Journal of Clinical Anesthesia (2016) **33**, 289–295

ELSEVIER

Journal of Clinical Anesthesia

Original Contribution

Efficacy of premedication with intranasal dexmedetomidine on inhalational induction and postoperative emergence agitation in pediatric undergoing cataract surgery with sevoflurane

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Received 2 March 2015; revised 1 April 2016; accepted 24 April 2016

Keywords:
Dexmedetomidine;
Induction;
Agitation;
Children;
Sevoflurane

Abstract

Study Objectives: This study aimed to test the hypothesis that premedication with a single dose of intranasal dexmedetomidine (DEX) could not only reduce preoperative anxiety but also minimize the emergence agitation in children undergoing cataract surgery with sevoflurane anesthesia.

Design: Single-blinded, randomized, placebo-controlled clinical comparison study.

Setting: Academic medical center.

Patients: Ninety American Society of Anesthesiologists physical status 1 and 2 children scheduled for cataract surgery.

Interventions: Patients were randomized into 3 groups: group D1, group D2, and saline group (group C), in which the children received 1 or 2 μg/kg of intranasal DEX or saline, respectively, and each group comprises 30 patients.

Measurements: The mask induction score and the incidences of postoperative emergence agitation evaluated by the Pediatric Anesthesia Emergence Delirium scale were assessed. The emergence time, postanesthesia care unit (PACU) stay time, and any adverse events were recorded.

Main Results: The mask induction scores were significantly higher in the saline group than those in the D1 and D2 groups ($P < .001$). The incidences of emergence agitation in the D1 and D2 groups were significantly lower than that in the saline group (7/30 in group D1 and 3/30 in group D2 vs 24/30 in group C, $P < .001$). The emergence time and PACU stay time were comparable among the 3 groups ($P > .05$). The emergence time and PACU stay time did not differ significantly in DEX-treated groups as compared with the saline group; there were no differences between 1- and 2-μg/kg groups. None of the patients exhibited significant clinical complications.

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http://dx.doi.org/10.1016/j.jclinane.2016.04.027

Conclusion: Intranasal DEX (1 or 2 μg/kg) dose independently improves the incidences of mask acceptance and prevents the incidences of postoperative emergency agitation mainly from sevoflurane without delaying the emergency time or inducing severe adverse events.

1. Introduction

Sevoflurane, a widely used inhaled anesthetic agent, has been suggested for mask induction and maintenance for pediatric anesthesia due to its favorable smell and its low blood-gas partition coefficient [1]. Furthermore, sevoflurane inhalational induction can provide excellent conditions for tracheal intubation or laryngeal mask airway (LMA) insertion [2]. Although many studies so far have demonstrated that sevoflurane is the most favorable violated agent for inhalational induction without irritating airway which may result in breath holding or laryngospasm [3], many children still refuse to accept the mask. The resistance may result in postoperative emergence delirium [4]; thus, appropriate hypnotic premedication should be recommended to induce smoother induction of sevoflurane [5].

The low pungency of sevoflurane can facilitate fast recovery from anesthesia, especially in short surgical procedures. However, it has repeatedly reported that sevoflurane is associated with a high incidence (up to 80%) of emergence agitation in children [6]. Furthermore, Dahmani et al [7] has stated that pediatrics undergoing cataract surgery suffered from higher incidence of postoperative emergence agitation compared with other surgeries because of disturbed vision and eye patching upon awaking. Emergence agitation, including restlessness, disorientation, and inconsolable crying, may lead to suture dehiscence and raise intraocular pressure after cataract surgery [8]. Additional medication is often necessary, although it may lead to prolonged stay in the postanesthesia care unit (PACU). Therein, the optimal sedatives should be adjusted to reduce the high incidence of emergence agitation with minimal potential to delay recovery.

Many anesthetic agents including sedatives and opioids are recommended to reduce the high incidence of postoperative emergence agitation; however, these agents may also result in undesirable side effects including nausea and vomiting, even respiratory depression [9]. Dexmedetomidine (DEX) is a new α2-agonist with a more selective action on the α2-adrenoceptor and a shorter half-life [10]. Several lines of evidence so far have noted that intranasal 1 and 1.5 μg/kg of DEX produces sedation in 45 to 60 minutes and peaks in 90 to 105 minutes [11]; moreover, intranasal DEX has other advantages including lack of respiratory depression and unnecessary for venous cannulation.

The cataract surgery is a short surgical procedure, and the duration of surgery usually lasts 30 to 50 minutes [12]. Thus, we speculated that intranasal DEX prior to surgery can not only facilitate sevoflurane inhalational induction but also reduce the postoperative emergence agitation without delaying emergence time or causing clinically significant adverse events. And this hypothesis was tested in pediatric patients with premedication of intranasal DEX who were undergoing cataract surgery in which the anesthesia was performed by sevoflurane for mask induction and maintenance.

2. Materials and methods

The trial was approved by the Ethics Committee of Zhongshan Ophthalmic Center of Sun Yat-sen University (Guangzhou, China; reference no. 2013PRLL001), and written consent was obtained from the parents. Also, the study was implemented in accordance with the principles of the Helsinki Declarations. This prospective, randomized trial was conducted from April to August 2014 at Zhongshan Ophthalmic Center.

2.1. Patients

Ninety-eight children aged from 1 to 8 years and weighing 9 to 38 kg with American Society of Anesthesiologists (ASA) physical status I or II undergoing cataract surgeries were enrolled in this study. Exclusion criteria included known adverse reactions to DEX, neurologic illness, developmental delay, previous anesthesia experience, parental refusal, or moderate upper tract infection.

2.2. Randomization grouping

Of 98 children screened, 90 were found eligible and randomized into 3 groups by using a computer-generated randomization program. Patients in groups C and D1, and D2 intranasally received normal saline, 1 μg/kg of DEX, and 2 μg/kg of DEX, respectively. Each group contained 30 patients. A flowchart of participants is shown in Fig. 1.

2.3. Protocols of intranasal DEX

Undiluted preservative-free DEX (Ai Bei Ning; Jiang Su Heng Rui Medicine Co Ltd, Jiangsu Province, China) was prepared at a concentration of 100 μg/mL and drawn up into a 1-mL tuberculin syringe. For pediatric patients assigned to the 1-μg/kg group, the DEX was diluted with an equal volume of 0.9% saline, whereas DEX was not diluted for patients in the