

Prophylactic use of dexamethasone in tonsillectomy among children

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Abstract

In this double blind, randomized placebo-controlled study, the effect of dexamethasone in two different doses 0.5mg/kg and 1 mg/kg on prevention of postoperative vomiting in children undergoing tonsillectomy with or without adenoidectomy by electrodissection was evaluated. One hundred fifty children were involved in this study; children were allocated randomly into three equal groups. Children received either 1.V dexamethasone 0.5mg/kg with maximum total dose 8mg (group D1), or dexamethasone 1mg/kg with maximal total dose 16 mg (group D2) or 2 ml normal saline, with induction of anesthesia. The incidence of early and late vomiting, the time to first oral intake, postoperative pain score and parent satisfaction scores were compared between groups. The over all incidence of postoperative vomiting episodes was less in the two dexamethasone groups compared to the saline group (D1 22%, D2 18%. saline 46%), also the time to first oral intake was shorter in the dexamethasone groups. Satisfaction scores were better in dexamethasone groups compared to saline group P<0.05. The VAS pain scores were significantly less in the two dexamethasone groups at 2, 4, 6 hours postoperatively. There was no significant difference between the two dexamethasone groups in all measured parameters, indicating that I.V dexamethasone 0.5 mg/kg was as effective as dexamethasone 1 mg/kg to reduce the incidence of postoperative vomiting, time to first oral intake, and postoperative pain with increased parent satisfaction among children undergoing tonsillectomy by electrodissection.

Introduction

Postoperative nausea and vomiting (PONV) in children remains a distressing problem after tonsillectomy done under general anesthesia. The antiemetic effect of dexamethasone was demonstrated successfully in pediatric tonsillectomy patients and ambulatory gynecological patients [1,2]. In 1964, Smith and colleagues injected a steroid penicillin-local anesthetic mixture in to the tonsillar fossa during surgery and observed a reduction in post-operative pain and inflammation [3]. In 1972, Papangelou compared oral dexamethasone and analgesics with analgesics alone in 480 patients undergoing tonsillectomy and found less tissue edema and pain in the steroid treated group in the postoperative period [4]. Tissue injury induced acute inflammation is known to play significant role in the genesis of surgical pain and dexamethasone should theoretically be beneficial in the management of acute surgical pain because of its potent antiinflammatory effect [5]. The effect of timing of dexamethasone administration as prophylactic antiemetic for postoperative nausea and vomiting have been studied by Wang et al. They concluded, that prophylactic administration of 10 mg of I.V dexamethasone, immediately before the induction of anesthesia was more effective than its injection at the end of anesthesia for preventingPONV in patients undergoing total abdominal hysterectomy [6]. In a cost-effective study for the effect of dexamethasone compared to ondansetron in preventing PONV after pediatric strabismus repair. Subramaniam et al. found that dexamethasone is comparable to ondansetron in prevention ofPONV and it is approximately 22 times less costly than that of ondansetron. [7]. In this study, we evaluated the effect of two doses of dexamethasone 0.5 mg/kg with maximum total dose 8mg and 1mg/kg with maximum total dose 16 mg of dexamethasone given with induction of anesthesia compared to saline in

prevention of postoperative vomiting. The effect of dexamethasone on postoperative pain intensity and parent satisfaction scores was also evaluated.

Patients and Methods

One hundred and fifty children aged between 2 to 6 years old with body weight between 10 to 18 kg. ASA physical status I or II undergoing tonsillectomy with or without adenoidectomy were included in this study. Children who received antiemetic, antihistaminic, or steroid drugs within 48 hour before surgery were excluded from the study. All children were fasting from midnight for solid food, and allowed to drink clear fluids for up to 4 hours before the time of surgery. All children were premedicated with atropine 0.01 mg/kg IM half hour before surgery.

Patients were randomized to receive either dexamethasone 0.5 mg/kg with a maximum total dose of 8mg or dexamethasone 1 mg/kg with a maximum total dose of 16 mg, or 2 ml of normal saline immediately after induction of anesthesia. The surgery was done using electro dissection technique in all patients.

At the end of surgery, all children were observed in the recovery room (RR) for 2 hours. Rectal paracetamol 30 mg/kg was given to all children on arrival to RR and continued 6 hourly for 24 hours postoperatively. Water and soft diet were offered to the children in the RR and in the ward, intravenous fluids were continued until their oral feeding was judged adequate. All children were observed in the RR and then in the ward for vomiting, retching and intensity of pain. Retching and vomiting were grouped together and considered as vomiting episode. Episodes of vomiting occurring less than 5 minutes apart were considered one episode. The time and number of vomiting episodes, and the time to first oral intake were recorded. Vomiting was treated with metoclopramide 0.15 mg/kg slowly I.V when it occurred more than twice. Postoperative pain intensity scores were obtained with the visual analogue scale (VAS) score at 2, 6, and 12 hours post operatively. They were classified into three categories according to VAS score, Pain was considered severe if VAS score greater than 7, moderate if VAS score was 3-7 and mild if VAS score was less than 3. At the end of 24 hour after surgery, the primary care takers were asked to give a global assessment of their satisfaction over the entire postoperative experience of the child (parental Satisfaction score) using 11- point verbal numeric scoring system (0 = not at all satisfied, 10= fully satisfied). The nurses in the RR and in the ward made all observations, they were unaware, which of the patients received dexamethasone or saline.

Quantitative statistical data were presented as mean±SD and comparisons between two groups were done using the student "t" test. Non-quantitative statistical data were presented as numbers and percentages and comparisons between two groups were done by the test. Results were considered statistically significant if "P" value was <0.05.

Results

There was no statistical significant difference between the different groups regarding the age, sex and the body weight (Table 1). The overall incidence of total postoperative vomiting episodes were significantly greater in the saline group 46% than in the other two dexamethasone groups (D1) 22 % and (D2) 18% respectively. The incidence of vomiting episodes in the two dexamethasone groups was more or less comparable [(D1) 22% and (D2) 18%] with no statistical significant difference (Table 2). The incidence of early postoperative vomiting episodes during first two hours in the RR was significantly lower in the dexamethasone groups (14% in D1 group, 12% in D2 group), in comparison to saline group (30%) (Table 2).

Also there was a significant increase in the numbers of patients who vomited in the saline group in the early post-operative period (0-2h) in the RR as compared to two dexamethasone groups [saline group 22%, group (D1) 12% and group (D2) 8%]. Two children in the saline group vomited twice while one child vomited 3 times in the RR, while one child vomited twice in (D1) group and two children vomited between 2-24 hours. The incidence of late postoperative vomiting episodes (2-24h postoperatively) in the ward was significantly lower in the (D1) and (D2) groups (8%) and (6%) respectively than in the saline group (16%).

Table 1: Demographic data [sex and ASA physical status in numbers, age and body weight Mean ± (SD)]

	Dexamethasone 0.5mg/kg (D1)	Dexamethasone 1 mg/kg (D2)	Saline Group
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Age (y)	4.2 (2.3)	4.1 (2.1)	4.3 (2.18)
Sex (M/F)	23/27	21/29	26/24
Weight (kg)	14.6 (3.9)	15.4 (3.2)	14.3 (8.36)
ASA physical status (I/II)	49/I	48/II	49/I

Table 2: Number of children vomited (), vomiting episodes (), time to first oral intake (h) and parent satisfaction scores in the different groups mean \pm (SD)

	Group D1	Group D2	Group saline
Total number of children	50	50	50
Total percentage of vomiting episodes	22%	18%	46%*
Percentage of children who vomited in RR	12%	8%	22%*
Percentage of vomiting episodes in RR	14%	12%	30%*
Percentage of children vomited in the ward	6%	4%	12%*
Percentage of vomiting episodes in the ward	8%	6%	16%*
Time to first oral intake (hrs) mean \pm SD	4.54 (3.4)	4.24 (2.6)	7.58 (6.3)*
Parent satisfaction score	8.9 (0.4)	9.1 (0.6)	6.2 (0.2)*

*P <0.05

Table 3: Postoperative pain severity according to VAS pain scores (mild <3, moderate 3-7, severe >7) at 2, 6 and 12 hours postoperative (No. of children %)

	D1 (N = 50)	D2 (N = 50)	Saline (N = 50)
At 2 hours			
Mild	84%	80%	56%*
Moderate	14%	16%	40%*
Severe	2%	4%	4%
At 6 hours			
Mild	92%	88%	66%*
Moderate	8%	12%	34%*
Severe	-	-	-
At 12 hours			

Mild	96%	90%	72%*
Moderate	4%	10%	28%*
Severe	-	-	-

*P <0.05

The number of children, vomited in the saline group during the late postoperative period was six, while in the dexamethasone groups D1 and D2, three and two children, respectively. One child vomited twice in each of the dexamethasone groups while 2 children vomited twice in the saline group during the late postoperative period. The incidence of early postoperative vomiting episodes was significantly higher than in the late postoperative period (2-24h) in the all study groups. The time to first oral intake was significantly shorter in the two dexamethasone groups D1 (4.54± 3.4), D2 (4.24± 2.6) as compared to the saline group (7.58±6.3) with no significant difference between the two dexamethasone groups (Table 2). Children in the dexamethasone groups had significantly higher parental satisfaction scores than those in the saline group (Table 2). There was statistically significant decrease in the pain severity in both dexamethasone groups, as compared to the saline group at 2, 6, and 12 hours postoperatively with no significant difference between the two postoperative groups (Table-3)

Discussion

Dexamethasone is an effective antiemetics agent with minimum side effects after single dose administration [8,9]. Its antiemetics effect is equal to or better than other antiemetic, such as metoclopramide, prephenazine, droperidol, and Ondansetron [8-11]. Although dexamethasone is effective in preventing PONV associated with surgical procedures, further investigations of dexamethasone should include a dose response study [12]. Many investigators suggest the use of dexamethasone as a prophylactic antiemetic agent for postoperative nausea and vomiting in patients recovering from general anesthesia. Apri1 et al [13] found that treatment with IV dexamethasone (1mg/kg up to 16 mg) in children before electrocautery tonsillectomy and adenoidectomy decreases morbidity and increases early postoperative oral intake. Pappas et al. [14] observed a decrease in the over all incidence of postoperative vomiting, especially during the 24 hours after discharge as well as an improvement in the postoperative quality of oral intake in children undergoing tonsillectomy who received dexamethasone (1mg/kg), after the induction of anesthesia as compared to those in a control group.

Splinter and Robest [11] found that dexamethasone 150 µg/kg IV up to maximum dose of 8mg administrated before tonsillectomy markedly decreased vomiting in children both during early recovery in RR and during late recovery over 24 hours. On the other hand study done by Ohlms et al. [15] failed to demonstrate any beneficial effect of dexamethasone on the incidence of postoperative vomiting and the degree of pain after tonsillectomy in children. Complications from corticosteroid therapy, such as increased rate of infection, peptic ulceration, and adrenal suppression, are usually related to its long term use.

In this study, dexamethasone 0.5 mg/kg and 1 mg/kg was used for preventing vomiting after tonsillectomy. The technique of anesthesia was standardized for all children. The incidence of early vomiting in the RR and late vomiting in the ward was more frequent in the saline group than in the dexamethasone groups indicating that dexamethasone is effective in preventing postoperative vomiting. However, there was no significant difference in the incidence of early and late vomiting when dexamethasone used as 0.5 or 1 mg/kg. The mechanism of dexamethasone induced antiemetic is not fully understood, but central inhibition of prostaglandins synthesis and decrease in 5-HT turn over in the central nervous system, release of endorphins and tryptophan depletion, or changes in the permeability of the blood CSF barrier to serum proteins may be involved [5]. Also dexamethasone was effective in reducing the time to first oral intake significantly than in the saline group. Dexamethasone 0.5mg/kg is as effective as 1 mg/kg in reducing postoperative vomiting and shortening the time to first oral intake after tonsillectomy by electrodissection. Dexamethasone shortens the time to first oral intake mostly due to the anti inflammatory effect, which may reduce edema and pain. Electrodissection may cause more pain and discomfort postoperatively as a result of more inflammation, edema, nerve irritation and spasm of exposed laryngeal muscles [16]. The use of dexamethasone in this study in doses of 0.5 and 1 mg/kg was equally effective in reducing postoperative VAS pain scores in the early and late postoperative period when compared to saline. This effect of dexamethasone may be produced, by reducing the local inflammation, and by blocking chemical mediators of inflammation. The parent satisfaction scores were better in the dexamethasone groups; which may be due to less incidence of vomiting episodes, less postoperative pain and earlier oral intake.

In conclusion, this study showed that dexamethasone 0.5 mg/kg, was as effective as dexamethasone 1 mg/kg in reducing of postoperative vomiting, time to first oral intake, the severity of pain, and improving parent satisfaction after electrodissection tonsillectomy in children, both in the early postoperative period in the RR and late during the next 24 hours in the ward. The use of the smaller dose of dexamethasone (0.5 mg/kg) for prevention of postoperative vomiting and reducing pain, in children undergoing tonsillectomy is recommended.

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