Assessment of postoperative pain scores in thermal welding and conventional tonsillectomy techniques: A randomized control study

Abdulkareem Rida Fida *, Khalil Sadaqa Sendi

* Corresponding author. Tel.: +966 563256565.
E-mail address: ak.rida@gmail.com (A.R. Fida).

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Objective: To assess postoperative pain of the thermal welding system tonsillectomy compared to the conventional tonsillectomy.

Design: 342 Patients aged from 8 through 39 years were enrolled in a randomized prospective controlled study. Extracapsular tonsillectomy with thermal welding system and conventional system was performed randomly in each patient. Patients with chronic tonsillitis were included. Patients undergoing adenoidectomy, suspected or confirmed tonsillar malignancy or any other procedure together with tonsillectomy were excluded from this study. Postoperative pain was measured by means of Faces Pain Scale and Numerical Pain Score for each patient in three occasions (6–8 h post operative, 24 h and 6 days later during the first postoperative visit) for each side.

Results: There was a statistically significant difference between the pain scores of both procedures, in all three occasions (P > 0.001). Patients treated with Thermal welding had the least postoperative pain score regardless of the occasion. Patients treated with the conventional technique had a significantly higher postoperative pain score in all three occasions.

Conclusions: Thermal welding tonsillectomy is superior to the conventional technique, with less postoperative pain scores, compared to the conventional technique.

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1. Introduction

Tonsillectomy is a 3000 year old procedure. It is derived from the word *tonsia*, (meaning “oar” in Latin) which means removal in ancient practice. Operations have been performed on the tonsil from the earliest times. The first mention of tonsillectomy refers to Hindu medicine about 1000 years B.C. Cel- sus (25 B.C.–50 A.D.), a Roman aristocrat, who lived about the time of J. Christ, described a method of complete removal
of the tonsil (tonsillectomy) as distinct from partial removal.\(^2\) Galen\(^2\) (A.D. 121–201) was apparently the first writer to advocate the use of a snare for amputating the tonsil.\(^2\) In modern literature “Cold” dissection has been reported first on The Lancet in 1909.\(^3\) It is defined as the removal of the tonsil including its capsule by dissecting the peritonsillar space between the tonsil capsule and the muscular wall.

Tonsillectomy is the most common surgical procedure in the routine practice of any otolaryngologist.\(^5,6\) However, it is one of the most controversial surgeries of all times. Indications for surgery include recurrent throat infections and sleep-disordered breathing, both of which can substantially affect child health status and quality of life.\(^6,7\) The marked advances in anesthesia, post operative care and surgical techniques over the last 100 years have led to a significant reduction in the post operative morbidity related to this procedure. Moreover, tonsillectomy remains the standard of care for treating chronic tonsillitis.

According to the American Academy of otolaryngology and head and neck surgery clinical guidelines\(^1\) “tonsillectomy is more cost-effective treatment than prolonged repeated medical therapy for recurrent tonsillitis over several years”. The continuing controversy on which technique is the “ideal” one has been long discussed in the literature; nonetheless, the conventional dissection is still considered the standard technique with which to compare the effectiveness, safety and cost of any new technique. In this era of evolving scientific discoveries, we will continue to witness many methods, which will prove their efficacy in reducing tonsillectomy related patient’s morbidity.

Different techniques for tonsillectomy have been proposed including, blunt dissection, harmonic ultrasonic scalpel, coblator, laser or radiofrequency excision, and tonsilloplasty.\(^8\)–\(^10\) Others, however, have used thermal welding system (TWS).\(^11\)–\(^14\)

2. Aim

The purpose of this study was to assess postoperative pain of the thermal welding system tonsillectomy compared with the conventional tonsillectomy. The null hypothesis was that variation between techniques would have no influence on patients’ postoperative pain.

3. Materials and methods

A prospective, randomized double blind controlled trial of 342 patients aged from 8 to 39 years who presented to our clinic between January 2007 and July 2011 was conducted. The age selection was to improve the data credibility and accuracy. The study protocol was approved by the Institutional Research Board of the King Abdulaziz University, Jeddah, Saudi Arabia, and a database was created at that time to record prospective patients. Inclusion criteria were history of chronic recurrent tonsillitis; defined as, recurrent throat infection of 7 or more attacks in the past year or 5 or more attacks per year in the last 2 years or 3 or more attacks per year for 3 years despite adequate medical therapy. Patients with history of peri-tonsillar abscess, suspected or confirmed tonsillar malignancy, and patients with enlarged adenoids were excluded. Pediatric and adult population with coexisting morbidities; congenital malformations, diabetes, and hematologic disorders were also excluded. Enrolled patients were admitted (per appointment) to the surgical daycare where, they were medically assessed by an anesthesia staff and an attending otolaryngologist.

Patients and/or caregivers were informed that they would be blinded to the side of each technique, and a written consent was obtained from all patients (above 18 years) and patients’ caregivers (18 years or less) explaining the two types of procedures used prior to the surgery. At daycare, all patients received an intravenous weight adjusted prophylactic loading dose of Augmentin\(^\text{R}\) (penicillin and calvulanic acid). Patients with penicilin allergy were given erythromycin, which was also adjusted per weight. All patients also received a single intra operative dose of intravenous Dexamethasone 0.5 mg/kg, with a maximum dose of 8 mg. Induction started with intravenous Propofol for adult 2.5 mg/kg, Rocuronium bromide 0.8 mg/kg and an analgesia with intravenous Fentanyl citrate 3 Mg/kg, followed by Nitrous oxide and Sevoflurance as maintenance. Ondansetron hydrochloride dihydrate 4 mg/kg was also given as an antiemetic.

All cases were performed under general anesthesia. Patients were placed in Rose’s position. Using David’s gag retractor, the tonsils were exposed and the site of each technique was selected randomly by the first author in the operating room, and was recorded on the patient’s chart for future reference. The operative notes were concealed from the second author to ensure a double-blinded method. Thermal welding uses the simultaneous application of heat and pressure to cut and coagulate tissue. Unlike diathermy, no electric current passes through the tissue. At the tip of the cautery forceps, a low voltage current activates a heating element. Tissue that is grasped using the forceps is vaporized at temperatures of 300–400 °C, while the vessels are sealed by a combination of heat (60–100 °C) and the clamping pressure of the forceps. In our technique, the tonsil was grasped and retracted toward the midline with Dennis Brown forceps. An anterior pillar mucosal incision was then made superiorly and coagulated with Thermal Welding Bayonet Ultra slim Forceps using the “1” and “8” coagulation and dissection settings of the power supply unit respectively. Using the same forceps, dissection of the peritonsillar tissue was performed, and hemostasis was achieved by coagulating the tonsillar vessels in the same setting.

The conventional technique was also initiated by an anterior pillar mucosal incision overlying the superior pole of the tonsil as the tonsil was grasped and retracted toward the midline with Dennis Brown forceps. The dissection proceeded along the tonsillar fossa in the peri-tonsillar plane keeping as close to the tonsil capsule as possible. Hemostasis was achieved by the application of pressure packs, and persistent bleeding was controlled by bipolar diathermy coagulation of the oozing vessels. One senior surgeon did all the operations to eliminate surgeon dependent bias.

A single dose of weight adjusted IV or oral Paracetamol was given to all patients in the recovery room. In order to increase the accuracy of the postoperative pain assessment, the second author (who was blinded to the site of each procedure) interviewed all patients 6–8 h after the procedure, and pain score was recorded for each side before discharge. Postoperative pharyngeal pain scores were recorded for each side on three occasions for each patient; upon discharge (6–8 h post operative, 24 h and 6 days later during the first postoperative
visit) for each side. Adult patients used the Numerical Pain Score ladder to express their pain scale, whereas the Faces Pain Scale was shown to our pediatric patients and they were asked to choose which face best described their “soar throat” (Fig. 1). Patients were encouraged to report any discrepancy in the pain on both sides. All patients were discharged on oral antibiotics for one week and encouraged to increase oral fluid intake at home. Differences between techniques were tested for statistical significance with 1-way analysis of variance (ANOVA) and the Tukey post hoc HSD at \( \alpha < 0.05 \).

4. Results

In total, 342 patients between the ages of 8 and 39 years (mean age 14.4 years) were enrolled in the study. There were 168 males and 174 females. Thermal Welding Technique was

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Postoperative pain score with thermal welding technology and conventional (mean ± SD).</th>
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<tbody>
<tr>
<td>Technique</td>
<td>Postoperative pain score</td>
</tr>
<tr>
<td>Thermal welding</td>
<td>3.3 ± 1.1a</td>
</tr>
<tr>
<td>Conventional</td>
<td>2.9 ± 1.1b</td>
</tr>
</tbody>
</table>

Values with the same letters are not significantly different at \( p < 0.05 \). Comparisons were made within the columns for each technique.

Figure 1  Face pain scales used in the patients’ assessment.

Figure 2  Average pain scores of both techniques at 6–8 h, 24 h and 6 days post operative.
performed on the right side in 219 patients and on the left in 123 patients. The average intra operative time for TWS was 5.2 ± 2.3 min and 9.35 ± 4.2 min for the conventional technique. Bleeding was minute and immeasurable in TWS, while the average blood loss in the conventional technique was around 10 ml.

The ANOVA results demonstrate a significant difference in postoperative pain score among techniques (p < 0.001). Tukey post hoc test disclosed a significant difference between pharyngeal pain scores for each technique, as shown in Table 1. Patients treated with TWS had the least postoperative pain score regardless to the occasion. The highest pain score (3.3 ± 1.1) was recorded with 6–8 h and the lowest pain score (2.2 ± 1.1) was recorded after 6 days. Patients treated with the conventional technique had a significantly higher postoperative pain score in all three occasions as shown in Fig. 2. The highest pain score (3.1 ± 5.2) was recorded with 24 h and the lowest pain score (1.9 ± 1.1) was recorded after 6 days.

5. Discussion

This study assessed the postoperative pain of the thermal welding system tonsillectomy compared to the conventional tonsillectomy. The entire tonsil was removed on both Thermal Welding and conventional technique to eliminate the discrepancy and prevent the possibility of recurrent tonsillar infection. Moreover, the tonsillar capsule was preserved, to protect the pharyngeal constrictor muscles and nerves to decrease post op pain. Also, the 2 procedures of tonsillectomy were performed on the same patient to eliminate personal discrepancy in pain threshold.

The data support rejection of the null hypothesis of the study, that variation between techniques would have no influence on patients’ postoperative pain. There is absolute agreement of previous and recent studies that morbidity from tonsillectomy remains a paramount factor in determining the success or failure of the operation and only pain is the most common reason for seeking outpatient medical attention in the first 2 weeks after tonsillectomy."15"

Previous studies looked at pain during the first 24 h after surgery, most investigators found no significant difference between the hot and cold methods.16 Tay16 was the only study that reported significantly less pharyngeal pain on the electrodissection side in the first postoperative day in adult patients. Wexler17 reported less pharyngeal pain on the cold dissection side in the first postoperative day in pediatric patients. Moreover, he reported no steroid or local anesthetic use but did report that patients later in the series received intraoperative and occasionally postoperative Ketorolac (NSAID). The most significant difference in pain, when comparing hot versus cold dissection, was encountered during days 4–10. All studies reported significantly more pain during days 4–10 postoperatively with the electrocautery tonsillectomy.

Thermal welding tonsillectomy is superior to the conventional technique, with less postoperative pain scores. Nevertheless, Patients treated with Thermal welding had the least postoperative pain score regardless to the occasion. Patients treated with the conventional technique had significantly higher postoperative pain score in all three occasions. This observation supports the results of previously published studies."11,14 However, Chimona et al.12 showed that the cold knife tonsillectomy group experienced significantly less postoperative pain on the 1st, 4th, 7th and 10th day after surgery, than the thermal welding and radiofrequency group. The thermal welding technology used by Starion Cautery Forceps, combines heat and pressure to simultaneously coagulate and divide tissue. It contains a heating element at the tip of the instrument activated by squeezing the closed forceps and by using the dual control footswitch. Our results revealed significant prolonged surgery time with conventional technique (9.4 ± 4.2 min). However, the average surgery time with TWS was (5.2 ± 2.3 min). No patient in this study reported history of postoperative bleeding.

6. Conclusion

Thermal Welding tonsillectomy technique is superior to the conventional technique, with less postoperative pain scores and shorter operative time. We recommend using this method in the pediatric population and in patients with coagulopathies.

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