Postoperative Recovery After Microdebrider Intracapsular or Monopolar Electrocautery Tonsillectomy

A Prospective, Randomized, Single-blinded Study

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Objective: To prospectively assess the postoperative recovery in patients randomly selected to receive either microdebrider intracapsular tonsillectomy (MT) or monopolar electrocautery tonsillectomy (ET).

Design: A prospective, randomized, single-blinded study.

Setting: Tertiary care children’s hospital.

Patients: A total of 74 patients between the ages of 3 and 7 years undergoing adenotonsillectomy for obstruction were randomly assigned to the MT and ET groups.

Main Outcome Measures: Families were blinded to the technique used and given a checklist to fill out daily quantifying pain, activity, diet, and the number of doses of pain medication given over a 10-day period. Other variables assessed included the time of surgery and intraoperative blood loss.

Results: The average time of surgery was 16.9 minutes for ET compared with 20.9 minutes for MT (P<.001). The average blood loss was 30 mL for ET compared with 45 mL for MT (P=.01). Resumption of near-normal dietary intake was achieved 1.7 days earlier in patients receiving MT compared with ET (P=.04). There was no significant difference in the number of days taken for the resolution of pain or resumption of normal activity between the 2 groups.

Conclusions: Microdebrider tonsillectomy takes over 4 minutes longer to perform compared with ET and has slightly higher intraoperative blood loss. There appears to be a slight advantage in the resumption of normal dietary intake with MT but no significant difference in the number of days taken for the resolution of pain or resumption of normal activity.

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enoidectomy, Stanislaw et al\textsuperscript{9} reported that the technique was 20\% faster and had 27\% less blood loss compared with the standard technique. They also found that it provided a more complete resection and better control of the depth of resection, having an overall greater surgeon satisfaction rating. Conversely, Elluru et al\textsuperscript{9} found that power-assisted techniques offer no advantage over electrocautery for the removal of the adenoids.

Over the past few years there have been only 5 retrospective studies reporting on the use of microdebrider technology for intracapsular tonsillectomy in patients with obstructive sleep–disordered breathing.\textsuperscript{10-14} The proposed benefit of the technique is that it preserves the tonsillar capsule, which acts as a protective barrier against pharyngeal muscle penetration. Initial results indicate that the microdebrider is associated with less postoperative pain and may be associated with a lower incidence of postoperative complications including delayed hemorrhage and dehydration.\textsuperscript{10,31} The rate of complications from intracapsular tonsillectomy has not been shown to exceed that seen with other techniques, although tonsillar regrowth was found to be as high as 3.2\% of reported cases in 1 study.\textsuperscript{14}

Despite these promising initial data, to our knowledge there are no prospective studies that have assessed the postoperative morbidity of microdebrider intracapsular tonsillectomy (MT) compared with conventional ET. The objective of this study was to perform a prospective, randomized, single-blinded study to determine if the postoperative pain, diminished activity, and reduced oral intake following adenotonsillectomy is lessened by using microdebrider technology rather than the traditional electrocauterization technique.

**METHODS**

**SUBJECT RECRUITMENT AND SELECTION**

The present study was approved by the institutional review board of The Children’s Hospital of Philadelphia (CHOP), Philadelphia, Pa. Medical charts of children aged 3 through 7 years, scheduled to undergo adenotonsillectomy at CHOP for upper airway obstruction, were reviewed by the lead author (S.E.S.) for potential candidacy criteria. Children younger than 3 years were excluded owing to the higher risk of complications following adenotonsillectomy,\textsuperscript{13} and children older than 7 years were excluded to allow the use of 1 standard pain rating scale for all children in our study population. Further exclusion criteria included the following: prior adenotonsillar surgery, a nonobstructive indication for tonsillectomy (ie, chronic tonsillitis and tumor), the presence of a craniofacial syndrome or mucopolysaccharidoses, patients with impaired ability to express their degree of pain (developmental delay and expressive language disorders), and patients with hematologic and wound-healing disorders and necrotizing dermatoses. All potential candidate families were contacted by the lead author 1 to 2 weeks prior to the planned surgical date to discuss the nature of the study and its potential risks. Interested families were sent copies of the research consent form and postoperative diary for evaluation.

**RANDOMIZATION**

Randomization was implemented with sealed envelopes that were to be opened only on the morning of surgery after consent and before the induction of anesthesia, with the family blinded to this process for the duration of the study. Randomization was balanced across the 2 surgeons (R.F.W. and I.N.J.) but was not otherwise stratified. Children were randomized in blocks of 10 into either the ET or MT group.

**SAMPLE SIZE**

The sample size was estimated based on a simulation of expected distributions, at an \( \alpha \) level of .05 without correction for multiple comparisons. For a sample size of 40 control and 40 experimental children, there is a 75\% chance of detecting a moderate improvement and a 99\% chance of detecting a large improvement.

**PROCEDURE**

The operative suite was set up for both MT and ET techniques prior to patient randomization. The perioperative anesthetic regimen was standardized for children in study and control groups. Intravenous antibiotics and dexamethasone dosed by body weight were routinely administered. All tonsillectomy procedures for the study patients were performed by attending surgeons trained in the use of ET and MT. After anesthetic induction and intubation, the Crowe-Davis mouth gag was inserted and red rubber catheters were placed to retract the palate. The adenoids were removed using the microdebrider in all patients to eliminate potential variability from using different adenoidectomy techniques. Pressure was applied to the nasopharynx for hemostasis. The tonsils were then removed by either ET or MT (Medtronic power system, 1800 rpm, variable setting; Medtronic, Minneapolis, Minn). Hemostasis of the tonsillar and adenoid beds was achieved using monopolary suction electrocautery.

**OUTCOME MEASURES**

Surgical time was defined and recorded by the operating surgeon as the time from mouth gag placement to removal. Estimated blood loss was recorded with inclusion of the removed tonsil volume (for ET, the excised tonsils were placed in the container) and corrected for the volume of saline used. Parents of the children in both groups were asked to record daily postoperative progress on a simple checklist over a 10-day period (Figure 1). The checklist included the Faces

![Figure 1. Mean daily pain score for microdebrider intracapsular tonsillectomy (MT) and monopolar electrocautery tonsillectomy (ET) groups.](image-url)
Pain Scale, a recording of medication dosing, and an estimation of activity and oral intake.

STATISTICAL ANALYSES

The mean surgical time and blood loss were compared using an unpaired, 2-tailed \( t \) test, with a significance factor of \( P \leq 0.05 \). For the parent checklist, the outcome measured was the number of days needed for a return to a near-normal diet and activity (rated as 3 out of 4 or 4 out of 4 for each), the number of days until almost no pain medication was given (0 or 1 dose/d), and the number of days taken for the resolution of pain. Because these measures are neither continuous nor normally distributed, the nonparametric Mann-Whitney test was used with a significance level of \( P \leq 0.05 \). The mean (SD) and confidence interval were calculated for each result.

There is no consensus as to what constitutes a clinically important treatment effect for these measures. However, we judge that a 1-day reduction in any of the recovery measures would reflect a small but meaningful improvement, considering the many thousands of tonsillectomies performed each year. Although on an individual basis small changes in surgical time may have little clinical significance, even a 1- to 2-minute difference may have a considerable financial impact over the course of a year. For children older than 3 years, a change in blood loss of less than 30 mL is unlikely to be clinically important.

RESULTS

DEMOGRAPHICS

A total of 74 patients between the ages of 3 and 7 years undergoing adenotonsillectomy for obstruction were randomly assigned to ET (n=36) and MT (n=38) groups. There were 22 boys and 16 girls in the MT group (mean [SD] age, 4.96 [1.29] years) and 28 boys and 8 girls in the ET group (mean [SD] age, 5.12 [1.32] years). The differences in male-female ratio and mean age between the ET and MT groups were not significant.

SURGICAL MEASURES

The mean surgical time was 16.6 minutes for the ET group and 20.9 minutes for the MT group (\( P \leq 0.001 \)). The average blood loss was 30.0 mL for the ET group and 45.0 mL for the MT group (\( P = 0.01 \)).

POSTOPERATIVE MEASURES

The mean number of days taken for resumption of near-normal dietary intake was 4.4 days in the ET group and 2.7 days for the MT group (\( P = 0.04 \)). There was no significant difference between the groups on the other measures (days to near-complete resolution of pain, days taken for the use of 0-1 doses of medication for daily pain, or days taken for resumption of near-normal activity) (Table). Figures 1, 2, 3, and 4 demonstrate the mean daily score for each of the postoperative measures. Analyses are presented in detail in the Table.

COMMENT

Over the past century there have been many different techniques used to remove the tonsils, each created with the goal of minimizing discomfort and the risk of complications from the procedure. To date, none of the different variations of tonsillectomy have been able to achieve this goal. The results of this study emphasize this point, demonstrating that patients have at least some pain for a mean of 4 to 5 days after surgery regardless of whether electrocautery or the microdebrider was used to remove the tonsils. Although there was a signifi-

Table. Treatment Effects

<table>
<thead>
<tr>
<th>Measure</th>
<th>MT Group, Mean (SD)</th>
<th>ET Group, Mean (SD)</th>
<th>Difference (95% CI)</th>
<th>( P ) Value</th>
<th>Clinically Important Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intraoperative measures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgery time, min</td>
<td>20.9 (4.4)</td>
<td>16.6 (4.0)</td>
<td>4.26 (2.3 to 6.2)</td>
<td>0.01</td>
<td>1-2</td>
</tr>
<tr>
<td>Blood loss, mL</td>
<td>45.0 (29.4)</td>
<td>30.0 (19.5)</td>
<td>5.0 (3.4 to 6.6)</td>
<td>0.01</td>
<td>30</td>
</tr>
<tr>
<td>Days to recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Near-normal diet</td>
<td>2.7 (2.3)</td>
<td>4.4 (3.4)</td>
<td>-1.7 (-3.1 to -0.3)</td>
<td>0.04</td>
<td>1</td>
</tr>
<tr>
<td>Near-normal activity</td>
<td>2.4 (1.8)</td>
<td>3.8 (3.0)</td>
<td>-1.4 (-2.6 to -0.2)</td>
<td>0.01</td>
<td>1</td>
</tr>
<tr>
<td>Little or no pain</td>
<td>4.6 (3.8)</td>
<td>3.9 (3.8)</td>
<td>0.7 (-1.1 to 2.5)</td>
<td>0.01</td>
<td>1</td>
</tr>
<tr>
<td>Little or no medication use</td>
<td>6.9 (3.7)</td>
<td>8.2 (2.7)</td>
<td>-1.3 (-2.9 to 0.3)</td>
<td>0.01</td>
<td>1-2</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; ET, monopolar electrocautery tonsillectomy; MT, microdebrider intracapsular tonsillectomy; NS, nonsignificant (\( P \geq 0.05 \))
cost of more than $370 per patient undergoing the MT at CHOP is $86.71. This may account for an increased interval of 30 mL. Therefore, the results, while statistically significant, are unlikely to be clinically significant.

The only complication seen in our study was a delayed postoperative bleed in 1 patient in the ET group. Delayed hemorrhage is one of the most common major complications seen after tonsillectomy. Electrocautery tonsillectomy removes the tonsil by dissecting along the capsule, which may leave the major feeding vessels vulnerable to desiccation and inflammation postoperatively. In theory, the rate of delayed hemorrhage may be less with MT because the tonsillar capsule, and thus the major feeding vessels, are not breached. A recent multicenter retrospective review reported a 0.7% rate of delayed postoperative hemorrhage after MT in 870 patients.

One theoretical risk unique to MT is tonsillar regrowth and the development of chronic tonsillitis. This is because MT serves to reduce tonsillar tissue down to the level of the capsule instead of removing the capsule in its entirety. Thus, there is a theoretical risk of leaving behind some elements, which may allow for regrowth and tonsillitis in the future. The rate of this complication after MT is estimated to be 0.5%, although Sorin et al reported a 3.2% regrowth rate in their patients.

In conclusion, the results of this randomized, prospective study demonstrate that MT takes over 4 minutes longer to perform compared with ET and has slightly higher in-

![Figure 3. Mean daily daily intake score for microdebrider intracapsular tonsillectomy (MT) and monopolar electrocauterity tonsillectomy (ET) groups.](image)

![Figure 4. Mean daily activity score for microdebrider intracapsular tonsillectomy (MT) and monopolar electrocauterity tonsillectomy (ET) groups.](image)
traoperative blood loss. There appears to be an advantage in the resumption of normal dietary intake with MT but no significant difference in the number of days taken for the resolution of pain or resumption of normal activity. Patients have at least some pain for a mean of 4 to 5 days after surgery regardless of whether electrocautery or the microdebrider was used to remove the tonsils.

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REFERENCES