Postoperative Tonsillectomy Pain in Pediatric Patients

Electrocautery (Hot) vs Cold Dissection and Snare Tonsillectomy—A Randomized Trial

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Objective: To determine the effect of the method of tonsillectomy on postoperative pain in pediatric patients.

Design: Prospective, randomized, single-blind, controlled clinical trial.

Setting: A university pediatric hospital in Aberdeen, Scotland.

Patients: A volunteer sample of 54 children, aged 3 to 12 years, with recurrent tonsillitis or symptomatic adenotonsillar hypertrophy. Two patients withdrew consent.

Interventions: Twenty-six children underwent a non-electrical (ie, cold) dissection tonsillectomy with cold steel instruments, 5 of whom also had adenoidectomy by curettage. Monopolar diathermy forceps were used for tonsillar bed hemostasis. Twenty-four children had electrocautery (ie, hot) dissection tonsillectomy, 7 of whom underwent adenoidectomy by curettage without a suction coagulator.

Main Outcome Measures: Postoperative analgesic consumption, time to regain normal diet and activity levels, and complications.

Results: Patients who underwent hot dissection tonsillectomy showed no difference in time to first drink or analgesic use within the first 24 postoperative hours compared with children undergoing cold nonelectrical dissection tonsillectomy. The hot dissection tonsillectomy group took 7.5 (95% confidence interval [CI], 1-14.1) more doses of analgesics than the cold dissection group over the next 12 days ($P < .05$). The hot dissection tonsillectomy group took 2.5 more days than the cold dissection tonsillectomy group to regain normal diet ($P < .05$). Thirteen children (54%; 95% CI, 34-74) in the hot dissection tonsillectomy group and 6 (23%; 95% CI, 7-39) in the cold dissection tonsillectomy group sought outpatient care for throat pain, otalgia, poor diet, pyrexia, and/or bleeding ($P < .05$). Throat pain delayed in onset or of prolonged duration affected 9 children (38%; 95% CI, 19-57) in the hot dissection tonsillectomy group and 6 (23%; 95% CI, 7-39) in the cold dissection tonsillectomy group as opposed to 3 children (12%; 95% CI, 0-24) in the cold dissection tonsillectomy group ($P < .05$).

Conclusion: Hot dissection tonsillectomy increases morbidity in pediatric patients in the recovery period following hospital discharge.


Tonsillectomy is one of the most common operations performed by pediatric otolaryngologists. Electrocoagulation diathermy has established advantages over ligation techniques in reducing intraoperative blood loss and the risk of primary (re reactionary) postoperative hemorrhage. Secondary hemorrhages in randomized clinical trials or large series have not been shown to be altered by the use of diathermy for hemostasis.

Electrodissection methods are increasingly being used for tonsillar dissection allowing simultaneous vessel coagulation, and while providing the advantages associated with the use of diathermy for hemostasis, there have been conflicting reports of an increase in postoperative pain. Studies restricted solely to pediatric patients assessing posttonsillectomy morbidity are uncommon and either children are excluded or their results analyzed along with those of adults. It is inappropriate, especially in the area of postoperative pain, to extrapolate findings from the practice of adult tonsillectomy to the pediatric population because children's responses are different from adults. This difference is well illustrated by Tay's study, which on analyzing postoperative pain in the first 24 hours, found no difference in perceived pain between electrodissection and blunt dissection ligation in pediatric patients while a con-
PATIENTS, MATERIALS, AND METHODS

Ethical committee approval was obtained and 54 children were recruited to the study with parental consent. Children attending a pediatric otolaryngology outpatient clinic with symptoms and signs consistent with a diagnosis of recurrent tonsillitis and or upper airway obstruction were recruited for the study. Patients with allergies, intercurrent disease, bleeding tendencies, using antibiotics, or unable to attend for follow-up at the clinic were excluded.

Patients whose parents consented to their inclusion in the study were randomized into 1 of 2 treatment groups. Most patients were admitted on the day of surgery and had a standard anesthetic given by a single consultant anesthetist (M.C.) or a junior member of his team. Premedication oral midazolam, 0.25 mg/kg, was given 30 minutes preoperatively when indicated. Intravenous induction of anesthesia was achieved with thiopental sodium, 4 to 5 mg/kg. In children who had a mask induction, halothane and nitrous oxide were used. All children were intubated. The child's status was maintained on a mixture of sevoflurane or isoflurane and oxygen. Perioperative rectal diclofenac sodium, 1mg/kg, and morphine sulfate, 0.1mg/kg, were given.

The surgical procedure was performed with the patient being supine on the operating table. A Boyle-Davis mouth gag was inserted. Adenoidectomy was performed when indicated in the same fashion in all children enrolled in the study. The technique involved digital examination of the nasopharynx to confirm the presence of adenoidal tissue and exclude the presence of any abnormal pulsation. The adenoids were then swept digitally away from the eustachian cushions toward the midline. A combination of unguarded St Clair-Thompson adenoidal curettes of the appropriate size were then used to remove the adenoids. This was usually achieved in 1 or 2 passages of the curette. Clearance of the adenoidal tissue was confirmed by digital examination following which a gauze swab was placed in the nasopharynx. The swab was left in situ while the ensuing tonsillectomy took place.

The operating surgeon (D.A.N.) and scrub nurse were informed prior to starting the tonsillectomy, but after the adenoidectomy, by a member of the surgical nursing team of the child's randomization when the randomization envelope attached to the case notes was opened. The diathermy dissection tonsillectomy was performed using a guarded-point electrode handle with finger-controlled cutting and coagulation switches attached to a diathermy machine (Eshmann TD411 RS; Eshmann Brothers & Walsh Ltd, West Sussex, England). The tonsil was held medially with an Eves tonsillar snare and the anterior palatopharyngeal arch incised with the diathermy needle in cutting mode at 70 W. Dissection was performed in coagulation mode to divide the attachments of the tonsil to the tonsillar bed close to the tonsil at 40 W. Great care was exercised to ensure minimal contact between the diathermy needle and the tonsil bed to reduce unnecessary charring. Vessels visualized were cauterized before division. The tonsil was separated from the lower pole and the posterior tonsillar pillar with the diathermy dissector. Minimal hemorrhage was noted in most cases, but a tonsil swab was left in the tonsil bed while the alternative tonsil was being removed. The swabs were removed from the nasopharynx and the first tonsillar fossae. In no instances was there nasopharyngeal hemorrhage to warrant further intervention. A diathermy coagulation forceps at 30 W was used to coagulate any significant bleeding points in the tonsillar fossa; this was not usually necessary.

Tonsillectomy in the cold dissection group was performed by incising the anterior pillar mucosa with the pointed end of a Gwynne-Evans tonsillar dissector. The tonsil was then dissected from the fossa with the blunt end. An Eves tonsillar snare was used to separate the tonsil from the lower pole. A swab was placed in the fossa and the other tonsil similarly removed. The swabs were removed in the order in which they were placed. The adenoid bed did not require attention. Bleeding points in the tonsillar fossae were coagulated with diathermy forceps attached to the diathermy machine at 30 W.

The randomization card was used to record intraoperative hemorrhage and the card returned from the operating theater to the departmental secretary at the end of operation. None of the nursing staff subsequently looking after the children was aware of the group to which they were randomized.

Postoperative analgesia was given as required and consisted of acetaminophen, diclofenac, meperidine hydrochloride, or morphine. No antibiotics were routinely used. Patients were discharged on the day after surgery in all cases.

The intraoperative blood loss was measured by weighing swabs and measuring the volume of suction aspirate. A record was made of the number of doses and type of analgesic used as an inpatient. Patients were given a diary card to record activity levels, diet, and analgesic use in the first 2 weeks after tonsillectomy. The diary cards were collected at the follow-up visit when the child's condition was assessed, often by another member of the surgical team (J.P.) other than the operating surgeon. A note was made of postoperative visits to the family practitioners who were independently contacted to ascertain if postoperative consultations occurred and the outcomes of such visits.

The results were analyzed using t, χ², Mann-Whitney, Wilcoxon rank sum, or Fisher exact tests wherever appropriate. The SD in time taken for pediatric posttonsillectomy patients to return to normal activity and diet is 0.4 days based on a sample of English children. Twenty-two children in each arm of the study would be sufficient to show a difference of 1 SD or greater in postoperative recovery times at a statistically significant α level of .05 with a power of 0.9.

temporaneous group of adults reported less pain after the electrodissection tonsillectomy.8

Pediatric trials of electrocautery (ie, hot) dissection tonsillectomy vs nonelectrical (ie, cold) dissection tonsillectomy have usually used bipolar dissection techniques, but differ in their findings concerning postoperative morbidity. No difference or a finding in favor of either technique have all been equally reported.9,11

This study compares the postoperative morbidity in a group of children undergoing tonsillectomy with hot dissection vs a group of children undergoing cold dissection. The confounding effects of added antibiotics,12

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RESULTS

Twenty-five children were randomized to hot dissection tonsillectomy and 29 to cold dissection tonsillectomy. There were 2 withdrawals. The parents of 1 child in the cold dissection tonsillectomy group withdrew consent at admission and 1 child in the hot dissection tonsillectomy group transferred to another hospital before admission. Another 2 children in the cold dissection tonsillectomy group were excluded because of concurrent antibiotic use or another breach of the study protocol.

A total of 24 children (12 females) underwent hot dissection tonsillectomy. Seven of these children also underwent adenoidectomy by curettage during the same anesthetic procedure. Twenty-six children (15 females) underwent a cold dissection tonsillectomy alone or with adenoidectomy in 5 cases.

The 2 groups of children were matched for mean age (SD) which was 6.4 (2.1) years and 6.4 (2.0) years in the hot and cold dissection tonsillectomy groups, respectively. No intergroup difference was noted in mean body weight (SD) at admission: 25.3 (7.8) kg and 25.3 (9.1) kg in the hot and cold dissection tonsillectomy groups, respectively.

The mean intraoperative blood loss of 33.7 mL (95% confidence interval [CI], 26.4-41) in the cold dissection tonsillectomy group was more than double the 15.1 mL (95% CI, 10.2-20) in the hot dissection tonsillectomy group (P<.001) (Table 1). No significant difference was noted in the average of 3.9 doses of postoperative analgesics consumed in the first 24 hours by the cold dissection tonsillectomy group and of 3.3 doses by the hot dissection tonsillectomy group (Table 2).

One child in each group failed to keep the follow-up appointment. One child in the hot dissection tonsillectomy group did not submit a completed outpatient diary card. Details of complications necessitating consultation with the family practitioner were obtained by interview and corroborated with the family practitioner for this patient and the patients who had completed the diary cards (Table 3).

No statistical difference was noted in the time taken to resume normal activity as judged by parents, a median of 7 days (95% CI, 5-8) in the hot dissection tonsillectomy group and 5 days (95% CI, 3-8) in the cold dissection tonsillectomy group, respectively. The hot dissection tonsillectomy group consumed more analgesics over the 12-day follow-up period, a mean (SD) of 26.7 (12.2) doses compared with 19.2 (10.1) doses in the cold dissection tonsillectomy group (P<.05). The hot dissection tonsillectomy group took a median of 5 days (95% CI, 5-8) to reestablish eating a normal diet compared with a median of 3 days (95% CI, 3-7) for the cold dissection tonsillectomy group (P<.05).

A greater proportion of children 54% (13 of 24 children) (95% CI, 34-74) sought medical advice as outpatients for problems with throat discomfort, otalgia, vomiting/poor diet, bleeding, or pyrexia in the hot dissection tonsillectomy group than in the cold dissection tonsillectomy group 23% ( 6 of 26 children) (95% CI, 7-39) (P<.05). Ten children in the hot dissection tonsillectomy group were prescribed antibiotics by their general practitioners as outpatients, but this was not statistically greater than the 5 children in the cold dissection tonsillectomy group who were likewise prescribed antibiotics as a result of the consultation. Throat pain singly or in combination with other features was the most common reason for seeking outpatient medical attention in the first 2 weeks after the operation accounting for 63% (12 of 19 children) of interactions and occurred more

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Table 1. Intraoperative Blood Loss According to Hot or Cold Dissection Tonsillectomy Group*

<table>
<thead>
<tr>
<th>Blood Loss Factor</th>
<th>Hot (n = 24)</th>
<th>Cold (n = 26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>1-59</td>
<td>3-90</td>
</tr>
<tr>
<td>Median</td>
<td>13</td>
<td>31</td>
</tr>
<tr>
<td>Mean</td>
<td>15.1†</td>
<td>33.7†</td>
</tr>
<tr>
<td>SD</td>
<td>11.7</td>
<td>18.4</td>
</tr>
</tbody>
</table>

*All values are expressed in milliliters.†Intergroup difference in mean blood loss values (t test, P<.001).

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Table 2. Postoperative Findings in the Hot and Cold Dissection Tonsillectomy Groups*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hot (n = 24)</th>
<th>Cold (n = 26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-h Analgesic doses, No./d</td>
<td>3.3 (1.5)</td>
<td>3.9 (1.2)</td>
</tr>
<tr>
<td>Time to first drink, h</td>
<td>3.5 (1.7)</td>
<td>2.9 (0.7)</td>
</tr>
<tr>
<td>12-d Analgesic doses, Total No.†</td>
<td>26.7 (12.2)‡</td>
<td>19.2 (10.1)‡</td>
</tr>
<tr>
<td>Meals, No. of days until eating‡</td>
<td>7.5 (5.0-8.0)‡</td>
<td>5.0 (3.0-7.0)‡</td>
</tr>
<tr>
<td>Activity, No. of days until active‡</td>
<td>7.0 (5.0-8.0)‡</td>
<td>5.0 (3.0-8.0)‡</td>
</tr>
</tbody>
</table>

*Values are expressed as mean (SD) for the analgesic doses and time to first drink entries, and as median values (95% confidence interval) for the days taken to return to normal meals and activity.†These were calculated on 22 children for the hot dissection group and 25 children for the cold dissection group. See the “Results” section for an explanation.‡P<.05.

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Table 3. Postoperative Complications and the Use of Antibiotics in the Hot and Cold Dissection Tonsillectomy Groups

<table>
<thead>
<tr>
<th>Complication</th>
<th>Hot (n = 24)</th>
<th>Cold (n = 26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General practitioner consultation, No.</td>
<td>13*</td>
<td>6*</td>
</tr>
<tr>
<td>Throat pain</td>
<td>9*</td>
<td>3*</td>
</tr>
<tr>
<td>Otalgia</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vomit/diet</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Secondary bleeding</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Pyrexia</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Antibiotic prescription</td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>

*P<.05.
frequently in the hot dissection tonsillectomy group affecting 38% (9 of 24 children) (95% CI, 19-57) as opposed to 12% (3 of 26 children) (95% CI, 0-24) of the cold dissection tonsillectomy group (P<.05). Parents sought advice for bleeding in 3 cases, but these were not consequential. None of the children studied required rehospitalization.

## COMMENT

This study found that hot dissection tonsillectomy halved perioperative blood loss compared with cold dissection tonsillectomy. Recovery in the first 24 hours after surgery were similar in both groups with no difference in analgesic consumption. Follow-up of the children in the community, however, revealed a greater analgesic consumption level, longer time to return to eating a normal diet, and more consultations with the family practitioner for throat pain by children in the hot dissection tonsillectomy group.

The reduction in intraoperative hemorrhage by electrodissection techniques has been previously reported.9,10 The volume of this reduction in intraoperative blood loss, while of statistical significance, is not clinically important in the children studied who, on average, weighed 25.3 kg.

No difference in analgesic consumption while in the hospital was found, agreeing with the findings of Tay,9 Pang,6 and MacGregor et al.10 Analgesic consumption was used as a marker of postoperative pain. Nursing staff familiar with a combination of behavioral assessment, physiological parameters, verbalization, and the faces diagram scale assessed postoperative analgesic requirements on all of the patients studied while on the ward. Subjective pain scales were not used to assess postoperative pain because of the established difficulty in collecting self-reported pain scores in children in the immediate postoperative period and the normal variation in young children's ability to use these scales.17 The nurses were unaware of the children's randomization and, thus, observations would be free of intergroup bias. Hot dissection tonsillectomy had no early discernible influence on postoperative pain in the pediatric patients studied.

Analgesic consumption did not remain similar in both groups when they were followed up in the community. The children in the hot dissection tonsillectomy group consumed on average 7.5 more doses of analgesics than the children in the cold dissection tonsillectomy group. A 6- to 8-hourly prescribed postoperative analgesic medication regimen translates into a consumption of 3 to 4 doses a day. A child who required 1 day less of analgesics would be illustrating a clinically important improvement in recovery. This equates to a reduction in analgesic consumption of 4 doses. The difference in analgesic consumption over the 2-week follow-up period was another marker of postoperative morbidity used in this study. The hot dissection tonsillectomy group had 31% (13 of 24 children vs 6 of 26 children) more consultations than the cold dissection tonsillectomy group, a difference of the same order of magnitude as reported by Telian et al12 between antibiotic-treated and nonantibiotic-treated adenotonsillectomy groups. Throat discomfort singly or in combination with other complaints was the most common reason for seeking postoperative attention in our study.

The hot dissection tonsillectomy group took statistically 2.5 days longer to return to a normal diet. A difference of 1 day in the time to return to normal diet is of clinical significance.15 No statistical difference was noted between the groups in the time taken to return to normal activity though the median value was greater in the hot dissection tonsillectomy group.

Several studies are described aimed at using adjunct medication steroids13-14 and antibiotics12,18 to reduce posttonsillectomy morbidity. The increase in morbidity resulting from the replacement of cold dissection tonsillectomy with hot dissection tonsillectomy found in our study is of the same order of magnitude as the reduction in morbidity reported by other authors12 when antibiotics are added to perioperative and postoperative tonsillectomy treatment protocols in pediatric patients.

Hot dissection tonsillectomy decreases intraoperative blood loss, but this does not justify the higher morbidity noted by patients in the community. Surgeons who do not routinely follow up all children undergoing tonsillectomy for at least a fortnight and meticulously chart their recovery, may be unaware of the extra burden electrodissection techniques place on their young patients.

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## REFERENCES