Abstract

Objectives/Hypothesis: Monopolar cauterity is the most commonly used technique for tonsillotomy. The aim of the present study is to compare postoperative pain using a new technology, PlasmaKnife tonsillectomy (PKT) in comparison to monopolar cautery tonsillectomy (MCT).

Study Design: Prospective, randomized, single-blinded, self-controlled study to compare PlasmaKnife tonsillectomy (PKT) with standard Bovie monopolar electrocautery tonsillectomy (MCT).

Subjects: Adult patients age 18 to 30 years undergoing tonsillectomy for recurrent infection or obstructive tonsillar hypertrophy.

Exclusion criteria: 1) history of peritonsillar abscess, 2) severe unilateral tonsil enlargement concerning for neoplasia, 3) obstructive sleep apnea, and 4) pregnancy or lactation.

Randomization was performed using a computerized random number generator to select the side allocated to receive PKT.

The opposition side underwent standard MCT for each subject. In this way, each subject served as their own control.

The study protocol was approved by the Naval Medical Center Portsmouth Institutional Review Board.

Methods

- Research design: prospective, randomized, single-blinded, self-controlled study to compare PlasmaKnife tonsillectomy (PKT) with standard Bovie monopolar electrocautery tonsillectomy (MCT).
- Subjects: adult patients age 18 to 30 years undergoing tonsillectomy for recurrent infection or obstructive tonsillar hypertrophy.
- Exclusion criteria: 1) history of peritonsillar abscess, 2) severe unilateral tonsil enlargement concerning for neoplasia, 3) obstructive sleep apnea, and 4) pregnancy or lactation.
- Randomization was performed using a computerized random number generator to select the side allocated to receive PKT.
- The side receiving PKT was revealed to the surgeon at the time of surgery.
- All patients received standardized postoperative narcotic analgesic medication consisting of 60 Percocet (acetaminophen 325 mg with oxycodone 5 mg) tablets.
- The study protocol was approved by Naval Medical Center Portsmouth Institutional Review Board.

Procedure

- Prior to the study, PKT was performed at least 5 times by each investigator. Guidance was provided from the manufacturer on recommended device settings.
- MCT was performed using the Valleylab electrosurgical headpiece with guarded flat blade on a power setting of 15 watts in the coagulation mode.
- For each method of tonsillectomy, blood loss was measured using separate suction canisters.
- Operative time for each tonsillectomy was also separately recorded.

Outcomes

- The primary outcome of interest was self-rated daily pain assessed using a 10-point scale.
- All subjects were discharged to home on the day of surgery and were each provided a 21-day pain diary and given detailed instruction on its use.
- Each of the 21 daily segments of the diary contained 10-point pain scales labeled “left side” or “right side” (Figure 2).
- Patients were also phoned twice weekly by a research assistant to separately assess pain and remind patients to complete their diaries.
- Secondary outcomes included comparison of operative time, blood loss, and postoperative complications related to each tonsillectomy technique.
- Because the device was modified after the first 10 tonsillectomies were performed, we also performed a 3-way ANOVA comparing the original device to a slightly modified device.

Results

- 32 subjects were enrolled in the study.
- 4 (12.5%) of the subjects underwent tonsillectomy but were lost to follow up.
- 28 (84.8%) subjects completed the protocol.

Subject Characteristics

<table>
<thead>
<tr>
<th>Age (y)</th>
<th>Early PlasmaKnife</th>
<th>Modified PlasmaKnife</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>705 (55)</td>
<td>718 (63)</td>
<td>713 (59)</td>
</tr>
<tr>
<td>Female</td>
<td>320 (60)</td>
<td>117 (19)</td>
<td>147 (20)</td>
</tr>
<tr>
<td>Diapause</td>
<td>3 (4%)</td>
<td>1 (2%)</td>
<td>4 (25%)</td>
</tr>
<tr>
<td>PlasmaKnife Right</td>
<td>4 (12.5%)</td>
<td>12 (24%)</td>
<td>16 (27%)</td>
</tr>
<tr>
<td>PlasmaKnife Left</td>
<td>4 (12.5%)</td>
<td>8 (33.3%)</td>
<td>12 (24%)</td>
</tr>
</tbody>
</table>

The mean blood loss was 1 ml for PKT and MKT for 21-day postoperative period.

Postoperative Pain Outcomes

- Repeated measures ANOVA comparing PKT to MCT for 21 postoperative days revealed no difference (p = .131) in pain scores between the two techniques (Figure 3).
- Both techniques demonstrated a decrease in pain during the 21-day postoperative period (p < .001).
- No interaction effect was seen (one group did not have a decrease in pain at a different rate than the other (p = .910).

Figure 4. ANOVA comparing postoperative pain for PKT vs MKT for 21-day postoperative period

Operative Time and Blood Loss

- The mean operative time was 8.9 minutes for PKT and 7.4 minutes for MCT (fig 5). The difference was not significant (p = .418).
- The mean blood loss was 11.3 ml for PKT and 17.7 ml for MCT (fig 6). The difference was not significant (p = .276).
- No surgical complications were observed.

Figure 5. Mean surgical time (minutes) for PKT and MCT (p = .148)

Conclusions

Compared with conventional electrocautery, use of the PlasmaKnife for tonsillectomy in adults with recurrent or chronic tonsillitis provides no advantage in terms of blood loss, surgical time, or postoperative pain.

Discussion

- Multiple studies have compared various techniques for tonsillectomy in order to identify one that is as effective as traditional methods while also minimizing postoperative morbidity.
- Although some studies have demonstrated decreased pain postoperatively, these findings are not consistent, and these newer devices are all more expensive than traditional techniques (the PlasmaKnife costs approximately $150 at our institution).
- In this study, PK tonsillectomy demonstrated no statistical difference in surgical time, blood loss or postoperative pain compared with traditional “bovie” tonsillectomy.
- The device underwent a minor modification of the suction port during our period of data collection. This modification appears to have had no impact on any of our analyzed outcomes.
- Although intuitively one would expect a device which causes less thermal damage to produce less postoperative pain, this does not seem to be the case based on our study.
- Possible explanations:
  1. Although the PK device uses bipolar technology and thus induces less thermal damage, the amount of thermal damage is still enough to cause significant pain.
  2. No matter how the tonsils are removed, the presence of a “raw surface” which must heal by secondary intention causes postoperative pain.
  3. There may be a difference, but our sample size is too small to detect it.

Figure 6. Mean blood loss (ml) for PKT and MCT (p = .276)

References


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