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# Comparison Of Post-Tonsillectomy Morbidity In Cases Of Sleep Apnoea Where Surgery Employed Either Cold Knife Or Coblation Techniques

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**Abstract**

**Objective:** To compare the snare and coblation methods in terms of post-tonsillectomy morbidity for patients with obstructive sleep apnoea.

**Method:** The study involved 49 cases. Twenty-one patients were operated on using the snare method, whilst the remaining 28 patients underwent coblation tonsillectomy. The amount of intraoperative bleeding was recorded. The pain level at the 6th and 12th postoperative hour was assessed. On postoperative days 1, 3 and 7, the patients were assessed through VAS (Visual analogue scale) and Wong-Baker Faces Pain Rating Scale (WBFPRS). The two groups were then compared. The Tonsillar Fossa Wound Healing Score (TFWHS) assessment was also undertaken to assess wound healing rates on postoperative days 1, 3, 5, 7 and 10.

**Results:** The patients who underwent coblation had significantly lower amounts of bleeding compared to those whose operations employed the snare method (p=0.046). Those patients who underwent tonsillectomy using the snare method had significantly higher 6th hour VAS and WBFPRS scores (p=0.011, p=0.005) than the other group. In contrast, VAS and WBFPRS scores at the 12th hour post-op and on days 1, 2, 3 and 7 were similar between the groups. TFWHS for those who underwent coblation were significantly higher on days 1 and 3 (p=0.007; p=0.008). However these scores were similar on days 5, 7, and 10.

**Conclusion:** The research indicates that the amount of intraoperative bleeding in cases undergoing coblation is significantly lower. Lower pain in the early postoperative period, resulting in earlier oral intake and better recovery scores for the tonsillary fossa seem to be the advantages of coblation as opposed to the snare method.
Key words: Tonsillectomy, Morbidity, Tonsillar Hypertrophy, Sleep Apnoea

## Introduction

Tonsillectomy is one of the earliest ENT surgical procedures known to have been performed and has remained in use throughout the history of otorhinolaryngology. The first known tonsillectomy was performed by Celsus in 30BCE [1]. Although there are certain other, alternative management protocols and appropriate therapies in existence currently, tonsillectomy, with or without adenoidectomy, is one of the most frequently performed surgical procedures in children [2].

Various surgical instruments and techniques have been used to reduce postoperative morbidity, such as pain and bleeding, during the early period and to improve patient comfort [3]. The classical snare method (i.e. cold knife

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technique), bipolar electrocautery, harmonic scalpel, laser, intratonsillary tonsillotomy, and plasma kinetic coblation are amongst the different surgical techniques in current use [4]. Each technique has its particular set of advantages and disadvantages, especially in terms of intraoperative bleeding, operating time, and morbidity, as measured by pain and bleeding during the postoperative period.

The coblation technique for tonsillectomy is a recently introduced surgical procedure. Coblation is a unique modality which cuts through the tissue by forming a field of ionized sodium molecules [5]. This device uses bipolar radiofrequency to perform surgical dissection and allow soft tissue coagulation without causing thermal damage [5]. During coblation, the conductive salt solution is transformed into an ionized plasma layer between the tip of the device and the tissue. Enough energy is produced to cut the molecular bonds at the point where this layer of plasma and the tissue meets; thus molecular disintegration takes place. Since the energy level required can be obtained at temperatures between 40°C and 70°C, any resulting tissue thermal damage is minimal [6].

We compared intraoperative bleeding, postoperative pain and recovery time of the tonsillary fossa by both coblator and snare methods in patients with sleep apnoea who underwent tonsillectomy, with a view to investigating the effects of this recent technique.

## Material and Methods

The study protocol was approved by the Recep Tayyip Erdogan University Ethics Committee on 13.04.2018. The approval number was 2018/80. The study was conducted in accordance with the Declaration of Helsinki. Forty-nine patients referred to the department of otorhinolaryngology between July 2014 and May 2016 for chronic tonsillitis and grade 4 tonsillary hypertrophy [7] resulting in sleep apnoea, were included in the study. All of the participitants had been diagnosed with obstructive sleep apnoea prior to the beginning of the study. *Polysomnography* was *used* to diagnose, or exclude, many types of sleep disorders, including narcolepsy, idiopathic hypersomnia, periodic limb movement disorder, REM behaviour disorder, parasomnias, and sleep apnoea. Consent to tonsillectomy was obtained following an explanation of the procedure (tonsillectomy) and possible complications. For any patients below the age of eighteen, consent from the legal guardians was also obtained.

All patients were operated on under general anaesthesia. After tonsillary tissue was dissected from the tonsillary fossa, dry gauze packing was performed to control the bleeding in patients who underwent the snare method. Bipolar cautery was used in patients where it was not possible to control the bleeding with packing alone.

Tonsillectomy through coblation surgery was performed with a Bipolar ENTec Coblator Plasma surgery system with an EVAC 70 plasma wand, the exit voltage of which was set to 8 (248 – 303 Vrms). Sterile 0.9% NaCl solution was chosen as irrigation fluid for the probe and it was set to flow at a rate of 1 to 3 drops per second. The intrinsic aspiration system of the probe, as well as a further aspiration connection, was used. Tonsillary tissue was dissected from the capsular plane with the coblator. Bleeding control was obtained by means of the coagulation setting of the coblator.

Since intraoperative bleeding and the pain levels of the patients might be affected by choice of procedure, patients with planned tonsillectomy in conjunction with adenoidectomy and/or ventilation tube placement were excluded from inclusion in the present study. Since bipolar cautery was needed in cases where the snare method had been performed and it had then been impossible to control the intraoperative bleeding with packing, these patients were excluded from analysis as well. Any patients with connective tissue disorders, diabetes mellitus, rheumatological diseases or coagulopathies were also excluded from the study.

The same surgeon performed the entire series of tonsillectomies. The vital signs of the patients were observed by the anaesthetist during the postoperative period, and were transferred to the ENT ward when it was deemed appropriate. All patients were started on 50 mg/kg amoxicillin and 10 mg/kg paracetamol. IV fluids were given until the patients had sufficient oral intake. The patients were discharged from hospital on the first day after surgery. The amount of bleeding during the operation was calculated by subtracting the volume of irrigation fluid from the total volume of aspirated fluids.

The pain levels of the patients were assessed through the Visual Analogue Scale (VAS) and Wong-Baker Faces Pain Rating Scale (WBFPRS) and were compared between the two groups. Pain levels were evaluated at the sixth and twelfth hour post-operatively and 1, 2, 3 and 7 days after surgery. VAS is a method used to quantify values that are not inherently quantitative. Two extreme values of the parameter under assessment are written at each end of a 100 mm line and the patient is then asked to point out the ap-

propriate point by drawing a line, making a dot or by simply pointing out the value they wish to assign. Wong-Baker Faces Pain Rating Scale is a scale that has been developed to evaluate pain levels. There are 6 different facial expressions on the scale and the patient is asked to pick out the one that corresponds to their perceived level of pain. For example, selecting the smiling face indicates that the patient is not experiencing any pain, whereas the choice of the crying face indicates an unbearable level of pain.

The Tonsillar Fossa Wound Healing Score (TFWHS) assessment was carried out on postoperative days 1, 3, 5, 7 and 10. The patients were examined by another otolaryngologist who was not present during the operation and did not know which operative technique had been employed. The TFWHS scale, which was also used by Magdy *et al.* [8] in their study, was utilised during the examination. This scoring system was used to evaluate tonsillar fossa wound healing including erythema, oedema, fossa whitening and wound healing according to the Magdy classification. In this scoring system, evaluation scores are given according to the presence or absence of each of these specific findings. Each evaluation point was calculated for each follow-up day *(Table 1)*.

**Table 1:** Scoring system for tonsillar fossa wound healing

| | Absent | Present | Severe |
|---|---|---|---|
| Erythema | 0 | 1 | 2 |
| Edema | 0 | 1 | |
| Fossa Whitening | 0 | 1 | |
| Wound Healing | 1 | 0 | |

## Statistical Analysis

Statistical analyses were performed with NCSS software. Besides descriptive statistical methods (mean ±SD), we used the Friedman test for repeated measures of multiple groups, the Dunn test of multiple comparisons for subgroup comparisons, the Wilcoxon test for two-way repeated measures of groups, the Mann-Whitney U test and the *Chi-Square* test for comparison of groups, and the Fisher exact test for comparison of qualitative data. Statistical significance was defined as $p < 0.05$.

## Results

Forty-nine patients were assessed as part of the study. The mean age of the patients involved was 25.2(±14.8) (minimum 16, maximum 52) years and 57.1% were male. The mean amount of bleeding was 55.1(±41.5) cc and the median value was 40 (min: 10, max: 250) cc.

Twenty-eight out of 49 patients (57.1%) were operated on with the coblator and 21 out of 49 patients (42.9%) were operated on with the snare method. The choice of surgical instrument defined the two groups to be compared. The patients were allocated randomly into the two groups. Those patients who underwent tonsillectomy with coblator had significantly lower amounts of bleeding compared to the snare method (p=0.046). The composition of the groups did not significantly differ in terms of age and sex (p>0.05) *(Table 2)*.

The cases who underwent tonsillectomy with the snare method had significantly higher 6th hour VAS and WBFRS scores (p=0.011, p=0.005; respectively) than the coblator group; whereas the 12th hour, day 1, 2, 3 and 7 VAS and WBFRS scores were similar (p>0.05) *(Table 3)*.

The TFWHS scores of the patients who underwent tonsillectomy with coblator were significantly higher on days 1 and 3 (p=0.007, p=0.008; respectively) but these scores were similar between groups on days 5, 7, and 10 (p>0.05). A statistically significant difference in TFWHS was observed in cases who had tonsillectomy with snare method, compared over time (p<0.001). The *post hoc* paired comparisons showed that the significant difference

**Table 2.** Outcome measures according to age, sex, intraoperative blood loss on both sides

| | | Snare (n=21) | Coblation (n=28) | p |
|---|---|---|---|---|
| **Age (year)** | | 32.62±11.01 (16-51) | 31.36±8.14 (21-46) | 0.762* |
| **Sex:** | **Male** | 11 (52.4) | 17 (60.7) | 0.560** |
| | **Female** | 10 (47.6) | 11 (39.3) | |
| **Intraoperative blood loss (cc)** | | 60.0±36.6 (10-150) | 41.43±20.1 (10-90) | 0.046* |

*Mann-Whitney UTest; ** Chi-Square Test

**Table 3.** Distribution of VAS and WBFPRS scores according to time

| | Snare (n=21) mean±SD (min-max) | Coblation (n=28) mean ±SD (min-max) | p* |
|---|---|---|---|
| **VAS** | | | |
| 6. hour | 8.0±1.2 (4-10) | 5.7±3.2 (0-10) | 0.011 |
| 12. hour | 6.9±1.4 (3-9) | 5.2±2.8 (0-8) | 0.122 |
| 1. day | 5.3±1.5 (1-8) | 4.0±2.4 (0-8) | 0.077 |
| 2. day | 3.8±1.3 (1-6) | 3.2±2.2 (0-8) | 0.247 |
| 3. day | 2.3±1.1 (1-5) | 2.4±2.3 (0-8) | 0.644 |
| 7. day | 1.1±0.8 (0-2) | 1.6±2.0 (0-9) | 0.744 |
| **WBFPRS** | | | |
| 6. hour | 4.4±0.6 (3-5) | 3.5±1.2 (0-5) | 0.005 |
| 12. hour | 3.3±0.9 (0-4) | 2.9±1.1 (0-5) | 0.057 |
| 1.day | 2.7±1.0 (0-4) | 2.3±1.2 (0-4) | 0.287 |
| 2. day | 2.0±1.0 (0-4) | 1.9±1.3 (0-5) | 0.511 |
| 3. day | 1.3±0.7 (0-3) | 1.3±1.1 (0-4) | 0.726 |
| 7. day | 0.5±0.6 (0-2) | 0.9±1.0 (0-4) | 0.214 |

*Mann-Whitney U Test; **Friedman Test; VAS: Visual Analogue Scala; WBFPRS: Wong-Baker FACES Pain Rating Scale

**Table 4.** Distribution of Tonsiller Fossa Wound Healing Score according to days

| mean ±SD (min-max) | Snare (n=21) mean ±SD (min-max) | Coblation (n=28) | p* |
|---|---|---|---|
| TFWHS days | | | |
| 1. day | 2.8±0.6 (2-4) | 3.4±0.8 (2-5) | 0.007 |
| 3. day | 2.6±0.7 (1-4) | 3.2±0.7 (1-4) | 0.008 |
| 5.day | 1.8±0.7 (1-3) | 1.9±0.7ab (1-3) | 0.824 |
| 7. day | 1.0±0ab (1-1) | 1.1±0.4ab (0-2) | 0.371 |
| 10. day | 0.6±0.6abc (0-2) | 0.8±0.6abc (0-2) | 0.361 |
| *p*** | <0.001 | *<0.001* | |

*Mann-Whitney U Test; **Friedman Test; TFWH: Tonsillar Fossa Wound Healing
a) There is significant difference comparing with 'first day' on Post- hoc binary comparison method p<0.005); b) There is significant difference comparing with 'third day' on Post- hoc binary comparison method p<0.005);c) There is significant difference comparing with 'fifth day' on Post- hoc binary comparison method p<0.005).

was between the 7th and 1st-3rd days' TFWHS scores (p<0.001, p<0.001; respectively), and in TFWHS between the 10th day and 1st, 3rd and 5th days (p<0.001, p<0.001 and p=0.003, respectively). The TFWHS of patients who had tonsillectomy with the snare method started decreasing significantly after the 7th day *(Table 4)*.

There was a significant decrease in TFWHS of the patients who underwent tonsillectomy with coblator as well, compared over time (p<0.001). The *post hoc* paired comparisons revealed that the statistically significant difference was between the 5th, and 1st-3rd days' TFWHS (p<0.001, p<0.003, respectively); between the 7th, and 1st-3rd days' TFWHS (p<0.001, p<0.001, respectively) and between the 10th and 1st-3rd-5th days' TFWHS (p<0.001, p<0.001, p=0.002, respectively). The patients who underwent tonsillectomy with coblator had significantly lower TFWHS on days 5 and 7, compared to their TFWHS on days 1 and 3, whereas their TFWHS on the 10th day was significantly lower than their TFWHSs on the 1st, 3rd and 5th day. In other words, the TFWHS of patients who underwent tonsillectomy with coblator started to decrease in a statistically significant fashion after the 5th day *(Table 4)*.

## Discussion

Operative techniques to perform tonsillectomy have changed over time in an attempt to decrease morbidity, increase patient comfort and enhance surgical efficiency, as has been the case with many other surgical procedures. There are many different surgical techniques for tonsillectomy, but none of the available techniques are clearly significant superior to the others [9,10].

There are inconsistent results in the literature, when coblation tonsillectomy and snare technique are compared to each other. Some studies have suggested that the amount of bleeding is higher, but there are also reports claiming the opposite [9]. Belloso *et al.* [11] found the secondary haemorrhage rate for coblation tonsillectomy to be 2.25%, whereas this rate was 6.19% for the control group in which the snare technique had been used in our study. The results of this present study also reveal that the amount of intraoperative bleeding in patients who underwent coblation tonsillectomy is significantly lower than the ones where the snare technique was used (p=0.046).

The most important cause of morbidity due to tonsillectomy is postoperative pain [11]. Unlike with some other surgical procedures, the surgery site is left open for sec-

ondary healing, and this is the most important reason for the pain. Since oral intake is limited because of the pain, dehydration is common and this also contributes to morbidity. Also, pharyngeal muscle activity is limited as well and this leads to the insufficient cleaning of the tonsillary fossa because of the pain; which then results in infection and an increased risk of bleeding during the postoperative healing period [12]. The double-blinded controlled study conducted by Timms *et al.* compared patients who underwent coblation and electrocautery bipolar tonsillectomy, finding postoperative pain caused by coblation surgery to be lower and the healing of the tonsillary fossa to be faster [13]. Stoker *et al.* compared coblation to electrocautery bipolar and reported that, although there was no significant difference in terms of postoperative pain, the postoperative quality of life was better [14]. Polites *et al.*, who compared coblation tonsillectomy and snare techniques, remarked that patients who underwent coblation tonsillectomy had lesser pain on day 1, 2 and 3, but no significant difference on the days that followed [12]. In our study, patients who underwent tonsillectomy with the snare method had significantly higher 6th hour VAS and WBFRS scores; whereas the 12th hour, day 1, 2, 3 and 7 VAS and WBFRS scores were similar.

There are various methods to assess postoperative pain, such as visual photography scales, verbal categorisation and behavioural scoring. The high associated validity and reliability of VAS and WBFRS are the reason the two methods we used in our study were chosen for the assessment of postoperative pain. In our present study, the VAS and WBFRS scores of the patients who underwent tonsillectomy with snare technique were higher at the 6$^{th}$ postoperative hour than those recorded from the patients who underwent coblation tonsillectomy. We propose that coblation has some advantageous over the snare method, as pain is lower during the early postoperative period, which entails an earlier start to oral intake and hence faster return to daily life.

Less heat energy is used in coblation tonsillectomy, compared with all other tonsillectomy methods except the snare technique. Thus, neighboring pharyngeal tissues are subjected to lesser thermal injury. Friedman, in his retrospective study, reported that the coblator is more advantageous than the snare technique. Whereas Back reported no significant advantage in terms of healing [15-16]. Chinpairoj *et al.,* in animal studies, incised the tongues of rats using coblation and bipolar electrocautery to compare tissue recovery. They showed recovery to be faster and local tissue damage lower in coblation surgery [17]. Also, in our present study, the results of assessment of the tonsillary fossa using TFWHS were that, for patients who underwent coblation tonsillectomy, TFWHS was significantly higher on the 1$^{st}$ and 3$^{rd}$ day, as compared with the snare technique ($p=0.007$ and $p=0.0058$, respectively), whereas the TFWHS on the 5$^{th}$, 7$^{th}$ and 10$^{th}$ days was similar ($p>0.05$). The reason for this may be thermal early tissue damage. During the early phase, a significant difference between coblation tonsillectomy and the snare technique was noted but during the late period, this significant difference ceased. On the other hand, the TFWHS of the patients who underwent coblation surgery began improving significantly after day 5, whereas for the snare technique, this improvement began on day 7. This difference may be attributable to the minimal local tissue damage produced by the coblation instrument. Moreover, it may be the case that coblation accelerated epithelialisation, and thus resulted in a speedier recovery.

The study published by the National Prospective Tonsillectomy Audit (NPTA) in the United Kingdom in 2007 compared tonsillectomy techniques in terms of complication rates. The snare method was put forward as the gold standard surgical technique [18]. But the lower intraoperative bleeding and lower early period postoperative pain resulting in earlier oral intake and better recovery scores for the tonsillary fossa seen with coblation seem to be the advantages of coblation surgery as opposed to the snare method.

## Conclusion

In our study, it was shown that the amount of intraoperative bleeding of the cases undergoing coblation was significantly lower. The lower early period postoperative pain resulting in earlier oral intake and better recovery scores for the tonsillary fossa seem to be the advantages of coblation as opposed to the snare method.

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