The Effect of Dexamethasone on Postoperative Vomiting, Parenteral Fluid and Oral Intake after Tonsillectomy

Aimen Hameed Latef /FICMS (Anesthesia)*

ABSTRACT:

Background: Vomiting is a common postoperative complication of tonsillectomy causing patients' discomfort, delay in hospital discharge and seldom pulmonary aspiration. The incidence of postoperative emesis is higher in pediatrics population and increases with age to reach a peak in preadolescence (ages 11-14 years).

Objectives: To determine the effectiveness of single dose intravenous dexamethasone, at induction of anesthesia, on postoperative emesis, starting oral intake and the period of intra venous fluid.

Patients and Method: In a randomized double blinded, placebo controlled clinical trial, 112 patients aged 5-12 years ASA (American Society of Anesthesiologists) class I were enrolled to receive 0.5 mg/kg iv dexamethasone up to 8 mg (n=56), as study group and placebo group had received equivalent volume of 0.9% normal saline at the time of induction of general anesthesia (n=56), as control group. The anesthetic regimen was standardized for all patients. The incidence of early and late vomiting, the time to first oral intake and duration of intra venous fluid administration was recorded.

Results: Data analysis showed that the overall incidence of early and late vomiting was significantly lesser in dexamethasone group than the control one. The time to first oral intake and duration of intravenous fluid therapy were also significantly shorter in dexamethasone group.

Conclusion: A single dose of dexamethasone at induction of anesthesia significantly decreased the incidence of postoperative vomiting in early and late recovery phase and shortened the time to first oral intake and duration of intravenous fluid therapy.

Key words: Dexamethasone, Postoperative Nausea and Vomiting, Tonsillectomy, Postoperative Oral Intake

Introduction:

Nausea and vomiting are common postoperative complication causing patients discomfort, delay in hospital discharge and seldom pulmonary aspiration. The incidence of postoperative emesis is higher in pediatrics populations and increases with age to reach a peak in preadolescence (11-14 years) ages. This complication depends on the type of operation and is higher after strabismus surgery, tonsillectomy and orthopedic surgeries [1].

Nausea is described as the unpleasant sensation associated with the urge to vomit, or awareness of the potential to vomit, while vomiting is the forceful ejection of stomach contents through the mouth [2].

There are various causes of postoperative nausea and vomiting (PONV) like pharyngeal or laryngeal stimulation, anesthetic agents, gastro intestinal distention, abdominal pain, opioids, hypotension, vestibular stimulation and psychological factors [3].

Risk Factors for PON:

The etiology of PONV is multi factorial, involving patients, medical, surgery and anesthesia related factors.

Patients related factors:

It becomes imperative to identify patient related risk factors during the preoperative anesthesia evaluation. They include age, gender, and history of motion sickness or PONV. Obesity is no longer considered a risk factor for PONV [4].

Medical related factors:

Some patients may have coexisting medical problems, such as gastro intestinal diseases(hiatus hernia, gastro esophageal reflux) and metabolic diseases(diabetes mellitus, uremia electrolyte abnormalities), that may predispose them to PONV. Preoperative anxiety also increases the risk of PONV [5].

The underlying surgical problem for which the patient is undergoing surgery, such as intracranial stimulation (raised intracranial pressure from tumors) and sensory stimulation from acute abdomen, intestinal obstruction, etc., can also initiate the vomiting reflux [5].

Patients undergoing chemotherapy or radiotherapy are also more prone to emesis [6].

Surgery related factors:

Otolaryngological surgery, dental surgery, breast augmentation surgery, orthopedic shoulder surgery, laparoscopy, strabismus surgery and varicose vein stripping were found to have a higher incidence of PONV than other procedures [7].

Anesthesia related factor:

While anesthetists have little control over surgical factors, they do have control over factors such as premedication, anesthetic technique, choice of anesthetic drugs, IV hydration and postoperative pain management [8].

Impact of PONV:

PONV is most distressing in the early hours after surgery. It is so unpleasant that reduces patient's satisfaction with postoperative care [8].

It can also lead to bleeding, pulmonary aspiration and may trigger cardio respiratory reflexes, dehydration, and water and electrolyte abnormalities [9].

The increase of day surgery in the 1990's has been challenged by the high incidence of PONV and still one of the major limiting factors in the early discharge of day surgery patients is the presence of

PONV, implying that economic consequences are involved [7, 8, 10, 11].

Managing PONV incurs costs for day surgery units through personnel costs associated with the direct management of PONV, cost of drugs used to prevent and mange PONV, costs of supplies used in caring for patients suffering from PONV, and costs associated with the extra time spent by patients with PONV in the post anesthesia care unit (PACU). So anti emetic prophylaxis appears to be cost effective [3, 5, 7, 9].

Glucocorticoids as anti-emetics:

The mechanism of the anti emetic action of corticosteroids is unknown, but prostaglandin antagonism has been proposed, and the release of endorphins is another explanation suggested [7, 12, 13]. It has also been speculated that the mechanism of action is related to the anti inflammatory and membrane stabilizing effect [12].

Regarding dexamethasone, it was first reported in 1981 as an effective anti emetic in patients receiving cancer chemotherapy. Since then, it has been widely applied in the prevention of nausea and vomiting after chemotherapy [12, 13].

Dexamethasone has also been found to have a prophylactic effect on PONV in patients undergoing tonsillectomy, thyriodectomy, abdominal hysterectomy and those having laparoscopic surgery [14].

Some authors even stated that dexamethasone reduce postoperative pain, fatigue and improve outcome besides reducing PONV and they recommended its routine use [12].

The analgesic effects of glucocorticoids are mainly provided through the peripheral inhibition of phospholipase, thereby decreasing the products of the cyclooxygenase and lipoxygenase pathways in the inflammatory response [14].

The major concern regarding the use of dexamethasone is infection, delayed wound healing and other side effects. But various studies have shown that single dose dexamethasone does not increase complications and it is quiet safe [8, 15, 16].

Among the anti emetics currently prescribed for PONV, serotonin subtype 3 antagonists (e.g., ondansetron and granisetron) are expensive. Other currently used, lower cost anti emetics (e.g., anticholinergics, antihistamines and dopamine receptors antagonists) have side effects, such as sedation, dry mouth, restlessness, changes in arterial blood pressure, and extra pyramidal symptoms[12, 13].

Tonsillectomy with or without adenoidectomy is one of the most frequently performed surgical procedures in the world [2, 15], and the incidence of PONV has been reported between 40% and 73% [12]. So prophylactic anti emetic therapy is recommended in these high risk patients and such drugs as metoclopromide and ondansetron have been used [16].

Dexamethasone when used in single dose has little side effects. Its' half life is 3 hrs, but the biological half life is 36 -48 hrs. [14].

Dexamethasone reduces postoperative edema and improves the quality of oral intake after tonsillectomy by its anti-inflammatory effects [12].

Methods:

The study was approved by institutional ethics committee, the University of Mustansiriyah, Medical College, surgical department, and written informed parental consent was obtained in all the patients, 112 patients aged 5-12 year (mean ± SD = 7.4±2.14), ASA I, candidate for tonsillectomy were enrolled to this double blind placebo controlled, clinical trial performing in Al- Yarmok Teaching Hospital, Baghdad, Iraq, October 1, 2007 until October 1, 2008.

Children with common cold, those who had received psycho active drugs, anti emetics, steroids, and antihistamines were excluded from the study.

Patients were not allowed solid food intake from the night 8h before surgery, but clear liquids were permitted until 4h before the operation. Intra venous cannula was inserted and standard patient monitoring was established. All patients received 30 ml\ kg\hr glucose 5% solution during the operation. They were randomly assigned to receive dexamethasone 0.5 mg\kg IV at induction of anesthesia with maximum dose of 8 mg as study group (n=56) and an equivalent volume of normal saline as control group (n=56), in a double blinded fashion.

All patients received 0.002 mg\kg fentanyl 3 minutes before induction with atropine 0.02 mg \kg as a premedication, and anesthesia was induced with sodium thiopental 4-6 mg\kg (sleeping dose) and endotracheal intubation with cuffed tube of suitable size was facilitated by succinyl choline 1.5mg \kg. Anesthesia was maintained with spontaneous breathing, 100% oxygen and 2% halothane. No case of delayed recovery reported. Any patient with contraindication to these anesthetic agents was excluded from the study.

When the patients were fully recovered from anesthesia; extubation were done on lateral position after good suctioning of mouth and pharynx. The patients were transferred to post anesthesia care unit (PACU) and observed for 2h and after stabilization of vital signs they were transferred to ward. Rectal acetaminophen (child suppositories) was administered to all patients. In the ward, IV fluid infusion was continued until adequate oral intake (ingestion of 150 ml of fluids and 150 ml of soft food) within 6 hr.

The incidence of vomiting was recorded during the 2 hr. of PACU stay (early vomiting) and from 2nd to 24th hours after surgery in the ward (late vomiting). Nausea was not recorded because it was

difficult to assess in children and we did not use any anti emetic drugs.

Demographic data of the patients, the time to first oral intake, duration of IV fluid therapy and duration of surgery were recorded. Data were analyzed with Chi square and t – tests.

Results:

Demographic characteristics of patients and surgical procedures duration were not significantly different between the two groups, Chi^2=0.4→P-value >0.05, (Table 1).

Table 1: Comparison of age, sex and surgical duration.

Characteristics	Dexamethasone Group(n=56)	Placebo Group(n=56)	Chi^2	P-value
Age(year) (mean ± S.D)	9.52±2	9.75±2	0.4	>0.05
Sex(male/female)	29/27	28/28	0.4	>0.05
Surgical duration(min) (mean ± S.D)	19 ± 1	18 ± 2	0.4	>0.05

Postoperative effect of dexamethasone after tonsillectomy:

There is highly significant relation between the use of dexamethasone and the decrease of early vomiting (≤ 2hr) ,Chi^2=11.8→ P-value 0.001,at 99% confidence interval (Table II) .There is highly significant relation between the use of dexamethasone and the decrease of late vomiting (2hr- 24hr), Chi^2=14.5→ P-value <0.001, at99% confidence interval(Table 2).

There is significant relation between the use of dexamethasone and the reduction in the mean time of first oral intake postoperatively, Chi^2=6.2→P-value<0.05, at95%confidence interval (Table 2).

There is significant relation between the use of dexamethasone and the reduction in the mean duration of IV hydration postoperatively, Chi^2=7.7→P-value<0.05, at 95%confidence interval (Table 2).

Table 2: Comparison of the incidence of early and late vomiting, the time to first oral intake and duration of IV hydration.

Characteristics	Dexamethasone Group(n=56)	Placebo Group(n=56)	Chi^2	P-value
Early vomiting(during the first 2hr of recovery)	12 (21%)	29 (52%)	11.8	<0.001
Late vomiting(2-24hr)	14 (25%)	35 (63%)	14.5	<0.001
The time to first oral intake (hr)(mean ± S.D)	4.4 ± 1.2	9.3 ± 1.4	6.2	<0.05
Duration of iv hydration (hr)(mean ± S.D)	10.7 ± 4.9	16.4 ± 6.8	7.7	<0.05

Discussion:

The most important complication of tonsillectomy is pain, inadequate oral intake, vomiting, fever, dehydration and bleeding [1].

This study showed a decrease in incidence of post operative vomiting in patients who received dexamethasone. A study done by Ohlms et al [3] failed to demonstrate any beneficial effect of dexamethasone on postoperative vomiting, this because small sample size and their anesthetic and anti emetic protocols were not standardized (0.25mg/kg droperidol given to all patients) [3] which can affect the results. PONV is multi factorial problem and several anesthetic and non anesthetic factors must be controlled to obtain meaningful results.

In the present study, the sample size was large enough and per operative factors capable to produce nausea and vomiting was controlled.

Dexamethasone may exert an anti-emetic action through its prostaglandin antagonism [5], serotonin inhibition in the intestine [6] and release of endorphins [8].

Aouad et al[1] and Pappas et al[9] have showed a significant decrease in the incidence of vomiting in patients treated with dexamethasone during the first 24hr but not in PACU phase, Al Shehr has also showed this finding[14]. We have not only found decreases in late vomiting but also the early vomiting (in PACU) and this may be due to potentiation of opioids analgesia by dexamethasone [12].

Like other investigation [6, 12], this study showed that preoperative dexamethasone shortens the time to first oral intake and duration of IV therapy. These results may be attributed to anti inflammatory effect of dexamethasone, which may reduce local edema and pain.

In conclusion, this study showed that use of dexamethasone, 0.5mg/kg iv up to 8mg, single dose, at induction of anesthesia, in patients undergoing tonsillectomy decreases the incidence of postoperative vomiting both in PACU(early vomiting) and in ward (late vomiting). In addition, it shortens the time to first oral intake and duration of IV fluid therapy without any significant side effects.

References:

(1) Steward DL, Welge JA, Myer CM. Do steroids reduce morbidity of tonsillectomy? Meta analyses of randomized trials. Laryngo III 2001; 10:1712-8.

(2) Vosdoganis FV, Baines DB. The effect of single dose intra venous dexamethasone in tonsillectomy in children. Anaesth Intens Care 1999; 27:489-92.

(3) Samarkandi AH, Shaikh MA, Ahmad RA, Almmar AY. Use of dexamethasone to reduce postoperative vomiting and pain after pediatric tonsillectomy procedures. Saudi Med J 2004; 25:1636-9.

(4) Kaan MN, Odabasi O, Geser E, Daldal A. The effect of preoperative dexamethasone on early oral intake, vomiting and pain after tonsillectomy. Int J Pediatr Otorhinolaryngol 2006; 70:73-9.

(5) Rich WM, Abdulhayoglu G, Disaia PJ. Methylprednisolone as an anti emetic during cancer chemotherapy – a pilot study. Gynecol Oncol 1980; 9:193-8.

(6) Fredrickson M, Hursti T, Furst CJ, Steineck G, Borjeson S, Wikblon M et al. Nausea in cancer chemotherapy is inversely related to urinary cortisol excretion. Br J Cancer 1992; 65:779-80.

(7) Ohlms LA, Wider RT, Weston B. Use of intraoperative corticosteroids in pediatric tonsillectomy. Arch Otolaryngol 1995; 121:737-42.

(8) Harris AL. Cytotoxic therapy induced vomiting is mediated via enkephalin pathways. Lancet 1982; 1:714-6.

(9) Pappas ALS, Sukhani R, Hotaling AJ, Mikat M, Javorski JJ, Donzelli J. The effect of preoperative dexamethasone on the immediate and delayed postoperative morbidity in children undergoing adenotonsillectomy. Anesth Analg 1998; 87:57-61.

(10) Aapro MS, Albert DS. Dexamethasone as an anti emetic in patients treated with cisplatin. N Engl Med 1981; 305:520.

(11) Splinter WM. Prevention of vomiting after strabismus surgery in children: dexamethasone alone versus dexamethasone plus low dose ondansetron. Paediatr Anaesth 2001; 11:591-5.

(12) Ehakim M, Ali NM, Rashed I, Raid MK, Refat M. Dexamethasone reduces postoperative vomiting and pain after pediatric tonsillectomy. Can J Anaesth 2003; 50:392-7.

(13) Fujii Y, Numazaki M. Randomized double blind comparison of subhypnotic dose propofol alone and combined with dexamethasone for emesis in parturients undergoing cesarean delivery. Clin Ther 2004; 26:1286-91.

(14) Al Shehri AM, Fazel MR. Steroid therapy for post tonsillectomy symptoms in adults: a randomized, placebo controlled study. Ann Saudi Med 2004; 5:365-7.

(15) Steward DL, Welgey JA, Myer CM. Steroids for improving recovery following tonsillectomy in children. Data base Syst. Rev. Laryngo III 2003; 1:93-7.

(16) Culy CR, Bhana N, Plosker GL. Ondansetron: a review of its use as an anti emetic in children. Paediatr Drugs 2001; 6:441-79.

* *Lecturer of Anesthesiology, Department of Surgery, College of Medicine, Al Mustansiriya University, Baghdad – IRAQ*