Original Article

Steroids for Reducing Post-Tonsillectomy Morbidity

Monther Ali Alajmi, Hamoud Saud Al Noumas, Khalid A Al-Abdulhadi, Gopalan Kavitha
Department of Otorhinolaryngology, Al-Sabah and Zain Hospital, Al Sabah Area, Kuwait

ABSTRACT

Objective: To determine the effects of a single dose of dexamethasone on post-operative morbidity in patients undergoing tonsillectomy / adeno-tonsillectomy

Design: Prospective, randomized, placebo-controlled clinical trial

Setting: Al-Sabah and Zain Ear, Nose, Throat Hospital, Kuwait

Patients: Eighty patients (47 male and 33 female), aged between 5 and 18 years, undergoing tonsillectomy and / or adeno-tonsillectomy.

Intervention: Patients were randomized to receive a single dose of intravenous dexamethasone or placebo (saline)

Main Outcome Measures: Post-operative pain, nausea, vomiting and edema were the primary outcome measures. Fever, time taken to resume oral fluids, duration of hospital stay, frequency of re-admission, and time taken for complete healing of the tonsil bed were also compared between the two groups.

Results: Statistically significant differences were noted in pain scores, post-operative nausea and vomiting (PONV), tolerance to oral fluids, discharge from hospital, re-admission and wound healing between the two groups of patients. In this study, dexamethasone did not significantly exert any effect on fever in the first 24 hours in patients undergoing tonsillectomy.

Conclusion: A single intra-operative dose of dexamethasone is an effective and safe method for reducing post-operative morbidity in tonsillectomy / adeno-tonsillectomy patients.

KEY WORDS: dexamethasone, post-operative morbidity, tonsillectomy

INTRODUCTION

Tonsillectomy and adenoidectomy are commonly performed otolaryngological operations, accounting for up to 20% of all operations performed by otolaryngologists. Despite improvements in anesthetic and surgical techniques, post-tonsillectomy morbidity has continued to be a significant clinical concern[1].

Post-tonsillectomy pain can limit oral intake and prolong the hospital stay. Similarly, post operative nausea and vomiting (PONV) can in addition cause tension on the sutures, venous hypertension, hemorrhage and pulmonary aspiration[2].

Dexamethasone has been used successfully as an antiemetic for chemotherapy induced vomiting[3] and is also proved to have an anti-inflammatory effect[4]. Analgesic effect of steroids has also been observed in other fields of surgical specialties[5,6]. These combined anti-emetic and anti-inflammatory effects may decrease post-operative edema and subsequently may improve oral intake after tonsillectomy.

The results of various randomized studies on steroids in post-tonsillectomy morbidity have demonstrated conflicting results, with some showing a clinical benefit[7,11] and others no benefit[12,13].

The aim of this study was to investigate the efficacy of a single dose of dexamethasone (1 mg/kg IV) on controlling the post-tonsillectomy morbidity, mainly pain, nausea and vomiting, and edema, and its influence on other factors like fever, intolerance to oral fluids causing prolonged hospital stay, complications, re-admissions and the healing time.

SUBJECTS AND METHODS

With approval from the Institutional Review Board, informed consent was obtained from each patient / patient’s parent / legal guardian.

Eighty patients (47 male and 33 female) between the ages of five and 18 years, posted for tonsillectomy or adeno-tonsillectomy were included in this study; 42 patients (25 male and 17 female) received a single intravenous dose of dexamethasone (1 mg/kg) intra-operatively and 38 patients (22 male and 16 female) received 5 ml saline IV as placebo.

Exclusion criteria were patients with medical or coagulation disorders or those with a known contraindication to steroid use. All
these patients fulfilled the routine pre-operative protocol for tonsillectomy/adenotonsillectomy, including history, ENT examination, and laboratory work-up such as complete blood count, prothrombin time and partial thromboplastin time.

The random allocation of participants into control group or dexamethasone group was done in the following way. In the operation theatre, the first two patients of this study group were given dexamethasone and rest were given saline and on the next operation theatre, this was reversed, i.e., the first two patients received saline and rest received dexamethasone. All the participants were blinded to treatment allocations.

The anesthetic protocol was standardized and did not include any other prophylactic antiemetic drug. All patients underwent normal oro-tracheal intubation. The calculated dose of dexamethasone or 5 ml saline was randomly administered after induction of anesthesia. The surgical technique was standardized for all patients by using the dissection method.

Bleeders were ligated using ties. When indicated adenoids were removed (50 patients) using curettes. Hemostasis was achieved using packs or sutures and electrocautery was used only to treat persistently active bleeding sites. No antibiotic was used.

Each patient had the following post-operative regimen for analgesia and anti-emesis: Paracetamol elixir 1gm orally was given routinely every 6 hrs; Profinal (5 mg/kg) was given orally when patient complained of pain and metoclopramide 5 ml orally when required.

All patients were monitored in the hospital for at least 24 hrs and the stay was prolonged depending on the morbidity. Each patient was monitored post-operatively for the following events. Pain was assessed by the need of additional analgesic (Profinal) post-operatively, i.e., when the patient complained of pain, extra analgesic was given and recorded. Number of episodes of vomiting after 6 hrs following tonsillectomy were recorded. If patient had more than two episodes of vomiting, metoclopramide was given and recorded. Tolerance to intake of 400 ml of oral fluids after 8 hrs following tonsillectomy was recorded. Edema as visual impression of swelling and elongation of uvula and soft palate was noted at 6 hrs and 24 hrs post-operatively. Temperature was recorded 4th hourly for 24 hours. Temperature of > 37.5 °C was considered as fever.

Patients were discharged after 24 hrs if good oral intake was achieved and when they were free from complications like bleeding, fever, pain, dehydration etc. Those patients who re-attend with secondary post-tonsillectomy hemorrhage, dysphagia with progressive throat pain and fever were admitted.

All patients had a regular follow-up visit with the consultant on 7th, 10th, and 16th post-operative day and information like fever, bleeding, vomiting and oral intake were collected during these visits. Healing time of the tonsil beds with complete removal of slough was noted at follow-up visit.

**Statistical analysis:**

The difference in various variables between the study group and the control group were assessed using Chi-square test and Fisher’s exact test wherever appropriate and a p value < 0.05 was considered as significant.

**RESULTS**

Eighty patients between 5 and 18 yrs of age were randomized to receive dexamethasone (n = 42) or placebo (n = 38). Maximum dose of dexamethasone used was 16 mg. No adverse effect of this drug was reported in our study. There was no significant difference in gender between the two groups; the male: female ratio was 1:0.68 in the study group and 1:0.73 in the control group. Also, there was no significant difference in mean age between the two groups (Mean ± SD = 8.3 ± 2.79 in study group Vs 8.6 ± 3.24 in the control group). Hence the groups were well-matched and comparable.

Table 1 shows the various post-operative events compared and analysed between the two groups. On the day of the operation, only six patients out of the 42 in the steroid group needed an extra analgesic, whereas 18 of the 38 patients in the placebo group required additional analgesics even after 48 hrs (p = 0.001). The chance of developing post-tonsillectomy pain in those patients who receive dexamethasone compared to those who do not is 0.185 (95% CI = 0.063 - 0.542, Table 1). This implies a statistically significant relative decrease in post-operative pain on the day of operation for those patients who received dexamethasone.

Twenty-five patients in the placebo group had more than two episodes of vomiting after 6 hrs post-operatively compared to only two patients in the trial group (p < 0.001). The risk of developing post-tonsillectomy vomiting in the dexamethasone group is only 0.026 compared to the control group (95% CI = 0.005 - 0.125). This implies a significant decrease in PONV in the dexamethasone group (Table 1).

All patients receiving dexamethasone were able to tolerate 400 ml of oral fluids at 8 hrs following surgery where as, none of the patients receiving the placebo could tolerate oral fluids at 8 hrs post-operatively. Thus, dexamethasone significantly improves oral intake in post-tonsillectomy patients.
Table 1: Comparison of post-tonsillectomy morbidities in the two groups

<table>
<thead>
<tr>
<th>Variables</th>
<th>Control group</th>
<th>Study group</th>
<th>Odds ratio (95% CI)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>18 (47.4)</td>
<td>6 (14.3)</td>
<td>0.185 (0.063–0.542)</td>
<td>0.001</td>
</tr>
<tr>
<td>Fever</td>
<td>25 (65.8)</td>
<td>2 (4.8)</td>
<td>0.026 (0.005–0.125)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Edema</td>
<td>29 (76.3)</td>
<td>8 (19.1)</td>
<td>0.073 (0.025–0.214)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Oral fluid intolerance</td>
<td>38 (100)</td>
<td>0 (0.0)</td>
<td>0 (0.000–0.002)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Delay in discharge</td>
<td>8 (21.1)</td>
<td>0 (0.0)</td>
<td>0 (0.000–0.360)</td>
<td>0.002</td>
</tr>
<tr>
<td>Re-admission</td>
<td>7 (18.4)</td>
<td>0 (0.0)</td>
<td>0 (0.000–0.425)</td>
<td>0.004</td>
</tr>
<tr>
<td>Delayed healing</td>
<td>38 (100)</td>
<td>4 (9.5)</td>
<td>0 (0.000–0.013)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

*p-values are generated by chi-square test; b Fisher’s exact test

(p < 0.001, Table 1)

The incidence of edema was significantly less in the study group (8 Vs 29 cases in the control group, p < 0.001), at the end of 24 hrs after surgery. The relative risk of developing edema in dexamethasone group is only 0.073 compared to control group (95% CI = 0.025-0.214) and this is highly significant (Table 1).

On the day of surgery, fever was recorded only in two patients from the study group compared to eight patients in control group (p = 0.041). The chance of developing fever following tonsillectomy in those patients who receive steroids is 0.188 compared to the control group (95% CI = 0.037-0.948, Table 1).

All the patients receiving dexamethasone were fit for discharge after 24 hrs post-operatively, but eight patients in the placebo group had to prolong their hospital stay due to morbidities like pain and dysphagia (p = 0.002). Thus dexamethasone significantly promotes early discharge of post-tonsillectomy patients (Table 1).

None of the patients from the study group got re-admitted signifying nil complications, whereas seven patients of the placebo group were re-admitted (p = 0.004, Table 1). Three out of them had secondary hemorrhage and four patients had severe dysphagia and throat pain.

Thirty-three patients of study group completed healing with normal tonsil bed on seventh post-operative day (POD) whereas only 33 patients from the control group completed healing after the tenth POD. Since none in control group completed healing on seventh POD, steroids have significantly (p < 0.001) promoted healing in post-tonsillectomy patients (Table 1).

DISCUSSION

Tissue injury induced acute inflammation, nerve irritation and spasm of exposed pharyngeal muscle is known to play a role in the genesis of post-tonsillectomy pain. By inhibiting phospholipase enzyme, corticosteroids block both the cyclooxygenase and lipo-oxygenase pathway and thus prostaglandin production, thereby leading to pain relief.

Corticosteroids reduce the inflammation by inhibiting the early processes of the inflammatory response which include edema, fibrin deposition, capillary dilatation, migration of lymphocytes and phagocytic activity[14].

Corticosteroids reduce edema, whether the cause of inflammation is infection, trauma or allergy[15] and are used extensively in otolaryngology in managing airway compromise as a result of laryngotracheal bronchitis, epiglottitis, laryngeal trauma, allergic laryngeal edema, subglottic stenosis and adenotonsillar enlargement secondary to acute infection[16].

When given intravenously before surgery, dexamethasone has been effective in reducing post-operative edema, pain and trismus in patients who have undergone extractions for impacted third molars[17]. Given this accumulated information, it seems reasonable that dexamethasone given before tonsillectomy would improve the patient’s post-operative course.

Oropharyngeal pain and irritation of gastric mucosa by swallowed blood are the main contributors for high incidence of PONV following tonsillectomy. Steroids exert anti-emetic activity via prostaglandin antagonism, release of endorphins and tryptophan depletion[18].

Multiple studies have shown benefits with corticosteroids alone or as adjuvant for chemotherapy induced vomiting, gynecological surgeries, thyroidectomy and opioid induced vomiting.

Henzi et al[19] did meta-analysis of 17 trials involving use of dexamethasone for prevention of PONV in surgical patients. The number needed to treat to prevent early and late vomiting compared with placebo in adults and children was 7.1 (95% CI 4.5 to 18) and 3.8 (2.9 to 5) respectively. They concluded that when there is a high risk of PONV, a single prophylactic dose of dexamethasone is antiemetic compared with placebo, without evidence of any clinically relevant toxicity in otherwise healthy patients. Late efficacy seems to be most pronounced.

Local infiltration of steroids and an oral four day course of steroids have shown promising results in tonsillectomy patients[20-22]. However the literature regarding the use of intravenous corticosteroids for tonsillectomy is conflicting. Most of the studies...
have either lacked the control group or are not standardized for the anesthetic as well as surgical technique. There are controversies about the type and dose of the corticosteroid, whether to use single or multiple doses and whether to use alone or as adjuvant to other drugs.

McKean et al[11] did a double-blind randomized controlled trial of intravenous steroid for adult tonsillectomy and concluded that a single dose of 10 mg of dexamethasone given intravenously, at induction of anesthesia for adult tonsillectomy significantly decreased the pain scores for the day of operation and the mean pain score for the week post-operatively was significantly reduced in these patients. In this study, there was no difference noted in the time to first ingestion of food and drink.

Steward et al[9] did a meta-analysis of randomized double-blind placebo controlled trials of a single dose of intravenous intra-operative steroid for pediatric patients who underwent tonsillectomy or adeno-tonsillectomy. Eight trials met their inclusion criteria. They concluded that routine use of steroids would prevent vomiting in one out of four children. In addition, it would result in earlier soft or solid diet intake. But, because of the missing data and varied outcome measures, pain could not be meaningfully analyzed as a distinct end point.

Goldman et al[10] did a meta-analysis of dexamethasone use with tonsillectomy and six articles met their inclusion criteria. They also concluded that one out of four children was prevented from vomiting with peri-operative dexamethasone. An additional benefit was earlier tolerance of a soft / regular diet, but low precision and heterogeneity among studies have precluded definitive conclusion.

Our main aim was to find the effect of steroids on reducing the post-tonsillectomy pain, edema, nausea and vomiting. Dexamethasone was selected because it has a long half-life of 36 to 48 hours [23] with glucocorticoid activity. A single dose lacks side effect like gastritis, adrenal suppression etc., and also has a low cost.

In our study, we administered dexamethasone 1 mg/kg, subject to a maximum dose of 16 mg immediately after induction of anesthesia and the anesthetic and surgical techniques were standardized for tonsillectomy and/or adeno-tonsillectomy.

Regarding the dosage of dexamethasone, doses ranging from 0.15 mg/kg to 1 mg/kg with maximum doses ranging from 8 to 25 mg have been commonly used in children[9]. In a large study involving 133 patients, Splinter and Roberts have used 0.15 mg/kg dexamethasone with good results [24].

All the patients in our study group were monitored in the hospital for 24 hours and all attended routine follow up on the 7th, 10th and 16th POD.

In our study, majority of dexamethasone treated patients did not require extra analgesia on the day of surgery. This also indicates prolonged analgesic effect of dexamethasone.

The over all incidence of PONV was significantly less in our study perhaps also due to avoidance of electrocautery. More severe pain and hence PONV are known to occur with electrocautery [25].

Pappas et al [24] showed decrease in incidence of PONV from 62% to 40% using 1 mg/kg dexamethasone for adenotonsillectomy. In our study, incidence of more than two episodes of vomiting, six hours after surgery reduced significantly in dexamethasone treated patients. Similarly at the end of 24 hours after surgery, incidence of edema of soft palate and uvula reduced significantly in the dexamethasone treated patients.

There was a significantly better quality of oral intake with dexamethasone, perhaps due to less pain and inflammation.

In a meta-analysis Steward et al[9] showed that children receiving dexamethasone were more likely to advance to a soft or solid diet on post-tonsillectomy day one ( RR = 1.69; 95% CI; 1.02 – 2.79, p = 0.04 ). In our study, all patients receiving dexamethasone were able to tolerate 400 ml of oral fluids at eight hours following surgery and none of the saline group was able to tolerate oral fluids at eight hours following surgery.

Our study did not show that dexamethasone can be used to control fever in post-tonsillectomy patients (p = 0.062).

All the patients who received dexamethasone were fit for discharge after 24 hours post operatively perhaps due to reduced overall morbidity. Eight patients from the control group had to prolong their hospital stay due to various morbidities like pain fever and edema.

Similarly none of the study group was re-admitted whereas seven patients from the control group were re-admitted (three patients with secondary hemorrhage and four patients with difficulty in swallowing and pain).

During the follow up visits, 90% of the dexamethasone group completed healing with normal tonsil bed on the 7th post operative day and 87% of the saline group completed healing after 10th POD.

CONCLUSION

Our results showed that the use of dexamethasone 1 mg/kg in patients undergoing tonsillectomy and/or adeno-tonsillectomy significantly decreases the incidence of PONV, pain, and edema of uvula and
soft palate. It also improves oral intake, shortens duration of hospital stay, reduces incidence of re-admission, and promotes early healing of tonsil bed significantly. Moreover, this single dose of dexamethasone is a safe and inexpensive method for reducing morbidity in tonsillectomy. But in this study, dexamethasone did not appreciably influence the fever in post-tonsillectomy patients. Even though a bigger sample size can increase the statistical power of the study, from our study (with this sample size and standardized surgical and anesthetic techniques) we can conclude that the routine use of dexamethasone seems reasonable in reducing post-tonsillectomy morbidity.

REFERENCES