

ARAŞTIRMA / RESEARCH ARTICLE

Tonsillectomy in children: thermal welding system versus cold dissection technique

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Çocuklarda tonsillektomi: Soğuk diseksiyon tekniğine karşı termal welding sistem tekniği

Amaç: Tonsillektomi, otolaringoloji işlemlerinden en eski ve çok sık uygulanan cerrahi uygulamalardan biridir. Soğuk diseksiyon yöntemi (SDM) en sık uygulanan tekniklerden biri olsa da tonsillektomide yeni yöntemler de bulunmaktadır. Termal welding sistemi (TWS) en yeni cerrahi yöntemlerden biridir. Bu prospektif, randomize, tek cerrahlı, tek kör çalışmada, TWS ve SDM'nun peri-/postoperatif parametreleri literatür eşliğinde karşılaştırılmıştır.

Yöntem: Bu çalışmaya 54 hasta dahil edilmiştir. Hastalar gelişigüzel olarak TWS ve SDM grubuna ayrıldı. Yirmidört hastaya TWS grubunda (ortalama yaş 10.38), otuz hastaya SDM grubunda (ortalama yaş 10.77) genel anestezi altında tonsillektomi işlemi uygulanmıştır. Cerrahi sırasında; operasyon zamanı, operasyon esnasında kanama, cerrahi sonrasında ise ağrı, konuşma aktivasyonuna dönme, oral alıma başlama zamanı ve komplikasyon oranları değerlendirildi. Adenoidektomi olanlar ve tonsillektomiye ek benzeri işlem yapılanlar ve kanama hastalığı olanlar çalışmadan çıkarıldılar.

Bulgular: TWS için ortalama operasyon zamanı 13.92 ± 3.66 dakika bulunmasına karşılık, SDM grubunda bu zaman 37.80 ± 14.13 dakika olarak bulundu ($p < 0.001$). Ortalama operasyon esnasındaki kan kaybı TWS için 6.33 ± 4.27 ve SDM için 30.17 ± 10.95 ml ($p < 0.001$) bulundu. Her 2 grupta postoperatif 1. günden 5. güne kadar ağrı şikayetlerinde giderek azalma görülmesine karşılık TWS grubunda, SDM grubundan daha yüksek ağrı skoru gözlemlendi ($p < 0.001$). Normal konuşma aktivitesine başlama zamanı TWS grubunda ortalama 5.42 ± 1.25

gün ve SDM grubunda 2.37 ± 1 gün olarak bulundu ($p < 0.001$). Buna karşılık oral alıma başlama zamanı açısından iki grup arasında istatistiksel olarak anlamlı farklılığa rastlanmadı (TWS grubunda 5.9 ± 0.99 , SDM grubunda 5.5 ± 1.35) ($p > 0.05$). Primer kanama TWS grubundan 3 hastada ve SDM grubundan 10 hastada gözlemlendi. Sekonder postoperatif kanama TWS grubunda 1 hastada gözlemlendi.

Sonuç: TWS, operasyon esnasında ve operasyon zamanı açısından daha iyi sonuçlar sağlamıştır. Buna karşılık SDM daha iyi postoperatif konfor sunmuştur. Bu konuda henüz yeterli yayın bulunmadığından, postoperatif kanama ve hasta konforu hakkında yeni karşılaştırmalı çalışmalar dizayn etmek gereklidir.

Anahtar Sözcükler: Soğuk diseksiyon yöntemi, termal welding sistem, tonsillektomi, çocuklar.

Türk Otolarengoloji Arşivi, 2009; 47(2): 77-82

Abstract

Objectives: Tonsillectomy is one of the most frequently applied and the oldest surgical procedures in otorhinolaryngology. While the cold dissection method (CDM) is the one of the most frequent techniques, new methods are being generated to improve the outcome of tonsillectomy. Thermal welding system (TWS) is the most recent surgical method. In this prospective, randomized, single-blind, single surgeon study, TWS and CDM are compared with respect to per/postoperative parameters under the light of current literature.

Methods: Fifty four patients were included in this study. Patients were randomly assigned to TWS or CDM groups. Twenty four patients in the TWS group (mean age 10.38 years) and thirty patients in CDM group (mean age 10.77)

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underwent tonsillectomy under general anesthesia. During surgery; operating time, intraoperative bleeding and postoperative pain, return of phonation, the initiation time of oral intake and complication rates were evaluated. Patients who had adenoidectomy and similar procedures in addition to tonsillectomy and patients with hemorrhagic diathesis were excluded from the study.

Results: While mean operative time was 13.92 ± 3.66 minutes for TWS, the time for CDM was 37.80 ± 14.13 minutes ($p < 0.001$). Mean intraoperative blood loss was 6.33 ± 4.27 ml for TWS and 30.17 ± 10.95 ml for CDM ($p < 0.001$). In both groups, from the first postoperative day on, complaints of pain decreased stepwise. However from the first to the fifth postoperative days ($p < 0.05$) higher pain scores were observed in the TWS group than the CDM group. Within our findings, mean time to recovery of normal phonation was 5.42 ± 1.25 days for TWS and 2.37 ± 1 days for the CDM group ($p < 0.001$). Time to recovery of normal oral intake activity was not significantly different between the two groups (5.9 ± 0.99 days in TWS group, 5.5 ± 1.35 days in CDM group) ($p > 0.05$). Primary hemorrhage occurred in 3 patients of the TWS and 10 patients of the CDM group. Secondary postoperative hemorrhage was seen in 1 patient of the TWS group.

Conclusion: TWS provides a lesser intraoperative bleeding and decrease the operative time. However CDM offers better postoperative comfort. Because there are not adequate publications concerning this issue, it is necessary to design new comparative studies between tonsillectomy techniques to evaluate postoperative bleeding and patient comfort.

Key Words: Cold dissection method, thermal welding system, tonsillectomy, children.

Türk Arch Otolaryngol, 2009; 47(2): 77-82

Introduction

Tonsillectomy is one of the most frequently applied and oldest surgical procedures in otorhinolaryngology.^{1,3} Increasing experience in practice, together with evolving technological advances have made the development of many different tonsillectomy methods possible.⁴ Common targets of these new techniques have been to reduce the incidence

of potential complications by shortening the operative time, and increasing the safety and comfort of the patient. However cold dissection is still one of the most frequently used methods.²

The Thermal Welding System (TWS) is a recent surgical method that has been offered to us by technological innovations on this issue.⁵ The main operating principle of this system which consists of a power source mounted with a cautery forceps and a foot pedal, is tissue dissection as a result of cellular protein denaturation with generation of higher focal thermal energy. Thus surrounding tissue is affected minimally from this higher focal thermal energy. At first sight, this system closely resembles bipolar cauterization, however the most important difference between them is that the system does not expose the targeted tissue to direct electrical current. The tip of the forceps contains a specialized gadget which converts electrical energy generated from power supply into very high frequency thermal energy.^{5,7}

In this prospective study, TWS and cold dissection method were compared with respect to peri/postoperative parameters under the light of current literature.

Materials and Methods

The Fifty four patients who had undergone bilateral tonsillectomy for chronic and recurrent tonsillitis in our clinics between March and September 2006 were included in this study. Patients who had adenoidectomy and similar procedures in addition to tonsillectomy and patients with hemorrhagic diathesis were excluded from the study. All surgical interventions were performed under general anesthesia. We performed the TWS technique to 24 patients and cold dissection technique was performed to 30 patients as the tonsillectomy procedure of choice.

All patients were induced with 5 mg/kg thiopental, 1 mcg/kg fentanyl and 0.6 mg/kg rocuronium for general anesthesia. They were intubated with an orotracheal intubation tube. All patients received patient controlled analgesia (PCA) with tramadol as a postoperative pain management method for 24 hours. Their parents were informed about the PCA machine.

In the cold dissection technique, the tonsil is grasped and medialized with an Allis clamp. After incising the anterior plica, the tonsil is separated from its upper pole with a dissection spoon through to its lower pole. Tamponade of the fossa is maintained till extraction of the other tonsil. After completion of the procedure, hemostasis is achieved with techniques of suture or ligature of all bleeding points.

In TWS a power supply mounted with an ultraslim bayonet forceps and foot pedal is used. Without incision, both tonsils are retracted to the midline, and the anterior plica is grasped with an ultraslim bayonet forceps and coagulated using 3-4 level thermal energy. Subsequent dissection is accomplished through to the lower pole with the same forceps using 8-level thermal energy. The lower pole is coagulated with the same forceps and the tonsil is extracted. Hemostatic control is done with the same forceps switching the power supply to level 3-4.

For calculation of the amount of intraoperative bleeding, the postoperative weight of the tampons used was subtracted from the dry preoperative values of the tampon and the result is added to the amount of the blood collected in the aspiration bottle. Operation time is derived from the beginning of tonsillar dissection up to complete haemostatic control.

During postoperative period all patients received the same analgesic regime (PCA machine with tramadol and on the postoperative 2nd day and from

the 3rd day onwards paracetamol suspension was given to patients every 8 hours (max 500 mg/d).

On the 1st postoperative day, all patients were discharged and they were requested to fill follow-up forms during the 7 days prior to their control date indicating the time to recovery of normal vocal activity, normal oral ingestion ability and postoperative pain score.

They were asked to record the severity of their daily perception of pain on a 10 point scale (VAS: visual analogue scale) (0: no pain, 1: very light pain; 10: the most severe pain). In addition, duration of complete resolution of postoperative pain, recovery of normal vocal activity, normal oral ingestion ability and postoperative complication were evaluated as the time lapsed till the patient discontinued routine analgesic therapy.

Statistical analysis

For the assessment of data the SPSS for Windows version 10.0 statistical package program was used. For comparisons Student t, Mann Whitney U, Fisher exact and chi-square tests were utilized. $P < 0.05$ was considered significant.

Results

In our department, on 54 patients in whom bilateral tonsillectomy was performed, 24 (10 male, 14 female) patients' age ranged from 7 to 12 years (mean age: 10.38 years) underwent TWS, and 30 patients age' ranged from 7 to 13 years (15 male, 15 female; mean age 10.77) underwent the cold dissection technique. A statistically significant difference between mean ages of both groups could not be found ($p > 0.05$). Mean operative time was 13.92 ± 3.66 minutes for TWS and 37.80 ± 14.13 minutes for cold dissection. The difference between mean operative time of the two groups were statistically significant ($p < 0.001$).

Mean intraoperative blood loss was 6.33 ± 4.27 ml for TWS and 30.17 ± 10.95 ml for cold dissection respectively. Primary hemorrhage was seen in 3 patients in the TWS group, haemostatic control was done with the bayonet forceps of the TWS, only one patient of primary hemorrhage patients had postoperative bleeding in the first postoperative week. Peritonsillar or uvular edema did not develop in any of the patients. Conventional ligatures were used for 10 patients who had primary hemorrhage in the cold dissection group to achieve hemostatic control. None of the patients in this group experienced postoperative bleeding. A statistically significant difference between groups for intraoperative blood loss was detected ($p < 0.001$).

In both groups, from the first postoperative day on, complaints of pain decreased stepwise. However, from the first to the fifth postoperative days ($p < 0.05$) (Table 1) higher pain scores were observed in the TWS group than the in the CDM group (Figure 1, Table 1). In parallel with this finding, mean time to recovery of normal phonation

Table 1. Mean pain scores for postoperative days of thermal welding system (TWS) and cold dissection method (CDM) groups.

Days	TWS Group	CDM Group	MW	p
1 st	5.8 ± 1.99	4.6 ± 2.99	35.5	0.26
2 nd	5.6 ± 1.84	3.8 ± 2.74	24.5	0.05
3 rd	5.4 ± 2.5	3 ± 1.94	21.5	0.027
4 th	4 ± 2.31	1.8 ± 2.15	22	0.029
5 th	3.4 ± 1.35	1.6 ± 2.22	24.5	0.05
6 th	2.8 ± 1.03	1.6 ± 2.22	31	0.133
7 th	2.8 ± 1.93	1.6 ± 2.22	34.5	0.22
Fr	38.8	36.59		
P	0.0001	0.0001		

activity was 5.42 ± 1.25 days for TWS and 2.37 ± 1 days for the cold dissection group respectively ($p < 0.001$). However time to recovery of normal oral ingestion activity was not significantly different between both groups ($p > 0.05$) (5.9 ± 0.99 days in the TWS group, 5.5 ± 1.35 days in the CDM groups $p: 0.505$).

In addition to these findings in the TWS group the number of the surgical instruments used is less than for the CDM group.

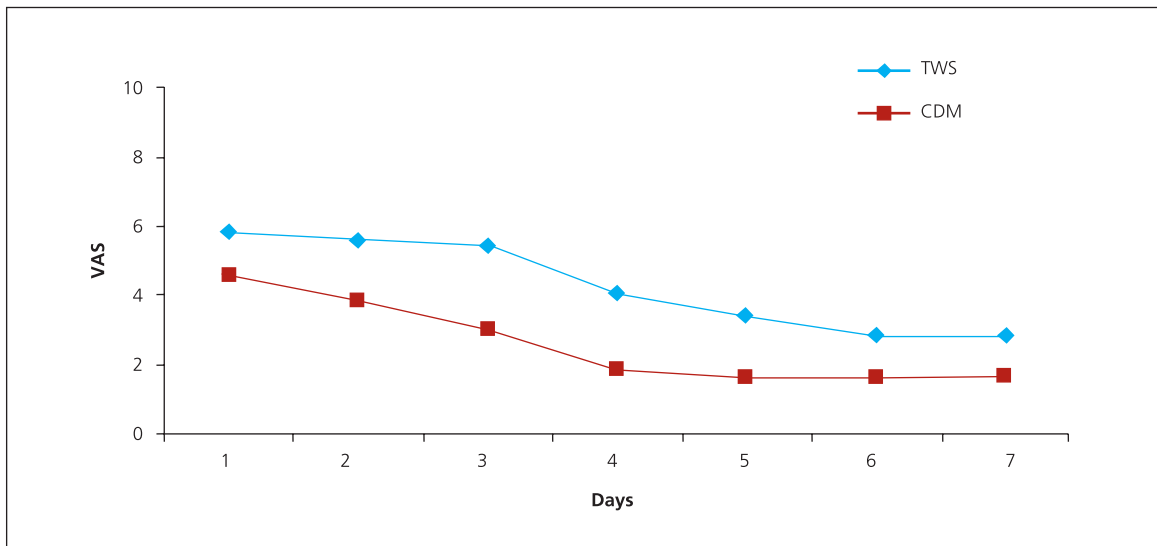


Figure 1. Postoperative pain scores according to postoperative days. [Color figure can be viewed in the online issue, which is available at www.turkarchotolaryngol.org]

Discussion

Tonsillectomy is one of the most frequently performed surgical interventions in otorhinolaryngology.^{1,2} Along the course of history various techniques and methods have been developed. Each method has its own advantages and disadvantages. However the main target is to establish a method which can reduce operative time, minimalise per/postoperative risk of bleeding, decrease number of complications, and enhance postoperative comfort of the patient as well.^{1,3,5-7}

TWS is a new method that has been offered by technological advances. This device is based on the principle that the focal pressure effect of direct thermal energy on tissue causes protein denaturation which enables easy dissection without harming surrounding tissues. However comparative studies of this newly developed method with available tonsillectomy techniques are rarely mentioned in literature. In their study, Karatzias et al. evaluated TWS for per/postoperative bleeding, operative time, and risk of complications, and proposed it as a safe and an effective method.⁶

In Karatzias's study⁶ 50 patients were evaluated and there was no measurable bleeding during surgery in any case. Postoperative hemorrhage and other complications were not seen.

The second study of Karatzias et al.⁷ which compared TWS and bipolar electrocautery, showed no significant difference regarding mean operative time. Marked reduction in the postoperative pain score and mean time for return to normal diet was noted. This was the first comparative study performed regarding TWS and bipolar electrocautery tonsillectomy published in literature.

Due to aforementioned minimal thermal reflection of TWS to the adjacent tissues, postoperative pain seems to be minimal in Karatzias' study. Supporting this result was the mean time that it took

to return to normal diet and recovery of normal phonation which were lower than bipolar electrocautery surgery.⁷

In our study, we compared cold dissection and TWS. We found higher pain scores for TWS than CDM. There is no thermal energy in CDM meaning that there is no thermal injury to adjacent structures which is one of the causes for pain.

Another study compares cold dissection with another hot technique bipolar electro dissection including 545 children; primary, secondary hemorrhage and postoperative pain were studied. Secondary hemorrhage was higher in the electro dissection technique compared to cold dissection approximating 2.3% compared to 1% respectively. Patients suffered more severe pain in the electro dissection technique compared to the cold dissection technique.⁸

One of the latest and only studies is made in 60 children with TWS using a different probe that is the thermal ligature shear (TLS). In this study, time of operation and bleeding during surgery were measured. It showed that TWS with the TLS is a very effective procedure providing sufficient hemostasis and diminished operating time (20 minutes).⁹ Actually this technique is not very different than TWS using the bayonet forceps. In this study they stated that the TLS provides better visualization than the bayonet forceps.

The newest and first comparative study in literature between cold dissection and TWS showed that thermal welding tonsillectomy was significantly less painful than CDM, from the first to the fourth postoperative days ($p < 0.05$).¹⁰ Unfortunately, our data could not support the conclusion that adults undergoing tonsillectomy with TWS had less pain. This study is different from our study in the fact that all patients include in the study were adults whereas our study included children patients only.

Though TWS is a new tonsillectomy technique with advantages such as shorter operation time, less blood loss and the usage of fewer surgical instruments which was used both as a hemostatic and dissection tool, for children patient's post operative comfort it can be considered to be inferior at least to cold dissection.

Advantages including postoperative frequency of bleeding when compared with other techniques have not been recognized yet. More comparative studies with larger series are needed.

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Conflict of interest statement:

No conflicts declared.

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