

Tonsil Surgery in Youths: Good Results With A Less Invasive Method

Elisabeth Ericsson, CRNA, MScN; Elisabeth Hultcrantz, MD, PhD

Objective: Comparison of two types of tonsil surgery for 16- to 25-year-old patients, with respect to primary morbidity, snoring, and recurrent infections after 1 year. Teenagers and young adults are a significant proportion (26%) of the population that receive tonsil surgery each year and appear to suffer more pain than younger children. Recurrent tonsillitis, in combination with obstructive problems, is the main indication for surgery. **Method:** One hundred fourteen patients 16 to 25 years of age were randomized to tonsillectomy (TT) with radiosurgery (RF) (Ellman International) or to cold tonsillectomy (TE). Pain and analgesics were logged until patients were pain free. **Results:** Thirty-two patients were operated on with TT and 44 with TE. The TT group had less blood loss during surgery and no postoperative bleedings, compared with the TE group (2 primary and 4 late hemorrhages). The TT group recorded significantly less pain from the first day, had less need of analgesics (diclofenac and paracetamol), and were pain free and in school/at work 4 days earlier than the TE group. After 7 days, the TE patients had lost a mean of 1.8 kg compared with TT, with no significant weight loss. After 1 year, both groups were satisfied. The positive effect on snoring was the same for both groups. There were few throat infections in both groups. **Conclusion:** TT with RF is an effective method for tonsil surgery for many teenagers and young adults, with much less postoperative morbidity than regular TE. Long-term follow-up is necessary. **Key Words:**

Tonsillectomy, tonsillectomy, radiofrequency surgery, postoperative pain, snoring, recurrent tonsillitis.

Laryngoscope, 117:654–661, 2007

INTRODUCTION

Tonsil surgery is common among teenagers and young adults. In Sweden during 2004, 26% of all such surgery was performed on the age group 16 to 25 years.¹ In contrast with the pediatric population, the indication for surgery is usually recurrent infections and only rarely because of tonsillar hypertrophy with obstructive symptoms solely. Infections causing repeated absences from school and academic studies may seriously risk a young person's future by resulting in less success in high school, college, and even in working life.

The natural function of the tonsils in youths is not very well understood. During the same period as the palatine tonsil tissue for most individuals involutes, the remaining tissue still is immunocompetent, both with respect to protein synthesis² and induction of b-cell responses.³ It is not known whether this function is disturbed in infection-prone individuals. However, quite often, the youths with recurrent throat infections also have hypertrophied tonsils that give them obstructive problems, at least during the infections. It is not clear whether this hypertrophy is caused by the throat infections or whether the hypertrophy per se makes these youths more likely to develop tonsillitis.⁴ The involution of the tonsils normally begins when the immune system is fully developed. This would be at the age of 10 to 12; development of obstructive problems caused solely by physiologic tonsillar hypertrophy would not be expected after that.

According to the most recent Cochrane review,⁵ the long-term effects on infection after "adult" tonsillectomy (TE) have not yet been established. Paradise et al.⁶ demonstrated among severe tonsillitis-affected children up to the age of 15 years that the number of throat infections after TE was reduced the first 2 years postoperatively but later was the same for both operated and nonoperated children. It is thus not clear whether the same situation holds for young people.

In recent investigations, we have shown^{7,8} that children up to the age of 15 with tonsillar hypertrophy, with and without recurrent infections, benefit from a less invasive tonsil surgery, tonsillectomy (TT) with ra-

From the Department of Neuroscience and Locomotion, Division of Otorhinolaryngology, Faculty of Health Sciences, University of Linköping, Linköping, Sweden.

Editor's Note: This Manuscript was accepted for publication December 5, 2006.

Financial support for this project was received from the Research Council of South East Sweden (FORSS), Capio Research Foundation, Sweden, the County Council of South East Sweden and the Research Foundation of Ollie & Elof Ericsson, Sweden. The authors have also received technical advice and support from Ellman International, Oceanside, New York, U.S.A., which provided them with specially made instrument tips.

Send correspondence to Dr. Elisabeth Hultcrantz, Professor of Otorhinolaryngology, Department of Neuroscience and Locomotion, Division of Otorhinolaryngology, Faculty of Medicine, Linköping University, SE-58185 Linköping, Sweden. E-mail: elihu@inr.liu.se

DOI: 10.1097/mlg.0b013e318030ca69

diosurgery (RF) (intracapsular partial TE with ellman Surgitron, Oceanside, NY). This applies in respect to both postoperative morbidity and to infections and snoring up to 3 years after surgery.⁹

The purpose of the present investigation is to 1) describe the RF method for TT when used on young people (16–25 yr), with recurrent infections as the primary reason for surgery and 2) to evaluate the technique in comparison with regular (cold steel) TE with respect both to postoperative morbidity and risk for further infections/obstruction within the first year.

METHODS

The study was approved by the Ethics Committee at Linköping's University. Three ear, nose, and throat (ENT) clinics within the same region of Sweden participated. One hundred fourteen patients 16 to 25 years of age on the waiting list for tonsil surgery were randomized and thereafter invited to participate in the study and informed about both treatment alternatives.

The patients eligible for the randomization were those with recurrent infections and with more or less obstructive problems (snoring, experienced restriction in the throat during exercise or eating). Patients who had been treated with antibiotics for throat infections during the last 3 months, had been treated for peritonsillitis, and those whose records stated that their tonsils were small were excluded from randomization. Written consent to the randomized choice was obtained from the patients and, for those under 18 years old, also from both parents.

Before surgery, the patients completed 1) a questionnaire, constructed for the study, concerning obstructive problems and history of tonsillitis, 2) the Swedish version of the health related quality of life instrument, Study Short Form 36 (SF-36),¹⁰ and 3) a self-rated health visual scale, Euroqol Visual Analogue Scale (EQ VAS).¹¹ The EQ VAS, one part of the EQ 5D, contains a vertical rating scale ("thermometer") from 0 to 100, with 0 being the "worst imaginable health state" and 100 being the "best imaginable health state," on which the patients mark how they perceive their health on that particular day. Except for the EQ VAS data, the results from the health related instruments will be published later with the 1 year follow-up.

At a presurgical office visit 2 weeks before operation, the indication for surgery was re-evaluated by a physician. The design of the study, the rating scales, and the schedule for taking the analgesics were explained by the nurse/researcher (E.E.).

While fasting, the patients arrived at the clinic in the morning on the day of surgery. Current weight was measured. The patients remained in the clinic postsurgery between 6 to 24 hours depending on the medical assessment and local tradition (at 1 clinic, all patients stayed overnight). The day after discharge, all patients were contacted by phone, and during the entire postoperative period, they had a direct number to call (to E.E.).

Tonsillotomy With Radiosurgery

The ellman 4.0 Mhz Surgitron Dual Radiowave unit (Ellman International Oceanside, NY) was used. A neutral electrode (antenna) was placed under the patient's shoulder and connected to the Surgitron (Fig. 1). Local anesthesia including vasoconstrictor (0.25% Marcaine-adrenaline) was slowly injected into the tonsillar tissue on both sides. A 2 cm wide gauze strip was pushed through the fossa supratonsillar into and along the groove between the tonsil and the posterior pillar to protect the posterior pillar (Fig. 2A). In adults, this groove can be very shallow.

A needle instrument tip was attached, and the Surgitron was activated. Superficial vessels were coagulated with 10% power (15 W). After changing to the cutting mode and increasing



Fig. 1. Ellman 4.0 Mhz Surgitron Dual Radiowave unit, Htz sling, needle, and neutral electrode.

to 15% power (35 W), an incision was made parallel to the anterior pillar up and over the upper pole without holding/pulling of the tonsil (Fig. 2B). After changing to the Htz tonsil sling (Fig. 2C) to the cut/coagulation mode at 40% power (45 W), the tonsil was grabbed with a fine artery forceps so that the incision opened up and the tonsil was cut through with a smooth movement down to the gauze protecting the pillar. If the groove into which the surgeon was to push the gauze strip was too shallow, the cut was made only halfway through the tonsil and the final incision performed from behind. An ordinary tonsillar swab was pressed against the remaining tonsillar surface for hemostasis. It is important to avoid taking too much tonsillar tissue and to hold to the first incision line. When both sides were finished, the final coagulation of remaining small vessels was performed either with the needle or the ball instrument tip (Fig. 2D).

Tonsillectomy

Local anesthesia including adrenaline was applied under the mucus membrane of the tonsil, medially of the anterior pillar. The tonsil was pulled medially so that the mucous membrane could be incised at the bottom of the fossa supratonsillar and the tonsil could be freed outside of its capsule without damage to the anterior pillar.

The upper pole of the tonsil was freed and the tonsil blunt dissected outside the capsule and removed at the tongue base. Diathermy or ligatures were used for hemostasis during the dissection.

Adenoidectomy

Adenoidectomy was performed if necessary. An ordinary ring knife was used under full vision by placing a mirror in the throat and pulling the soft palate forward using two catheters through the nose to the mouth. The removed adenoid tissue was sent for Pathological Anatomical Diagnosis to exclude lymphoma or other pathologies.

Anesthesia and Pain Treatment

Premedication was given orally, paracetamol 2 g and diclofenac 50 to 100 mg. Two of the ENT clinics used intravenous induction with propofol and fentanyl and maintained with sevoflurane/air/O₂, and the third used total intravenous anesthesia with remifentanyl and propofol. Oral intubation was performed.

Postoperative analgesia was given with paracetamol 1 g administered orally every 4 hours during the first 24 hours (max 4 g/24 hr loading dose not included) and diclofenac 50 mg three

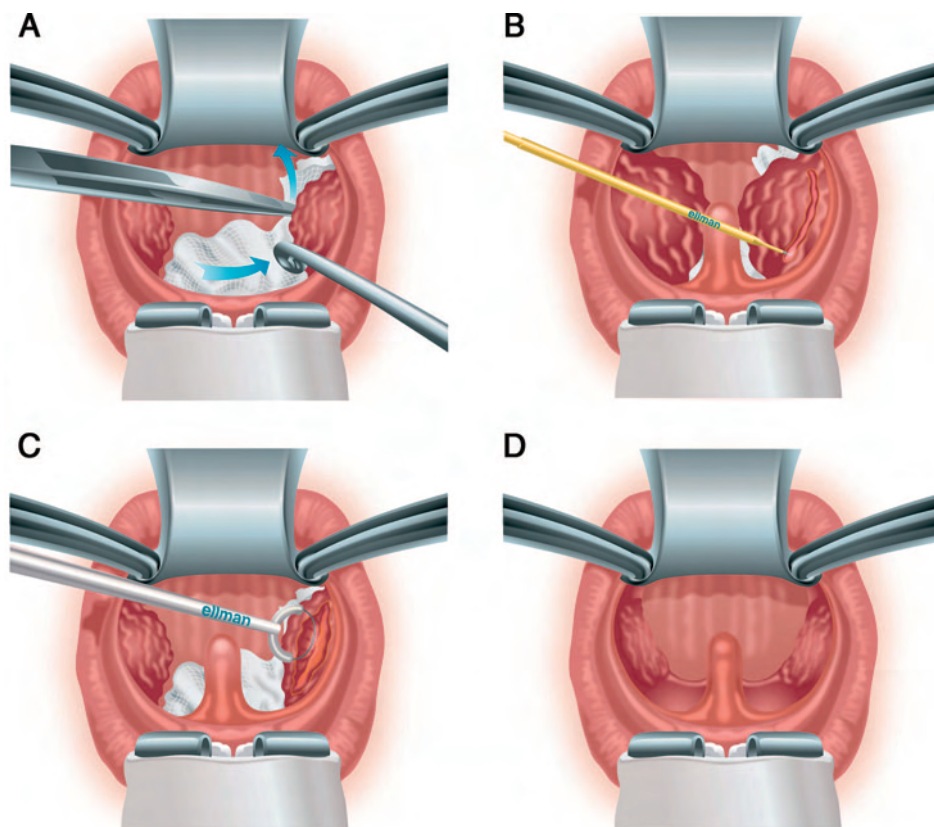


Fig. 2. (A) After injection of local anesthesia into tonsil, a 2 cm wide gauze strip is pushed into groove between tonsil and posterior pillar for protection. (B) Incision is made along anterior pillar with needle instrument. (C) Htz sling is used to cut through tonsil. (D) Final result, normal sized tonsils.

times (max 150–200 mg/24 hr including loading dose). Additional morphine or ketobemidone intravenous were titrated when the registered pain score “was equal to or more than 3.” Medication continued with paracetamol and diclofenac after discharge as long as needed. The patients were instructed to first withdraw diclofenac and thereafter reduce the dosage of paracetamol while keeping their pain level “below 3” (e.g., accepting a minor/slight pain level). The instructions for pain medication were given verbally and in writing.

Pain Registration

A 7-point verbal rating scale in which 0 was no pain and 6 the most pain possible was used. In the hospital, pain was recorded every hour the patient was awake. After discharge, he/she logged the experienced pain once a day in the evening, indicating the highest pain level experienced any time during that day. The number and dosage of analgesics was also logged. This procedure continued until the patient was pain-free, at which time the logbooks were mailed in.

No restrictions were placed on food intake. In the logbook, the patients recorded each day how difficult food intake had been using a 5-point scale (1 = no problems, 5 = quite severe problems in eating and drinking).

The seventh day after surgery, a postoperative check-up office visit was carried out. The patient scored her/his health state on the EQ VAS, and the weight was measured once again.

One year after surgery, the patients were contacted by mail, and they answered a questionnaire about their present situation with respect to snoring and infections since the surgery. A second SF-36 and EQ VAS were also completed. The detailed results from the follow-up will be published elsewhere.

Statistical Analysis

Statistical analysis was performed with SPSS Windows version 11.0 (Chicago, IL). Parametric data are expressed as number of cases and mean \pm SD. Nonparametric data are expressed in median and interquartile ranges. Student’s *t* test is used for comparison between surgery method and age, duration of surgery and anesthesia, blood-loss, and number of doses of pain relief medication given. Chi-square analysis was used when testing for sex differences. The Mann-Whitney *U* test was used to analyze differences between surgical methods in relation to patient activity, eating problems, EQ VAS, and pain level. *P* values less than .05 were considered statistically significant.

RESULTS

Demographic Data and Dropouts

Of 114 randomized patients, 76 were operated according to the outcome of randomization: 32 TT and 44 TE. A diagram of study enrollment, exclusions, and dropouts is presented in Figure 3. One TT was changed to TE during surgery because of difficulties in maintaining intracapsular hemostasis and was not included in the postoperative analysis. All postoperative logbooks were collected, and 100% answered the inquiry after 1 year. The study group consisted of 49 females and 27 males, with a mean age of 18.7 ± 3.1 years.

Table I presents the demographic data and the answers from the preoperative questionnaire. There was a significant difference in the sex ratio ($P < .05$), with more girls in the TE group. Otherwise, the groups did not differ with respect to background data. All except 1 of the 76

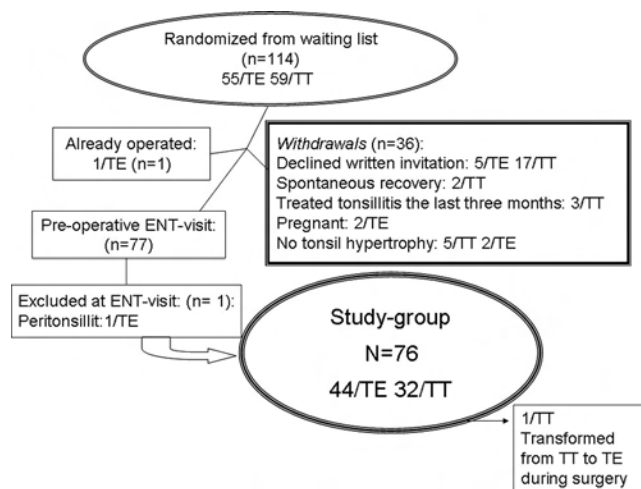


Fig. 3. Study enrollment, exclusions, and drop-outs.

patients had had one or more episodes of tonsillitis in addition to obstruction. The percentage of antibiotic-treated tonsillitis episodes in each group the year before surgery did not differ significantly (Fig. 4).

Sixty-nine of 76 of the study patients underwent tonsil surgery solely; 7 of 76 also had adenoidectomy performed (2 TE and 5 TT). One TT was adenoidectomized the year after surgery because of persistent stuffed nose.

Perioperative Events

There were no primary or secondary hemorrhages in the TT group. Two primary postoperative bleedings occurred in the TE group. One was stopped by "suction on ice," the other by injection of desmopressin, and both patients continued with tranexamic acid (1 g × 3) for 4 days. Four TE patients had secondary hemorrhage. Of these,

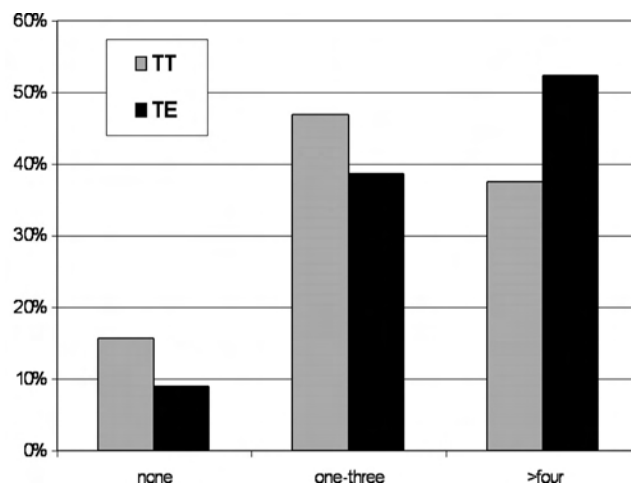


Fig. 4. Percentage in each group of antibiotic-treated tonsillitis the year before surgery. Tonsillectomy (TE, n = 44), tonsillotomy (TT, n = 32). No sign difference (Mann-Whitney U test).

one was severe, occurring on the ninth day, and had to be treated in the operating room. The other three were minor. For further perioperative data, see Table II.

Eighteen of 31 in the TT group were discharged on the day of surgery. None of the TE patients were discharged on the same day. Three patients stayed 2 nights in the hospital: one TE patient because of acute infection with pneumonia, one of the TE patients with primary bleeding for extra observation, and one TT patient stayed 2 nights because of nausea and vomiting caused by virosis in his family.

Postoperative Pain

There was no difference between males and females in the pain levels recorded or in the use of analgesics. The

TABLE I.
Demographic Characteristics for Tonsillectomy (TE) and Tonsillotomy (TT) Groups.

Variables	TE (n = 44)	TT (n = 32)	P Value, TT/TE	Total (n = 76)
Age, yr (mean ± SD)	19.6 ± 3.2	19.8 ± 2.6	ns*	18.7 ± 3.1
Sex, females/males (n)*	32/12	17/15	<.05†	49/27
Self-rated health, preoperative, EQ VAS (median)	70	80	ns‡	75
Sore throat in case history, yes/no (n)	44/0	31/1	ns†	75/1
Prevalence of snoring, never/sometimes/always (n)	1/27/16	0/13/19	ns†	1/40/35
Sleeping with open mouth, yes/no (n)	33/10	29/3	ns†	61/13
Dryness of mouth in morning, yes/no (n)	40/4	27/5	ns†	67/9
Prevalence of apneas, yes/no (n)	18/26	20/11	ns†	38/36
Refreshed by sleep, yes/no (n)	10/34	10/22	ns†	20/56
Frequent upper respiratory infections, yes/no (n)	33/11	23/9	ns†	56/20
Problems with swallowing, yes/no (n)	36/8	25/7	ns†	61/15
Influence on speech, yes/no (n)	30/14	19/13	ns†	49/27
Smoking, yes/no (n)	6/38	5/27	ns†	11/65
Close relative tonsillectomized person, yes/no/do not know (n)	28/17/0	19/12/1	ns†	46/29/1

*t test.

†Chi-square test.

‡Mann-Whitney test.

ns = not significant; EQ VAS = Euroqol Visual Analogue Scale.

TABLE II.
 Perioperative Data for Tonsillectomy (TE) and Tonsillotomy (TT) Groups.

Variables	TE (n = 44)	TT (n = 31)	P Value, TT/TE
Duration of surgery, min (mean ± SD)	29.1 ± 25.0	29.8 ± 27	ns*
Duration of anesthesia, min (mean ± SD)	58.7 ± 50	56 ± 15.8	ns*
Mode of anesthesia (inhalation/intravenous)	22/22	11/20	
Operative blood loss, mL (mean ± SD)	81.4 ± 99.2	18.4 ± 23.8	<.001*
Number of adenoidectomies (n)	2	5	
Primary/secondary hemorrhage‡ (n)	2/4	0/0	
Self-rated health, day 7, EQ VAS (median)	60	80	<.000†
Mean weight change, day 7, kg (mean ± SD)	-1.8 ± 1.5	-0.03 ± 1.1	<.000*
Days to normal eating (mean ± SD)	12.0 ± 3.1	7.9 ± 3	<.001†
Days to normal activity (mean ± SD)	10.6 ± 2.8	6.4 ± 2.3	<.000†
First pain-free day (mean ± SD)	12.8 ± 3.1	8.6 ± 2.1	<.000†
Days for intake of paracetamol (mean ± SD)	11.8 ± 2.8	7.7 ± 2.3	<.000*
Days for intake of diclofenac (mean ± SD)	8.8 ± 2.8	5.4 ± 1.9	<.000*

*t test.

†Mann-Whitney test.

‡Primary hemorrhage = within 24 hours; secondary = within 14 days.
 ns = not significant; EQ VAS = Euroqol Visual Analogue Scale.

difference in anesthetic techniques between the clinics did not influence the pain scoring or delivery of analgesics.

During the first 24 hours, the TE group received more doses of morphine or ketobemidone (intravenous) than the TT group ($P < .05$). The pain level recorded by TT and TE patients differed significantly from the second hour through day 14. Figure 5 shows the daily percentage of patients in each group recording "no pain" and the daily percentage of patients recording pain scores 3 to 6 ("pain" to "severe pain").

At the postoperative check-up on the seventh day, 8 of 31 of the TT group were pain free, and 17 of 31 scored "1" (slight pain) compared with the TE group, in which

none were pain free. Twelve of 44 in the TE group reported postoperative otalgia, and 1 of 31 in the TT group reported it. The self-reported health status (EQ-VAS) was lower for the TE group as compared with the TT group (Table II).

Twenty-one of 44 in the TE group made one or more extra telephone calls (to E.E.) to consult her about pain or bleeding. In the TT group 1 of 31 called once regarding pain. Extra visits to the physician because of pain or bleeding were made by nine TE and two TT patients. One of the TT patients had gotten a burn ulcer of the mandibular gingival during surgery and therefore came in for an extra check-up.

The prescription of analgesia with paracetamol and diclofenac was not sufficient for 50% of the TE group.

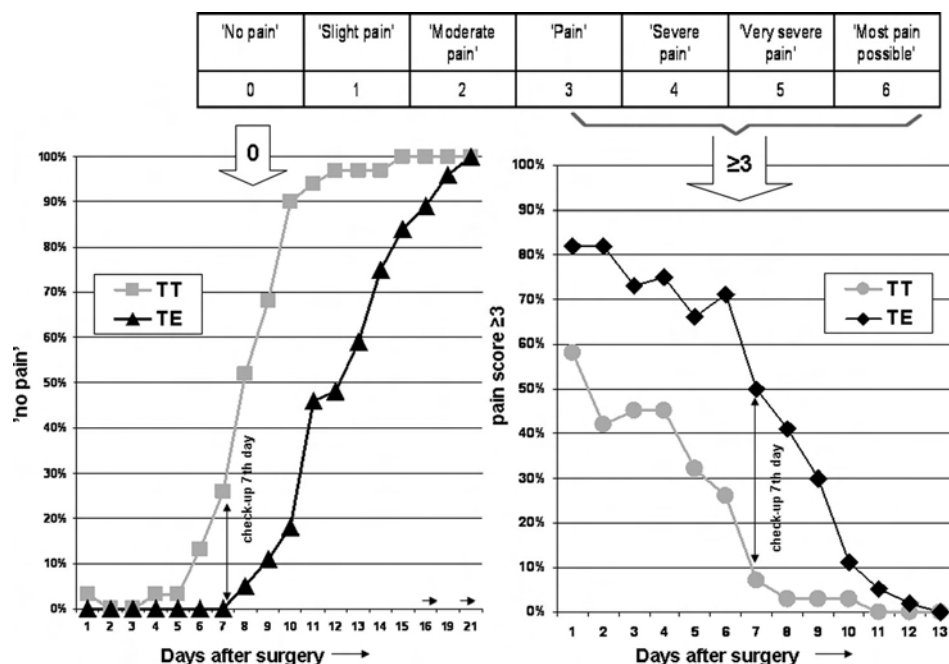


Fig. 5. Seven-point verbal rating scale (VPRS). Percentage of patients scoring "no pain" in each group, tonsillectomy (TE, n = 44) and tonsillotomy (TT, n = 31), from day 1 after surgery until all in both groups were pain free. Percentage in each group recording pain greater than 3 for each day. Difference in pain scores between TE and TT was significant from day 1 (Mann-Whitney U test).

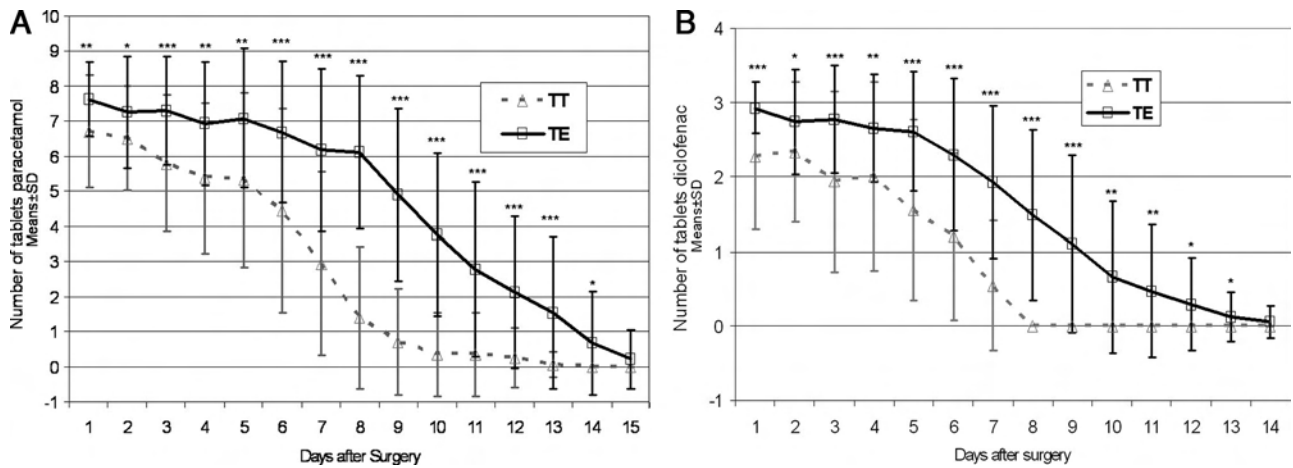


Fig. 6. (A) Number of tablets of paracetamol (500 mg) (mean ± SD) used by each group on each of 15 postoperative days. Sign difference between groups tonsillectomy (TE, n = 44) and tonsillotomy (TT, n = 31) from first day (Student's t test). * $P < .05$; ** $P < .01$; *** $P < .001$. (B) Number of tablets of diclofenac (50 mg) (mean ± SD) used by each group on each of first 14 postoperative days. Sign difference between TE (n = 44) and TT (n = 31) from first day (Student's t test). * $P < .05$; ** $P < .01$; *** $P < .001$.

Both groups followed the instructions to withdraw and reduce the analgesia, and the number of days to the end of medication and the total dosage of paracetamol and diclofenac differed significantly (Table II) (Fig. 6). Five TE and one TT patients with poor pain control received extra tramadol. Three TE, two of whom had had primary bleeding and one with gastritis, were prescribed paracetamol plus codeine instead of diclofenac. The one TE patient with severe secondary hemorrhage on the ninth day was changed from diclofenac to tramadol.

Postoperative Eating Difficulties and Activity

The degree of eating difficulties is shown in Figure 7. The TT group had returned to normal eating habits by day 7 compared with day 12 for the TE group. The TE group lost a mean of 1.8 kg during the first postoperative week compared with no significant weight loss for the TT group.

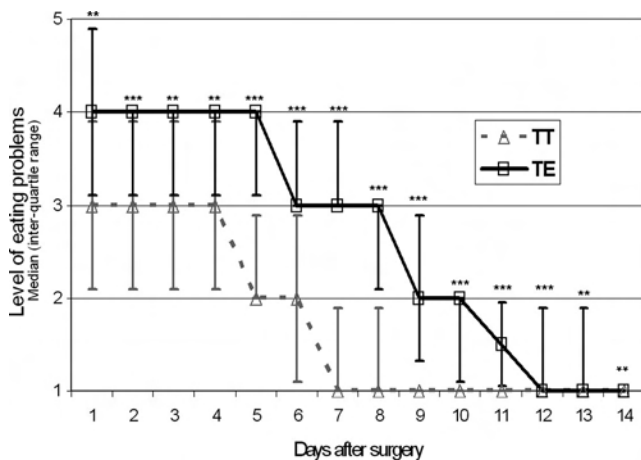


Fig. 7. Median logged level of eating problems after surgery within each group. Median and interquartile range (25th and 75th percentiles). Difference between groups was significant from first day (Mann-Whitney U test). 1 = no eating problems; 2 = almost none; 3 = some; 4 = severe; 5 = quite severe. * $P < .05$; ** $P < .01$; *** $P < .001$.

The TT group was back to normal activity, school/work, 4 days earlier than the TE group (Table II).

One Year Follow-Up

After 1 year, most youths were satisfied with the surgery they had received. Obstructive problems were improved for all, and there was no significant difference in experienced snoring between the groups. The number of infections had been low in both groups. These results will be further analyzed and presented later together with the SF-36 evaluation.

DISCUSSION

This study demonstrates that for youths, TT with RF is less painful and reduces the postoperative morbidity considerably in comparison to regular TE. The first pain-free day occurred 4 days earlier for TT than for TE, whereas in the previously studied younger age group, 5 to 15 years, the difference was 3 days.⁷⁻⁹ However, we can see that the older age group still experiences pain over a longer period than the younger children. Almost none of the youths who had had a TE was pain free at the postoperative visit on day 7. This is in agreement with the generally held expectation that older people have more pain after tonsil surgery than children. We followed a regime based on results reported by Thorneman and Åkervall,¹² who showed that a regular postoperative schedule for pain treatment after TE has advantages compared with taking analgesics only on demand.

Our analgesic schedule was sufficient for most TT patients, but 50% of the TE patients still had considerable pain after 1 week. TE patients would perhaps have required opiates from the very beginning to be sufficiently medicated; instead, an extra telephone call was necessary to get a prescription. Otherwise, it would be preferable to routinely plan for these calls as part of good care after all full TE, a step not necessary after TT.

The higher postoperative morbidity in the TE group was also seen in the EQ VAS scores and in weight loss

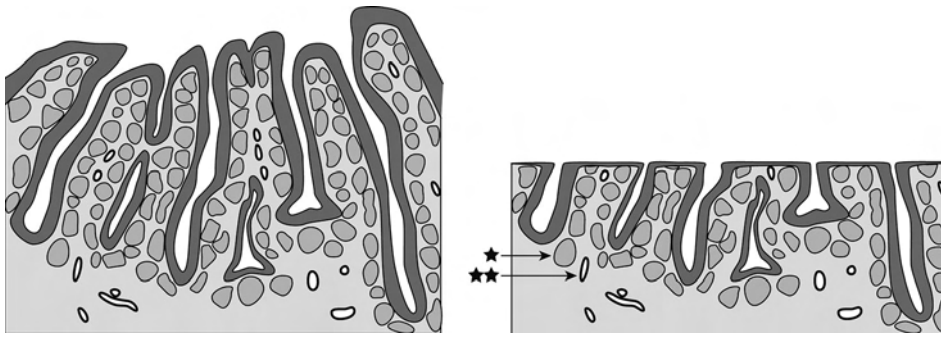


Fig. 8. Schematic picture of palatine tonsil before and after tonsillotomy, with crypts and lymphoid tissue. Blood vessels are seen in capsule and septae. *Lymph node; **blood vessel.

(which is a pain variable and not only a sign of reduced food intake). The TT group experienced less pain and also started to eat solid food sooner.

Shortening the period in pain not only reduces the suffering for the patient but also shortens the time away from school or work, yielding considerable socioeconomic gain. That many TT patients were voluntarily discharged on the day of surgery is a medico-economic gain when compared with the TE patients, who all stayed overnight. Moreover, the TT patients' lesser need to call for extra support as compared with the TE patients can also be measured in economic terms, as discussed by Valtonen et al.¹³

The study has the strength of being randomized and a complete follow-up. The sex distribution with more females in the total group is in accordance with the Swedish national quality assurance register, where substantially more girls than boys in the age group 15 to 20 years receive tonsil surgery each year.¹ A certain inclusion bias may exist because more patients "declined" the TT alternative at invitation than the TE. Because we did not analyze the group who declined, we cannot exclude that people with a heavier burden of tonsillitis may have hesitated when suggested that they be operated with TT. Because we required that patients have no throat infections 3 months presurgically, at the clinical examination, we could not see any differences between the two groups. All had hypertrophied tonsils, with the base filling out the tonsillar pouch and often with detritus filled crypts. This is different from younger children in that more often they have "shafted" smooth tonsils. Few of the youths complained of throat pain on a daily basis ("chronic tonsillitis"), but instead complained of recurrent infections (tonsillitis) with more or less high temperatures.

That these youth had hypertrophy of their tonsils is remarkable because the immunologic importance of the tonsils would normally have subsided at this age⁴ and the tonsils involuted. It is also interesting that 10% of the present study group still had obstructive adenoids. The recurrent throat infections might hinder a natural involution but may also be a sign of still ongoing "utility" for the individual.

The histology of the tonsils explains the difference in pain levels after TT compared with TE as well as the lower risk for postoperative bleedings. The tonsils are developed within the lamina propria with a special reticular epithelium folded into crypts where intense antigen transportation occurs. The lymphoid nodes with germinal centers

develop in reaction to this antigen load. Developed from the lamina propria, the tonsil capsule and its septae meeting the crypts contain blood vessels and vasoregulating nerve fibers. The larger vessels pass within the "capsule," but only the smaller radiate into the lymphoid parts.¹⁴

When TT is performed "following standard procedure" (keep ablation parallel with tonsillar pillars), the capsule and the bottom of the crypts are not damaged (Fig. 8). This minimizes the risk for bleeding from larger vessels and damage to autonomic nerve fibers. The decision of which instrument to use for TT is also important in avoiding unnecessary pain after TT because each produces different amounts of "lateral heat."¹⁵⁻¹⁷ A new alloy (patent pending) in the tool tips of the ellman 4.0 MHz Surgitron, which has come into use after the present study, has further reduced the lateral heat and appears to reduce the pain even more.¹⁸

The surgeon always has the responsibility to check the attachment of the tip to the handpiece because even a slight gap will result in energy leakage, with ulcers occurring as a result. This was probably the cause of the ulcer of the gingival mucosa that caused extra pain in one TT patient. The ulcer was not noticed until after surgery.

Performing a full TE "inside out"¹⁹ as an alternative to regular TE might be possible in children with shafted tonsils and poorly developed crypts but would not be recommended in youths with hypertrophied tonsils; one may hit larger vessels that may be present close to the bottom of the crypts (Fig. 8). A too deep excavation of the tonsil had been performed in the one case in the present study in which a TT was changed to a TE because of difficulties in stopping bleeding by compression.

A surgical technique can be very sophisticated, but if it does not achieve the goal of the treatment, it will still be worthless. The youths in this study were operated on for recurrent infections plus more or less obstructive symptoms. It was therefore important to look at the primarily positive results of lesser postoperative morbidity in light of the continued health development of the patients: the number of infections within the first year postoperatively was very low in both groups. This is in accordance with our earlier results with the younger age group,⁷ who have now been followed for 3 years.⁹ The low frequency of infection results in low power to measure significant differences between the surgical techniques.

The younger age group was most often operated on because of tonsillar hypertrophy and the youths in the present study for infections. In both situations, careful

examination of the medical records showed that throat infections appeared to be the underlying denominator for tonsillar hypertrophy. According to Fox et al.,²⁰ neither children nor adults waiting for tonsil surgery “outgrow” their condition in 2 years. The risk for recurrence of tonsillar hypertrophy after TT would theoretically be less for the youths compared with the pediatric population because the younger people are closer to the natural involution/aging of the tonsils than children still under maturation.⁴

In meta analyses, there is no strong evidence that nonsteroidal anti-inflammatory drugs more frequently give rise to episodes of clinically important bleeding than other analgesics.^{21,22} The number of bleedings in connection with TE in the present study was higher than that reported in the U.K. National audit, 10% compared with 2.9% with similar technique.²³ However, if the patients had not been participating in an investigation, the three minor late bleedings would probably never have been reported. With the size of the present study group, the differences in postoperative bleedings between TT and TE cannot be evaluated reliably. In this regard, reports to a national quality register for tonsil surgery would more adequately measure this outcome, especially if extended to include events after discharge.

Several investigations have shown that tonsil surgery for snoring in children and youths may not cure all patients: some may not be helped at all and other only improved temporarily.²⁴ This may be because snoring and obstruction have caused irreversible damage (orthodontic aberrations or vibration damage to the palatal tissues). Therefore, it is important to continue to follow the present study group, with respect both to infections and further development of snoring to establish, in a definitive manner, the value of performing TT instead of TE in young people with recurrent tonsillitis and snoring.

CONCLUSION

In young people who are prone to tonsillitis and have large tonsils, TT with RF appears to produce the same good effect as complete TE but with much less postoperative morbidity. The surgery appears to contribute to the natural involution of the tonsils. However, long-term follow-up is needed to confirm these 1 year results.

Acknowledgments

The authors thank the otorhinolaryngologists and the nurses who have participated in the clinical work. Special appreciation is extended to the patients who willingly participated.

BIBLIOGRAPHY

1. Socialstyrelsen, Sweden. The National Board of Health and Welfare, Statistic of Surgery 2005 (database online). Available at: <http://www.socialstyrelsen.se/Statistik/statistikdatabas/>. Accessed October 31, 2006.
2. Januszkiewicz A, Klaude M, Loré K, et al. Determination of in vivo protein synthesis in human palatine tonsil. *Clin Sci* 2005;108:179–184.
3. Quiding-Jarbrink M, Granström G, Nordström I, et al. Induction of compartmentalized B-cell responses in human tonsils. *Infect Immunol* 1995;63:853–857.
4. Brandtzaeg P. Immunology of tonsils and adenoids: everything the ENT surgeon needs to know. *Int J Pediatr Otorhinolaryngol* 2003;67:S1:S69–S76.
5. Burton MJ, Towler B, Glasziou P. Tonsillectomy versus non-surgical treatment for chronic/recurrent acute tonsillitis. *Cochrane Database Syst Rev* 2000;2:CD001802.
6. Paradise JL, Bluestone CD, Bachman RZ, et al. Efficacy of tonsillectomy for recurrent throat infection in severely affected children. Results of parallel randomized and non-randomized clinical trials. *N Engl J Med* 1984;310:674–683.
7. Hultcrantz E, Ericsson E. Pediatric tonsillectomy with radiofrequency technique: less morbidity and pain. *Laryngoscope* 2004;114:871–877.
8. Ericsson E, Wadsby M, Hultcrantz E. Pre-surgical child behavior ratings and pain management after two different techniques of tonsil surgery. *Int J Pediatr Otorhinolaryngol* 2006;70:1749–1758.
9. Ericsson E, Graf J, Hultcrantz E. Pediatric tonsillectomy with the radiofrequency technique: long-term follow-up. *Laryngoscope* 2006;116:1851–1857.
10. Sullivan M, Karlsson J, Ware J. The Swedish SF-36 Health Survey: evaluation of data quality, scaling assumptions, reliability and construct validity across general populations in Sweden. *Soc Sci Med* 1995;41:1349–1358.
11. Brooks R, with the EuroQual Group. EuroQol: the current state of play. *Health Policy* 1996;37:5372.
12. Thorneman G, Åkervall J. Pain treatment after tonsillectomy: advantages of analgesics regularly given compared with analgesics on demand. *Acta Otolaryngol* 2000;120:986–989.
13. Valtonen H, Qvarnberg Y, Blomgren K. Patient contact with healthcare professionals after elective tonsillectomy. *Acta Otolaryngol* 2004;124:1086–1089.
14. Geneser F. The digestive system. In: Geneser F, ed. *Textbook of Histology*. Copenhagen: Munksgaard, 1986;437–438.
15. Hultcrantz E, Linder A, Markström A. Tonsillectomy or tonsillectomy? A randomized study comparing postoperative pain and long-term effects. *Int J Pediatr Otorhinolaryngol* 1999;51:171–177.
16. Koltai PJ, Solares A, Koempel JA, et al. J. Intracapsular tonsillar reduction (partial tonsillectomy): reviving a historical procedure for obstructive sleep disordered breathing in children. *Otolaryngol Head Neck Surg* 2003;129:532–538.
17. Isaacson G. Pediatric intracapsular tonsillectomy with bipolar electrosurgical scissors. *Ear Nose Throat J* 2004;83:702–706.
18. Tutino M, Restivo S, Casanova S, et al. From the proceedings of the Asian Pacific Academy of Cosmetic Surgery/International Academy of Cosmetic Surgery World Congress, Tokyo, Japan, 2005;72–73.
19. Isaacson G. Inside-out complete tonsillectomy: extended intracapsular tonsillectomy for severe sore throat. *Ann Otol Rhinol Laryngol* 2005;114:757–761.
20. Fox R, Tomkinson A, Myers P. Morbidity in patients waiting for tonsillectomy in Cardiff: a cross-sectional study. *J Laryngol Otol* 2006;120:214–218.
21. Cardwell M, Siviter G, Smith A. Non-steroidal anti-inflammatory drugs and perioperative bleeding in paediatric tonsillectomy. *Cochrane Database Syst Rev* 2005;2:CD003591.
22. Krishna S, Hughes LF, Lin SY. Postoperative hemorrhage with nonsteroidal anti-inflammatory drug use after tonsillectomy: a meta-analysis. *Arch Otolaryngol Head Neck Surg* 2003;129:1086–1089.
23. Lowe D, van der Meulen J. National Prospective Tonsillectomy Audit. Tonsillectomy technique as a risk factor for postoperative haemorrhage. *Lancet* 2004;364:697–702; erratum, *Lancet* 2005;366:808; comments, *Lancet* 2004;364:642–643.
24. Guilleminault C, Li KK, Khramtsov A, et al. Sleep disordered breathing: surgical outcomes in prepubertal children. *Laryngoscope* 2004;114:132–137.

LIT-70-03