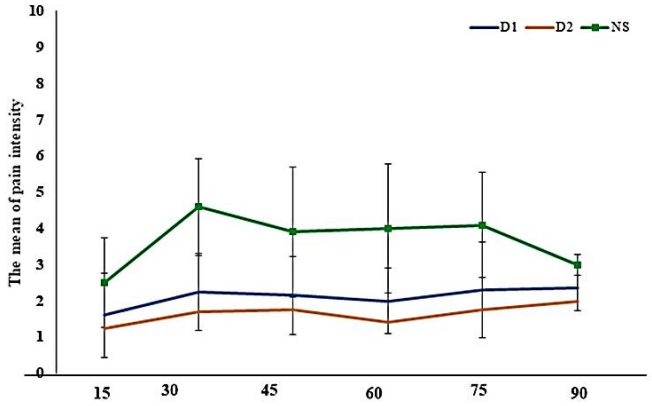

Figure 2- The mean of pain intensity in different times in 3 groups.

Table 6- Comparison of the percentage of request of analgesic medications after surgery in different groups.

Groups	Analgesic consumption	Number of requests		
		Once	Twice	Three times
D1	20%	15%	5%	-
D2	15%	15%	-	-
NS	55%*	25%	20%	10%

Discussion

Dexmedetomidine plays important roles in controlling anxiety and pain through its central sympatholytic action. Also, it may regulate intraoperative heart rate and blood pressure in patients [14]. This drug can relieve the pain by inhibiting norepinephrine production and preventing pain signal transmission [15]. Dexmedetomidine serves as a valuable adjuvant in anesthesia by reducing the need for analgesic consumption. In fact, this adrenoreceptor agonist provides analgesic actions by influencing the a2c- and a2a-receptors located on neurons in the dorsal horn [16]. In the present study, infusion of dexmedetomidine with different concentrations prolonged postoperative analgesia compared with the control group. Also, the average pain intensity was higher in the control group compared to groups receiving dexmedetomidine. In fact, patients in the dexmedetomidine group experienced better analgesia following surgery.

Consistence with our results, Lee et al. showed that injection of dexmedetomidine during gynecology surgery can significantly reduce the pain score and the additional opioids consumption in recovery room [17].

A study showed that consumption of dexmedetomidine can significantly decrease the request of opioids in the recovery room in patients under spinal anesthesia [18]. Another study showed that intraoperative administration

of dexmedetomidine as an additional medication provides a positive effect on pain control and morphine consumption compared with the remifentanil drug following lumbar laminectomy [19].

Alinaghimaddeh et al. compared the effect of midazolam, propofol and dexmedetomidine on nausea and vomiting rate in patient under cataract surgery. The results showed that there are no significantly difference between three groups in rate of incidence of nausea and vomiting [20]. However, out results showed that the incidence of nausea and vomiting significantly decease following administration of dexmedetomidine.

In addition to that, adding 0.1 μg/kg dexmedetomidine to an opioid-based analgesic could provide a higher oxygen saturation in arterial blood during the first 24 hours of spine surgery compared with the control group [21]. Another study proved that administration of respiratory dexmedetomidine provides stability in cardiovascular parameters, and this is consistent with our study [22]. The small sample size, use of two dexmedetomidine doses, and only one type of surgery were the limitations of the present study.

Conclusion

This study demonstrated that use of dexmedetomidine with both of the concentrations (especially 0.7 μg/kg infusion) as an alpha agonist could play a reduction role on pain and postoperative nausea and vomiting. Also, dexmedetomidine regulates stable hemodynamics following rhinoplasty surgery in patients. So, this medication may be a suitable choice in controlling surgery complications.

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