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ORIGINAL RESEARCH

Intrapersonal Randomized Controlled Trial Comparing Bipolar Scissors and Conventional Cold Tonsillectomy

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ABSTRACT

Objective: To evaluate bipolar scissors tonsillectomy by comparing it with traditional cold dissection tonsillectomy in the same patients, utilizing one technique on either side.

Study design: Randomized controlled trial.

Settings: The ENT day care unit of the Karolinska University Hospital at Danderyd Hospital, Stockholm.

Patients: A total of 50 patients of which 49 were eligible (M/F 20/29), mean age 14.3 (4-41) years and included in the study. Thirty-one patients were operated due to upper airway obstruction and 18 for chronic tonsillitis.

Outcome measures: (1) Intraoperative bleeding, (2) operative time, (3) postoperative pain and (4) complication rates, including postoperative primary and secondary hemorrhage.

Methods: Modern cold technique; cold scissors, Henke tonsil elevator, bipolar diathermia. Hot technique; bipolar scissors (Ethicon, set on 20 W), bipolar diathermia if needed. Each side was completed separately. Blood loss and total operative time on each side were registered. Pain was evaluated daily on a visual analog scale, VAS (0-100 mm) in patients from 10 years of age.

Results: Mean operative time for the conventional cold technique was 11.6 SD ± 8.5 (range 1.0-55 mins) and for the hot technique 3.1 SD ± 3.1 min (range 0.5-8.5 mins) (Wilcoxon-test, $p < 0.001$). The corresponding median values were 3 and 1.9 mins, respectively. The mean blood loss was 43.2 SD ± 41.7 ml (range 7-225 ml) *vs* 3.0 SD ± 4.7 ml (range 0-25 ml) (Wilcoxon-test $p < 0.001$). The corresponding median values were 30 and 1 ml respectively. No primary or secondary postoperative hemorrhages requiring surgical intervention occurred. There was no difference in pain.

Conclusion: Tonsillectomy with bipolar scissors was almost four times faster and the blood loss significantly less than on the side operated with the conventional cold technique, whereas no difference in morbidity was found.

Keywords: Tonsillectomy, Bipolar scissors, Pain, Bipolar diathermy, Henke, Hot technique, Cold technique, Intrapersonal.

INTRODUCTION

The first known tonsillectomy was performed by Celsus, 2000 years ago, using blunt digital dissection.[1] Snaring and 'guillotining' the tonsils (i.e. tonsillotomy) were introduced in the 19th century and the tonsil elevators at the turn of that century. Only 50 years ago, patients were often operated in a sitting position under local anesthesia.

The more common use of general anesthesia with intubated patients made it possible to perform complete tonsillectomies with the patients in the supine position, which was more convenient for both the patient and the surgeon. The standard technique is still cold steel dissection, but hot techniques have evolved during the last 40 years, like monopolar and bipolar diathermy, laser and more recently also the ultrasonic scalpel and coblation.

The refinements of surgical and anesthesiological techniques have made it possible to treat patients on a day care basis.[2] At the present, ear, nose and throat, head and neck surgery day care (ENT-HNS) unit and day care tonsillectomies have been performed since 1996. Previous investigations indicate that tonsillectomy performed in day care surgery may be considered cost-effective and safe.[3,4]

Conventional tonsillectomy is performed with Blohmke tonsil forceps and cold scissors. The tonsil dissection is performed either with a sharp or serrated tonsil elevator. Bleedings were formerly stopped by compression, ligatures or vessel strangulation obtained by deep sutures in the tonsillar bed. The latter measure infrequently caused life-threatening injury to the branches of the external carotid artery.[5] These procedures have, therefore, been replaced by monopolar or bipolar diathermy.

Bipolar scissors technically combine bipolar diathermia with the scissors. They are, thereby, replacing the tonsil elevator, scissors and usually also the bipolar diathermy. There are indications that the bipolar scissors allow faster intervention than the conventional cold steel techniques.[6,7]

In the present trial, the patients were subjected to a 'hot' or a 'cold' technique on either side, in a randomized patient-

-blinded manner. The outcomes were operating time, perioperative blood loss, postoperative pain and complications related to each technique.

MATERIALS AND METHODS

Patients

Fifty consecutive patients aimed for day care surgery (ASA I) were, after informed consent, subjected to bilateral TE in a randomized controlled trial using bipolar scissors on one side and to the conventional cold technique on the other side. Patients with a history of peritonsillitis were excluded. One male did not disclose his history of quinsy until after surgery and he was then excluded from the study. Forty-nine patients (M/F 20/29), mean age 14.3 (4-41) years were eligible and could be included. Thirty-two (65%) of these patients were operated due to upper airway obstruction and 17 were operated due to chronic tonsillitis.

Surgery

The left side of the patients were externally randomized either to conventional cold tonsillectomy or to the hot technique with bipolar scissors immediately prior to surgery. The right side automatically fell into the other group. Surgery was performed by the two senior consultants (POH/LF) on one side at a time and considered finished when full hemostasis was achieved, always beginning with the left side.

The conventional "cold technique"; the tonsils were pulled with Blohmke tonsil forceps and the tonsillar bed was opened with cold Metzenbaum scissors. A serrated Henke tonsil elevator then was utilized for the tonsil elevation (Fig. 1). Bipolar diathermy was used when compression was insufficient for hemostasis.

The 'hot technique' comprised Blohmke tonsil forceps and Power-Star bipolar scissors (Ethicon) set on 20 W (see Fig. 1). They consist of a pair of modified 18 cm Metzenbaum scissors where the cutting blades have a partial ceramic isolation in order to act as electrodes in the bipolar instrument.[7] Vessel bleeding was usually stopped by the bipolar scissors but, if necessary, with the more effective bipolar diathermy forceps.

Parameters

Registered operation time comprised both time for elevation and hemostasis for each side using a chronograph. Perioperative bleeding from each side was simultaneously measured. Primary postoperative hemorrhage was defined as hemorrhage occurring within the first 24 hours after the operation and secondary hemorrhage occurring between 24 hours and 28 days.[8] Postoperative hemorrhage requiring surgical intervention was considered significant and included.

Pain was self-reported on a visual analog scale (VAS 0-100 mm) at noon every day on patients from 10 years of age. Maximum pain measured in millimeters and total pain duration in days were registered.

Postoperative Analgesia

All patients were injected with local analgesia in the tonsillar bed with 5 ml of bupivacain chloride (2.5 mg/ml) in children and 5 ml of bupivacain chloride (5 mg/ml) in adults (> 50 kg), respectively. No epinephrine was used during the study. The patients were treated with morphine (0.1 mg/kg) IV during the first 2 hours at the hospital. At home, the smallest children < 40 kg were given citodon minor® suppositories (paracetamol 350 mg + kodein 15 mg), 4 times daily, whereas children > 40 kg and < 50 kg were given suppositories diklofenac 25 mg, 3 times daily, and paracetamol, 4 times daily. Adults were given Citodon® (paracetamol 500 mg + kodein 30 mg), 4 times daily and diclofenac 50 mg, 3 times daily.

Statistics

Data are given as median, mean, standard deviation (SD), or min-max range, or the combination of these. Wilcoxon test was used to compare the mean values for pain, bleeding and time for the total surgical procedure. χ^2-test was used for comparison of rate of complications. Statistically significant difference was defined as $p < 0.05$.

The estimation of the required sample size obtaining 80% power and alfa 0.05 for the main outcomes operation time, perioperative bleeding and pain on VAS was performed from a pilot study including 10 patients. The required sample size was 6, 10 and 47, respectively. The sample size for postoperative bleeding could not be calculated.

The study was approved by the local Ethical Committee at the Karolinska Institute, Stockholm.

RESULTS

Total Surgical Time

Mean surgical time was almost 4 times longer for the conventional cold technique compared with the hot technique; 11.6 SD ± 8.5 mins (range 1-55 mins) *vs* 3.1 SD ± 1.9 mins (range 0.5-8.5 mins) ($p < 0.001$) (Fig. 2). The corresponding median values were 10.0 *vs* 3.0 mins.

Blood Loss

Mean blood loss was 14 times greater for the conventional cold technique compared with the hot technique; 43.2 SD ± 41.7 ml (range 7-225 ml) *vs* 3.0 SD ± 4.7 ml (range 0-25 ml) ($p < 0.001$) (Fig. 3). The corresponding median values were 30 *vs* 1 ml.

Fig. 1: Bipolar scissors *vs* Henke tonsil elevator

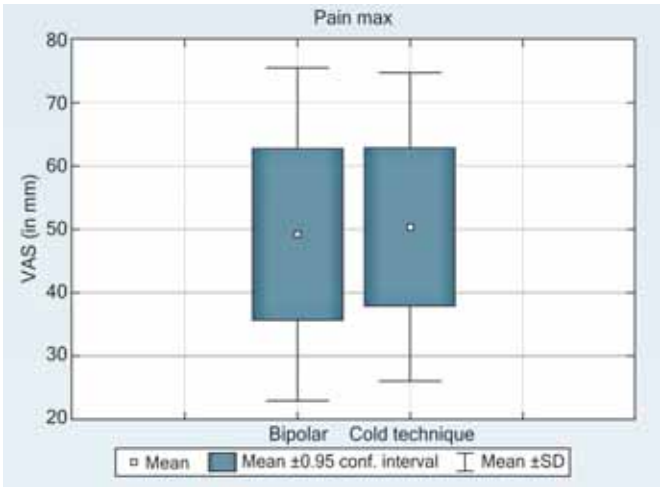

Fig. 4: Pain maximum on a visual-analog scale ranging from 0 to 100 mm

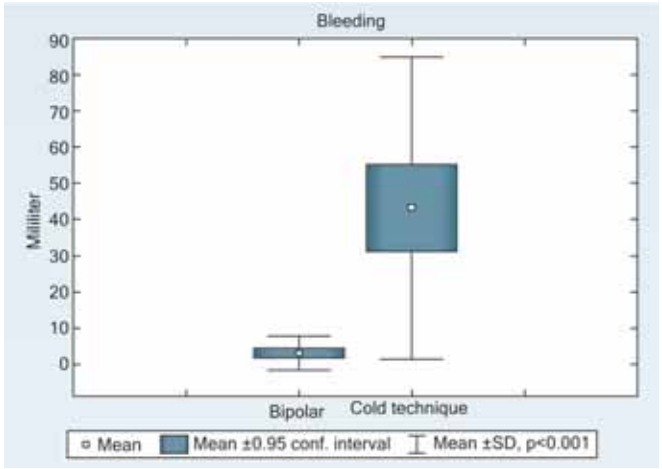

Fig. 2: Bleeding in milliliter from first cut to complete hemostasis on each side

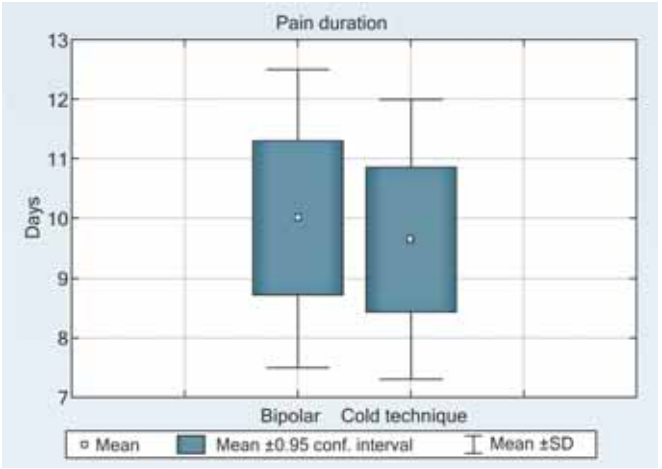

Fig. 5: Pain duration in days

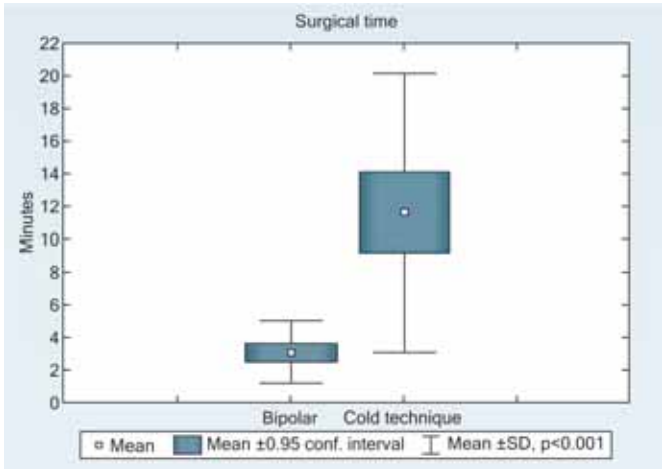

Fig. 3: Surgical time in minutes from first cut to complete hemostasis on each side

Five patients bled more than 100 ml on the cold side. The corresponding bleeding was mean 3.5 ml on the hot side.

Pain

Only 18/26 (69%) patients aged 10 years or more completed the VAS procedure.

Maximal Pain

No difference was found. Mean VAS value for the conventional cold technique was 52.4 SD ± 26.7 mm (range 11-97 mm) *vs* 52.0 SD ± 27.4 mm (range 8-97 mm) for the hot technique (Fig. 4).

Pain Duration

No difference was found. Mean pain duration for the conventional cold technique was 9.1 SD ± 2.3 days (range 6-14 days) and 9.4 SD ± 2.3 days (range 6-14 days) (NS) for the hot technique (Fig. 5).

Early and Late Complications

No accidental burn from the use of the bipolar scissors was seen. No primary or secondary postoperative hemorrhages requiring surgical intervention occurred in any group. One patient was treated for a general throat infection. No postoperative taste disturbance was reported.

DISCUSSION

The present study is based on a randomized controlled study including 50 patients undergoing TE with bipolar scissors on one side and with conventional cold technique on the other.

The intrapersonal design is aiming to give a more precise comparison of perioperative blood loss and surgical time than if conventional interpersonal methods had been used.

Surgical time was much in favor of the hot technique (Fig. 2). The time gain of 8.5 mins for a single side operation may seem insignificant but, as tonsillectomies usually are performed in a row, it may matter at the end of the day. It not only shortens the time under general anesthesia but may also allow an increased turnover in the operating theater.

The difference in blood loss between the two methods used was significant (Fig. 3). This might be of importance especially in small children susceptible to blood loss and for patients with hemostatic disturbances. The five patients with a substantial bleeding (>100 ml) on the conventionally operated side altogether had a mean blood loss of only 3.5 ml on the side operated with bipolar scissors. Plain bupivacain chloride was injected in the tonsillar bed during the comparative study to minimize external impact on the results. Use of epinephrine in the local anesthesia would probably have decreased the perioperative bleeding, especially on the conventionally operated side.[9]

A number of life-threatening or lethal hemorrhages have been reported after tonsillectomy[5,10] even if they, in general, are rather harmless.[8] The lingual, facial and internal maxillary arteries are the main suppliers of the tonsillar region. There may even exist some collaterals between these branches from the external carotid artery to the internal carotid artery. The lingual and the facial arteries often pass in close vicinity of the inferior tonsillar bed and are at special risk of being traumatized by deep sutures. Pulsations in the inferior tonsillar bed may be caused by a tortuous internal carotic artery or by aberrant lingual or/and facial arteries.[5] The glossopharyngeal nerve passes external to the superior pharyngeal constrictor to which the tonsillar bed may be attached after an inflammatory process like peritonsillitis. The lingual branch of the nerve passes between the superior and middle pharyngeal constrictors close to the inferior tonsillar bed. Nerve injury causes taste disturbances.[11]

By using the bipolar scissors, it is possible to elevate the tonsils with minimal bleeding and thus to perform the operation with better visual control as compared with traditional cold techniques. Furthermore, diathermia usually makes the blind and dangerous deep strangulating sutures superfluous. A couple of transient secondary hemorrhages occurred in both groups, none of which needing any intervention. No taste disturbances were reported.

Pain assessment was performed with a VAS, suitable for adolescents and adults but not for small children. Still it is difficult to compare VAS interpersonally, as it may depend on the individual pain references and the mood, but it might be feasible for intrapersonal evaluation.

However, a reliable side discrimination between the tonsillar beds may be difficult to obtain.

For small children, secondary assessment of eating and behavior is usually performed, but it was not possible with the current method. Two-thirds of the patients completed and returned the VAS formulas. No significant differences were registered for maximal pain and pain duration between the bipolar and cold techniques as previously indicated by others.[12,13]

Patel et al[14] found that tonsillectomy with bipolar scissors did not cause more postoperative pain or postoperative hemorrhage than when operating with the bipolar forceps. The latter was, in accordance with the present surgical tradition at the department, not infrequently used to get an instant stop of bleeding also when cold instruments were used. This fact may have contributed to the similarity in pain intensity and duration between the groups. However, regardless bipolar diathermia was used for hemostasis in both groups, the significant differences in surgical time and bleeding between the techniques still remained.

The main purpose of the present randomized controlled study was to detect if the bipolar scissors have perioperative advantages compared with traditional cold technique for tonsillectomy. We found that the bipolar scissors significantly decreased surgical time and blood loss. No difference in complication rate was seen in this limited sample, but the conclusion of the British National Prospective Tonsillectomy Audit, when comparing postoperative hemorrhages after hot and cold techniques in thousands of patients was that hot techniques like diathermy and coblation still lead to an increased risk of postoperative bleeding.[15] If these hemorrhages will be found less harmful than those after cold techniques with suture ligatures, the hot techniques most likely still will dominate in the future.

CONCLUSION

Bipolar scissors significantly reduced the operating time and the perioperative blood loss, whereas postoperative morbidity did not differ in this limited sample of patients.

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