

## The effect of dexamethasone on the incidence of laryngospasm in pediatric patients after the Tonsillectomy

Molouk Jaafarpour<sup>1</sup>, Ali Khani<sup>2,\*</sup>, Javaher Khajavikhan<sup>3</sup>

<sup>1</sup>Midwifery Dept., Ilam University of Medical Sciences, Ilam, I.R. Iran; <sup>2</sup>Nursing Dept., Ilam University of Medical Sciences, Ilam, I.R. Iran; <sup>3</sup>Anesthesiology Dept., Ilam University of Medical Sciences, Ilam, I.R. Iran.

Received: 15/Apr/2015 Accepted: 28/Aug/2015

### ABSTRACT

**Background and aims:** Laryngospasm and vomiting occurring in children after tracheal extubation might be dangerous. The aim of this study was to evaluate the effects of preoperative 0.5 mg/kg intravascular (IV) of dexamethasone on the incidence of post extubation laryngospasm, and vomiting in children after the tonsillectomy.

**Methods:** This study was performed at Ilam Imam Khomeini hospital in 2009. In a randomized double-blind controlled trial, 66 pediatric patients, 4-12 years old were randomly assigned in two equal groups: treatment group (Dexamethasone, 0.5mg/kg IV) and placebo (saline) group, after the induction of anesthesia before the surgery. Surgery and anesthesia were the same in 2 groups. Children who received steroids, antihistaminics, or psychoactive drugs within 24 h before the surgery were excluded from the study. Children with IV induction or steroid administration, with diabetes and mental retardation were not included in the study. The incidence of post-extubation laryngospasm and vomiting was recorded by the investigator.

**Results:** The mean of age of Dexamethasone and placebo groups were  $6.4 \pm 2.2$  and  $6.1 \pm 2.8$  year, respectively. Furthermore, the mean weight of Dexamethasone and control groups were  $19.2 \pm 5.3$  and  $20.3 \pm 6.8$  kg, respectively ( $P > 0.05$ ). In addition, while the mean anesthesia duration in dexamethasone group was  $57.4 \pm 7.4$  minutes, in placebo group it was  $55.6 \pm 4.6$  minutes. The mean of surgery duration of dexamethasone and placebo groups were  $40.7 \pm 6.7$  and  $42.3 \pm 8.4$  minutes, respectively ( $P > 0.05$ ). Moreover, the incidence of post-extubation laryngospasm in dexamethasone group (6%) was lower than in the placebo group (30%) ( $P < 0.05$ ). Finally, the incidence of vomiting in dexamethasone group (18%) was significantly lower than the placebo group (51.5%) ( $P < 0.05$ ).

**Conclusion:** In the pediatric patients undergoing tonsillectomy, using preoperative dexamethasone could significantly reduce the post-extubation laryngospasm, without any significant side effect, so it is recommended for routine usage.

**Keywords:** Anesthesia, Children, Dexamethasone, Laryngospasm, Tonsillectomy.

### INTRODUCTION

Tonsillectomy (with or without adenoidectomy) is one of the most common surgical operations in children which might be

associated with postoperative vomiting ranging between 40% and 73%.<sup>1-7</sup> In addition, morbidity related to postoperative nausea and

\*Corresponding author: Ali Khani, Department of Nursing, Nursing & Midwifery Faculty, Ilam University of Medical Science, Ilam, IR-Iran Tel: 00989188345385, E-mail: nimakhani@gmail.com

vomiting (PONV), pain, poor oral intake, dehydration and fever is a challenge for children undergoing tonsillectomy in ambulatory setting.<sup>2,4</sup> The delay in postoperative oral fluid intake as well as inadequate oral feeding due to the nausea, vomiting and pain, may prolong the discharge period, and also may increase dehydration risk in the early or late postoperative period.<sup>2,7</sup> Moreover, laryngospasm after tracheal extubation could be an emergency in pediatrics general anesthesia with various occurrence in different studies about 0.8-23.8%.<sup>1</sup> In fact, it is a potentially life threatening issue and may be associated with bronchospasm, hypoxia, arrhythmias, pulmonary aspiration, ventilatory insufficiency and cardiac arrest.<sup>8,10</sup> Several methods have been used to prevent post extubation laryngospasm but the choice of technique remains controversial. The examples of such methods may include: using acupuncture,<sup>11</sup> topical and parenteral Lidocaine,<sup>8</sup> Propofol,<sup>10</sup> and intravenous nitroglycerin.<sup>9</sup>

Dexamethasone and other steroid preparations have been used to minimize tissue injury and edema and some related morbidity, such as pain, fever and poor oral intake in children undergoing tonsillectomy.<sup>2</sup> Dexamethasone could have no side effect when is used as a single injection with a low cost and a prolonged biological half-life of 36 to 48 hours. In addition, it has combined antiemetic and anti-inflammatory effects which may decline the postoperative edema, and subsequently may improve oral intake after tonsillectomy.<sup>1</sup>

The effect of dexamethasone in tonsillectomy-associated PONV, pain and oral intake is not completely known. Anaesthesiologists and otolaryngologists are seeking the methods to minimize this problem, especially in operation room.<sup>2</sup> Therefore, due to the lack of comprehensive studies in this field, and because of the importance and high

occurrence of Laryngospasm and vomiting in pediatrics, the aim of this study was to assess the effects of 0.5 mg/kg i.v. of dexamethasone given after the induction of anesthesia on post extubation Laryngospasm and vomiting in pediatric patients undergoing tonsillectomy with or without adenoidectomy.

## METHODS

This was an experimental study at the Ilam Imam Khomeini hospital, located in west of Iran in 2009. After obtaining the approval from institutional review board and informed written consent from the parents, 66 patients, 4-12 years old, undergoing tonsillectomy, with or without adenoidectomy, were enrolled in the study in two equal groups: Dexamethasone and placebo groups.

The study was a randomized double-blinded design. Children who received steroids, antihistaminics, or psychoactive drugs within 24 hours before surgery were excluded from the study. Additionally, children in whom IV induction was indicated or steroid administration was contraindicated, and patients with diabetes and mental retardation were not included in the study. Oral intake was stopped 8 hours and clear fluids were stopped 4 hours preoperatively.<sup>1,2</sup>

After establishing standard monitoring, general anesthesia was induced using halothane and a gas mixture of 50% nitrous oxide and oxygen. Each child received fentanyl 1 µg/kg before the surgery. Dexamethasone 0.5 mg/kg (Dexamethasone group) or an equal volume of saline (placebo group) was administered IV in a randomized double-blind fashion after the induction of anesthesia before the surgery. Randomization was done by a computer-generated number table. Surgery and anesthesia condition in two groups were the same. Ages, weight, surgery time, anesthesia time, incidence of post-extubation laryngospasm, were documented for each patient.

Laryngospasm was defined as a condition occurring within 2 minutes of extubation, characterized by the following findings: Stridor on inspiration; total closure of the vocal cords, i.e. silence with no air movement; cyanosis.<sup>8</sup>

Children who were diagnosed with developed laryngospasm were immediately treated with jaw thrust to maintain airway patency and controlled ventilation with a bag and mask with 100% oxygen. The vomiting was clearly observed in patients in the post anaesthesia care unit. The incidence of vomiting was recorded by nurses in the post-anesthesia care ward. The data was analysed using the statistical software SPSS, applying descriptive statistics, Student t-test, Mann-

Whitney test,  $\chi^2$  or Fisher's exact tests. P less than 0.05 was considered as significant.

## RESULTS

None of 66 enrolled patients was withdrawn. Baseline patient's characteristics and duration of surgery and anesthesia are shown in Table 1. Demographic and duration of anesthesia and operation were not significantly different between the two groups (Table 1).

The incidence of post extubation laryngospasm in dexamethasone group (6%) was lower than that in the placebo group (30%) ( $P<0.05$ ). In addition, the incidence of vomiting in dexamethasone group (18%) was significantly lower than the placebo group (51.5%) ( $P<0.05$ ) (Table 2).

**Table 1:** Patient characteristics

Characteristics	Treatment group		P-value
	Dexamethasone (n=33)	Placebo (n=33)	
Age (years)	6.4±2.2	6.1±2.8	>0.05
Weight (kg)	19.2±5.3	20.3±6.8	>0.05
Sex (F/M)	18/15	16/17	>0.05
Duration of surgery (min)	40.7±6.7	42.3±8.4	>0.05
Duration of anesthesia (min)	57.4±7.4	55.6±4.8	>0.05

**Table 2:** Frequency and incidence of laryngospasm and vomiting

Characteristics	Treatment group		P-value
	Dexamethasone (n=33)	Placebo (n=33)	
Laryngospasm [n (%)]	2(6%)	10 (30%)	<0.05
Vomiting [n (%)]	6 (18%)	17 (51.5%)	<0.05

## DISCUSSION

Dexamethasone 0.5 mg/kg IV application after the induction of anesthesia in children undergoing tonsillectomy with or without adenoidectomy could significantly decline the incidence of post extubation laryngospasm and vomiting.

Several methods have been used to prevent post extubation laryngospasm and vomiting but the choosing the best technique remains controversial.<sup>11</sup> Baraka reported that intravenous Lignocaine may prevent extubation laryngospasm.<sup>12</sup> However, Leicht

and colleagues showed that Lignocaine cannot always prevent from that.<sup>13</sup>

Although some studies failed to show any significant effect of dexamethasone on the incidence of post extubation laryngospasm, there have been quite a number of randomized controlled studies revealing a decrease in vomiting and laryngospasm incidence.<sup>7</sup> Aouad and colleagues found that the vomiting incidence in patients undergoing tonsillectomy or adenotonsillectomy and in those who were administered 0.5 mg/kg of dexamethasone preoperatively was 10% but 30% in the placebo group ( $P<0.05$ ).<sup>14</sup> In a similar study, Elhakim and colleagues demonstrated that the vomiting incidence was 30% and 56% in treatment and placebo groups, respectively ( $P<0.05$ ).<sup>14</sup> In a meta-analysis of eight published studies, Steward reported that in patients undergoing tonsillectomy, preoperative dexamethasone decreased the vomiting incidence two times and improved the oral intake of clear fluids and a soft diet within the first 24 hours when compared with the placebo group.<sup>15</sup>

Furthermore, anaesthetized extubation has been used to prevent from laryngospasm but Patel and colleagues reported that there was no difference in the incidence of laryngospasm between groups of patients undergoing awake and anaesthetized extubation.<sup>16</sup> In addition, steroids is used for treatment of croup.<sup>17,18</sup> For example, Lee and colleagues reported that acupuncture prevents from laryngospasm and is used for treatment of the after extubation in pediatric anaesthesia.<sup>11</sup>

In the present study, the administration of preoperative dexamethasone at a dose of 0.5 mg/kg in patients undergoing tonsillectomy with or without adenoidectomy with sharp dissection technique was associated with reduction of post-extubation laryngospasm and vomiting. These results may be attributed to the anti-inflammatory effect produced by

dexamethasone, which may reduce local edema and pain.<sup>7</sup>

Laryngospasm is a prolonged glottic closure in response to intense or supraglottic stimulation; in fact, it can be elicited by repetitive supralaryngeal nerve stimulation and might be depressed by barbiturate and hypoventilation.<sup>11</sup> The incidence of laryngospasm in the placebo group in our study was 30% which is almost similar to that reported by Leicht,<sup>13</sup> and Lee.<sup>11</sup> In the group whom was received dexamethasone, the incidence of laryngospasm was significantly lower of 6%. Complications from corticosteroids therapy, such as an increased rate of infection, peptic ulceration, and adrenal suppression, are usually related to its long term use. The risks of steroid therapy within 24 hours are negligible.<sup>1,2,7</sup>

## CONCLUSION

In conclusion, our results showed that the use of dexamethasone 0.5 mg/kg IV after the induction of anesthesia in children undergoing tonsillectomy with or without adenoidectomy could significantly decrease the incidence of post extubation laryngospasm and vomiting.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

## ACKNOWLEDGMENT

This study was supported by the Ilam University of Medical Sciences. We thank Ilam University of Medical Sciences, participants, coordinators, and data reviewers who assisted in this study.

## REFERENCES

1. Aouad MT, Siddik SS, Rizk LB, Zaytoun GM, Baraka AS. The effect of dexamethasone on postoperative vomiting after tonsillectomy. *Anesth Analg*. 2001; 92(3): 636-40.

2. Pappas AL, Sukhani R, Hotaling AJ, Mikat-Stevens M, Javorski JJ, Donzelli J, et al. The effect of preoperative dexamethasone on the immediate and delayed postoperative morbidity in children undergoing adenotonsillectomy. *Anesth Analg.* 1998; 87(1): 57-61.
3. White MC, Nolan JA. An evaluation of pain and postoperative nausea and vomiting following the introduction of guidelines for tonsillectomy. *Paediatr Anaesth.* 2005; 15(8): 683-8.
4. Busoni P, Crescioli M, Agostino R, Sestini G. Vomiting and common paediatric surgery. *Paediatr Anaesth.* 2000; 10(6): 639-43.
5. Gross D, Reuss S, Dillier CM, Gerber AC, Weiss M. Early vs late intraoperative administration of tropisetron for the prevention of nausea and vomiting in children undergoing tonsillectomy and/or adenoidectomy. *Paediatr Anaesth.* 2006; 16(4): 444-50.
6. Dillier CM, Weiss M, Gerber AC. Tropisetron for prevention of nausea and vomiting in children undergoing tonsillectomy and/or adenoidectomy. *Anaesthesist.* 2000; 49(4): 275-8.
7. Kaan MN, Odabasi O, Gezer E, Daldal A. The effect of preoperative dexamethasone on early oral intake, vomiting and pain after tonsillectomy. *Int J Pediatr Otorhinolaryngol.* 2006; 70(1): 73-9.
8. Ronald D. Miller. *Miller's Anesthesia*. Text book of Anesthesia. USA: Saunders; 2005: 714-1041.
9. Sibai A, Yamout I. Nitroglycerin relieves laryngospasm. *Acta anaesthesiol scand.* 1999; 43(10): 1081-3.
10. Nawfal M, Baraka A. Propofol for relief of extubation laryngospasm. *Anaesthesia* 2005; 57: 1028-44.
11. Lee CK, Chien TJ, Hsu JC, Yang CY, Hsiao JM, Huang YR, et al. The effect of acupuncture on the incidence of postextubation laryngospasm in children. *Anaesthesia.* 1998; 53(9): 917-20.
12. Baraka A. Intravenous lidocaine controls extubation laryngospasm in children. *Anesth Analg.* 1978; 57(4): 506-7.
13. Leicht P, Wisborg T, Chraemmer-Jorgensen B. Does intravenous lidocaine prevent laryngospasm after extubation in children? *Anesth Analg.* 1985; 64(12): 1193-6.
14. Elhakim M, Ali NM, Rashed I, Riad MK, Refat M. Dexamethasone reduces postoperative vomiting and pain after pediatric tonsillectomy. *Can J Anaesth.* 2003; 50(4): 392-7.
15. Steward DL, Welge JA, Myer CM. Do steroids reduce morbidity of tonsillectomy? Meta-analysis of randomized trials. *Laryngoscope.* 2001; 111(10): 1712-8.
16. Patel RI, Hannallah RS, Norden J, Casey WF, Verghese ST. Emergence airway complications in children: a comparison of tracheal extubation in awake and deeply anesthetized patients. *Anesth Analg.* 1991; 73(3): 266-70.
17. Freezer N, Butt W, Phelan P. Steroids in croup: do they increase the incidence of successful extubation? *Anaesth Intensive Care.* 1990; 18(2): 224-8.
18. Kairys SW, Olmstead EM, O'Connor GT. Steroid treatment of laryngotracheitis: a meta-analysis of the evidence from randomized trials. *Pediatrics.* 1989; 83(5): 683-93.

**How to cite the article:** Jaafarpour M, Khani A, Khajavikhan J. The Effect of Dexamethasone on the incidence of laryngospasm in pediatric patients after the Tonsillectomy. *Int J Epidemiol Res.* 2015; 2(3): 113-117.