Comparative Study of Hemodynamic Infusion of Dexmedetomidine With Alternative Sufentanil-Midazolam Injection for Sedation of Patients Undergoing Cataract Surgery

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Abstract- In order to induce sedation during cataract surgery, various medications with different side effects are used in separation or in combination. Dexmedetomidine has no effect on the respiratory system, but being dependent on dosage, it may cause cardiovascular disorders. The present study aims to compare the hemodynamic and sedative effects of dexmedetomidine and the combination of sufentanil-midazolam on patients undergoing cataract surgery. In a randomized clinical trial study, 60 patients were randomly divided into two dexmedetomidine and sufentanil-midazolam groups. In sufentanil-midazolam group, dexmedetomidine (DEX infusion at 0.5 µg/ kg for 10 minutes, then adjusted to 0.2 µg/kg/h) was prescribed. In the sufentanil-midazolam group, sufentanil (0.1 µg/kg for 5 minutes) and midazolam (0.2 µg/kg) were injected five minutes before the operation. Hemodynamic variables (Systolic blood pressure, diastolic blood pressure, heart rate), complications (nausea, vomiting, hypoxia), sedation level, and pain intensity were recorded (at the beginning of the study, 5, 10 minutes after anesthesia, at the start of surgery, 5, 10, 15 minutes after the surgery) as well as patient's satisfaction, surgeon's satisfaction, and complications. Results suggest that apart from gender, other primary characteristics of patients, including age, history of blood pressure, diabetes history, ASA score, mean of systolic, diastolic blood pressure, heart rate, and SPO2 levels, were similar in both groups (P>0.05). Systolic blood pressure patients receiving dexmedetomidine declined significantly more than that of patients receiving sufentanil-midazolam (P>0.5). Diastolic blood pressure suddenly fell 5 minutes after the infusion of sufentanil-midazolam (P>0.05), but then a relative increase and finally a relative decrease occurred, while diastolic blood pressure in patients receiving dexmedetomidine decreased steadily. The mean heart rate in patients receiving dexmedetomidine and sufentanil-midazolam declined gently (P>0.05). SPO2 was reduced significantly in the sufentanil-midazolam group (P<0.05). Drugs used in both groups reduced pain intensity equally (P>0.05). From the beginning of the study, dexmedetomidine produced a relatively stable sedation level (score 2) based on Ramsay's criteria, while the combination of sufentanil-midazolam-medications causes deeper sedation (score 3) in patients (P<0.05). Despite this fact, 23.33% of the patient receiving sufentanil-midazolam could have movements during the surgery, which was 6.66% higher in patients receiving dexmedetomidine (P=0.071). The satisfaction of patients receiving dexmedetomidine was significantly higher (P=0.044), while the surgeon's satisfaction was almost identical in both anesthesia procedures (P=0.94). In the end, the results of the present study showed that although dexmedetomidine is associated with few respiratory problems and higher satisfaction of patients, it decreases blood pressure and heart rate progressively. However, it seems that this medicine is more effective than a combination of midazolam-sufentanil because of more patient satisfaction, lack of hypoxia, fewer complications, and more suitable immobility.

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Keywords: Dexmedetomidine; Sufentanil-midazolam; Sedation; Cataract surgery

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Introduction

A cataract is a widespread disease among adults so that 46 percent of Americans at 75 to 85 years of age have this disease (1). In Iran, cataract is done in 20000 to 30000 surgeries of all kind (2). Evidence suggests that aging is one of the most important reasons for cataracts (3). Most of the patients undergoing cataract surgery were old people who have the disease in which hemodynamic changes lead to complications (2). Not any medical treatment which could delay or eliminate the fundamental chemical changes in cataract creation has not yet been found (4). Sedation or localized anesthesia is safer than general anesthesia for patients undergoing cataract surgery (5). Localized anesthesia is done by retrobulbar, peribulbar, subpterygeal or facial block injection, or distilling anesthetic eye drop (4). Cataract surgery aims to provide a proper situation with the least hemodynamic changes and faster recovery. The sedation level used in this type of surgery is very important because deep and intensive sedation can cause respiratory weakness and hemodynamic changes, including blood pressure decline, hypoxia, a little awareness of time and place, and lack of cooperation during the surgery (5). As the needle causes pain and local anesthesia doesn't bring about analgesia for surgery, the patient gets nervous. Thus, this surgery must be done with sedatives under MAC (monitored anesthesia care), and it is impossible without sedation (4). Currently, Intravenous Drugs (propofol, midazolam) and narcotics (sufentanil and fentanyl) are used to sedate patients for cataract surgery which mostly causes respiratory-cardiovascular depression and unawareness of time and place (5).

The simultaneous combination of midazolam and narcotics causes hypoxia, hypotension, and respiratory depression (6), those who undergo surgery are more sensitive to narcotics due to their age (7). Nausea is another side effect of narcotics. Narcotics also incarcerate CO2 by respiratory repression, which results in drowsiness. So, in order to sedate these patients, we must use methods with the least hemodynamic changes and the least complications (8).

Dexmedetomidine is an α_2 agonist adrenergic, which has anti-anxiety, sedative, Hypnotic and sympatholytic effects approved by FDA in 1999 for less- than-24 hours sedation in patients undergoing mechanical ventilation in CCU. Pharmacokinetic dexmedetomidine is not affected by renal disorders and aging (9). Its elimination half-life takes 2-3 hours, and its sensitive half-life starts from 4 minutes after a 10-minute infusion to 250 minutes after an 8-hour infusion. Dexmedetomidine infusion causes a decrease in heart rate and in resistance of systemic vessels which finally results in declining systemic blood pressure by 30 percent. On the other hand, dexmedetomidine can cause dry mouth syndrome by reducing salivation; also, it can alleviate eye pressure. Narcotics have an important role in special care and pain control.

All basic and clinical aspects of pharmacological narcotics are safe and effective. Suppressed pain from narcotics affects the brain, medullar and narcotic system, other organs such as the respiratory and cardiovascular systems (9). Suppression of the respiratory system is the most unfavorable effect of these medicines, and many of these factors can increase the risk of respiratory depression. Major risk factors are the high dose of narcotics and aging (10).

Opioids of fentanyl group cause bradycardia by increasing vagus nerve tuner in the brainstem Vasodilatation by suppressing the vasomotor centers and direct effect on vessels and decline in blood pressure by decreasing preload and afterload (9), sufentanil is a widely used and strong narcotic in sedation, and its low amount of dosage is needed compared to ineffective medicines (10).

Because of the growing old population and an increase in cataract surgery, we need sedations with more stable hemodynamics and fewer complications more than before. However, dexmedetomidine is a medicine accepted by FDA in 1999, few studies were performed on cataract surgeries and concurrent use of narcotics and sufentanil. Thus, the present study aimed to compare the hemodynamic effects of Dexmedetomidine infusion for sedation in cataract surgery and alternative sufentanil-midazolam method.

Material and Methods

This study was a randomized clinical trial done on patients with cataract class I to IV referring to Imam Khomeini hospital of Kermanshah. The inclusion criteria were age range of 30 to 70, not having nephrogenic and hepatic diseases. The exclusion criteria were less than 30 or more than 70 age range, pregnancy, pulmonary diseases, nephrogenic diseases, hepatic diseases, SBP>180, SBP<90, HR>120, HR<60, history of alcohol or drug abuse, and persistent use of painkillers.

Sample volume and sampling method

Considering the poor clarification on comparing given variables in published articles (as diagrams, not tables),

the least number of samples was determined to be 23 in each group using STATAIR with regard to the difference of patients' satisfaction level in both groups (in a 7-degree scale; at least two units, standard deviation=2, 95% confidence level and the testing power to track the difference equaling 95%). In order to strengthen the study, the number of samples in each group reached 30. Sampling was done based on the randomized number of patients undergoing cataract surgery scheduled in the operation room of Imam Khomeini hospital.

Designing study and collecting data

After getting Ethical Committee approval, 60 patients with ASA class I to III volunteer for cataract surgery in Imam Khomeini hospital included in the randomized clinical trial study based on the inclusion and exclusion criteria. Patients were randomly classified into two groups of dexmedetomidine and sufentanil midazolam by non-interventionists based on a table of random numbers (Figure 1). Before starting the infusion, the general plan was explained to the patients, and the written consent was taken from the sedation assistant. After the cardio monitoring, an i.v. the line was devised, and the ringer serum was injected into patients. Patients were oxygenated with a face mask (a flow of 5 lit/min).

In the Dexmedetomidine group, a dose of 0.5 µg/kg dexmedetomidine was infused by Anesthesiology Assistant 10 minutes before the surgery, and in the sufentanil sufentanil-midazolam group, a dose of 0.1 µg/kg sufentanil and 0.2 µg/kg midazolam were injected 5 minutes before the surgery. Then in group D, a dose of 0.2 µg/kg Dexmedetomidine continued being infused.

SBP, DBP, HR, and SPO2 were recorded before the infusion and every 5 minutes by Anesthesiology Assistant, and the sedation level was inserted in a regulated table based on Ramsey Norms. The pain was measured based on VAS criteria. The movement of patients was recorded in a data chart by a co-worker who knew nothing about the patient's classification.

During the surgery, data were recorded in case of any hypoxia. If HR was less than 40, the patient would be cured by Atropin, and the results could be recorded. For determining the sedation level of medicines, we used refined grades of Ramsey. According to Ramsey criteria graded 1 to 6, 1 means totally awake and anxious, two means quiet and relax with enough assistance, 3 means asleep who wakes up when she/he hears the orders, 4 means asleep who wakes up by a mild stimulation by a tough reaction to painful stimulation, 5 means a light reaction to painful stimulation and 6 means no reaction to painful stimulation. In order to determine pain in this study, VAS was used, which measured pain from 0 (no pain) to 10 (the toughest pain) based on the estimations.

Data analyses

Data were analyzed using SPSS 21. Statistic indicators like mean and standard deviation were used to describe quantitative data. Descriptive statistical indicators like frequency and percentage were used to describe the qualitative variables such as medical complications. To compare the qualitative and quantitative data, a *t*-test and Chi-square test were used, respectively. And Fisher's exact test was used as required. The significant level was $P<0.05$.

Ethical considerations

All the used medicines were certified by the FDA. The satisfaction of patients is needed to include and exclude whenever he/she wants. All the standard measures and actions were done for all patients. No excess cost was imposed on patients.

Results

Demographic data of patients

Of 60 patients, 30 were in the sufentanil-sufentanil-midazolam group other 30 in the dexmedetomidine group. Eighty patients (60%) of those in the sufentanil-midazolam sufentanil-midazolam group and ten patients (33%) of those in the Dexmedetomidine group were males. There was a significant difference between both groups in terms of gender ($P=0.038$). Mean age in sufentanil-midazolam sufentanil-midazolam and Dexmedetomidine groups were 64.17±7.23 (median=66) and 62.67±6.33 (median=64), respectively, which were not statistically different ($P=0.39$) (Table 1). In the sufentanil- midazolam sufentanil- midazolam group, the ASA points were I and II for 21 patients (70%) and nine patients (30%).

In the Dexmedetomidine group, the ASA points were I and II for 14 patients (46.7%) and 16 patients (53.3%) I. The ASA points in both groups were not statistically different ($P=0.067$).

HTN was positive for 22 patients of sufentanil-midazolam (73.3%) and 19 patients of the Dexmedetomidine group ($P=0.40$). Twenty-seven patients of the sufentanil-midazolam group (90%) and 22 patients of the Dexmedetomidine group (73.3%) had diabetes ($P=0.095$) (Table 1).

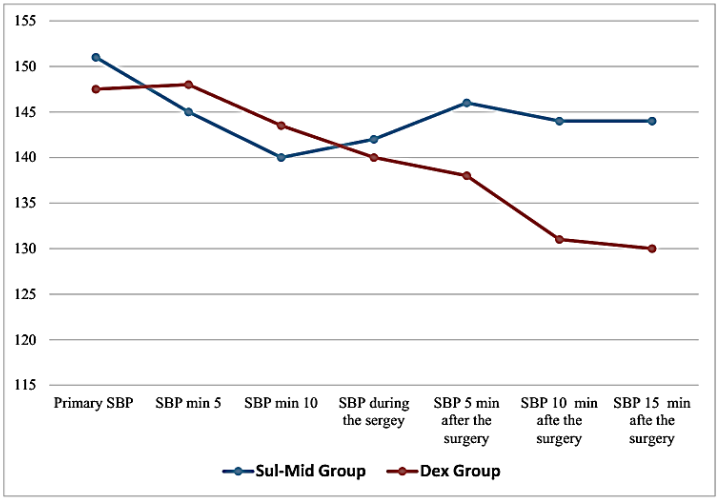

Figure 1. Comparing systolic blood pressure changes Median in Two groups

Table 1. Comparison of both groups

Study Factor		Sufentanil- midazolam Group	Dex Group	*P*
Gender	**Male**	10 (33.3%)	18 (60%)	0.038
	Female	20 (66.6%)	12 (40%)	
Age (Mean±SD)		64.17±7.23	62.67±6.33	0.39
ASA	**I**	14 (46.7%)	21 (70%)	0.067
	II	16 (53.3%)	9 (30%)	
Blood Pressure History		8 (26.7%)	11 (36.7%)	0.40
Diabetes history		3 (10%)	8 (26.7%)	0.095

Homodynamic changes

Statistic blood pressure changes

The primary systolic blood pressure (*P*=0.73), the 5th minute after the anesthesia (*P*=0.59), the 10th minute after the anesthesia (*P*=0.80), the starting point of surgery (*P*=0.19), and the 5th minute after the starting of surgery (*P*=0.075) were not statistically different between both groups. In this regard, systolic blood pressure patients in the Dexmedetomidine group declined drastically at the 10th (*P*=0.007) and 15th minutes (*P*=0.021), respectively, and the difference between both groups was significant (Table 2, Figure 1).

Diastolic blood pressure changes

Both groups were almost the same considering primary average diastolic blood (*P*=0.26). DBP of sufentanil-midazolam patients dropped dramatically at the 5th minute from the starting point of sedation significantly (*P*=0.012). In this regard, following the DBP drop in the Dexmedetomidine group, the statistical difference in DBP of both groups faded away (*P*>0.5). At the 5th minute after the surgery, DBP of the sufentanil-midazolam group has relatively risen, which wasn't statistically significant (*P*=0.055) (Table 3).

The point is that in the Dexmedetomidine group, the DBP decreased with an almost constant slope, while in sufentanil-midazolam, we witnessed a sudden drop, then a relative increase, and finally a relative drop (Figure 2).

Heart rate changes

The mean of heart rate changes in Dexmedetomidine and Sufentanil-midazolam patients at the beginning of the study (*P*=0.44), at the 5th minute after the sedation (*P*=0.80), at the 10th minute after the sedation (*P*=0.79), at the beginning of surgery (*P*=0.26), at the 5th (*P*=0.13), 10th (*P*=0.21) and 15th (*P*=0.17) minute after the start of surgery were not significantly different (Table 4). As you see in Figure 3, the heart rate of patients in both groups decreased with a constant slope.

SPO2 changes

The mean of SPO2 level in both groups was not significantly different from the beginning of the study to the 10th minute after the sedation (*P*>0.05). Though at the beginning of surgery (*P*=0.003), at the 5th (*P*=0.001) and 10th (*P*=0.002) minutes after the surgery, the mean of SPO2 level was significantly higher in the dexmedetomidine group than in the other group (Table 5). Figure 4 shows that average changes in the SPO2 level of patients in the Dexmedetomidine group raised with a higher slope and reached a maximum, while in the

sufentanil-midazolam group, it raised with a lower slope and remained stable at one level less than the dexmedetomidine group (Figure 4).

Sedation intensity changes

Based on Ramsey criteria, the mean of sedation level in both groups didn't have a significant difference (*P*=0.32), though, in other time durations of the study, Ramsey score was significantly higher in patients receiving sufentanil- midazolam than those receiving dexmedetomidine which shows a dramatic effect of sufentanil- midazolam (*P*<0.001) (Table 6). As the Chart shows, dexmedetomidine had a constant and permanent sedative effect since the sedation started, while sufentanil- midazolam reached the top 5 minutes after the operation and had a constant effect (Figure 5).

Satisfaction level and complications

Patients' motions during the surgery were seen in seven sufentanil- midazolam patients (23.33%) and two Dexmedetomidine patients (6.66%) with no significant difference (*P*=0.071) (Table 7).

The mean pain intensity in Sufentanil- midazolam and dexmedetomidine groups were 2.53±1.83 (median=2) and 3.17±1.62 (median=3), which didn't have a significant difference (Table 7).

Eighty percent of sufentanil- midazolam patients (24) and 96.7% of Dexmedetomidine patients (29) were satisfied with their sedation method. The satisfaction level was significantly higher in the Dexmedetomidine group than the other group (*P*=0.044) (Table 7). The surgeon's satisfaction level in both groups was almost the same, and no significant difference was found (*P*=0.94) (Table 7).

Table 2. Comparing Average systolic blood pressure changes in both groups

Systolic blood pressure	Sufentanil- midazolam	Dex group	*P*
SBP at sedation start	151.83± 17.27	150.4± 15.16	0.73
SBP 5 minutes after sedation	146.7± 17.40	149.1± 16.93	0.59
SBP 10 minutes after sedation	143.73± 15.93	142.67± 17.24	0.80
SBP at surgery start	146.50± 17.77	140.8± 15.99	0.19
SBP 5 minutes after surgery	146.53± 16.29	138.7± 17.19	0.075
SBP 10 minutes after surgery	144.60± 16.47	132.23± 17.72	0.007
SBP 15 minutes after surgery	146.54± 17.49	134.27± 17.49	0.021

Table 3. Comparing Average diastolic blood pressure changes in both groups

Systolic blood pressure	Sufentanil- midazolam	Dex group	*P*
SBP at sedation start	84.57±6.97	87.2±10.8	0.26
SBP 5 minutes after sedation	81.5±7.99	87.57±10.98	0.012
SBP 10 minutes after sedation	80.70±9.43	82.17±10.65	0.57
SBP at surgery start	82.90±9.46	81.3±8.9	0.5
SBP 5 minutes after surgery	84.33±9.08	79.63±9.52	0.055
SBP 10 minutes after surgery	80.50±10.78	77.4±10.9	0.27
SBP 15 minutes after surgery	80.67±11.67	77.37±10.96	0.26

Table 4. Comparing Average Heart Rate changes in both groups

Heart Rate changes	Sufentanil- midazolam	Dex group	*P*
HR at sedation start	75.0± 8.98	77.23± 13.1	0.44
HR 5 minutes after sedation	73.13± 10.19	73.90± 13.5	0.80
HR 10 minute after sedation	72.63± 10.19	71.83± 13.1	0.79
HR at surgery start	72.43± 10.60	69.1± 12.43	0.26
HR 5 minutes after surgery	72.23± 12.23	67.53± 11.92	0.13
HR 10 minutes after surgery	71.0± 10.87	67.23± 12.26	0.21
HR 15 minutes after surgery	71.50± 11.39	67.43± 11.34	0.17

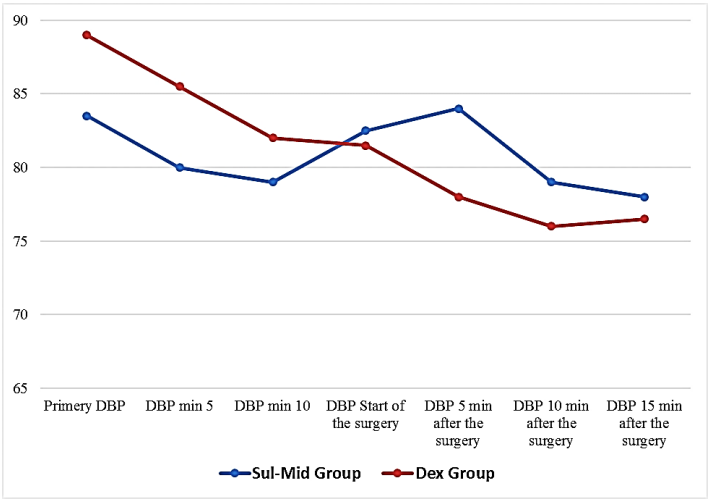

Figure 2. Comparing Diastolic blood pressure changes Median in two groups

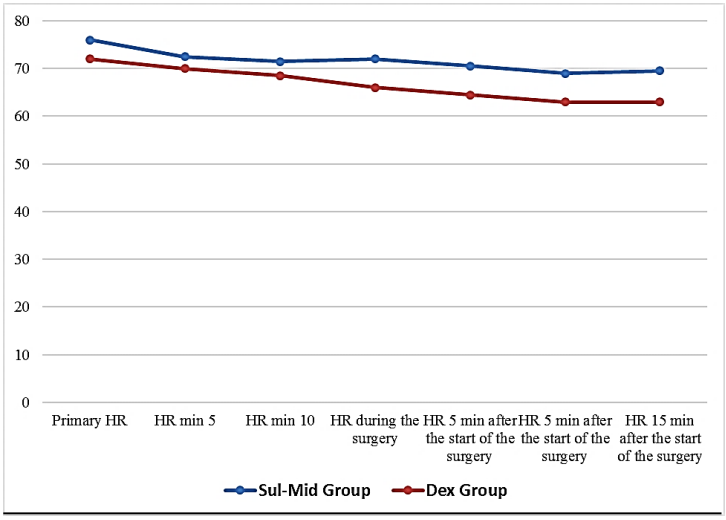

Figure 3. Comparing Median of Heart Rate changes in two groups

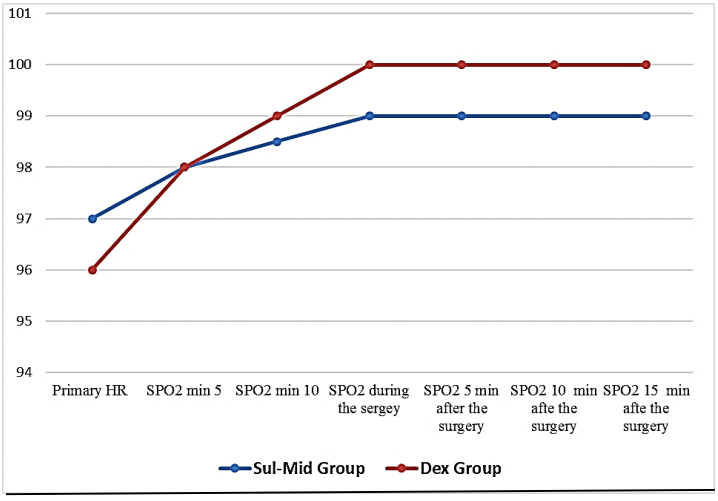

Figure 4. Comparing Median of SPO2 changes in two groups

Table 6. Comparing Average Ramsey points (Sedation Level) in Two groups

Sedation Level changes	Sufentanil- midazolam	Dex group	*P*
Sedation Level at sedation start	2.0±0	1.97±0.18	0.32
Sedation Level 5 minutes after sedation	2.53±0.5	2.0±0	0.001<
Sedation Level 10 minutess after sedation	2.63±0.55	2.0±0	0.001<
Sedation Level at surgery start	2.63±0.49	2.0±0.26	0.001<
Sedation Level 5 minutes after surgery	2.9±0.6	2.03±0.32	0.001<
Sedation Level 10 minutes after surgery	2.87±0.62	2.1±0.3	0.001<
Sedation Level 15 minutes after surgery	2.77±0.62	2.1±0.3	0.001<

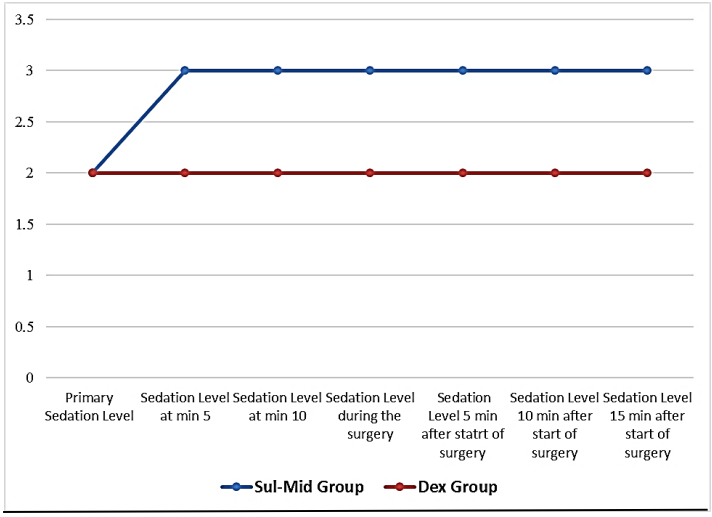

Figure 5. Comparing the Median of Sedation level changes in two groups

Table 7. Comparing Pain Intensity Complications and Satisfaction in two groups

Study Factors		Sufentanil-midazolam	Dex Group	*P*
Patients movement		7 (23.3%)	2(6.66%)	0.071
Pain intensity (Mean ±SD)		2.53± 1.83	3.17± 1.62	0.16
Patients satisfaction level		24(80%)	29(96.7%)	0.044
Surgeons satisfaction level	**Slightly dissatisfied**	1(3.3%)	2(6.7%)	0.94
	Hesitant	2(6.7%)	2(6.7%)	
	Nearly satisfied	7(23.3%)	8(26.7%)	
	Satisfied	13 (43.3%)	13 (43.3%)	
	Totally satisfied	7(23.3%)	5 (16.7%)	

Discussion

Cataract surgery is usually done with Topical anesthesia. In this regard, it can't provide complete anesthesia, and it can't prevent the patients from anxiety or sudden and uncontrolled movement. So MAC was used to provide patients with comfort during eye surgery. For this purpose, different medicines like propofol, benzodiazepines, and narcotics were used for sedation during cataract surgery. But the application of these medicines has limitations because of the unexpected complications such as respiratory repression, hypoxemia,

apnea, hemodynamic instability (8). Thus, the present study compared the sedation effects and complications in the Dexmedetomidineand sufentanil- midazolam patients for cataract surgery.

In the present study, all primary features of patients, including age, blood pressure history, diabetes history, ASA point, average SBP, Average DBP, heart rate, and SPO2 level, were almost the same except gender. SBP drop in patients receiving dexmedetomidine was significantly higher than the others receiving sufentanil-midazolam. DBP dropped suddenly 5 minutes after the Sufentanil- midazolam infusion but followed by a relative rise and finally a relative decrease, while DBP of patients receiving dexmedetomidine decreased with an almost constant slope.

The mean of HR changes in patients in both groups decreased with a gentle and almost the same slope. SPO2 level drops significantly in patients receiving Sufentanil-midazolam. Both drugs alleviated pain intensity equally. Based on Ramsey's criteria, dexmedetomidine created almost constant sedation (point 2) from the beginning of the study, while Sufentanil-midazolam created deeper sedation in patients (point 3). Although sufentanil-midazolam had deeper sedation, 23.233 % of patients could have motions more than patients receiving dexmedetomidine (6.66%). The satisfaction level of patients receiving dexmedetomidine was significantly higher, while surgeons' satisfaction level was almost the same in both groups.

Ramaswang *et al.*, performed studied on 60 patients candidate for cataract surgery, which was classified into three groups of Sufentanil-midazolam receiving a dose of 05. µg/kg, Dexmedetomidine receiving a dose of 0.5 µg/kg) and dexmedetomidine receiving a dose of 0.25 µg/kg). In their study, a preservative dose of dexmedetomidine was 0.25-0.4 µg/kg. Patients undergoing sedation received 0.25 µg/kg Dexmedetomidine had at the best sedation level (score 3 based on Ramsey criteria), a stable hemodynamic and surgeon's satisfaction level. There was no nausea and respiratory failure in these patients. In patients receiving a dose of 0.5 µg/kg Dexmedetomidine, there were hypotension, Ramsey sedation level 4, surgeon's dissatisfaction, and the highest rate of bradycardia; while in this study, using a dose of 0.5 µg/kg Dexmedetomidine, we witnessed Ramsey sedation level 2 and no obvious bradycardia. In their study, nausea and vomiting in Midazolam-fentanyl were more than two other groups.

Finally, they concluded that a loading dose of 0.25 µg/kg Dexmedetomidine for 10 minutes and then 0.25-0.4 µg/kg preservative does are the best substitute for midazolam-fentanyl, which has deeper sedation, the least complications, and the highest level of surgeon's satisfaction (11).

Although in our study, the amount of used medicine was almost the same in all groups, patients receiving dexmedetomidine were more satisfied, which was consistent with the result of the Ramaswang study.

Park *et al*., studied the effects of Dexmedetomidine and Remifentanil in 60 patients undergoing cataract surgery. Similarly, Dexmedetomidine patients received a dose of 0.5 µg/kg for 10 minutes and kept taking 0.2 µg/kg preservative dose. Remifentanil patients were sedated with a dose of 1 µg/kg.

Patients receiving dexmedetomidine had a lower level of BP and ETCO2 and higher breath rate than the Remifentanil group. There was no significant difference between heart rate, BIS grade, and SPO2 level in both groups. Dexmedetomidine patients had a higher sedation level in 10 minutes.

The satisfaction levels of the two groups were not significantly different, but the surgeon's satisfaction level was higher in the Remifentanil group. The recovery period for dexmedetomidine patients was longer than the others.

Finally, they concluded that the surgeon's satisfaction level in the dexmedetomidine group was lower due to the deeper anesthesia. Based on the results, it seems that remifentanil is a better sedative during cataract surgery (12). While in the present study, based on Ramsey criteria, dexmedetomidine had sedation level 2 (quite calm and good cooperation). Gratz and *et al*., (13) compared the safety and complications of Propofol and Dexmedetomidine for patients to volunteer for cataract surgery. For this purpose, 47 cataract patients above 55 years old included the study and divided into two groups. In the beginning, a dose of 0.1 µg/kg IV Dexmedetomidine was injected in 10 minutes to both groups of patients, and afterward, in the dexmedetomidine group (n=24), a preservative dose of 0.2-0.7 µg/kg/h of this drug and in propofol group (n=23), a dose of 15-20 µg/kg/min were prescribed.

Their results showed that the mean of BP and HR of Dexmedetomidine patients was significantly less than the others. Complications were indicated in three patients of the Dexmedetomidine group, while none of the patients of the propofol group had complications. Patients and surgeon's satisfaction level was the same in both groups. Finally, they concluded that propofol was better than dexmedetomidine during cataract surgery in old patients (13). In contrast to Gratz *et al*., Kumar *et al.*, (14) had studied 60 patients volunteer for cataract surgery and

randomly divided into two groups of 30 patients each and compared sedation level of dexmedetomidine and propofol. And the mean of BP, HR, breath rate, and SPO^2 were compared in both groups, which were significantly different at various times. Iowa Satisfaction with Anesthesia Scale (ISAS) was 53.50±2.193 and 43.10±2.090 in dexmedetomidine and propofol groups, respectively, which had a significant difference (P=0.0001).

Ramsey's benchmark score was not significantly different in both groups. Finally, they concluded that dexmedetomidine could be a good sedative in cataract surgery compared to propofol (15).

In their study, Na *et al*., compared the sedation effect of dexmedetomidine to that of Propofol-Alfentanil. A dose of 0.6 µg/kg/hr, 2 mg/kg/h, and 20 µg/kg/hr was prescribed to Dexmedetomidine and Propofol-Alfentanil groups, respectively. The results showed that post-surgery ISAS in Dexmedetomidine and Propofol-Alfentanil groups were 50.4 and 42.7, respectively, which had a statistically significant difference (P<0.001). SBP was significantly lower in the Dexmedetomidine group that was consistent with the results of our study. Thus, the number of HR, breath, and SPO2 was not significantly different. In this regard, eight patients had hypertension, of whom seven were in Propofol-Alfentanil groups and one in the Dexmedetomidine group (P<0.05). Of patients receiving dexmedetomidine, one had hypertension, and one had bradycardia. In the end, they concluded that dexmedetomidine is better for cataract surgeries due to the patient's higher satisfaction and more constant cardiovascular state, compared to the combination of Propofol-Alfentanil (16). To compare Dexmedetomidine and Midazolam in cataract surgery, Alhashemi *et al*., designed a double-blind study and randomly divided 44 patients into two groups. First, a dose of 0.1 µg/kg Dexmedetomidine in 10 minutes was prescribed, and then the preservative dose of 0.1-0.7 µg/kg infusion was used. Midazolam patients first got a dose of 20 µg/kg intravenous injection, and then 0.5mg was prescribed with bolus. The mean Arterial blood pressure and heart rate were significantly lower in Dexmedetomidine receivers.

Similarly, the patient's satisfaction level in the Dexmedetomidine group was significantly higher than midazolam, and surgeons' satisfaction level in both groups was the same. Finally, they concluded that dexmedetomidine is not as good as midazolam in cataract surgery because of cardiovascular depression and longer recovery time (8). Poorzamany Nejat Kermany *et al.*, claimed that dexmedetomidine with the primary dose of 0.1 µg/kg in 10 minutes and the preservative dose of 0.02 µg/kg/min is better than 0.1 µg/kg Remifentanil and preservative dose of 0.05 µg/kg/min for cataract surgery and has fewer complications, little effect on the cardiovascular system and slight changes in postoperative cognitive status (17). Most of the medicines used in Monitored Anesthesia Care contain midazolam, propofol, and narcotics like fentanyl, alfentanil, remifentanil, and sufentanil.

A combination of narcotics with midazolam or propofol is widely used in MAC. So, some side effects like cardiorespiratory depression limited the use of this drug (18). Sufentanil is an industrial narcotic painkiller that is 5 to 10 times stronger than pure fentanyl and 500 times stronger than morphine.

Midazolam, a derivative of Benzodiazepine, is another well-known sedative used in eye surgeries (19). Previous studies showed that Sufentanil-midazolam combination could cause respiratory system suppression (20,21). The results of their study were consistent with those of our study in terms of SPO2 level, which was lower in patients receiving midazolam-sufentanil than those receiving dexmedetomidine.

One of the main concerns of Dexmedetomidine usage by bolus and infusion in old patients is its descending effect on venous blood pressure and heart rate (8). This medicine is an alpha2-adrenergic receptor agonist which not only provokes descending inhibitory pain pathways but also can cause hypotension and bradycardia in patients (18,22). In the present study, as time went by and a dose of medicine in the body increased, SBP, DBP, and HR dropped with a descending slope which continued during the study. This result verifies the dose-affiliated effect of dexmedetomidine on the cardiovascular system. Nagy *et al*., (15) and Ramsawang *et al*., (11) claimed that a primary dose of 0.25 µg/kg dexmedetomidine instead of 0.5 µg/kg causes less hemodynamic changes and cardiovascular complications.

In our study, the patient's respiratory condition evaluated by SPO2 was constant during the study and had an ascending trend. This result was consistent with that of previous studies. Previous studies have mentioned that respiratory parameters are constant in patients receiving dexmedetomidine and cause no complications like apnea, airway obstruction, and hypoxemia (23). Generally, previous studies proposed that factors like short half-life, the inactive metabolite, ineffectiveness on the respiratory system, and painkilling effect of dexmedetomidine and introduced it as good medicine for short time surgeries (23).

Finally, the results of the present study showed that

although dexmedetomidine causes fewer respiratory problems and more patients satisfaction, it decreases BP and HR. It seems that this medicine is good for sedation during cataract surgery because it brings patients satisfaction, does not cause hypoxia, it has fewer complications less immobility than sufentanil-midazolam.

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