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RESEARCH ARTICLE

THE EFFECT OF DEXAMETHASONE ON POSTOPERATIVE VOMITING AND ORAL INTAKE AFTER TONSILLECTOMY

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ABSTRACT

Background: Vomiting is one of the postoperative complications of tonsillectomy.

Aim of the study: This study was designed to determine the effectiveness of preoperative intravenous dexamethasone on postoperative emesis, starting oral intake and shorten the period of intravenous fluid.

Methods: In a double – blind, placebo - controlled clinical trial, 112 patients aged 5—12 years, ASA classes I were randomly selected to receive 2 mg / body weight (wt.) IV dexamethasone (n = 56), as study group or an equivalent volume of saline preoperatively, as control group. The anesthetic regimen and surgical procedures were standardized for all patients. The incidence of early and late vomiting, the time to first oral intake and duration of intravenous hydration were compared in both groups.

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 IV 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 the duration of intravenous therapy.

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INTRODUCTION

Nausea and vomiting are common postoperative complications causing patients' discomfort, delay in hospital discharge and seldom-pulmonary aspiration (Steward, 2001). The incidence of postoperative emesis is higher in pediatrics population and increases with age to reach a peak in preadolescence (Steward, 2001). This complication depends on the type of operation and is higher after strabismus surgery, tonsillectomy and orchiopexy in comparison with extremities or orthopedic surgeries (Steward, 2001). There are various causes of postoperative nausea and vomiting like laryngeal stimulation, anesthetic agents, gastro intestinal distension, abdominal pain, opioids, hypoxia, hypotension, vestibular stimulation and psychological factors (Vosdoganis, 1999; Samarkandi *et al.*, 2004). The increase of day surgery in the 1990's has been challenged by the high incidence of post-operative nausea and vomiting and still one of the major limiting factors in the early discharge of day surgery patients is the presence of post-operative nausea and vomiting, implying that economic consequences are involved (Aapro, 1981; Splinter, 2001; Ohlms *et al.*, 1995; Harris, 1982).

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Managing post-operative nausea and vomiting incurs costs for day surgery units through personnel costs associated with the direct management of post-operative nausea and vomiting, costs of drugs used to prevent and manage post-operative nausea and vomiting, costs of supplies used in caring for patients suffering from post-operative nausea and vomiting, and costs associated with the extra time spent by patients with post-operative nausea and vomiting in the postanesthesia care unit (PACU). So antiemetic prophylaxis appears to be cost-effective (Samarkandi *et al.*, 2004; Ohlms *et al.*, 1995; Rich, 1980; Pappas *et al.*, 1998). Glucocorticoids as anti-emetics: After corticosteroids were found effective in chemotherapy-induced nausea and vomiting, they were used in anaesthesia as prophylaxis against post-operative nausea and vomiting (Pappas *et al.*, 1998). The mechanism of the anti-emetic action of corticosteroids is unknown, but prostaglandin antagonism has been proposed to be the mechanism, and the release of endorphins is another explanation suggested for the action (Ohlms *et al.*, 1995; Elhakim *et al.*, 2003). It has also been speculated that the mechanism of action is related to the anti-inflammatory and membrane-stabilizing effect. The glucocorticoids betamethasone and dexamethasone have been studied for the prophylaxis of post-operative nausea and vomiting. The half-life of betamethasone is 5 hrs. and that of

dexamethasone is 3 hrs., but the biological half-life of dexamethasone is 36-48 hrs (Al-Shehri, 2004). Regarding dexamethasone, it was first reported in 1981 as an effective antiemetic in patients receiving cancer chemotherapy. Since then, it has been widely applied in the prevention of nausea and vomiting after chemotherapy (Elhakim *et al.*, 2003; Fujii *et al.*, 2004). Dexamethasone has also been found to have a prophylactic effect on post-operative nausea and vomiting in patients undergoing tonsillectomy, thyroidectomy, abdominal hysterectomy, and theoretically in those having ambulatory laparoscopic surgery. It lacks side effects when used as a single injection and has a low cost (Al-Shehri, 2004). 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 (Al-Shehri, 2004). Among the antiemetic's currently prescribed for post-operative nausea and vomiting, serotonin subtype 3 antagonists (e.g., ondansetron and granisetron) are expensive (Elhakim *et al.*, 2003; Fujii *et al.*, 2004). Other currently used, lower-cost antiemetic (e.g., anticholinergic, antihistamines, and dopamine receptor antagonists) have side effects, such as sedation, dry mouth, restlessness, changes in arterial blood pressure, and extra pyramidal symptoms (Elhakim *et al.*, 2003; Fujii *et al.*, 2004).

Tonsillectomy with or without adenoidectomy is one of the most frequently performed surgical procedures in the world (Vosdoganis, 1999; Steward *et al.*, 1997), and the incidence of postoperative nausea and vomiting has reported between 40 % and 73 % (Elhakim *et al.*, 2003). So prophylactic antiemetic therapy is recommended in these high risk patients and such drugs as metoclopramide and ondansetron have been used (Culy, 2001). Dexamethasone was first reported as an antiemetic drug in patients undergoing chemotherapy (Aapro, 1981). Recently, prophylactic effect of this drug on postoperative nausea and vomiting has been showed in patients undergoing laparoscopy, tonsillectomy, gynecological and strabismus procedures (Splinter, 2001; Haynes, 1990). Dexamethasone when used in single dose has little side effects and prolonged biologic life (36-48 h) (Ohlms *et al.*, 1995). Dexamethasone can reduce postoperative edema and improve the quality of oral intake after tonsillectomy by its anti-inflammatory effects (Elhakim, 2003). The aim of this study was planned to determine the effectiveness of preoperative intravenous dexamethasone on postoperative emesis, starting oral intake and shorten the period of intravenous fluid.

Patients, Materials and Methods

Patients and Materials

- **Study Setting:** Al – Yarmouk Teaching Hospital, Baghdad, Iraq.
- **Study Time:** First Jan.2010 – Jan.2011.
- **Study Type and Design:** double - blind, placebo-controlled clinical trial
- **Group Size:** 112 patients aged 5 — 12 years.
- **Inclusion Criteria:** Candidates for tonsillectomy.
- **Exclusion Criteria:** Children with symptoms of common cold, Those who had received psychoactive drugs, antiemetic, steroids and antihistamines and
- Patients with contraindication to the anesthetic drugs used in the study.

- After obtaining approval of ethics committee and written informed parental consent.

Intravenous Cannula was inserted and standard patient monitoring was established.

All patients received 10 ml/kg iv fluid (Ringer's solution) during the operation.

Patients were randomly assigned to two groups in a double - blinded fashion:

- Those who receive dexamethasone 2 mg/body wt. IV at induction of anesthesia as study group (n = 56).
- Those who receive an equivalent volume of saline as control group (n = 56).

MATERIALS AND METHODS

All patients received 0.001 mg/kg fentanyl 3 minute before induction with atropine 0.02 mg/kg as a premedication, and anesthesia was induced with sodium thiopental (sleeping dose) 5 mg/kg. Endotracheal intubation with cuffed tube of suitable size was facilitated by succinylcholine 1.5 mg/kg. Anesthesia was maintained with 100% O₂ and 1% halothane. The same surgeon performed all operations while patients were on spontaneous ventilation. When sufficient spontaneous ventilation was guaranteed, extubation done, the patients were transferred to the post anesthesia care unit (PACU) and observed for 2 hours. After stabilization of vital sings they were transferred to ward, Rectal acetaminophen suppositories was administered to all patient. In the ward, they were on cold liquid and soft diet regimen, Intravenous fluid infusion was continued until adequate oral intake (ingestion of 150 ml of fluids and 150 ml of soft food within 6 h). The incidence of vomiting was recorded during the 2 h of PACU stay (early vomiting) and from second 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 antiemetic drugs. Demographic data of the patients, the time to first oral intake, duration of IV therapy and duration of surgery were recorded together with all other parameters in a special formula prepared for the study. Data were analyzed statistically with Chi-square and t-tests. P value of less than or equal to 0.05 was considered statistically significant.

RESULTS

From 112 patients enrolled to the study, 56 received dexamethasone and 56 saline (placebo) intravenously. Demographic characteristics of patients and surgical procedures duration were not significantly different between the two groups.

Mean surgical duration: Mean surgical duration in those who take Dexamethasone preoperative is (19 min), while the mean surgical duration in those who take Placebo is (18 min).

Chi² = 0.4 → P-value > 0.05

There is No significant relation between the use of Dexamethasone preoperative and the mean significant duration. i.e. The use of Dexamethasone is Not significant related to the duration of surgery. The incidence of early vomiting, first 2 h stay in PACU and late vomiting, 2nd to 24th

hours stay in ward was significantly lower in dexamethasone group than placebo one.

Table 1. Comparison of age, sex and surgical duration in 112 patients, Al- yarmouk Teaching Hospital, Baghdad, Iraq, 2011

| Characteristics | Group | |
|---------------------------------------|------------|------------------|
| Dexamethasone | (n = 56) | Placebo (n = 56) |
| Age (year) (mean _ S.D.) | 9.50 _ 2.0 | 9.75 _ 2.0 |
| Sex (male/female) | 29/27 | 28/28 |
| Surgical duration (min) (mean _ S.D.) | 19 | 18 |

Table 2. Comparison of the incidence of vomiting, the time to first oral intake and duration of IV hydration in 112 patients, Al- yarmouk Teaching Hospital, Baghdad, Iraq, 2011

| Characteristics Group | P-value | Dexamethasone (n = 56) | Placebo (n = 56) |
|---|------------|------------------------|------------------|
| Early vomiting (during 2 h) | 21% | 52% | 0.001 |
| Late vomiting (2–24 h) | 25% | 63% | 0.001 |
| The time to first oral intake (h) (mean _ S.D.) | 4.4 _ 1.2 | 9.3 _ 1.4 | 0.001 |
| Duration of IV hydration (h) (mean _ S.D.) | 10.7 _ 4.9 | 16.4 _ 6.8 | 0.001 |

In addition, the time to the first oral intake and duration of IV hydration were significantly shorter in dexamethasone group than placebo.

Early vomiting (during 2 h)

$\text{Chi}^2 = 11.8 \rightarrow \text{P-value} < 0.001$

There is highly significant relation between the use of preoperative Dexamethasone and the decrease of the early vomiting ($\leq 2\text{hr}$) at 99% confidence interval. i.e preoperative Dexamethasone significantly reduces the early postoperative vomiting.

Late vomiting (during 2hr – 24hr)

$\text{Chi}^2 = 14.5 \rightarrow \text{P-value} < 0.001$

There is highly significant relation between the use of preoperative Dexamethasone and the decrease of the of late vomiting (2hr–24hr) at 99% confidence interval. e. preoperative Dexamethasone significantly reduce the late postoperative vomiting.

Postoperative oralintake

$\text{Chi}^2 = 6.2 \rightarrow \text{P-value} < 0.05$

There is significant relation between the use of preoperative Dexamethasone and the reduction in the meantime of first oral intake at 95% confidence interval. I.e. the use of preoperative Dexamethasone significantly shortens the time of first oral intake postoperatively.

Mean Duration of i.v – hydration

$\text{Chi}^2 = 7.7 \rightarrow \text{P-value} < 0.05$

There is significant relation between the use of preoperative Dexamethasone and the reduction in the mean duration of i.v – hydration postoperatively at 95% confidence interval, i.e. the use of Dexamethasone preoperative significantly shortens the duration of i.v hydration postoperatively

DISCUSSION

The most important complications of tonsillectomy are pain, inadequate oral intake, vomiting, fever, dehydration and

bleeding (Steward, 2001). Vomiting causes patients' discomfort, prolonged intravenous therapy and delayed discharge. To avoid it, in the first step anesthesiologist avoids potentially emetic drugs and tries to use drugs with antiemetic effects. This study showed a decrease in incidence of postoperative vomiting in patients who received dexamethasone. This finding is showed in some other studies (Steward, 2001; Steward *et al.*, 2003), but several others have failed to demonstrate any beneficial effect of dexamethasone on postoperative vomiting (Steward *et al.*, 2003; Fredrikson *et al.*, 1992). These studies had limited number of patients, and their anesthetic and antiemetic protocols were not standardized. Postoperative nausea and vomiting is a multifactorial problem and several anesthetic and non – anesthetic factors must be controlled to obtain meaningful results. In the present study, the sample size was large and perioperative factors capable to produce nausea and vomiting were omitted. Dexamethasone may exert an antiemetic action through its prostaglandin antagonism (Rich *et al.*, 1980), serotonin inhibition in the intestine (Fredrikson *et al.*, 1992) and release of endorphins (Harris, 1982). Aouad *et al.* (2001) and Pappas *et al.* (1998) have showed a significant decrease in the incidence of vomiting in patients treated with dexamethasone during the first 24 h but not in PACU phase, Al - Shehri has also showed this findings (Al-Shehri, 2004).

We have not only found decreases in late vomiting but also the early vomiting (in PACU) and this may be due to potentiation of opioid analgesia by dexamethasone (Elhakim *et al.*, 2003). Like other investigations (Elhakim *et al.*, 2003; Fredrikson *et al.*, 1992), 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. Inconclusive results in other studies may be due to difficulties in standardizing preoperative clinical conditions, for example, Ohlms *et al.* (1995), in their study had used 0.25 mg/kg of droperidol in both groups which can affect the results.

Conclusion

Nausea and Vomiting are one of complications following tonsillectomy. PONV is one of the major challenges against performing Tonsillectomy as a day case surgery. Dexamethasone is more effective than the known antiemetic (metoclopramide), with no observed adverse effects. This study showed that use of a single prophylactic dose of dexamethasone is cheap, safe, and effective in decreases the incidence of postoperative vomiting both in PACU and in ward (early and late vomiting). In addition, it also shortens the time to first oral intake and duration of IV therapy without any reported side effects.

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