

Post-tonsillectomy morbidities: randomised, prospective controlled clinical trial of cold dissection versus thermal welding tonsillectomy

S AYDIN¹, U TASKIN¹, B ALTAS¹, M ERDIL¹, T SENTURK¹, S CELEBI², M F OKTAY¹

¹Otorhinolaryngology Department, Bagcilar Education and Research Hospital, İstanbul, and

²Otorhinolaryngology Department, Taksim Education and Research Hospital, İstanbul, Turkey

Abstract

Background: New surgical techniques and devices have been described that decrease post-tonsillectomy morbidities. This study aimed to compare the two most popular tonsillectomy techniques.

Method: Forty children underwent tonsillectomies using both the thermal welding and cold dissection techniques. In each patient, one side was removed with thermal welding and the other was removed with cold dissection.

Results: There was a significant decrease in intra-operative blood loss, and the mean operation time was significantly lower on the thermal welding side compared with the cold dissection side. On the cold dissection side, tissue healing (i.e. the rate of complete tissue healing) was better and less pain was reported compared with the thermal welding side. However, there were no significant differences between the two techniques in terms of throat pain scores on the 1st, 3rd or 14th day post-operatively, or tissue healing scores on any of the post-operative days assessed.

Conclusion: Cold dissection resulted in better tissue healing and lower pain scores than thermal welding, but thermal welding was associated with less intra-operative blood loss and lower mean operation time than cold dissection.

Key words: Tonsillectomy; Otolaryngology; Surgical Procedures, Operative; Pediatrics

Introduction

Tonsillectomy is one of the most frequently performed surgical procedures in children. Various new surgical techniques and devices that decrease tonsillectomy morbidities have been described.¹ However, because it is cheaper, safer and reported in the literature to be less painful, cold dissection is still the most commonly used technique among otolaryngologists.²

Thermal welding is a recently developed technique that combines heat and pressure to simultaneously coagulate and divide tissue. It has been reported to have many advantages.² Numerous studies have compared thermal welding tonsillectomy with other techniques, and different results have been reported.

Intra-operative blood loss, and post-operative pain and bleeding are still the main problems associated with paediatric tonsillectomy.³ The frequency and severity of these morbidities may depend not only on the surgical technique used, but also on the patient's general status, food intake and environment. However, studies comparing surgical techniques lack reports regarding these more general issues.

This study aimed to compare the two most popular tonsillectomy techniques among otolaryngologists: thermal welding and cold dissection. Both techniques were performed simultaneously on each patient. Specifically, one tonsil was removed using cold dissection and the other with thermal welding, during the same operation.

Materials and methods

In this prospective, randomised, single-blinded clinical study, 40 children underwent cold dissection and thermal welding adenotonsillectomy. Permission was obtained from the Bagcilar Education and Research Hospital Local Ethics Committee. All parents were informed regarding the procedure and written consent was provided, according to the principles presented in the Declaration of Helsinki.

All operations were performed under general anaesthesia, by the same surgeon. Adenoidectomies were performed by curettage. One tonsil was removed via cold dissection and the other was removed with thermal

welding. The allocation of sides to tonsillectomy techniques was determined randomly before the study began.

The indications for adenotonsillectomy were obstructive sleep apnoea syndrome and chronic tonsillitis. Any children with a history of peritonsillar abscess, bleeding disorders, acute tonsillitis or previous adenoidectomy were excluded from the study. Children, parents and the resident doctor involved with the study were all blinded to the sides on which the procedures were performed.

For each tonsil side, the duration of surgery and amount of blood lost during surgery were recorded. Intra-operative blood loss was estimated based on the amount of blood collected in the suction bottle. Operative time for each side, defined as the time taken for tonsil dissection (and haemostasis when necessary), was recorded at the end of the operation.

The children and their parents were contacted on post-operative days 1, 3, 7 and 14 in order to obtain information regarding: throat pain for each side (using a visual analogue scale, with scores ranging from 0 (no pain) to 10 (intolerable pain)); the presence or absence, and sidedness, of otalgia during swallowing, drinking and speaking (using a similar analogue scale); post-operative healing for each side; and bleeding. Tissue healing was assessed by the resident doctor involved with the study on the 1st, 3rd, 7th and 14th post-operative days using a visual analogue scale (whereby 0 = full epithelisation, 1 = epithelisation and granulation, 2 = granulation only, and 3 = no granulation). Complete tissue healing was defined as full epithelisation of the tonsil bed. The tissue healing scores recorded on the 14th post-operative day were used to calculate the rate of complete tissue healing. All children received standard post-operative care for tonsillectomy. Most of the patients were discharged from the hospital the day after the tonsillectomy.

Statistical analysis was performed using the Statistical Package for the Social Sciences version 20.0 Base software (SPSS; Chicago, Illinois, USA). The data were analysed with the Mann–Whitney U test, Wilcoxon signed rank test, chi-square test and Fisher's exact test. *P* values of less than 0.05 were considered statistically significant.

Results

The study comprised 40 children (17 males, 23 females). The mean age of patients was 6.7 ± 2.2 years (range, 4–14 years). The technique type (i.e. cold dissection or thermal welding) was randomly allocated to the tonsil sides of each patient. All patients completed the study.

There was significantly lower mean intra-operative blood loss on the thermal welding side compared with the cold dissection side (3.30 ml and 11.56 ml respectively; $p = 0.000$) (Table I). The mean operation times were 4.24 ± 2.17 minutes (range, 2–12 minutes) for the thermal welding side and 5.58 ± 3.73 minutes (range, 2–18 minutes) for the cold dissection side;

TABLE I
INTRA-OPERATIVE BLOOD LOSS AND OPERATION TIME DATA

Variable	Thermal welding side*	Cold dissection side*	<i>p</i>
Intra-op blood loss (ml)	3.30 ± 3.03	11.56 ± 11.15	0.000
Operation time (min)	4.24 ± 2.17	5.58 ± 3.73	0.045

*Data represent means \pm standard deviations. Intra-op = intra-operative; min = minutes

the difference was statistically significant ($p = 0.045$) (Table I). There were no occurrences of post-operative haemorrhage.

The overall mean throat pain scores for each technique on post-operative days 1, 3, 7 and 14 are shown in Table II. The scores indicate a gradual post-operative decrease in pain for both techniques. There were no significant differences in throat pain scores on the 1st, 3rd and 14th days post-operatively between the thermal welding and cold dissection sides ($p > 0.05$). However, throat pain scores were significantly lower on the cold dissection side on the seventh post-operative day ($p < 0.05$). The mean pain scores were persistently lower on the cold dissection side on all post-operative days, and the pain experienced during swallowing, drinking and speaking disappeared 2 days earlier on the cold dissection side than on the thermal welding side. At two weeks, two patients reported mild pain on the cold dissection side that did not interfere with normal daily activities, whereas four patients experienced such pain on the thermal welding side (Table II).

On the 14th post-operative day, the rate of complete tissue healing was significantly better on the cold dissection side than the thermal welding side ($p < 0.05$) (Table III). However, there were no significant differences between the scores for the two techniques on any of the post-operative days assessed (Table III).

Discussion

Although various tonsillectomy techniques and devices that decrease post-tonsillectomy morbidity have been described, intra-operative bleeding and post-operative

TABLE II
POST-OPERATIVE PAIN SCORES

Post-op day	Thermal welding side*	Cold dissection side*	<i>p</i>
1	2.46 ± 1.95	1.80 ± 2.00	0.053
3	1.90 ± 2.21	1.46 ± 2.18	0.221
7	1.62 ± 1.87	0.94 ± 1.56	0.025
14	0.50 ± 1.07	0.30 ± 0.86	0.291

*Data represent mean visual analogue scale scores \pm standard deviations (0 = no pain, 10 = intolerable pain). Post-op = post-operative

TABLE III
TISSUE HEALING SCORES

Post-op day	Thermal welding side*	Cold dissection side*	<i>p</i>
1	2.82 ± 0.52	2.78 ± 0.62	0.643
3	2.34 ± 0.69	2.38 ± 0.81	0.660
7	1.80 ± 0.73	1.86 ± 0.73	0.996
14	1.16 ± 0.58	1.24 ± 0.56	0.471
14	46% [†]	63% [†]	0.025

*Data represent mean visual analogue scale scores ± standard deviations (0 = full epithelisation, 1 = epithelisation and granulation, 2 = granulation only, and 3 = no granulation). [†]Complete tissue healing rate. Post-op = post-operative

pain are still the main problems associated with tonsillectomy.⁴

Cold dissection is one of the most commonly used techniques among otolaryngologists.² Thermal welding is another commonly used tonsillectomy technique.³ The latter is a newly described procedure associated with reduced intra-operative bleeding and decreased operation times.² Some authors have suggested that thermal welding tonsillectomy facilitates an earlier return to normal functioning. However, while some papers have reported a lower risk of late bleeding, others have reported an increased risk of bleeding.⁴ Importantly, none of these studies reported objective findings.

- Cold dissection and thermal welding are common tonsillectomy techniques
- In this comparative study, both techniques were performed simultaneously on each patient
- On the cold dissection side, tissue healing was better and less pain was reported
- Thermal welding was associated with shorter operation times and less intra-operative bleeding

Even in a well-designed study, pain scores can be confounded. Confusion may occur because of: the highly subjective nature of pain, the effects of varying medication doses, and the presence of comorbid factors such as low fluid intake, nausea and vomiting. These factors, and other, patient-related factors, may contribute to variations in pain scores and interfere with the accurate comparative assessment of different techniques.^{5,6} In our study, we objectively compared thermal welding and cold dissection: both techniques were performed simultaneously on each patient. We standardised the surgeon performing the techniques, and the antibiotics and analgesic used. In addition, because of the possibility of pain experienced

through the entire oropharynx, we applied the techniques to equally-sized regions on each side, and the sidedness of otalgia acted as an indication of the side of pain origin. This paired study design provided a reliable evaluation of differences in pain. Furthermore, the design of this study enabled differentiation between the techniques regarding: operation time, extent of intra-operative bleeding, time taken to return to a normal diet, daily activity level, tissue healing ratings and pain treatment requirements.

The present study showed that cold dissection had advantages over thermal welding in terms of post-operative pain and tissue healing, but was associated with a longer operation time and more intra-operative bleeding. Although the intra-operative advantages of thermal welding were prominent, post-operatively tissue healing was better and pain was lower (and disappeared earlier) on the cold dissection sides. Thus, this study supports the findings of most previous studies regarding the advantages and disadvantages of these two techniques. Our study revealed that patient-related factors did not change the technical results.

In conclusion, cold dissection tonsillectomy was associated with reduced post-operative pain and better tissue healing. However, thermal welding had the advantages of shorter operation times and less intra-operative bleeding.

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Address for correspondence:

Dr U Taskin, Otorhinolaryngology Department,
Bagcilar Education and Research Hospital,
İstanbul, Turkey

E-mail: taskin_umit@yahoo.com

Dr U Taskin takes responsibility for the integrity of the content of the paper

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