

Post-Tonsillectomy Pain and Vomiting: Role of Pre-operative Steroids

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ABSTRACT

Objective: To evaluate the effects of a single pre-operative dose of dexamethasone with the frequency of postoperative vomiting and severity of throat pain in children undergoing electrocautery tonsillectomy under standard general anaesthesia.

Study Design: Randomised controlled trial.

Place and Duration of Study: ENT Department, Combined Military Hospital, Kharian, from January to December 2010.

Methodology: Children of either gender aged between 4 – 12 years, undergoing tonsillectomy were divided into two groups of 50 each. One group was selected to receive dexamethasone 0.5 mg/kg (maximum of 8 mg); the second group was given equivalent volume of saline, pre-operatively. The frequency of early and late vomiting was assessed post-extubation. Mean time of first oral intake in minutes after extubation and mean score of postoperative throat pain were compared in both groups. Severity of throat pain was monitored by Visual Analogue Scale (VAS) score 0-10 after 4,8,12 and 24 hours of extubation.

Results: Dexamethasone group showed significantly less postoperative early vomiting (12%, n = 6) as compared to placebo (30%, n = 15) group ($p < 0.05$). The mean time of first oral intake was earlier in the dexamethasone group (4 hours and 16 minutes postextubation), while in saline group it was 5 hours and 20 minutes ($p < 0.001$). Pain score was also significantly lower and swallowing was less painful in patients after 4,8,12 and 24 hours in dexamethasone group. Pain score on the average was 0.8 – 1.2 factors less in dexamethasone group than in saline group in first 24 hours on a VAS score of 1 -10.

Conclusion: Pre-operative intravenous dexamethasone reduced postoperative vomiting and pain significantly in children undergoing electrocautery tonsillectomy.

Key words: Tonsillectomy. Pain. Children. Electrocautery. Dexamethasone.

INTRODUCTION

According to American Association of Otolaryngology, tonsillectomy is the second most commonly performed paediatric surgery.¹ Despite improvement in anaesthetic and surgical technique, postoperative pain continues to be a significant clinical concern.¹ The incidence of post-operative nausea and vomiting (PONV) ranges between 40 – 73%.²

The introduction of electrodissection surgical technique has virtually eliminated immediate postoperative haemorrhage, however, it may cause more pain, discomfort and poor oral intake due to local inflammation, nerve irritation and laryngeal spasm.²

After surgery, patients usually have considerable odynophagia, change of diet, and decreased activities.

The recovery period of children usually lasts 4 days to a week, while adults may remain symptomatic upto 2 weeks. The odynophagia can be severe enough to limit oral intake that on occasion patients may become dehydrated requiring admission for intravenous fluids.³

Although nausea and vomiting is considered a minor postoperative complication, yet it may assume significance in short stay and day care surgery like tonsillectomy.⁴ PONV can be very distressing, resulting in bleeding, dehydration, electrolytes and acid base imbalance.⁴ Persistent retching and vomiting can impair the results of various surgical procedures and increase the risk of pulmonary aspiration of vomitus. It also prolongs stay in the post-anaesthesia care unit (PACU), delays discharge and increase hospital admission rate.⁴

The frequency of postoperative nausea and vomiting can be reduced by refined anaesthetic technique and by avoiding the factors predisposing to it. Although routine antiemetic prophylaxis in elective operations is not indicated but it may be justified in patients who are at greater risk of PONV.

Dexamethasone has recently been used as prophylaxis for postoperative nausea and vomiting in children undergoing tonsillectomy.⁵⁻⁷ Dexamethasone has combined

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antiemetic and anti-inflammatory effects, which decreases postoperative tissue injury, oedema and pain after electrocautery tonsillectomy.⁸⁻⁹

The aim of this study was to assess the effect of pre-operative single dose of dexamethasone on post-operative vomiting and severity of pain in children undergoing tonsillectomy using a standardized anaesthetic technique.

METHODOLOGY

It was a randomized, double blinded, placebo controlled study. Patients between 4 and 12 years of age of either gender undergoing an elective tonsillectomy with and without adenoidectomy, who consented to participate in the study, were included. Informed consent was taken on a specially designed form explaining the protocol of the study. Approval from hospital ethical committee was sought before the start of study. Patients had right to withdraw from the study at any time. As an institutional policy, anonymity and confidentiality of the participants and the collected data was ensured. All the tonsillectomies were bilateral, and surgical indications were chronic tonsillitis, recurrent acute tonsillitis and symptomatic tonsillar hypertrophy. There was no diagnostic tonsillectomy for cancer suspicion.

The exclusion criteria were patients undergoing emergency surgery, a history of tonsillar abscess within the previous month, patients using pain medication on a regular basis, patients exhibiting corticoddependency or immunosuppression, patients with a history of psychosis or tuberculosis, and non-immune patients who had been in contact with chickenpox infected case in the last 3 weeks. Children who received antiemetics, steroids and antihistamine during the week before surgery were also excluded from the study.

Patients were divided into two groups having 50 patients in each group. Patients were prospectively randomized to receive either dexamethasone 0.5 mg/kg (maximum 8 mg) or equivalent volume of saline. One group received dexamethasone was labelled as "D", while control group given saline was labelled as "C". Study agent or equivalent volume of saline was given immediately after I/V access was established by the anaesthesiologist who was not involved in monitoring of patients post-operatively.

Patients were kept nil by mouth 6 hours before operation, clear liquids were allowed until 3 hours before surgery. To ensure that all the patients received the same medications before and during the surgery, a standardized anaesthetic protocol was used.

A standard anaesthetic technique was used for all patients. After insertion of I/V cannula pre-medication was done with glycopyrrolate (5 microgram per kilogram) and metachlorpromide 0.1 – 0.2 mg/kg.

Anaesthesia was induced with propofol 2 – 3 mg/kg and atracurium 0.5 mg/kg was used to facilitate tracheal intubation. A mixture of isoflurane in nitrous oxide and oxygen (FiO₂ 0.4) was administered for maintenance of anaesthesia. All patients received ketorolac 0.75 mg/kg and 20 ml/kg of ringer's lactate during operation. Heart rate (ECG), arterial oxygen saturation (SPO₂), blood pressure, temperature and end-tidal CO₂ were monitored. At the end of surgery muscle blockade was reversed with neostigmine 0.04 mg/kg and atropine 0.01 mg/kg.

Surgeons of almost equal surgical competence performed tonsillectomy by electrodissection method using electric cautery. After recovery all children were shifted to PACU and kept there till they were fully conscious.

Early vomiting was defined as vomiting occurring within 4 hours of extubation and late vomiting was defined as vomiting after 4 hours of extubation. Early and late vomiting was recorded in numbers. Repeated vomiting within 1 – 2 minutes period was recorded as a single emesis. Nausea was not recorded because it was difficult to assess in children. Vomiting occurring more than twice was treated with I/V metachlorpromide 0.15 mg/kg.

Pain was assessed postoperatively by using a 10 points "Faces" visual analogue scale (1 = no pain and 10 = severe pain). All parents and children were shown the VAS pre-operatively and its use was explained. VAS was recorded at 4, 8, 12 and 24 hours after extubation. Nursing staff was trained in recording VAS. Postoperatively all children were given oral ibuprofen at 5 mg/kg and co-amoxiclav at 50 mg/kg in three divided doses. Injection ketorolac 0.5 mg/kg was kept for children who were repeatedly crying because of pain and having pain score more than 8. Additional requirement of analgesics was also recorded.

Time of the first oral intake was also recorded as minutes after extubation. Quality and the amount of oral intake e.g. water, ice cream, jelly, custard etc. were also recorded. All children were kept in the hospital for a minimum of 24 hours before discharge.

Mean and standard deviation were calculated for age and postoperative pain score after 4, 8, 12 and 24 hours on Visual Analogue Score 1 – 10 in two groups and analyzed by applying independent sample t-test. Presence of early and late vomiting was assessed in two groups and statistical significance was analyzed by chi-square test. P-value of less than 0.05 was considered significant.

RESULTS

Eight patients were excluded from data analysis because of protocol violation. Demographic charac-

teristics of the 100 patients and the types of their surgery were not significantly different in two groups (Table I). The average age of patients was 8.26 ± 2.08 years in placebo (C) and 8.02 ± 2.19 years in dexamethasone (D) group. Thirty-four patients had only tonsillectomy $n = 34$ (34%), 16 in the placebo (32%) and 18 in D group (36%).

Tonsillectomy was accompanied by adenoidectomy in most of the patients ($n = 50$, 50%); 27 patients (54%) in C group and 23 patients (46%) in D group. adenotonsillectomy was accompanied by myringotomy in 16 cases (16%); in 7 cases of group C (14%) and in 9 of D group (18%).

Administration of dexamethasone showed significant reduction in the postoperative early vomiting to 12% ($n = 6$) as compared to 30% ($n = 15$) in saline group. Late vomiting was also more frequent in saline group (16%, $n = 8$) than in dexamethasone group (4%, $n = 2$). Statistical significance was less than 0.05 (Table III).

Table I: Demographic characteristics of placebo "C" and dexamethasone "D" groups.

Characteristics	"C" Saline group (n = 50)	"D" Dexamethasone group (n = 50)
Age (years) mean \pm SD	8.26 ± 2.08	8.02 ± 2.19
Gender (M/F)	28/22	23/27
Type of surgery		
Tonsillectomy	16 (32%)	18 (36%)
Adenotonsillectomy	27 (54%)	23 (46%)
Adenotonsillectomy+	07 (14%)	09 (18%)

Table II: Comparison of postoperative pain on visual analogue score and time of oral start in Placebo "C" and dexamethasone "D" groups.

Characteristics	"C" Placebo group (n=50) Mean \pm SD	"D" Dexamethasone group (n=50) Mean \pm SD	p-value
VAS at 4 hours	5.92 ± 0.99	4.72 ± 0.5	0.001
VAS at 8 hours	5.37 ± 1.03	4.26 ± 0.61	0.001
VAS at 12 hours	4.66 ± 0.94	3.87 ± 0.62	0.003
VAS at 24 hours	4.06 ± 0.84	2.17 ± 0.073	0.001
Oral start (in minutes)	320 ± 15	256 ± 20	0.001

Values are expressed as number (n), or mean (\pm SD). VAS=Visual Analogue Score (1-10 max). Oral start mentioned in minutes after extubation.

Table III: Frequency of early and late vomiting in placebo "C" and dexamethasone "D" Group.

Characteristics	"C" Placebo group (n=50) Mean	"D" Dexamethasone group (n=50) Mean	p-value
Early vomiting (within 4 hours postextubation)	15 (30%)	06 (12%)	0.027
Late vomiting (4 - 24 hours postextubation)	08 (16%)	02 (4%)	0.046

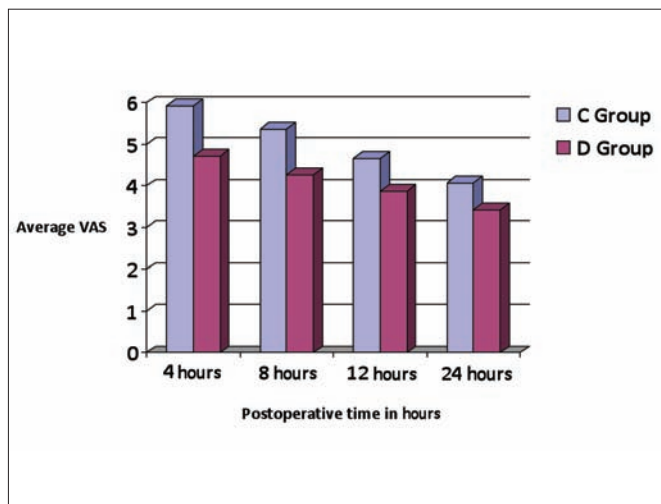


Figure 1: Mean VAS of pain (1-10) postoperatively in dexamethasone "D" and placebo (control) "C" groups.

Visual analogue scale score was also much lower in "D" group than in "C" group at all the time postoperatively. VAS on the average was 4.7, 4.2, 3.8 and 3.4 at 4, 8, 12 and 24 hours respectively in D group while C group had an average VAS of 5.9, 5.3, 4.6, and 4.0 at the same time. P-value also showed a significant difference ($p < 0.05$ as shown in Table II).

Oral feeding was started earlier in D group than in C group. Average oral feeding time in D group was 4 hours and 16 minutes, while in C group it was 5 hours and 20 minutes.

DISCUSSION

Over the last decade there has been an increasing recognition of the impact of obstructive sleep apnoea (OSA) on the development of children. Adenotonsillar hypertrophy is the primary cause of OSA in children and increasing number of children are having adenotonsillectomy for this indication.³

The postoperative course of tonsillectomy encompasses significant morbidity and potential complications. After surgery, patients usually have considerable odynophagia, change of diet, and decreased activity.

The recovery period after tonsillectomy in children is usually 4 days to a week, while adults may have symptoms upto 2 weeks.³ The odynophagia can be severe enough to limit oral intake and patients on occasion may become dehydrated requiring admission for intravenous fluid administration.

High incidence of postoperative nausea and vomiting (PONV) along with trismus and delayed oral starts always posed a challenge for otolaryngologist and anaesthesiologist after tonsillectomy.¹⁰ Heavy dose of antibiotics along with steroids and analgesics have been used, but with controversial results.¹¹ This study

was aimed at the pre-operative use of single dose of dexamethasone in cases of tonsillectomy and its effect on PONV and pain severity postoperatively.

It showed a decrease in the frequency of postoperative vomiting (early and late) as well as reduction in postoperative pain score and improved quality of oral intake during the first 24 hours after tonsillectomy in children who received dexamethasone 0.5 mg/kg I/V after induction of anaesthesia compared with those who received placebo.

Evaluation of pain is a difficult task because of its subjectivity and wide degree of its inter-patient variability especially in children. Pain threshold and sensitivity, social behaviour of children and parents is also variable in our society. The evaluation of pain was made objective by adding quality of life questionnaire along with "Faces" type of VAS scale. Quality of life questionnaire was having questions for the parents about drinking, eating in the last one hour, talking, drooling, activity and mood of the child postoperatively. These parameters were assessed for the support of proper assessment of VAS. Quality of life questionnaire was not used for the interpretation of results.

Research into the physiology of pain has delineated two distinct pain mechanisms that result from the stimulus of surgical trauma. There is inflammatory pain and local effect produced by surgical trauma. The other is a physiological or functional pain as control effect produced by stimulation of central nervous system.¹²

Anti-inflammatory agents would successfully treat pain and in fact is a standard practice in the treatment of post-surgical pain. Likewise many surgeons use pre-emptive analgesia (the use of local anaesthesia at a surgical site before a surgical procedure is commenced) because this blocks the development of hypersensitivity and hyperalgesia, which are important mechanisms in the promotion of central sensitization.¹²

Systemic steroids have powerful anti-inflammatory effects and are expected to improve postsurgical trauma. Several well-controlled studies have shown that dexamethasone can decrease postsurgical pain, nausea and vomiting postoperatively.^{1,4,7,13}

The mechanism by which, dexamethasone exerts an analgesic effect is not fully understood. Glucocorticoids have strong anti-inflammatory action and have demonstrated reduced pain and swelling after oral surgery.¹⁴

Systemic glucocorticoids administration has been found to suppress tissue levels of bradykinin and the release of neuropeptides from nerve endings, both of which can enhance nociception in inflamed tissue. The established reduction in prostaglandin production mediated by glucocorticoids might further contribute to analgesia by inhibiting the synthesis of the cyclo-oxygenase isoform 2 (COX-2) in peripheral tissues and in the CNS.¹ They

also inhibit other mediators of inflammatory hyperalgesia, like tumour necrosis factor- α (TNF- α), interleukin-1 β (IL- β), and IL-6.¹

However, not all clinical studies show such profound effects. Failure of dexamethasone to decrease pain was reported by some authors.^{12,15} Decrease in nausea and vomiting has not been a universal finding.¹⁶

Thus, despite the fact that the exact mechanism is not fully understood, many authors support the role of postoperative pain reduction by corticosteroids.^{8,9} In addition quicker return to normal diet is also reported.⁹

The recent guidelines regarding tonsillectomy strongly recommend the use of a single, intra-operative dose of intravenous dexamethasone to children undergoing tonsillectomy.¹⁷

Dexamethasone administration would not only lead to a decreased incidence of postoperative nausea and vomiting, an important morbidity associated with paediatric tonsillectomy, but would also decrease throat pain and time to resumption of oral intake.¹⁸ The mechanism of the efficacy of dexamethasone is unknown, but believed to be related to its anti-inflammatory properties.

CONCLUSION

This study has shown that a single dose of dexamethasone (0.5 mg/kg), given intravenously, at induction of anaesthesia for tonsillectomy significantly decreased the postoperative pain. Postoperative nausea and vomiting was also reduced significantly for the day of operation. Apart from markedly reduced postoperative morbidity there are economic benefits because of reduced need for analgesia and anti-emetics and early return to normal diet. Single pre-operative dose administration of dexamethasone carries no significant adverse effects.

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