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Short communications

Dexmedetomidine during local anesthesia

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Abstract
The objective of our study was to assess the efficacy and safety of dexmedetomidine given in a small dose for a 1-h infusion as an adjuvant to local analgesia in ophthalmic operations. The study was double-blind prospective, randomized, and placebo controlled. We studied the effects of a small dose of dexmedetomidine ($0.5\,\mu\cdot kg^{-1}\cdot h^{-1}$ for 10 min followed by $0.2\,\mu\cdot kg^{-1}\cdot h^{-1}$ for 50 min. Patients were divided randomly into two groups with 20 patients in each: group A was the study group and group B was the placebo group. Heart rate, systolic blood pressure, and diastolic blood pressure were significantly lower in the dexmedetomidine group than the placebo group. Bispectral index values were significantly lower in the dexmedetomidine group than the placebo group. Also, intraocular pressure significantly decreased in the dexmedetomidine group compared to the placebo group. The study revealed that dexmedetomidine in the studied dose has a sedative effect, provides safe control of heart rate and blood pressure, and also decreases intraocular pressure during ophthalmic surgery under local anesthesia.

Key words Dexmedetomidine · Sedation · Ophthalmic surgery · Intraocular pressure · BIS

Introduction

Dexmedetomitine, a selective α-2 adrenergic receptor agonist, exhibits sympatholytic, sedative, and analgesic effects, and it is eight times more potent for the α-2 receptor than clonidine [1]. The drug has been approved by the FDA as a short-term sedative (less than 24 h) and analgesic in the critical care setting, specifically for use in the early postoperative period [2]. Dexmedetomidine has several advantages for use as a sedative because the drug does not cause respiratory depression [3]. Another advantage of the drug is easy arousability of the treated patients, and they can be calm and cooperative [1]. Conventional tools to assess sedation need acoustic and tactile stimulations that are not suitable intraoperatively [4]. Bispectral index (BIS) is a new processed electroencephalographic variable that monitors anesthetic and sedative levels on a relative scale during the administration of different drugs [5].

The objective of our study was to assess the efficacy and safety of dexmedetomidine given in a small dose for 1-h infusion as an adjunct to local analgesia in ophthalmic operations.

Subjects and methods

This is a randomized, double-blind, prospective, and placebo-controlled study. After following the local protocols of Hamad Medical Corporation for the scientific research committee, consents were taken from our patients who agreed to participate in the study. Patients were scheduled for cataract operation under local anesthesia. Patients were divided randomly into two groups, 20 patients in each. Group A, the study group, received dexmedetomidine as an intraoperative infusion in a dose of $0.5\,\mu\cdot kg^{-1}\cdot h^{-1}$ for 10 min, followed by $0.2\,\mu\cdot kg^{-1}\cdot h^{-1}$ for 50 min. Group B, the placebo group, received a saline infusion.

The drug or placebo infusions were prepared by one anesthetist and observation was done by a blinded second anesthetist. All patients were monitored by HP monitor for heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse oximeter, and respiratory rate. Degree of sedation was measured in BIS using an A-2000 BIS Monitor (Aspect Medical Systems, Newton, MA, USA). Intraocular pressure (IOP) was measured blindly by the ophthalmologist in

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Table 1. Some characteristics in the patients studied

Patient characteristics	Dexmedetomidine ($n = 20$)	Placebo ($n = 20$)	P value (significance)
Age (years) (mean ± SD)	63 ± 11	60 ± 13	0.413
Sex, male/female, *n*	11/9	12/8	0.127
Height (cm) (mean ± SD)	172 ± 5	170 ± 6	0.689
Weight (kg) (mean ± SD)	75 ± 7	78 ± 6	0.721
Preexisting diseases, *n* (%)			
Hypertension	13 (65)	12 (60)	0.635
Coronary artery disease	5 (25)	4 (20)	0.518
Diabetes mellitus	7 (35)	6 (30)	0.761
Bronchial asthma	3 (20)	3 (20)	0.999

Table 2. Statistical analysis of hemodynamic results comparing between the two groups

	Dexmedetomidine (mean ± SD)	Placebo (mean ± SD)	P value (significance)
Heart rate			
1 min	80.40 ± 12.46	86.70 ± 10.19	0.373
10 min	73.35 ± 7.40	82.55 ± 8.80	0.539
30 min	66.90 ± 5.42	81.20 ± 7.83	0.041
60 min	63.60 ± 4.55	79.75 ± 7.83	0.049
90 min	72.10 ± 5.80	81.20 ± 6.86	0.352
Systolic blood pressure			
1 min	162.10 ± 21.50	153.55 ± 22.92	0.698
10 min	155.40 ± 18.48	152.05 ± 22.06	0.249
30 min	136.10 ± 15.24	150.15 ± 21.73	0.043
60 min	127.60 ± 14.76	149.05 ± 21.82	0.056
90 min	137.40 ± 16.23	147.10 ± 20.68	0.164
Diastolic blood pressure			
1 min	84.15 ± 6.17	82.85 ± 7.78	0.481
10 min	81.35 ± 5.28	81.50 ± 7.04	0.305
30 min	75.05 ± 6.00	82.15 ± 7.96	0.155
60 min	71.40 ± 7.00	81.25 ± 7.20	0.783
90 min	77.90 ± 5.77	79.30 ± 8.55	0.205

Minutes (min) refers to the time from starting infusion

the normal eye under topical analgesia (proparacaine 0.5%) before starting the infusion and at the end of surgery. We used the standard procedure in measuring eye pressure by using a Schioetz-Tonometer, which works by gravity, assuring good and reliable measurements [6]. We recorded HR, SBP, and DBP before the infusion at 1, 10, 30, 60, and 90 min after starting infusion. BIS was recorded at 1, 60, and 90 min after starting infusion.

Student t and Mann–Whitney tests were used to ascertain the significance of differences between mean values. Fisher exact and chi-square tests were performed to test for differences in proportions of categorical variables between two or more groups. One-way analysis of variance (ANOVA) with repeated measures was employed for comparison of several group means. The level $P < 0.05$ was considered as the cutoff value for significance.

Results

Table 1 shows the characteristics of the studied patients. Basic patient characteristics did not significantly differ between the dexmedetomidine group and the placebo group. There was no significant preoperative difference concerning preexisting diseases and type of surgery.

Table 2 shows the analysis of hemodynamics between the two groups. HR, SBP, and DBP showed no statistical significant difference in 1-min, 10-min, and 90-min records. HR in the dexmedetomidine group was significantly lower than the placebo group at 30 and 60 min.

Table 3. Results on bispectral index (BIS) and intraocular pressure values (IOP) comparing the two studied groups

	Dexmedetomidine (mean ± SD)	Placebo (mean ± SD)	*P* value (significance)
BIS, 1 min	96.95 ± 02.26	97.35 ± 02.06	0.629
BIS, 60 min	78.90 ± 04.99	96.50 ± 02.09	0.008
BIS, 90 min	93.00 ± 03.00	96.35 ± 01.87	0.047
IOP before surgery	14.35 ± 02.58	15.25 ± 02.12	0.236
IOP after surgery	11.95 ± 01.93	15.00 ± 01.86	<0.001

Minutes (min) refers to the time from starting infusion

However, SBP was significantly lower in the dexmedetomidine group than the placebo group at 30 and 60 min of infusion. At half an hour after the end of infusion (minute 90), there was no significant difference in SBP. DBP did not show any marginal difference at any of the study times.

Table 3 shows results for BIS and IOP comparing the two studied groups. BIS was significantly lower in the dexmedetomidine group than the placebo group at 60 and 90 min, whereas there was no significant difference in 1-min BIS values. IOP significantly decreased after dexmedetomidine infusion compared to placebo infusion.

Discussion

In a previous study, Ebert and coworkers [7] found that lower plasma concentrations of dexmedetomidine provided sedation and analgesia while preserving recall and recognition. In our study, we started at a lower dose than that given by Ebert and coworkers [7]. We avoided bolus dosing of dexmedetomidine. A previous study [8] indicated that when dexmedetomidine was administered in a 1 $\mu g \cdot kg^{-1}$ bolus (which resulted in plasma levels of 0.9 $ng \cdot ml^{-1}$), a transient increase in BP and a reflex decrease in HR were noted. Peripheral hemoglobin oxygen saturation was not affected by dexmedetomidine infusion. This finding is consistent with the study done by Ebert and coworkers [7]. However, more pronounced respiratory effects have been reported when dexmedetomidine is rapidly infused to high concentrations. We considered these pharmacodynamic effects of dexmedetomidine in our study specifically in older patients. Dexmedetomidine infusion significantly decreased the heart rate as compared to the placebo group (see Table 2). That effect of dexmedetomidine on heart rate is considered to be caused by its sympatholytic action. Jalonen et al. [9] did not find a reduction in heart rate in patients already prescribed B-receptor-blocking drugs. Reduction in IOP in the study group was in the normal physiologic range. Dexmedetomidine was effective as a sedative in the small dose used, as BIS values were significantly lower in the study group than the control group.

In conclusion, the present study revealed that dexmedetomidine in the dose studied has a sedative effect, provides safe control of heart rate and blood pressure, and decreases IOP during ophthalmic surgery under local anesthesia.

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