

# Microscopic tonsillectomy: A double-blind randomized trial

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**OBJECTIVE:** To evaluate microsurgical bipolar cautery tonsillectomy (TE<sub>mic</sub>) by comparing it with traditional blunt dissection tonsillectomy (TE<sub>trad</sub>).

**DESIGN:** A double-blind prospective randomized trial with stratification in two age groups.

**PATIENTS:** 200 consecutive patients undergoing tonsillectomy for tonsillar hypertrophy, or recurrent or chronic tonsillitis.

**OUTCOME MEASURES:** Duration of surgery, intraoperative bleeding, daily postoperative pain and otalgia, postoperative bleeding episodes.

**METHODS:** Duration of surgery and operative bleeding were evaluated by the anesthesiologist. The patients were instructed to record daily pain and otalgia. Final postoperative evaluation was done by a different physician, blinded to the surgical technique.

**RESULTS:** Mean intraoperative bleeding was 12 ml for TE<sub>mic</sub> and 36 ml for TE<sub>trad</sub> ( $p < 0.001$ ). Mean duration of surgery was 37 minutes for TE<sub>mic</sub> and 36 minutes for TE<sub>trad</sub> (NS). Otalgia was present in 41% of TE<sub>mic</sub> patients and 69% of TE<sub>trad</sub> patients ( $p < 0.001$ ). Daily postoperative pain was lower in the TE<sub>mic</sub> group than it was in the TE<sub>trad</sub> group for the entire study period (10 days). Postoperative hemorrhage was present in three TE<sub>mic</sub> patients (3%) and in eight TE<sub>trad</sub> patients (8%), a difference that did not reach significance ( $p > 0.1$ ).

**CONCLUSION:** Microsurgical bipolar cautery tonsillectomy compares favorably with traditional techniques in terms of intraoperative bleeding, postoperative pain, otalgia, and hemorrhage. This technique combines the hemostatic advantage of cautery dissection, the excellent visualization achieved by a microscope, and, with the use of a video, greatly improves the physician's ability to teach how to perform a tonsillectomy. (Otolaryngol Head Neck Surg 1997;117:641-7.)

Tonsillectomy (TE) is one of the most ancient operations and is still one of the most frequently performed surgical procedures. The numerous surgical techniques described are witness to the search for decreasing the operative complications and morbidity. Most recent studies compare TE techniques in terms of facility of surgical dissection and hemostasis.

Recently, Andrea<sup>1</sup> described a bipolar cautery dissection TE (TE<sub>mic</sub>) using the operating microscope. By providing excellent visualization, the microscope allows dissection to be started at the inferior tonsillar pole, the most critical location for TE hemostasis.<sup>2-4</sup> Microscopic dissection also allows identification of the lingual branch of the glossopharyngeal nerve, which, according to Andrea, is responsible for the postopera-

tive referred otalgia. The author also mentions that the intraoperative and postoperative bleeding, as well as the postoperative pain, were decreased with this technique.

To evaluate the advantages of this new technique, we compared it with the classical tonsillectomy in a double-blind randomized trial.

## PATIENTS AND MATERIALS

From November 1993 to March 1995, 200 tonsillectomy patients were included in the study. All patients scheduled for TE were candidates to enter the trial. Exclusion criteria included patients using anticoagulation drugs, taking nonsteroidal antiinflammatory drugs (NSAIDs) within 10 days of surgery, receiving antibiotic treatment,<sup>5,6</sup> having recent or past history of peritonsillar abscess, and refusing to participate in the study.

One hundred patients underwent microscopic tonsillectomy (TE<sub>mic</sub>), and 100 patients underwent traditional dissection tonsillectomy (TE<sub>trad</sub>). The type of surgical technique was randomized, following stratification into two age-groups because of different pain evalua-

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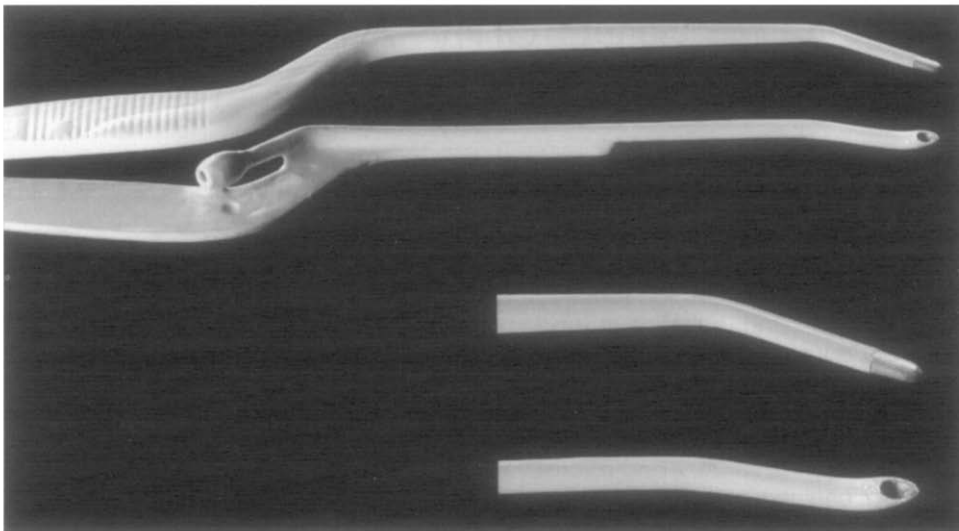


Fig. 1. The newly developed bipolar coagulation forceps that includes a suction channel within one of its prongs for the aspiration of blood and smoke. This prong is thicker than the other one, and its outer surface has been smoothed to allow its use as a blunt dissector.

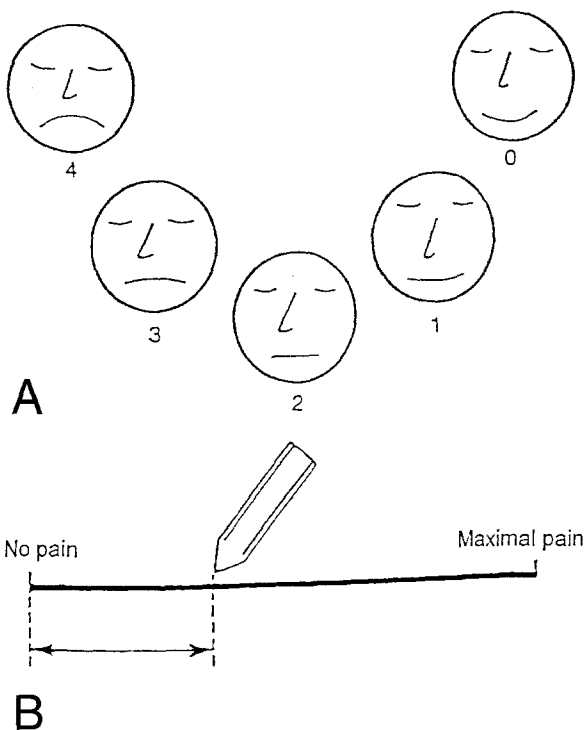


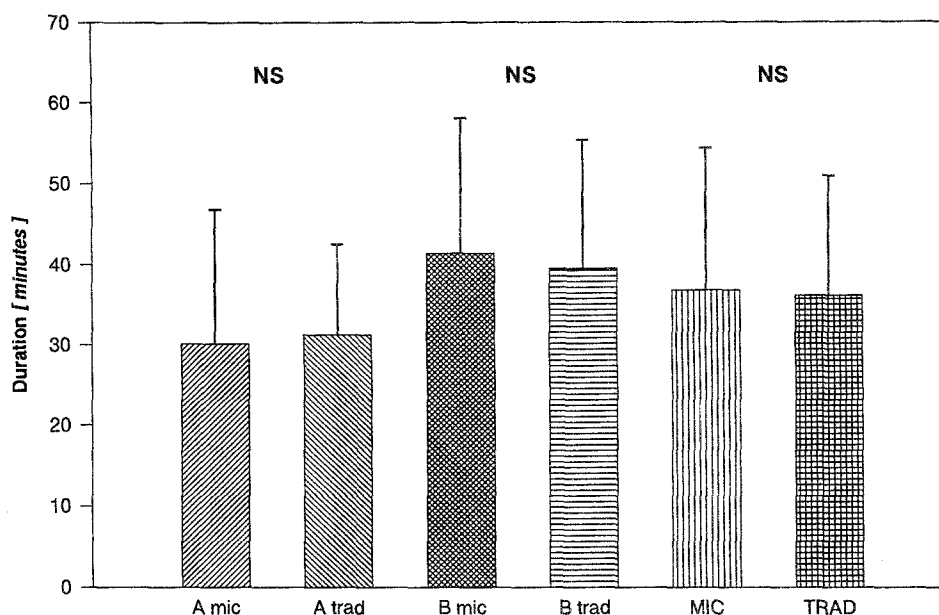
Fig. 2. Postoperative pain assessment drawings. **A**, "Happy faces drawings" scale used for children younger than 7 years of age. Children were asked to point to the face corresponding the most to how they feel. **B**, Analog visual scale used in adults and children older than 7 years of age. Patients were asked to place a mark along the line at a location corresponding to the intensity of their pain. The left edge corresponds to no pain, and the right one corresponds to maximal pain.

tion methods. Group A (age < 7 years) included 80 patients, and group B (age  $\geq$  7 years) included 120 patients. The patient and, for children, the parents were blinded to the surgical technique used, as was the physician who did the postoperative evaluation.

Most of the procedures were performed by residents in their early head and neck surgery training, under the supervision of an experienced surgeon familiar with both TE techniques. All operations were performed with general anesthesia. Traditional TE (TE<sub>trad</sub>) was performed under direct vision, starting at the superior tonsillar pole and using either sharp scissor dissection or blunt dissection with the Neivert raspary. Hemostasis was achieved with standard bipolar cautery, usually done after removal of the tonsil. Standard bipolar cautery is identical to bipolar cautery used in other head and neck procedures, such as parotidectomy.

Microscopic TE (TE<sub>mic</sub>) was performed using binocular microscopic visualization and illumination. The original Andrea technique was modified by using newly developed bipolar coagulation forceps. These bipolar forceps differ from standard bipolar cautery by the modification of one prong. A suction channel was included for the aspiration of blood and smoke, and its outer surface was smoothed to allow its use as a blunt dissector (Fig. 1). The dissection was started at the inferior tonsillar pole, and hemostasis was achieved during the dissection.

Some patients also required an adenoidectomy, which was performed using standard curetting techniques. Hemostasis was generally achieved by packing.



**Fig. 3.** Duration of surgery. The average standard deviation of the duration of surgery is plotted for each group and for the entire population. Statistical comparison between  $TE_{mic}$  and  $TE_{trad}$  using Student's *t* test was not significant at the 0.05 level.

**Table 1.** Results for each group and for the entire population

Parameters	Group A			Group B			Entire population		
	$TE_{mic}$	$TE_{trad}$	<i>p</i>	$TE_{mic}$	$TE_{trad}$	<i>p</i>	$TE_{mic}$	$TE_{trad}$	<i>p</i>
No. of patients	40	40	—	60	60	—	100	100	—
Duration of surgery (min)	30	31.2	0.73	41.4	39	0.43	36.9	35.9	0.67
Blood loss (ml)	7	26	<0.001*	15	42	<0.001*	12	36	<0.001*
Hemorrhage (N)	1	2	0.56	2	6	0.14	3	8	0.15
Admission for hemorrhage (N)	0	1	0.32	1	5	0.09	1	6	<0.05*
Average pain score days 1-5	4.05	5.86	0.12	4.61	5.95	<0.01*	4.33	5.90	<0.01*
Otalgia (%)	30	46	0.19	48	78	<0.01*	41	69	<0.001*

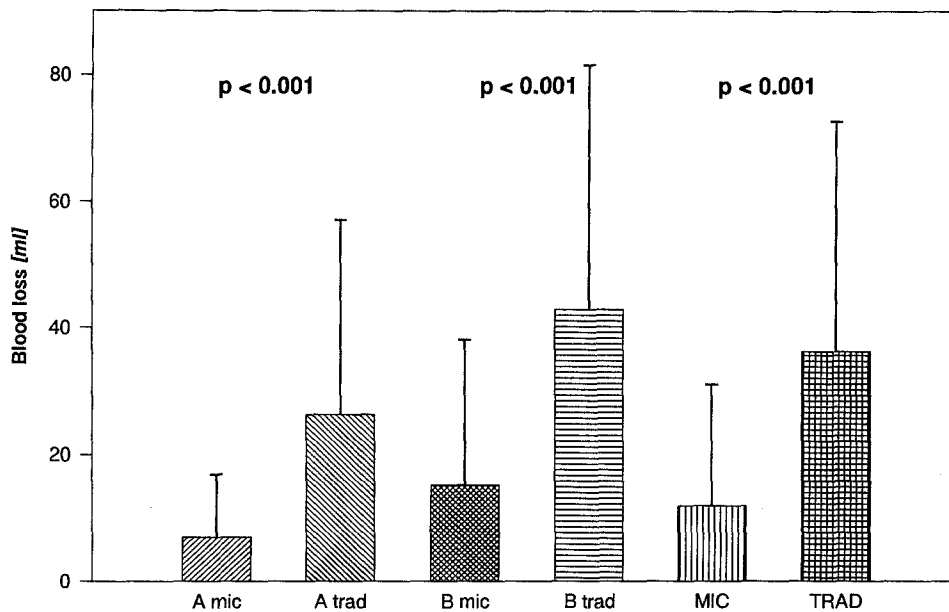
\*Statistically significant. See Patients and Materials for the statistical tests used.

In rare cases cauterization was used. A concomitant adenoidectomy was performed in 70% of group A and 2% of group B patients. In group A, both arms of the study ( $TE_{mic}$  and  $TE_{trad}$ ) had a similar percentage (70%) of concomitant adenoidectomies.

Outcome measures included duration of surgery, intraoperative bleeding, daily postoperative pain and otalgia, and postoperative bleeding episodes. Duration of surgery was evaluated by the anesthesia staff, starting from the beginning of the dissection and continuing until removal of the Crowe-Davis mouth retractor. In cases where an adenoidectomy also was performed, the duration was evaluated until the beginning of this second procedure. Intraoperative blood loss was estimated

by the anesthesiologist from the blood aspirated during surgery. If an associated adenoidectomy was necessary, it was performed after the TE, in order to estimate the TE blood loss accurately. The incidence of postoperative hemorrhage was evaluated during the hospital stay (2 days) by daily oropharyngeal inspections and for the next 10 days by a questionnaire given to the patient or the patient's parents. Patients and their parents were instructed to return to the hospital if any evidence of bleeding was present. Because our hospital is the only major emergency center in the area, missing any postoperative hemorrhage would have been unlikely.

In children younger than 7 years, postoperative pain evaluation used a "happy faces drawings" scale (Fig.



**Fig. 4.** Intraoperative blood loss. The average standard deviation of the intraoperative blood loss is plotted for each group and for the entire population. Statistical comparison between  $TE_{mic}$  and  $TE_{trad}$  using Student's *t* test was significant at the 0.001 level.

2A).<sup>7</sup> In patients older than 7 years, pain intensity was assessed by using an analog visual scale (Fig. 2B).<sup>8,9</sup> Initial instruction on the use of these pain scales was provided by the same pediatric nurse. Before discharge from the hospital, the operating surgeon assessed the patient's comprehension and further instructions were given if necessary.

The presence of otalgia and the ear(s) involved were noted daily. Tympanotomy tube placement was not an exclusion criterion. To rule out otitis media or posttympanostomy drainage as a cause for otalgia, the ears of all the children were evaluated at the first postoperative visit, 10 days after surgery. Pain evaluation sheets and otalgia assessments were returned, along with the hemorrhage questionnaire, during this visit. If patients missed this follow-up appointment, they were contacted by phone or mail and strongly encouraged to return for a clinic visit.

An analgesic medication (mefenamic acid), appropriately adjusted for the patient's weight, was prescribed. No routine postoperative antibiotics were given.<sup>5,6</sup> However, in 20 patients (10%) antibiotic administration was judged necessary. Also 21 patients (10.5%) either could not be reached or did not correctly fill out the postoperative questionnaire. Therefore, these 41 patients (20.5%) were excluded from the postoperative pain and otalgia evaluation ( $n = 159$ ).

Statistical analysis for duration of surgery and intra-

operative blood loss were done using the Student's *t* test. Significance of otalgia and postoperative hemorrhage differences were assessed with contingency analysis and  $\chi^2$  statistics. For each stratification group the daily pain scores were averaged and statistical significance assessed for each day with the Student's *t* test.

## RESULTS

The average duration of surgery was 36.4 minutes. The average duration for  $TE_{mic}$  was 36.9 minutes and 35.9 minutes for  $TE_{trad}$  (Table 1 and Fig. 3), a non-significant (NS) difference ( $p = 0.67$ ). In group A the TE durations were 30 minutes for  $TE_{mic}$  and 31.2 minutes for  $TE_{trad}$  (NS). In group B the duration was 41.4 minutes for  $TE_{mic}$  and 39 minutes for  $TE_{trad}$  (NS).

The average estimated blood loss for the entire population was 24 ml. The blood loss was 12 ml for  $TE_{mic}$  and 36 ml for  $TE_{trad}$  (Table 1 and Fig. 4), a statistically significant difference ( $p < 0.001$ ). The difference between the two techniques was more pronounced in group A: 7 ml for  $TE_{mic}$  and 26 ml for  $TE_{trad}$  ( $p < 0.001$ ). For group B, the difference in blood loss was also statistically significant: 15 ml for  $TE_{mic}$  and 42 ml for  $TE_{trad}$  ( $p < 0.001$ ).

No case of postoperative bleeding was encountered during the hospital stay of either group. There were 11 patients (5.5%) who consulted with a history of bleeding after TE. In four patients, physical examination did

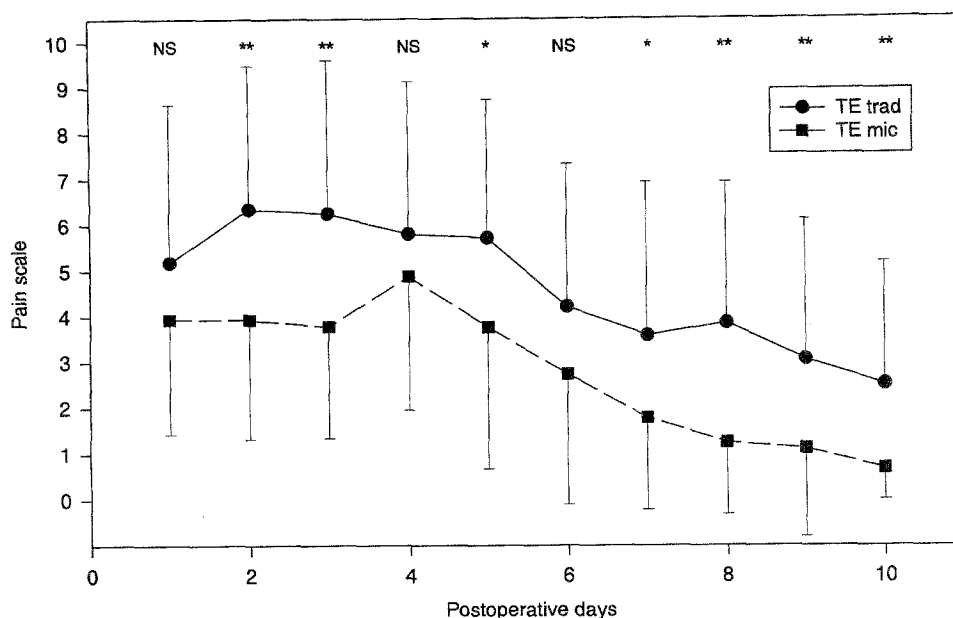


Fig. 5. Postoperative pain, group A. The daily average and standard deviation of the postoperative pain for children less than 7 years of age. The pain score was assessed using the "happy faces drawings" scale (Fig. 2A). Statistical comparison between TE<sub>mic</sub> and TE<sub>trad</sub>, using Student's *t* test is indicated on the top. NS, Nonsignificant ( $p > 0.05$ ); \*,  $p < 0.05$ ; \*\*,  $p < 0.001$ .

Table 2. Role of adenoidectomy in postoperative hemorrhage and pain

Parameters	Group A mic			Group A trad		
	With adenoidectomy	Without adenoidectomy	<i>p</i>	With adenoidectomy	Without adenoidectomy	<i>p</i>
No. of patients	28	12	—	28	12	—
Hemorrhage (N)	0	1	—	0	2	—
Admissions for hemorrhage (N)	0	0	—	0	1	—
Average pain score days 1-5	3.9	4.5	.94	5.9	5.6	.62
Otalgia (%)	30	18	.03*	43	50	.01*

\*Statistically significant. See method section for the statistical tests used.

not reveal any blood in the mouth or pharynx, and these patients were discharged without untoward consequences. None of these patients had a concomitant adenoidectomy. In seven patients (3.5%), bleeding or a blood clot within the tonsillar fossa was confirmed by the resident on call, and these patients were all hospitalized. In six patients, ancillary measures were sufficient to control the bleeding. In one patient (0.5%), the bleeding was significant enough to require reoperation for hemostasis. This patient was an adult who had had a TE<sub>trad</sub>. The distribution of patients admitted for bleeding shows one TE<sub>mic</sub> and six TE<sub>trad</sub> patients. This is the only statistically significant difference regarding postoperative hemorrhage between the two TE techniques.

For the entire study period (10 days), daily postoperative pain was lower in the TE<sub>mic</sub> group than it was in

the TE<sub>trad</sub> group. For group A (Fig. 5) the difference in pain scores was statistically significant for all postoperative days except 1, 4, and 6. Similarly, for group B (Fig. 6) the pain scores were statistically different for all postoperative days except 4, 5, 9, and 10.

The possible role of a concomitant adenoidectomy on postoperative pain was assessed by analyzing the postoperative pain data of group A patients according to whether an adenoidectomy was performed or not (Table 2). Concomitant adenoidectomy did not change the average pain score, but it was associated with increased otalgia ( $p < 0.05$  in both techniques).

No otitis media or posttympanostomy drainage was observed. Otalgia (Fig. 7) was present in 41% of TE<sub>mic</sub> patients and in 69% of TE<sub>trad</sub> patients, a statistically significant difference ( $p < 0.001$ ). This difference between TE<sub>mic</sub> and TE<sub>trad</sub> patients was also present within the

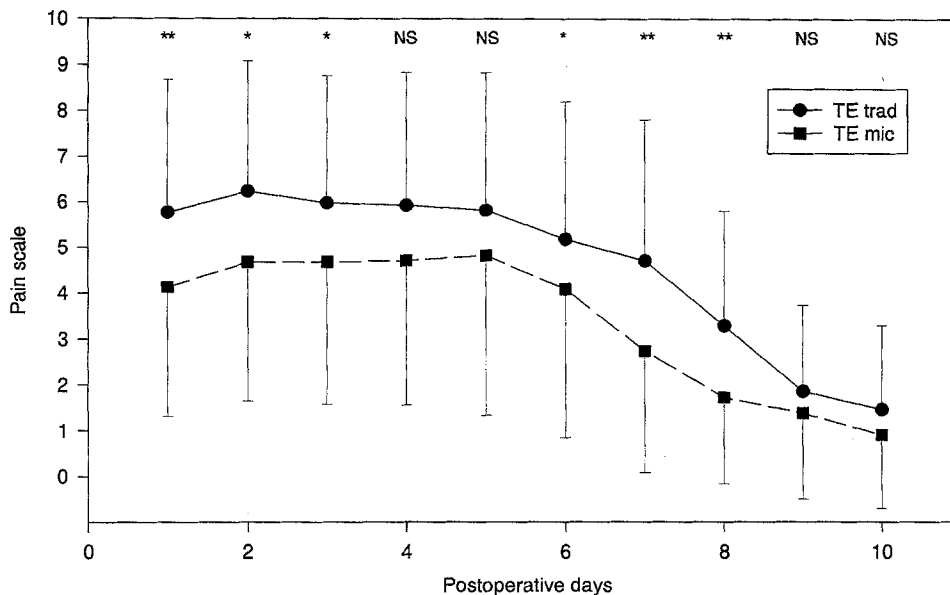


Fig. 6. Postoperative pain, group B. The daily average and standard deviation of the postoperative pain for adults and children older than 7 years of age. The pain score was assessed using the analog visual scale (Fig. 2B). Statistical comparison between TE<sub>mic</sub> and TE<sub>trad</sub>, using Student's *t* test is indicated on the top. NS, Nonsignificant ( $p > 0.05$ ); \*,  $p < 0.05$ ; \*\*,  $p < 0.001$ .

two groups, but reached statistical significance only for group B (Table 1).

## DISCUSSION

This double-blind, randomized trial covers the entire TE population, with the exception of patients with current or past peritonsillar abscess. The data show that microscopic bipolar tonsillectomy compares favorably with traditional dissection tonsillectomy. The microscope provides better illumination and magnification, allowing for greater precision in the dissection and hemostasis. The originality of our study is in the use of a newly developed bipolar coagulation forceps that includes a suction channel within one of its prongs (Fig. 1). This prong is thicker than the other one, and its outer surface has been smoothed to allow its use as a blunt dissector.

The most significant difference of this TE technique is the decrease in intraoperative blood loss. This is due in part to the use of preventive hemostasis, as done with other electrocautery TE techniques,<sup>10-12</sup> but also to the use of the surgical microscope, which allows clear visualization of small tonsillar bed vessels before their section. Although the difference might not have an obvious clinical significance in normal adults, the possibility of an almost bloodless operation is a distinct advantage in infants, Jehovah's Witness patients, and patients with coagulopathies.

No early episode of bleeding was observed, confirming that good hemostasis can be achieved with both TE techniques. Although delayed post-TE hemorrhage is considered to be unrelated to surgical technique,<sup>13</sup> we found a lower incidence of postoperative bleeding with the TE<sub>mic</sub> technique. The difference, however, did not reach statistical significance, probably because of the small numbers of post-TE bleeding in the entire population.

Average postoperative pain was lower for TE<sub>mic</sub> on every day in both groups (Figs. 5 and 6), although the difference did not always reach statistical significance. One possible explanation for the observed lower postoperative pain is the use of a bipolar cautery to achieve hemostasis. Postoperative pain in cold dissection and electrocautery TE is said to be either comparable<sup>13</sup> or worse with electrocautery.<sup>14</sup> It is possible that the smaller electrical current spread associated with bipolar cautery might produce less local burning, scarring, and pain.

Postoperative otalgia was less important with the TE<sub>mic</sub> than it was with the TE<sub>trad</sub> technique for both children and adults. The difference was statistically significant in adults but not in children. The difficulty in assessing pain in children and the frequency of otalgia as a pediatric complaint might be one explanation. Whether the lingual branch of the glossopharyngeal nerve has a role in post-TE otalgia<sup>1</sup> is difficult to ascertain from our study because no specific attempt was

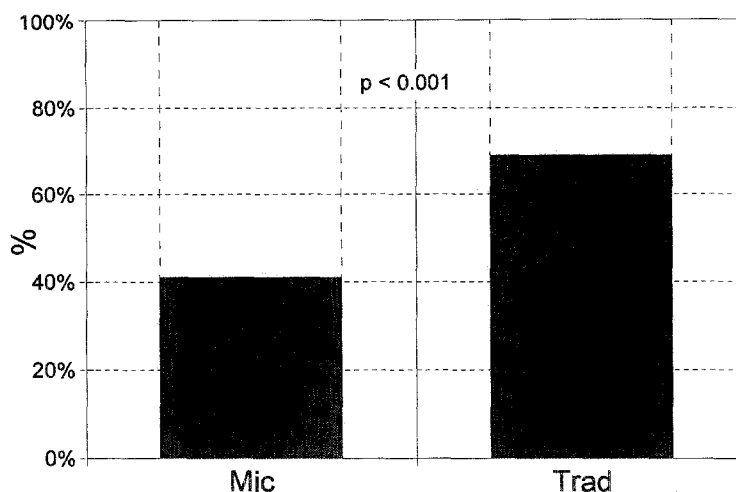


Fig. 7. Postoperative otalgia. Percentage of patients who experienced unilateral or bilateral otalgia are shown for each group. Statistical comparison between TE<sub>mic</sub> and TE<sub>trad</sub>, using the  $\chi^2$  test is significant at the 0.001 level.

made to identify and preserve this nerve. Such a trial is currently underway.

Concomitant adenoidectomy did not seem to affect the postoperative pain scores, but it was associated with increased otalgia. To our knowledge, the role of adenoidectomy in postoperative adenotonsillectomy pain has not been evaluated previously.

Regardless of the surgical TE technique used, our results confirm that TE in younger patients is a simpler procedure with lower morbidity. We found the intraoperative bleeding, incidence of postoperative hemorrhage, hospital admissions for postoperative bleeding, and postoperative otalgia to be more significant in the older age-group. Previous studies have reported similar findings.<sup>15</sup> No clear difference was observed in the pain scores between our two groups, a fact not supported by common clinical observation and several studies.<sup>16,17</sup> This lack of difference might be related more to the use of different scales for pain evaluation, the type of pain scores used, or to the fact that pain in children tends to be underestimated.<sup>7</sup>

Using TE<sub>mic</sub> did not increase the duration of TE in our trial. Although the dissection time appears longer with TE<sub>mic</sub>, no time is spent trying to achieve hemostasis at the end of surgery, and therefore the overall duration is similar. The technique is notably easy to master. The operations were done by residents in their early HNS training. A major advantage of this technique is the possibility of attaching a camera to the microscope, thereby greatly facilitating teaching.

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