Journal of Current Research in Otolaryngology
ISSN: 3065-6974

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Research Article *Volume 6 Issue 1*

Coblation Versus Conventional Tonsillectomy: A Comparative Study

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Received Date: February 05, 2025; **Published Date:** February 27, 2025

Abstract

Tonsillectomy is though a less common surgical procedure nowadays but is known since ancient times. Techniques have evolved from simple dissection with fingers, to gullitone, snare crush and cut, Cryo or diathermy, laser and recently using coblation technique. Coblation is slowly becoming a choice of surgical method due to less post op complication and ease of surgery with less blood loss. However, due to the unavailability at all centre, is still a limiting factor. In this study we have compared the surgical duration, blood loss and post-surgical pain and healing period following coblation tonsillectomy and conventional tonsillectomy. We concluded that coblation tonsillectomy reduces operating time, intraoperative bleeding, and postoperative pain. It also promotes better healing and provides patient comfort during the postoperative period compared to conventional tonsillectomy

Keywords: Coblation; Tonsillectomy; Hemorrhage Postoperative Pain

Abbreviation

VAS: Visual Analog Scale

Introduction

Tonsillectomy, though less commonly performed in recent years, remains a prevalent surgical procedure. A variety of techniques are available, including diathermy, laser, cryosurgery, and coblation, with the dissection and snare approach being the most frequently utilized by ENT surgeons [1]. The other techniques are less commonly employed due to the prohibitive costs of the required equipment. Recent advances, particularly the introduction of the coblator, have yielded promising outcomes, as evidenced by multiple studies [2]. In contrast to most surgical interventions, which typically involve primary closure, tonsillectomy leaves an open wound that heals by secondary intention. The most significant postoperative complications due to healing with secondary intentions are pain and hemorrhage. Pain results from the disruption of the mucosal lining, irritation of the glossopharyngeal nerve fibers, and the ensuing inflammatory response, which causes muscle spasms, ischemia, and a protracted pain cycle [3]. Pain typically resolves after two to three weeks when the muscle tissue is covered by mucosa. Secondary hemorrhage arises from infection in the tonsillar fossa, which compromises blood vessels in tonsillar bed and leads to bleeding [4].

Coblation is a technique that combines radiofrequency energy with controlled ablation processes.

Coblation which was introduced in 1997, relies on the passage of radiofrequency energy through isotonic sodium chloride, which generates a plasma field [5]. The interaction between the energy and saline causes free sodium ions to dissociate, leading to the breakdown of intercellular bonds and the consequent dissociation of tissue structures. What sets Coblation apart from electrocautery is its significantly lower operating temperature, ranging between 60-70°C, in contrast to electrocautery's much higher range of 400-600°C. Furthermore, the cooling effect of the isotonic saline protects adjacent tissues from thermal damage [6]. In the context of tonsillectomy, a variety of lasers, including CO2, KTP, ND: YAG, and diode, are frequently utilized [7,8].

It is essential that any novel technique introduced achieves the following objectives
Significantly lowers intraoperative blood loss, Minimize the time required for the procedure, Reduce the incidence of complications after surgery [9].

In terms of tonsillectomy, there are two primary variations of the coblation technique:

- **Subtotal Intracapsular Ablation:** This method leaves some tonsil tissue behind.
- **Total Subcapsular Dissection:** The entire tonsil is removed by dissecting it from the surrounding pharyngeal muscle at the tonsillar capsule.

In agreement with other studies, it has been suggested that subtotal tonsillectomy is not the optimal choice for chronic tonsillitis, as leaving behind tonsillar tissue may result in recurrent infections. As such, the Subcapsular technique was selected for the present study to evaluate and compare the efficacy of coblation with conventional tonsillectomy techniques. Both approaches were performed on the same patient, thereby eliminating potential confounding factors and allowing for a more accurate comparison of the two techniques [10].

Materials and Methods

This was a prospective, controlled, randomized, single-blinded clinical trial done in private hospital located in Abu Dhabi, UAE, from July 2019 to June 2021. The study's primary objective was to compare two tonsillectomy techniques-Coblation and conventional dissection-on patients aged between 4 and 50 years who required tonsil removal due to chronic tonsillitis or significant tonsil hypertrophy. Patients were randomly assigned to undergo Coblation tonsillectomy and conventional dissection on the right or left side respectively, with the allocation being blinded to the patients. This design allowed a within-subject comparison of Pain, healing times and recovery rates for the two procedures.

The inclusion criteria were patients aged 5 to 50 with chronic tonsillitis or severe tonsillar enlargement. Exclusion criteria included individuals with previous tonsil surgeries, certain pre-existing medical conditions, or those who opted not to participate. Ethical approval was obtained from the relevant institutional review boards, and all procedures were performed in accordance with ethical guidelines. A total of 60 patients were enrolled in the study, with 30 receiving Coblation tonsillectomy on the right side and 30 conventional tonsillectomies on the left. Similarly, in second set of 30 patients coblation tonsillectomy was done on Left side and conventional on Rt side to removed technical bias. Surgery duration and blood loss were carefully documented to facilitate a detailed comparison between the two techniques.

Surgical Technique

All surgeries were performed under general anesthesia with the patient positioned supine and draped to expose only the mouth. A Boyle-Davis mouth gag was inserted, followed by Draffin suspensors. The tonsils were then held medially with tonsil holding forceps, and dissection was initiated. For the Coblation group, the Coblator® II system was used, with an Evac T&A Plasma Wand set to 8 Watts (rapid mode) and 400 kHz frequency for dissecting the tonsils at the subcapsular plane. Hemostasis was achieved using an intensity of 6 Watts in coagulation mode. In the conventional dissection group, the tonsils were removed using traditional dissection techniques with a tonsillar dissector and Eve's tonsillar snare.

Blood loss was measured by weighing gauze pads pre- and post-use after they were soaked in normal saline and then squeezed to remove excess fluid and blood collected in the suction bottle. This method provided an estimate of the blood lost during the procedure. All surgeries were performed by experienced surgeons familiar with both techniques.

Postoperative Monitoring and Analysis

Following surgery, patients were monitored every 3 hours for the first 24 hours for signs of bleeding and to assess vital signs. Pain management was standardized with intravenous and oral paracetamol administered every 6 hours during the first 24 hours, after which it was adjusted based on patient need. Additionally, all patients received prophylactic amoxicillin for the first 7 days postoperatively.

Pain and healing assessments were conducted at 3 hours, 8 hours, 24 hours, and 7 days postoperatively. The Visual Analog Scale (VAS) from 0 to 10 was used to quantify pain levels. Follow-up appointments were scheduled for the first and second weeks after surgery. Statistical analysis was performed using Chi-squared tests to compare categorical variables and independent sample T-tests for continuous

data. A p-value of less than 0.05 was considered significant. To calculate the clinical effect size, paired sample T-tests were used to analyze changes in the continuous variables.

This study involved 60 patients, with right side treated with Coblation tonsillectomy and the other side using the conventional method, and the data were examined according to age, gender, and the indications for tonsillectomy

Variables	Coblation N=60	Conventional method N=60	P-Value
Age group			1
Less than 20	48 (80%)	48 (80%)	
More than 20	12 (20%)	12 (20%)	
Gender			1
Male	42 (70 %)	42 (70%)	
Female	18 (30%)	18 (30%)	
Indication for Tonsillectomy			1
Recurrent infection	37 (61.6%)	37 (61.6%)	
Tonsillar Enlargement	23 (38.3%)	23 (38.3%)	

Table 1: Age, Sex and Indication data for tonsillectomy.

	Eligibility Criteria	Non-eligibility Criteria
1	Chronic tonsillitis (7 or more episodes/year or 5 or more episodes/year for 2 years or 3 or more episode/year for 3 years	Age less than 5 years and more than 45 years.
2	Obstructive symptoms related to tonsil hypertrophy	Patient with history of bleeding disorder
3	Age between 5 to 50 years come under the study	Patient who gives negative consent for surgery
4	-	History of tonsillitis within three weeks prior to surgery

Table 2: Prerequisite Criteria.

A total of sixty patients met the inclusion criteria and were enrolled in the study. The patient's ages ranged from 5 to 51 years, with a median age of 9 years and an interquartile range (IQR) of 3 years. The majority of patients (n = 48, 80%) were aged 20 years or younger. Of these, 12 (20%) were female.

Recurrent infections accounted for 61% (n = 37) of the indications for tonsillectomy, as shown in Table 1. Statistical analysis revealed no significant differences between the Coblation and Conventional tonsillectomy groups in terms of age, gender, or the reason for undergoing tonsillectomy (P = 1.000).

The mean operative time for Coblation tonsillectomy was 9.1 minutes (± 2.38), while for conventional tonsillectomy it was 12.7 minutes (± 2.43), with a statistically significant difference between the two methods (P = 0.002). Similarly, there was a significant difference in the mean blood loss between the two groups (P = 0.003). The average blood loss was 15.11 ml (± 2.78) for Coblation and 33.07 ml (± 3.39) for conventional tonsillectomy.

Regarding postoperative pain, the mean VAS (Visual Analog Scale) scores at different time points were lower in the Coblation group compared to the conventional tonsillectomy group. For the Coblation group, the VAS scores were 7.61 ± 0.75 at 3 hours, 6.35 ± 0.75 at 8 hours, 5.24 ± 0.62 at 24 hours, 0.31 ± 0.67 at 7 days, and 0.10 ± 0.78 at 14 days. In contrast, for the conventional group, the VAS scores were 9.40 ± 0.72 at 3 hours, 8.97 ± 0.82 at 8 hours, 7.85 ± 0.73 at 24 hours, and 5.03 ± 0.18 at 7 days. Statistically significant differences in pain scores were found between the two groups during the first four postoperative time points (P < 0.05).

Clinically, the effect size for all statistically significant parameters between the two techniques was moderate (effect size ≥ 0.5), except for the pain scores at 7 days, which showed a small clinical effect (effect size = 0.6).

It was revealed that primary and secondary hemorrhage rate was higher in conventional Tonsillectomy than Coblation Tonsillectomy (Table 3)

	Conventional Tonsillectomy	Coblation Tonsillectomy
Primary Hemorrhage	8 (13%)	3 (5%)
Secondary Hemorrhage	6 (10%)	2 (3%)

Table 3: Table showing Hemorrhage rate.

The two groups were compared based on how long the surgery took, how much blood was lost, how long it took to get back to normal activities, and if there were any postoperative bleeding issues. Before surgery, we checked for infections or bleeding problems and excluded those patients. All tonsillectomies were done with the same anesthetic method. Surgery time was recorded from when the mouth gag was placed to when it was removed. Blood loss was measured by how much blood was in the suction bottle after the surgery.

	Mean +/_ SD		P Value
Parameter	Coblation	Conventional	
Operative Time (min)	11.48+/-2.67	28.63+/-7.46	0
Blood loss (ml)	43 +/- 6.22	140 +/- 34.65	0
Return to normal Behaviour (Days)	8.63 +2.74	14.28 +/- 3.23	0

Table 4: Table showing duration of time and blood loss during surgery.

Results

The cohort consisted of 60 patients with a mean age of 10.6 years (range 5– 50 years). The first group underwent coblation tonsillectomy on the right side and conventional tonsillectomy on the left side, with the results being compared. The patient demographic included 42 males (70%) and 18 females (30%).

Statistical analysis showed no significant age difference between the two groups ($p > 0.05$). The mean intraoperative blood loss was significantly lower for the coblation group (43 ± 6.22 mL) compared to the dissection group (140.31 ± 34.65 mL), with a p-value of <0.000. The mean operative time for the coblation group was also significantly shorter (11.48 ± 2.67 minutes) compared to the dissection group (28.63 ± 7.46 minutes, $p < 0.000$). Return to normal activity was faster in the coblation group (8.63 ± 2.74 days vs. 14.28 ± 3.23 days, $p < 0.05$). The incidence of post tonsillectomy hemorrhage, both primary and secondary, was higher in the dissection group.

Discussion

Although tonsillectomy is a common procedure performed by otolaryngologists, it still presents risks such as bleeding and pain after surgery [11,12]. Surgeons continually assess various tonsillectomy techniques to find the most effective method in terms of reducing surgical time, minimizing blood loss, and preventing complications such as postsurgical hemorrhage and pain. This study aimed to compare Coblation tonsillectomy with the traditional dissection technique in both pediatric and adult patients. One of the key strengths of the study was the comparison of both methods in the same patient, with Coblation used on one side and dissection on the other, which helped to minimize bias. The results showed that Coblation was more efficient than the dissection method in terms of shorter operative time and reduced blood loss, and it also provided better outcomes in terms of postoperative pain relief compared to conventional dissection tonsillectomy [13-15].

The key factors in evaluating improvements in tonsillectomy include reduced operative time, minimized blood loss during surgery, lower rates of both primary and secondary post-operative bleeding, less postoperative discomfort, and a quicker recovery allowing patients to return to their normal activities16. Although numerous studies have assessed these factors across various tonsillectomy techniques [16], there remains no clear agreement on the optimal surgical approach. As such, when selecting a tonsillectomy method, considerations should include the availability of necessary instruments and equipment, the surgeon's expertise, and the preferences of the patient or their parents.

Conclusion

The study indicated that Coblation tonsillectomy outperformed the Conventional dissection method in terms of operative time and intraoperative blood loss. Additionally, the Coblation technique demonstrated significantly lower postoperative pain VAS scores at 3, 8, and 24 hours, as well as 7 days post-surgery. The study also revealed a moderate clinical effect size, highlighting the beneficial outcomes of the Coblation method across all measured parameters.

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