

Original Article

Effects of local anesthesia combined with intravenous midazolam and sufentanil in ophthalmic plastic surgery

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Abstract: Objective: To investigate the effect of local anesthesia combined with intravenous midazolam and sufentanil in ophthalmic plastic surgery. Methods: 180 patients who underwent ophthalmic surgery in our hospital from January 2018 to December 2019 were enrolled. 90 cases in the control group were given local infiltration anesthesia and 90 cases in the observation group were treated by the antiemetics tophenasetron hydrochloride, midazolam and sufentanil after the establishment of intravenous channels. After local infiltration anesthesia was given, the operation started. The double-frequency index (bispectral index, BIS), systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR) and respiration rate (RR) were monitored at different time points. The adverse reactions and dosage of local anesthetics were observed. Results: The SBP, DBP and HR of the control group were significantly higher than those of the observation group, BIS of the observation group were significantly lower than those of the control group, and the RR of the observation group was significantly higher than that of the control group. VAS score and local anesthetic dosage were also significantly lower in the observation group than those in the control group. The number of patients with complications in the control group was significantly larger than that in the observation group. Conclusion: Local anesthesia combined with intravenous midazolam and sufentanil can lower the SBP, DBP, HR and BIS, and improve the RR. It can also lower VAS score and local anesthetic dosage with fewer complications. It is thus suitable for anesthesia in ophthalmic plastic surgery.

Keywords: Midazolam, sufentanil, ophthalmic plastic surgery, anesthesia

Introduction

As a common way to permanently correct the eyelid deformity, the appropriate surgery is always performed after clinically meticulous eye examination and pathological type analysis [1]. Orbital and peri-ocular surgery is the most common plastic surgery [2]. Currently, vast majority of ophthalmic procedures can be implemented under local anesthesia by anesthesia monitoring [3, 4]. During ophthalmic operation, patients often feel uncomfortable due to local anesthesia, which can be attributed to the incomplete analgesic effect of local anesthesia. Intraoperative effective sedation and analgesia enables patients to feel comfortable and to be cooperative, thus ensuring smooth communication with patients during surgery, and conducting to feed and discharge as soon as possible after surgery for elderly patients with comorbidities [5, 6]. In addition,

sedation and analgesia have a beneficial effect on intraoperative assessment of eyelid height, eyelid contour and eyelid closure, which can improve the surgical outcomes. Yet currently there is no local anesthesia technique or method that can perfectly meet the needs of most ophthalmic surgery [7]. As the injection technique advances and the risk of intravenous and anesthesia complications increases, the level of analgesia after local anesthesia can be improved by supplementing intravenous anesthetics [8].

Midazolam plays an active role in promoting γ -aminobutyric acid function by acting on benzodiazepine receptors. γ -aminobutyric acid has the properties of boosting sedation, anti-anxiety and anti-convulsions [9]. Studies have shown that in addition to local anesthetics, the combination of dezocine and midazolam in retrobulbar nerve block surgery can help relieve

pain and anxiety during vitrectomy [10]. Sufentanil is a powerful α -1 receptor antagonist opioid, with fewer side reactions. Thus it is widely applied in clinical practice along with its pharmacokinetic characteristics [11].

This study primarily explored the role of local anesthesia combined with intravenous midazolam and sufentanil in ophthalmic plastic surgery.

Materials and methods

General information

180 patients treated by ophthalmic surgery in our hospital from January 2018 to December 2019 were enrolled. The differences were not significant between the control group and the observation group with respect to their age, gender, height, body weight, etc. All patients or family members were informed in advance of the study and signed the informed consent form.

Inclusion and exclusion criteria

Inclusion criteria: (1) patients met the requirement for ophthalmologic plastic surgery; (2) patients with ASA anesthesia grade I or II [3]. Exclusion criteria: (1) patients displayed mental disorders and not able to take care of themselves; (2) patients developed malignant tumors in other organs of the body; (3) patients complicated with chronic diseases such as severe diabetes, coronary heart disease, and hypertension; (4) patients had primary liver and kidney dysfunction who could not tolerate surgery.

Anesthesia methods

Patients were asked to fast for 8 hours before surgery. After entering the operating room, 2 L/min conventional nasal cannula was used to inhale oxygen. The control group was given local infiltration anesthesia: 50:50 bupivacaine 5 g/L, 2% lidocaine and 1:200,000 epinephrine. During the routine observation, if the patients were uncomfortable or the monitoring index changed, local invasive anesthesia was given again. The observation group was given 4 mg antiemetic agent tropisetron hydrochloride, 0.05 mg/kg midazolam and 0.04 μ g/kg sufentanil after the establishment of intrave-

nous channel; after 5 minutes, the dose of sufentanil was changed to 0.06 μ g/kg. After local infiltration anesthesia was given, the operation started. During the routine observation, if pain or irritability occurred, 0.025 mg/kg midazolam and 0.025 μ g/kg sufentanil were added in a single-dose manner.

Observation indicators

The bispectral index (BIS), systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR) and respiration rate (RR) were recorded after entering the operating room, at the time of local infiltration anesthesia, beginning of the operation, 20 minutes after the beginning of the operation, and at the end of the operation.

Adverse reaction assessments

The complications such as hypoxemia, apnea, nausea, and restlessness during operation were observed. The operation time was recorded. The pain of patients was evaluated during local anesthesia and operation according to the visual analogue scale (VAS).

Statistical analysis

SPSS 22.0 software (SPSS Inc., Armonk, NY, USA) was used for data analysis. The measurement data were expressed in the form of mean \pm standard deviation ($\bar{x} \pm sd$), and the independent sample t test was performed for comparison between groups; the count data were analyzed by chi-square test. The difference was statistically significant when $P < 0.05$.

Results

Comparison of general information

The differences were not significant between the control group and the observation group with respect to their age, gender, height, body weight, etc. See **Table 1**.

Surgical methods with no significant difference between the control group and the observation group

There were 27 cases of ptosis correction, 26 cases of blepharoptosis correction, 8 cases of benign skin conjunctival tumor resection, 7 cases of internal canthus skin correction, and 6

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Table 1. Comparison of general information between the two groups

Groups	Age (year, $\bar{x} \pm S$)	Sex (male/female)	BMI (kg, $\bar{x} \pm S$)	Height (cm, $\bar{x} \pm S$)	Operation time (min, $\bar{x} \pm S$)
Control group	64.3±18.3	46/44	56.4±9.5	164.7±7.9	35.3±7.9
Observation group	63.9±17.8	45/45	55.8±9.3	162.9±8.2	33.9±8.6
t/χ^2	0.351	0.226	0.423	1.433	1.088
P	0.882	0.881	0.669	0.135	0.257

Table 2. Comparison of surgery approaches between the two groups

Groups	Surgery approaches (n, %)					
	ptosis correction	blepharoptosis correction	benign skin conjunctival tumor resection	internal canthus skin correction	blepharobasal cell carcinoma resection	periorbital tumor resection
Control group	27 (30.00)	26 (28.89)	8 (8.89)	7 (7.78)	6 (6.67)	16 (17.78)
Observation group	24 (26.67)	25 (27.78)	7 (7.78)	8 (8.89)	8 (8.89)	18 (20.00)
χ^2				0.859		
P				0.578		

cases of blepharobasal cell carcinoma resection and 16 cases of periorbital tumor resection in the control group. There were 24 cases of ptosis correction, 25 cases of blepharoptosis correction, 7 cases of benign skin conjunctival tumor resection, 8 cases of internal canthus skin correction, 8 cases of blepharobasal cell carcinoma resection, and 18 cases of periorbital tumor resection in the observation group. The differences were not significant between the control group and the observation group with respect to their surgery methods (**Table 2**).

Comparison of changes in hemodynamics, BIS value and RR

The DBP, SBP and HR of both groups increased from entering the operating room to 20 minutes after the start of surgery, but the SBP, DBP and HR levels of the control group were significantly higher than those of the observation group. The intraoperative BIS of the observation group was significantly lower than that of the control group, but there was no significant difference between the two groups at the end of the operation. In addition, from the beginning to the end of the operation, the RR of the observation group was significantly higher than that of the control group (**Table 3**).

Lower VAS score and local anesthetic dosage in the observation group

The VAS score of the observation group was significantly lower than that of the control group,

and the difference was statistically significant. The amount of local anesthetic in the observation group was also significantly lower than that of the control group (**Table 4**).

Fewer complications in the observation group

The incidence of complications of the control group was significantly higher than that of the observation group. The most common complications were agitation and additional local anesthesia, but the probability of nausea and hypoxemia in the control group was lower than that in the observation group. See **Table 5**.

Discussion

Currently, local invasive anesthesia is the most commonly used anesthesia approach in clinical ophthalmic surgery. Due to its insufficient analgesic effects, patients are vulnerable to symptoms of anxiety and pain, thus resulting in difficulties in cooperating with the operation and further affecting the progress and efficiency of the operation. Sobriety and sedation can raise the patient's pain threshold and eliminate negative emotion, therefore conscious sedation has been widely used in plastic surgery and intensive care unit [12, 13].

A study claimed that intravenous injection of midazolam subhypnotic doses can effectively reduce the incidence and severity of restlessness in children after cataract extraction without significantly delaying recovery and dis-

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Table 3. Comparison of changes in hemodynamics, BIS value and RR between two groups

Indexes	Groups	After entering the operating room	At the time of local anesthesia	At the beginning of the operation	20 minutes after the start of the operation	At the end of the operation
SBP (mmHg)	Control group	120.2±11.8	140.3±13.2	137.3±10.7	135.7±12.6	137.1±11.6
	Observation group	120.3±11.7	115.3±11.2*	118.2±11.6*	121.8±13.2*	120.3±13.8
DBP (mmHg)	Control group	68.8±7.2	85.3±9.6	83.5±11.1	84.6±10.8	82.4±8.8
	Observation group	67.7±9.3	64.3±10.2*	65.7±12.0	67.9±11.5*	69.2±9.8*
HR (times/min)	Control group	79.9±11.0	88.9±11.9	91.7±13.5	91.8±12.9	89.9±12.9
	Observation group	80.2±10.9	69.2±12.4*	71.8±14.2*	74.3±12.7*	79.8±12.7*
BIS	Control group	95.2±2.8	95.6±2.4	95.7±1.9	95.6±2.3	94.6±2.7
	Observation group	95.6±2.3	74.6±3.8*	75.2±2.9	74.5±3.8*	94.6±3.2*
RR (times/min)	Control group	18.2±1.6	19.1±3.2	19.4±2.7	19.1±2.4	18.2±2.4
	Observation group	17.8±2.0	13.7±3.3*	14.8±3.2*	14.2±2.5*	17.2±2.2*

*Compared with the control group, $P < 0.05$.

Table 4. Comparison of VAS score and local anesthetic dosage between two groups

Groups	VAS score		Local anesthetic dosage (mL)
	During local anesthesia	During operation	
Control group	5.2±1.3	2.7±1.4	2.6±0.6
Observation group	1.5±0.9	1.6±0.7	2.2±0.4
<i>t</i>	23.566	6.250	3.272
<i>P</i>	<0.001	<0.001	<0.001

Table 5. Comparison of complications between the two groups (n, %)

Groups	nausea	hypoxemia	agitation	additional local anesthesia
Control group	1 (1.11)	1 (1.11)	15 (16.67)	30 (33.33)
Observation group	3 (3.33)	3 (3.33)	3 (3.33)	4 (4.44)
χ^2			28.900	
<i>P</i>			<0.001	

charge [14]. Sevoflurane-sufentanil combined anesthesia can stabilize hemodynamics and ensure rapid recovery after AIS [15], and sufentanil plays a preventive role in intraocular pressure elevation [16, 17]. This study mainly explored the effects of local anesthesia combined with intravenous midazolam and sufentanil in ophthalmic plastic surgery.

It is demonstrated in this study that the SBP, DBP and HR in the control group were significantly higher than those in the observation group. Studies have shown that normal high arterial blood pressure can effectively maintain normal vascular shear force and reduce the

occurrence of atherosclerosis. On the contrary, increased blood pressure can enhance the risk of atherosclerosis and reduce blood flow velocity. In this study, intravenous midazolam and sufentanil can reduce DBP and SBP in patients in the observation group, indicating that intravenous midazolam and sufentanil can improve the hemodynamics of patients with lung cancer lobectomy. Xu declared that sufentanil prevails in analgesia, and it can stabilize hemodynamics and improve the recovery [20]. Zhang found that nicardipine combined with low-dose midazolam can reduce the stress response induced by surgical stress in patients undergoing ophthalmic surgery, lower blood pressure and catecholamine levels [21], which was similar to the results of this study.

Physical signals such as the excited or inhibited state of the cerebral cortex, the sedation and hypnosis are mainly reflected through EEG dual frequency index, which can monitor the sedation component in the depth of anesthesia [22]. Because moderate anesthesia is beneficial to the perioperative safety of patients and reduces postoperative complications, the EEG dual frequency index BIS is widely used in clinical practice [23]. In this study, the BIS of the observation group were significantly lower than that of the control group. It is suggested that

the observation group outperformed the control group in sedative effect, which in turn favors the surgery procedure and speeds up the surgical process.

A study revealed that sufentanil can significantly relieve the postoperative pain of children, with fewer adverse reactions such as respiratory depression [24]. Midazolam can play a vital analgesic and sedative role in mechanical ventilation of newborns with acute respiratory distress syndrome, and can effectively improve airway resistance and boost respiratory function [25]. In this study, the respiratory frequency of the observation group was significantly higher than that of the control group, and it has contributed to mechanical ventilation during the operation and reduced the occurrence of respiratory complications. In addition, it is also shown that the VAS score and local anesthetic dosage of the observation group were significantly lower than those of the control group, and there were more patients with complications in the control group. It was clarified that patients receiving sufentanil had less need for postoperative analgesia and better cognitive function [26], which was consistent with the results in this study.

In conclusion, local anesthesia combined with intravenous midazolam and sufentanil is available for anesthesia in ophthalmologic plastic surgery. It has a remarkable sedative and analgesic effect with few complications.

Disclosure of conflict of interest

None.

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