Effect of Steroids on Posttonsillectomy Pain in Adults

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Objective: To determine whether a single intraoperative dose of intravenous dexamethasone has an effect on pain after tonsillectomy.

Design: Double-blinded randomized controlled clinical trial.

Subjects: Thirty-four consecutive nonpediatric patients presenting for tonsillectomy.

Intervention: Patients scheduled for electrocautery tonsillectomy were randomized to receive either intravenous dexamethasone or placebo during surgery. Pain was measured twice daily for 10 days by means of a visual analog scale.

Results: There were no statistically significant differences between the groups, but the dexamethasone group had a trend to report less pain over the first several days. The dexamethasone group received less analgesic in the recovery room, but there were no differences between the groups in the 10 days afterward.

Conclusions: There is evidence that a single dose of dexamethasone reduces pain after tonsillectomy to a small degree. A single dose was not associated with adverse effects, so the risk-benefit ratio may be favorable for this practice.


THERE ARE various surgical techniques and adjunctive maneuvers for tonsillectomy, with a great deal of debate over their value. We examine the efficacy of a single intraoperative dose of glucocorticoid in reducing postoperative pain and morbidity.

Studies have compared the use of systemic intraoperative and postoperative steroids for tonsillectomy in children.1-6 The findings of these studies suggest that there may be slight benefit to patients by using intraoperative steroids. However, these studies had limitations, including small study groups, nonrandom allocation of patients, lack of control groups, invalid methods of rating pain, too short a duration of pain measurement, and inappropriate statistical analysis.

Short-term doses of perioperative steroids are used routinely by many surgeons especially when operating in the head and neck region, to reduce swelling and protect function. This type of protocol is believed to be safe in otherwise healthy patients.7-9 There remains another equally large group of surgeons who believe that the addition of perioperative steroids increases the risk of complications without significantly improving morbidity.

RESULTS

Thirty-four patients were enrolled, 29 of whom returned their data collection forms. Fourteen were randomized to the placebo group and 15 were randomized to the dexamethasone group. There were no statistically significant differences between the groups for sex, age, smoking status, or reason for tonsillectomy (Table 1).

Pain scores are shown in Figure 1. Analysis of variance revealed no significant difference. Daily doses of codeine and acetaminophen are shown in Figure 2, with no significant difference between the groups. There was a trend to lower pain scores and fewer codeine doses but more acetaminophen doses in the dexamethasone group.

In the recovery room, the average number of doses per patient was the same between the groups (1.1 doses per patient), and 5 patients (32%) in the dexamethasone group and 4 patients (29%) in the placebo group required no analgesic...
PATIENTS AND METHODS

Consecutive patients presenting for tonsillectomy by the participating surgeon (J.G.N.) were given a full explanation of the study and recruited. Criteria for exclusion included contraindications for steroid use (eg, diabetes, viral illness, psychosis, or pregnancy), any relevant drug allergies, poor attitude toward participation or inability to complete the data collection, taking any daily analgesics preoperatively, and undergoing additional procedures at the same time as tonsillectomy (eg, adenoidectomy or uvulopalatopharyngoplasty).

Participants were admitted through the day surgery unit and were hospitalized for the first postoperative night. Preoperative preparation, anesthetic induction, and maintenance and recovery room analgesia were ordered as per the Department of Anesthesia. Patients were randomized, using a random number table, to receive either 20 mg of dexamethasone or placebo (an equal volume of isotonic sodium chloride solution) intravenously inoperatively. Both patient and surgeon were blinded as to which was received. Tonsillectomy was performed by first injecting 1 carpule (1.8 mL) of 2% lidocaine hydrochloride with 1:100 000 epinephrine into each tonsillar bed; then electrodissection was used to remove the tonsils. Suction cautery was used sparingly as needed for hemostasis. Each patient was given codeine phosphate elixir on an as-needed basis during the first postoperative night. Dimenhydrinate and acetaminophen were given on an as-needed basis.

Patients were discharged the morning after surgery with a prescription for codeine elixir at the recommended dose and prescribed at 4-hour intervals on an as-needed basis. Participants scored their throat pain on a visual analog scale (VAS) in the morning, after swallowing but before using any analgesics, and in the evening, before they went to bed. They drew a vertical line crossing a 10-cm line where 0 was anchored as “no pain” and 10 was “worst pain.” This was a well-accepted, validated method of pain measurement in the investigation of posttonsillectomy pain. During the day, participants recorded the number of doses of analgesics used. They also noted which day they returned to a normal diet and when they returned to work or school. This was done for the first 10 days after surgery. All posttonsillectomy hemorrhagic events were recorded.

This study was approved by the institutional ethical review board. A sample size of 15 patients per group was calculated to reveal a clinically significant difference of 2 units on the VAS with a probability of 80%.

Analysis was done using a Microsoft Excel 97 spreadsheet and SPSS 7.5 (SPSS Inc, Chicago, Ill). Repeated measures were compared using analysis of variance, and nonrepeated, nonparametric data were compared using a Mann-Whitney test. Nonrepeated parametric data were compared with t tests.

Steroids have a multiplicity of physiological actions: effects on metabolism, electrolyte and water balance, skeletal muscle, the cardiovascular system, the central nervous system, formed blood elements, and anti-inflammatory and immunosuppressive actions. They exert their effect by binding specific intracellular receptors that then alter gene expression, blocking formation of some substances and accelerating production of others. Clinical effects take several hours to become apparent because time is required for this gene transcription and protein synthesis to take place.9

Otolaryngologists use steroids because of their anti-inflammatory actions. These are mediated by inhibition of production of inflammatory cell factors, such as cytokines in macrophages, monocytes, and lymphocytes, which results in decreased extravasation of leukocytes,

### Table 1. Characteristics of Study Groups

<table>
<thead>
<tr>
<th></th>
<th>Placebo Group (n = 14)</th>
<th>Dexamethasone Group (n = 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, No.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Female</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Age, mean, y (range)</td>
<td>27.6 (17.2-52.8)</td>
<td>26.9 (15.5-40.0)</td>
</tr>
<tr>
<td>Smokers, No.</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Indication for tonsillectomy, No.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recurrent tonsillitis</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Tonsil lesion</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
lysosomal enzyme release, and vascular permeability in areas of injury. This reduces edema. There is also ultimately decreased fibrosis during healing.

Complications of steroid use are thought to be dose related, and the belief is that a single dose of glucocorticoid is "virtually without harmful effects." Well-known side effects include gastric ulceration, avascular necrosis of bone, hyperglycemia, susceptibility to infections, osteoporosis, cataracts, growth disturbance, hypertension, mood and personality changes, and posttreatment adrenal insufficiency due to suppression. Dexamethasone is among the most potent glucocorticoids available, being 25 times as potent as endogenous cortisol. It has a 36- to 72-hour biological half-life.

About 10 mg of cortisol is secreted by an adult daily, which is equivalent to 0.4 mg of dexamethasone; thus, the dose chosen for this study (20 mg) is very supraphysiological. Debates in the literature exist as to the appropriate dosage of dexamethasone for reduction of edema and inflammation in the head and neck. Dogma states that 1 to 1.5 mg/kg should be used intravenously, about 70 to 105 mg in an adult male. This is probably unnecessarily excessive and may invite adverse drug reactions.

This study is, to our knowledge, the first to examine the effect of an intravenous steroid on posttonsillectomy pain in adults. Clinicians believe that adults tolerate posttonsillectomy pain more poorly than do young children. Whether this is because they have more scarring from repeated infections, resulting in more muscle damage during tonsillectomy, or are better able to express their discomfort, or other reasons, is a matter of debate. Studies of posttonsillectomy pain in children may not be generalizable to an adult population for these reasons. Table 2 summarizes some details from the previous pediatric studies. In general, the steroid groups are no different or do slightly better than the control groups, especially if tonsillectomies are performed using electrocautery and not sharp or blunt dissection. The most common differences are reduced vomiting and better tolerance of oral diet intake; only 1 study showed a reduction in pain, and it used parental reports to measure pain. Splinter and Roberts also showed that dexamethasone reduced posttonsillectomy vomiting in children and noted that it is used in oncology patients for its anti-emetic effects. Thus, this effect is probably separate from the effect on pain. It is undoubtedly a central effect, as opposed to the peripheral one postulated to reduce operative pain (although central effects, such as elevated mood and reduction of the need for narcotic analgesics, may contribute).

In the present study, use of the steroid dexamethasone improved pain very slightly but consistently across the first several days after surgery, and blunted the "pain peak" seen around the fourth or fifth day (Figure 1). Patients use slightly less codeine after the third day, and can substitute acetaminophen as an analgesic, which lessens the potential for narcotic side effects (Figure 2). None of these findings are statistically significant because the group is small. We chose a clinically significant difference of 2 cm on the VAS in our initial sample size calculation, which would be considered reasonable in biomedical research. However, if patients knew that this treatment would reduce their pain by only 10% (as seen in our figures where the average difference is about 1 cm on the 10-cm VAS) over the first several days after surgery, would they opt for it?

Figure 1. Pain scores, determined by a visual analog scale, in the morning before breakfast (top) and in the evening before retiring (bottom) for the 10 days after tonsillectomy in the dexamethasone and placebo groups. Bars represent SD.

Figure 2. Analgesic use for the 10 days after tonsillectomy in the dexamethasone and placebo groups. Top, Codeine use; bottom, acetaminophen use. Bars represent SD.
Our treatment group also required less narcotic analgesic in the recovery room. Using analgesic doses administered by a third party is not a valid way of measuring pain since confounding factors exist,\textsuperscript{17} so we do not attach undue importance to this finding. This finding does suggest, however, that further study of steroid effect in the first 12 hours after surgery would be warranted. This is also important to examine since there is a trend to outpatient tonsillectomy. Splinter and Roberts\textsuperscript{6} noted that each episode of vomiting in the recovery room delayed outpatient discharge in their group by 13 minutes. Vomiting is increased with more narcotic doses, so pain may influence emesis in this way.

### CONCLUSIONS

In this study of nonpediatric patients undergoing electrocautery tonsillectomy, a 20-mg dose of intravenous dexamethasone given intraoperatively was shown to only slightly reduce pain over the first 10 days after surgery. Until evidence becomes available that there is a measurable risk to using a single dose of steroid, the benefit probably outweighs the risk of this practice. Patients should be advised that this potential risk exists with steroid administration but that its use may result in this small amelioration in the postoperative pain experience.

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### REFERENCES


### Table 2. Summary of Studies of Dexamethasone Use in Pediatric Tonsillectomy

<table>
<thead>
<tr>
<th>Study, y</th>
<th>Tonsillectomy Method</th>
<th>N</th>
<th>Pain Measurement</th>
<th>Steroid Dose</th>
<th>Hemorrhagic Events, No.</th>
<th>Significant Outcomes</th>
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</thead>
<tbody>
<tr>
<td>Catlin and Grimes,\textsuperscript{1} 1991</td>
<td>SD</td>
<td>S = 10 NS = 15</td>
<td>Parental questionnaire</td>
<td>8 mg/m\textsuperscript{2}</td>
<td>S = 2 NS = 1</td>
<td>S = normal diet sooner</td>
</tr>
<tr>
<td>Volk et al,\textsuperscript{2} 1993</td>
<td>SD</td>
<td>S = 25 NS = 24</td>
<td>Parental questionnaire (scale 0-3)</td>
<td>10 mg</td>
<td>S = 2 NS = 1</td>
<td>No difference between groups</td>
</tr>
<tr>
<td>Ohlms et al,\textsuperscript{3} 1995</td>
<td>SD</td>
<td>S = 34 NS = 35</td>
<td>Faces Scale (7 d)</td>
<td>0.5 mg/kg</td>
<td>S = 3 NS = 0</td>
<td>No difference between groups</td>
</tr>
<tr>
<td>April et al,\textsuperscript{4} 1996</td>
<td>EC</td>
<td>S = 41 NS = 39</td>
<td>Faces and Oucher scales (24 h)</td>
<td>1 mg/kg</td>
<td>S = 1 NS = 1</td>
<td>No difference in pain between groups; S = less vomiting, normal diet sooner</td>
</tr>
<tr>
<td>Tom et al,\textsuperscript{5} 1996</td>
<td>EC</td>
<td>S = 26 NS = 32</td>
<td>Parental diary (10 d)</td>
<td>1 mg/kg</td>
<td>S = 1 NS = 2</td>
<td>S = less pain, less vomiting, more tolerated normal diet on first day</td>
</tr>
</tbody>
</table>

*SD indicates sharp dissection; EC, electrocautery; S, steroid (dexamethasone) group; and NS, no steroid (control) group.*