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Original Article

Effect of propofol combined dexmedetomidine on anesthesia recovery and postoperative complications in pediatric ophthalmologic surgery

Jun Zhao[1], Yongbin Wang[2], Xiangxue Jiao[3]

Departments of [1]Anesthesiology, [2]Ophthalmology, Central Hospital of Xianyang, Xianyang, Shanxi, China; [3]Department of Anesthesiology, The First People's Hospital, Xianyang, Shanxi, China

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Abstract: Pediatric eye surgery need high quality anesthesia with safety, braking, and analgesia, while avoiding oculocardiac reflex, nausea and vomiting. Dexmedetomidine is a kind of α2 adrenergic agonists characterized as sedative, hypnotic, analgesia, and inhibiting sympathetic activity. This study applied propofol combined dexmedetomidine on ophthalmic surgery to analyze its effect on quality of anesthesia and postoperative complications. 60 pediatric patients receiving eye surgery were enrolled. Different anesthesia methods were applied, including propofol combined dexmedetomidine group and propofol combined normal saline group. Duration of eye opening and extubation were observed. OASS was used to score recovery quality at eye opening, extubation, and after extubation. Cough time and severity during recovery period, and the agitation incidence at 10, 20, 30 min after extubation were recorded. Ramsay score was performed to score sedation. Complications after recovery, including intraoperative awake, nausea, vomiting, lethargy, and bradycardia were evaluated. Compared with propofol combined normal saline, the patients in propofol combined dexmedetomidine showed significantly longer duration of eye opening and extubation, lower OASS score at eye opening, extubation, and after extubation ($P < 0.05$). They also presented declined cough case number, times, and severity ($P < 0.05$), obviously lower agitation incidence at 10, 15, 20, 30 min after extubation, and higher Ramsay score ($P < 0.05$). They appeared lower incidence complications including nausea, vomit, lethargy, and bradycardia ($P < 0.05$). Propofol combined dexmedetomidine has good anesthesia effect in pediatric eye surgery.

Keywords: Propofol, dexmedetomidine, eye surgery, anesthesia

Introduction

Compared with other surgeries, eye surgery is characterized as limited operation and small impact on whole body. Local anesthesia can reduce anesthesia related complications, shorten hospitalization time, and promote postoperative recovery. However, the effect of simple local anesthesia is poor, leading to incomplete retardation. The patients in surgery may appear pain, fear, and nervous that easily cause posttraumatic stress disorder [1]. Pediatric eye surgery requires higher anesthesia quality by complete retarding, guaranteeing the analgesia effect, and maintaining intraocular pressure stability [2]. Dexmedetomidine is a high selective α2 adrenergic agonist that can play a sedative, analgesic, and anti-anxiety effect [3]. Early in 2002, dexmedetomidine had been used in pediatric ICU in clinic for sedation and anesthesia. It has been successfully applied in many fields including preoperative medication, general anesthesia adjuvant drugs, and postoperative analgesia [4]. Propofol belongs to alkyl phenol general anesthetics that can be used for anesthesia induction, anesthesia maintaining, and sedation, etc. It is an ideal hypnotic intravenous general anesthesia [5]. This study selected eye surgery patients in our hospital and applied propofol combined dexmedetomidine to observe the anesthesia recovery quality and complications, so as to provide theoretical basis for clinical anesthesia selection.

Materials and methods

General information

A total of 60 pediatric patients receiving eye surgery in Central hospital of Xianyang between

Table 1. General information comparison

Group	Cases	Age (y)	Weight (kg)	Anesthesia time (min)	Extubation time (min)
Propofol combined dexmedetomidine	30	6.6 ± 1.2	31.8 ± 1.5	32.42 ± 7.05	9.13 ± 4.75
Propofol combined normal saline	30	6.2 ± 1.1	31.6 ± 1.9	32.17 ± 9.12	7.98 ± 4.56

P > 0.05, with no statistical difference.

Table 2. Duration of eye opening and extubation, and OASS score comparison ($\bar{X}$ ± s)

Group	Cases	Duration of eye opening (min)	Duration of extubation (min)	OAAS score		
				Eye opening (min)	Extubation (min)	After extubation (min)
Propofol combined dexmedetomidine	30	11.31 ± 1.31*	12.61 ± 2.27*	3.08 ± 0.51*	3.27 ± 0.68*	4.12 ± 0.38*
Propofol combined normal saline	30	7.54 ± 2.45	9.01 ± 2.12	3.97 ± 0.98	4.47 ± 0.82	4.98 ± 0.98

*P < 0.05, compared with propofol combined normal saline.

Table 3. Cough in recovery period comparison

Item	Propofol combined dexmedetomidine	Propofol combined normal saline
Cough case number (n%)		
Intubation	12 (40)*	24 (80)
Extubation	9 (30)*	24 (80)
Cough times		
Intubation	0 (0-3)*	2 (0-6)
Extubation	0 (0-4)*	0 (0-9)
Cough severity		
Intubation	0 (0-2)*	2 (0-3)
Extubation	0 (0-2)*	0 (0-3)
First cough time (min)	11.1 ± 2.2	10.9 ± 4.5

*P < 0.05, compared with propofol combined normal saline.

Jan 2014 and Jan 2015 were enrolled. There were 35 males and 25 females with mean age 4.6 ± 1.2 (1-10) years old and ASA I~II. No statistical difference was observed on gender, age, and weight (P > 0.05) (**Table 1**).

The subjects were randomly divided into two groups, including propofol combined dexmedetomidine group and propofol combined normal saline group.

The study protocol was approved by the Research Ethics Committee of Central hospital of Xianyang, and all patients gave their informed consent before study commencement.

Inclusion criteria: age > 1 year old; intubation anesthesia

Exclusion criteria: Congenital nerve or mental disease history; intraoperative severe organ failure in need; organ dysfunction leads to delayed awakening or cannot breathe out of machine; severe mental state changes; organic brain disease.

Anesthetic monitoring

Routinely monitor electrocardiogram, blood pressure, blood oxygen saturation, respiratory rate, and PCO_2. Pay attention to open the vein tunnel.

Anesthesia induction

2 mg/kg phenobarbital and 0.01 mg/kg scopolamine were intramuscular injected at 30 min before surgery. 4 ml mixture of 0.5% ropivacaine and 1% lidocaine was applied for local anesthesia. Endotracheal intubation was performed after anesthesia induction and breathing machine was used for mechanical ventilation. Tidal volume was 8-10 mL/kg, oxygen concentration was 100%, inspiratory/expiratory ratio was 1:2, and respiratory frequency was 12-16 times/min.

Anesthesia maintenance

Propofol combined dexmedetomidine group: Propofol was intravenous pumped at 4-6 mg/kg/h. Dexmedetomidine was intravenous infused at 5 μg/kg/h.

Propofol combined normal saline group: Propofol was intravenous pumped at 4-6 mg/kg/h. Normal saline was intravenous infused at 5 μg/kg/h.

Table 4. Agitation incidence comparison ($\bar{X}$ ± s)

Group	Cases	Agitation incidence				Ramsay score
		10 min	15 min	20 min	30 min	
Propofol combined dexmedetomidine	30	2 (6.67)*	1 (3.33)*	1 (3.33)*	0*	2.2 ± 0.7*
Propofol combined normal saline	30	6 (20)	9 (30)	7 (23.33)	6 (20)	1.2 ± 0.4

*P < 0.05, compared with propofol combined normal saline.

Anesthesia recovery

Propofol was stopped at 10 min before the end of surgery. Extubation was performed after autonomous respiration recover, oxyhemoglobin saturation ≥ 95%, and tidal volume ≥ 8 ml/kg. All the patients received intravenous painkiller.

Index observation

Duration of eye opening and extubation were observed. OASS was used to score recovery quality at eye opening, extubation, and after extubation.

Cough time and severity during recovery period were observed. 0: no cough; 1: single cough; 2: moderate cough, more than 1 time, duration for < 5 s; 3: severe cough, duration for > 5 s [6].

The agitation incidence at 10, 20, 30 min after extubation were recorded. Ramsay score was performed to score sedation.

Complications after recovery, including intraoperative awake, nausea, vomiting, lethargy, and bradycardia were evaluated.

Standard of evaluation

Agitation criteria [7]: 1, sleep; 2, sober, quiet; 3, irritability, emotional lability; 4, inconsolable cry; 5, unquiet, agitation, aggression. Score 1, 2, and 3 were non-awakening period agitation. Score 4 and 5 were pediatric anesthesia emergence delirium.

OASS criteria [8]: 1, response to noxious stimulation; 2, slight body response; 3, response to call; 4, slow response; 5, wide awake, right response.

Ramsay criteria [9]: 1, restless, anxious, or both; 2, cooperation, quiet, normal orientation; 3, only response to order; 4, sleep, but response to intense sound or brow stimulus; 5, sleep, slow response to intense sound or brow stimulus; 6, no response.

Data processing and statistical analysis

All statistical analyses were performed using SPSS17.0 software. Measurement data were presented as means and standard deviation ($\bar{x}$ ± S). Differences between multiple groups were analyzed by t test or chi-square test. P < 0.05 was considered as significant difference.

Results

Duration of eye opening and extubation, and OASS score comparison

Duration of eye opening and extubation, and OASS score in two groups were observed. Compared with propofol combined normal saline, the patients in propofol combined dexmedetomidine showed significantly longer duration of eye opening and extubation, lower OASS score at eye opening, extubation, and after extubation (P < 0.05) (**Table 2**).

Cough in recovery period comparison

Cough in recovery period comparison showed that the patients received propofol combined dexmedetomidine presented declined cough case number, times, and severity (P < 0.05). Two group showed no significant difference in first cough time (P > 0.05) (**Table 3**).

Agitation incidence comparison

Agitation incidence at different time point was compared. It revealed that obviously lower agitation incidence at 10, 15, 20, 30 min after extubation appeared in propofol combined dexmedetomidine compared with propofol combined normal saline (P < 0.05). Ramsay score showed that it significantly increased in propofol combined dexmedetomidine compared with propofol combined normal saline (P < 0.05) (**Table 4**).

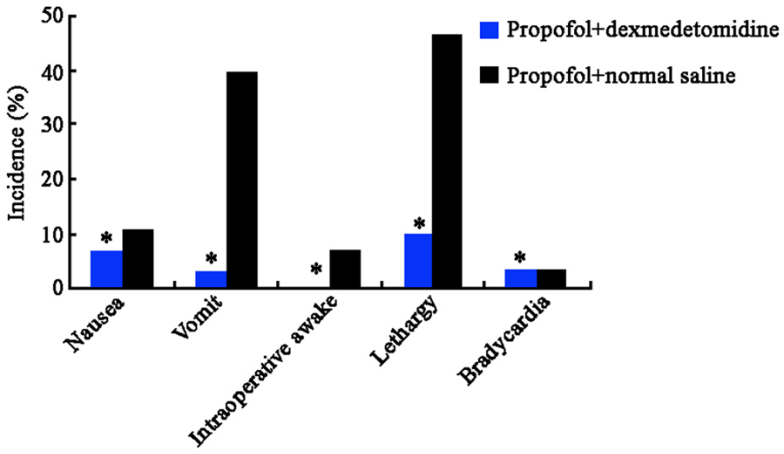

Figure 1. Complications comparison. *P < 0.05, compared with propofol combined normal saline.

Complications comparison

The patients in propofol combined dexmedetomidine presented nausea at 6.67%, vomit at 3.33%, and lethargy at 10%, which were all obviously lower than that in propofol combined normal saline group (P < 0.05) (**Figure 1**).

Discussion

Patients often appear sympathetic nervous excitement caused by fear and anxiety during eye surgery, leading to catecholamine excess secretion. At this time, no sedation therapy cannot eliminate fear and anxiety even with good preoperative local anesthesia effect [10]. As a common perioperative complication, anxiety is most obvious in younger and hotheaded mood children. Benzodiazepines drugs usually do not have significant effect on such patients [11]. Dexmedetomidine showed 1600:1 binding ratio between α2 and α1 adrenergic receptors as a high selective α2 adrenergic agonist. It can act on α2 adrenergic receptor in the brain and spinal cord to play the role of sedation, analgesia, and antianxiety. For dexmedetomidine has relatively unique sedative effect, it presents the dose dependent without no addiction, thus no strong inhibition to respiration [12, 13].

In this study, we selected pediatric patients receiving eye surgery in our hospital and applied two anesthetic methods. The patients in propofol combined dexmedetomidine showed significantly longer duration of eye opening and extubation, lower OASS score at eye opening, extubation, and after extubation, suggesting that propofol combined dexmedetomidine had good anesthetic effect. Previous study revealed that applying propofol laryngeal mask anesthesia in patients with eye surgery can ensure intraoperative breathe easy, spontaneous breathing, rapid recover after surgery, no intraocular pressure elevation, and low incidence of adverse reactions such as nausea and vomiting. Related study confirmed that compared with patients oral taking 0.5 mg/kg midazolam, 1 g/kg dexmedetomidine showed better sedation effect and more stable hemodynamics [14, 15]. This study further analyzed cough status in recovery period and found that propofol combined dexmedetomidine group presented declined cough case number, times, and severity, obviously lower agitation incidence at 10, 15, 20, 30 min after extubation, and higher Ramsay score. It suggested that propofol combined dexmedetomidine can reduce cough incidence and severity, and agitation incidence in recovery period without affecting extubation time. As a high selective α2 adrenergic agonist, dexmedetomidine acts on postsynaptic α2 adrenergic receptor in the brain and spinal cord to activate pertussis toxin sensitive G protein and improve potassium ion permeability, producing sedative and analgesic effect [16, 17].

Patients in propofol combined dexmedetomidine group appeared lower incidence complications including nausea, vomit, lethargy, and bradycardia. The reason of bradycardia might be dexmedetomidine can inhibit norepinephrine release in neuro-effector-junctor, and it can act on the sympathetic nervous system to slow the heart rate [18, 19]. When patients appear bradycardia, it should stop administration at one, increase oxygen inhalation, give vasopressors or anticholinergic agent [20]. Even so, dexmedetomidine is more effective and safer in pediatric perioperative usage compared with other drugs.

In conclusion, Propofol combined dexmedetomidine has good anesthesia effect in pediatric

eye surgery by reducing cough incidence and severity, declining agitation incidence, while not affecting extubation in recovery period. It is worth to be widely applied in clinic with fewer complications and safe. It is a relative ideal selection in eye surgery anesthesia.

Disclosure of conflict of interest

None.

Address correspondence to: Dr. Xiangxue Jiao, Department of Anesthesiology, The First People's Hospital, 78, Xianyang 712000, Shanxi Province, China. Tel: +86-29-33233930; Fax: +86-29-3323-3930; E-mail: jiaoxiangxue@126.com

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