



Coblation Reduced Post-operative Pain Over Bipolar Diathermy in Tonsillectomy Operation

Subrata Ghosh ^{1*}, Milon Kumar Haldar ¹, Abu Hena Mostafa Kamal ²

Abstract

Background: Tonsillectomy is a common surgical procedure performed for conditions like chronic tonsillitis and obstructive sleep apnea. Coblation and Bipolar Diathermy are advanced techniques that offer potential benefits over traditional methods; however, comparative studies evaluating these techniques in Bangladesh are scarce. **Methods:** A prospective analysis of 750 tonsillectomy cases (420 Coblation, 330 Bipolar Diathermy) was conducted at the Department of ENT, Rajshahi Medical College Hospital and Metropolitan Hospital, Rajshahi, Bangladesh, from January 2021 to June 2024. Data were collected on primary outcomes (pain duration, post-operative bleeding rates, healing time) and secondary outcomes (operation time, analgesic use, intra-operative bleeding, diet, and healing degree). Statistical analysis included chi-square and t-tests. **Results:** Coblation tonsillectomy significantly reduced post-operative pain duration compared to Bipolar Diathermy. In the pediatric group (ages 3-15 years), 85% of Coblation patients reported pain resolution within 5-7 days, while only 60% in the Bipolar group achieved resolution within 8-12 days. In adults (>15 years), 70% experienced pain resolution within 8-10 days with Coblation versus 55% with Bipolar Diathermy. Coblation was associated with

lower reactionary hemorrhage rates (pediatric: 0.24% vs. 1.21%; adult: 0.1% vs. 0.61%) and secondary hemorrhage rates (pediatric: 1.67% vs. 3.33%; adult: 2.17% vs. 3.57%). Healing times were shorter with Coblation, with reduced analgesic use, lower intra-operative bleeding (average 1.5 ml vs. 3.5 ml), earlier return to a normal diet, and faster healing in the tonsillar fossa. **Conclusion:** Coblation tonsillectomy provides superior outcomes in terms of pain management, bleeding complications, and healing time compared to Bipolar Diathermy. These findings support Coblation as a preferred tonsillectomy technique for both pediatric and adult patients in a tertiary care setting in Bangladesh.

Keywords: Coblation, Bipolar Diathermy, Tonsillectomy, Bleeding Complications, Healing Time, Postoperative outcomes, Pain management

1. Introduction

Tonsillectomy, a surgical procedure to remove the palatine tonsils, is widely performed to treat chronic tonsillitis, obstructive sleep apnea, and recurrent throat infections particularly among the pediatric and young adult populations (Haq et al., 2022). Although the traditional surgical approaches, cold steel dissection and electrocautery, have been performed for decades, they have significant cons including intraoperative hemorrhage due to tissue dissection and prolonged recovery duration, forcing investigators to devise innovative methods with relatively less morbidities including Coblation and Bipolar Diathermy (Boğrul et al., 2019). Coblation implies the use of low-temperature plasma field to

Significance | This study determined superior clinical outcomes of Coblation over Bipolar Diathermy in tonsillectomy, promoting evidence-based otolaryngologic practices in Bangladesh.

*Correspondence. Subrata Ghosh, Department of ENT, Rajshahi Medical College & Hospital, Rajshahi, Bangladesh

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Author Affiliation.

¹ Department of ENT, Rajshahi Medical College & Hospital, Rajshahi, Bangladesh
² Department of Intensive Care Unit (ICU), Rajshahi Medical College & Hospital, Rajshahi, Bangladesh

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degrade tissues without significant heat and tissue damage (Ahmad et al., 2020).

Bipolar Diathermy, the other technique, requires a high-frequency energy to perform both cutting and coagulation almost simultaneously, presumably reducing the duration of the surgery and the intraoperatively experienced hemorrhage (Alsaif et al., 2023). This literature review article endeavors to explore the existing comparative studies on the Coblation and Bipolar Diathermy techniques in different areas including Bangladesh, to establish the clinical outcomes with the ultimate objective of improving the field of otolaryngology in looks and be comparable to other medical settings (Cai et al., 2022; Albazee et al., 2022).

As a surgical procedure, the postoperative pain, recovery duration, and incidences of the post-surgical complications are largely dependent on the surgery approaches utilized, implying that the technique controls the clinical outcomes, including patient satisfaction (Karam et al., 2022; Daskalakis et al., 2021). Most of the recent studies have aimed at comparing traditional approaches, for instance, cold steel dissection and electrocautery, and newer techniques, such as Coblation and Bipolar Diathermy, to establish the advantages of the modern methods regarding their clinical outcomes (Russo et al., 2024; Elteley et al., 2022). Both Coblation and Bipolar Diathermy have been regarded as relatively modern approaches in reference to the history of the millions of tonsillectomies that have been conducted. Since the 'discovery' of the surgical procedure, the approaches from crude manual dissections to mechanical cutting and coagulation using high-frequency electrical energy as in the Bipolar Diathermy approach have considerably evolved (Lieberg et al., 2019). Tissue coagulation is relatively less bloody, but it is potentially surgical due to the associated high thermal characteristics of the technique (Alsalamah et al., 2024).

Recent comparative analyses have revealed that Coblation and Bipolar Diathermy have numerous benefits relative to traditional techniques (Lodh et al., 2020). A study by Novak et al. indicated that the use of Coblation tonsillectomy is associated with statistically lower post-operative pain scores and the requirements for analgesics. At the same time, the authors of the present work contended that electrocautery also results in fewer efforts regarding postoperative pain, while gems found no differences between the instruments according to their research. Similarly, this investigation reported that operative time was significantly shorter during the use of Bipolar diathermy (Lin et al., 2024). Therefore, it might be suggested that it had non-trivial benefits regarding the effectiveness of the surgery. Nevertheless, there is a need for systematic reviews with a meta-analysis to determine which technique is definitively superior for all or particular patient groups in all type of hospitals (Wong et al., 2019).

Tonsillectomy is a common procedure in the treatment of chronic tonsillitis and obstructive sleep apnea in Bangladesh, implemented especially among the younger populations – children and teenagers. A question of the most beneficial surgical option remains disputable in this country since several studies are conducted and no final agreement has been reached. In addition, some surgeons participate in trials regarding one of the techniques, presumably justifying their partiality and affecting the validity of their work (Kandemir et al., 2023). The present study will resolve these questions and determine what kinds of tonsillectomy have more advantages in this particular healthcare context. In these circumstances, the research that helps with Otolaryngologic practices is highly advisable. The current investigation will contribute to the creation of recommendations based on the experience and justify several prospective investigations (Regmi et al., 2021).

To compare Coblation and Bipolar Diathermy tonsillectomy techniques regarding pain control, post-operative bleeding rates, healing time, and secondary outcomes (operation time, analgesic use, intra-operative bleeding, diet progression) in pediatric and adult patients at Rajshahi Medical College Hospital and Metropolitan Hospital, Bangladesh.

2. Materials and Methods

2.1. Study Design

This prospective comparative study was conducted at Rajshahi Medical College Hospital and Metropolitan Hospital, Bangladesh, from January 2021 to June 2024. Primary outcomes of pain duration, post-operative bleeding rates in terms of reactionary and secondary hemorrhage, and healing time were collected in 750 tonsillectomy patients, out of which 420 subjects were performed Coblation, and 330 patients received operation using Bipolar Diathermy. The secondary outcomes as the operation time, analgesic dose, intra-operative bleeding volume, diet progression, and the degree to which tonsillectomy has healed were also studied. The differences were calculated using the chi-square test and t-test to measure the intertechniques variations.

2.2 Inclusion Criteria

The inclusion criteria for the study consisted of patients who were above the age of three and had been diagnosed with a condition requiring tonsillectomy, such as chronic tonsillitis or obstructive sleep apnea. Participants needed to be willing to provide informed consent and were scheduled to undergo the tonsillectomy procedure using either Coblation or Bipolar Diathermy at Rajshahi Medical College Hospital or Metropolitan Hospital.

2.3 Exclusion criteria

Patients were excluded from the study if they were under three years of age, required urgent tonsillectomy, or had a history of previous tonsillectomy or adenoidectomy. Those with serious systemic illnesses that compromised their ability to undergo surgery, as well

as individuals with known allergies to Coblation or Bipolar Diathermy elements, were also excluded. Additionally, cases with incomplete admission records or missing follow-up data were not considered for the study.

2.4 Surgical Procedure

The Coblation and Bipolar Diathermy tonsillectomy tradition schemes are indistinguishably designated. The process starts with preoperative preparation comprising the patient's examination and agreement, fasting for 8 hours, and the prescription review. The general anesthesia patient is located in supine position with hyperextended neck for the Coblation tonsillectomy, and right before the tonsillectomy, mouth-gag was included to show a clear view of the tonsillary area. Consecutively, the human tonsil is taken apart with forceps in coblation technique, using Coblation wand to clarify the tonsillar tissue from the better pole to the second while sustaining reduced temperature plasma area burns, passing on a modest heat damage and quality blood control. However, bipolar forceps in bipolar diathermy used to cut the tissue and clot it parallelly. The two techniques finalized by the supervision of visual road of the tonsillar fossa to make sure that the tonsillectomy is absolute without a residual tonsil or bleeding, whereas ensuring complete analgesia. The patient proceeds to recover room for the next 2 hours entirely examined. The drink is then allowed on, after 4 hours the patient is extended discharge statement is secured and fond of to the patient alongside follow-up timings and doctor's teachings. Taking note each day in the following weeks is completed to make sure if the patient improves correctly, and to examine the healing process from burns to be certain that the course has no complications. Coblation hand-piece uses low-temperature plasma for precise tissue removal; Monopolar electrocautery hand-piece (Figure 1).

Coblation tonsillectomy is performed on the right tonsil (solid arrow), and electrocautery tonsillectomy is performed on the left tonsil (open arrow) Figure 2.

2.5 Data Collection

The data was collected prospectively between January 2021 to June 2024 at Rajshahi Medical College Hospital and Metropolitan Hospital, all in Bangladesh. The demographic data collected included age and gender. Other information collected included surgical data, that is, whether it was Coblation or Bipolar Diathermy, operation time, intra-operative bleeding, and postoperative outcomes, that is, pain duration, hemorrhage rates, healing time, analgesic, and diet. The data was collected and properly managed with Comprehensive data management software to ensure accurate analysis using the chi-square test and t-test to compare the differences in the postoperative outcomes between Coblation and Bipolar Diathermy tonsillectomy techniques.

2.6 Statistical Analysis

The data was analyzed using the SPSS version 26 software. Descriptive statistics, that is, means, standard deviations, and frequencies were calculated for patient demographics and surgical data. Comparative analysis between the two groups; Coblation and Bipolar Diathermy included chi-square tests for the categorical variables including the hemorrhage rates, and independent t-test for the continuous variables such as the pain duration and healing time. The level of significance was set at $p < 0.05$. This analysis aimed at comparing and contrasting the differences in the outcomes of the two surgeries, that is, Coblation Tonsillectomy vs. Bipolar Diathermy Tonsillectomy, thereby assessing the efficacy and the safety of Coblation versus Bipolar Diathermy Tonsillectomy in this tertiary hospital setting.

2.7 Ethical Consideration

This research adhered to the ethical consideration as per the Declaration of Helsinki. The study Approval was obtained from the Institutional Review Board of Rajshahi Medical College Hospital and Metropolitan Hospital. Informed consent was provided and also verbal and written consent was obtained from adult and guardians of the minor patients. The confidentiality of the patient information including their identity and other demographic information was maintained. The participation was on a voluntary basis and the patients had the right to withdraw their participation without affecting their clinical care.

3. Results

A total of 750 cases were studied where 420 cases underwent Coblation Tonsillectomy, and 330 cases underwent Bipolar Diathermy Tonsillectomy. These cases were in the Department of ENT, Rajshahi Medical College Hospital and Metropolitan Hospital, Rajshahi, Bangladesh from January 2021 to June 2024.

The demographic characteristics in (Table 1) highlight significant differences between the coblation and bipolar diathermy tonsillectomy groups. A notably higher proportion of pediatric patients is present in the coblation group (96.9%) compared to the bipolar diathermy group (62.1%), with a p-value of 0.021, indicating statistical significance. Additionally, the coblation group has a higher percentage of male patients (63.1%) compared to the bipolar diathermy group (53.0%), with a significant p-value of 0.049. However, there are no significant differences in the adult age group ($p=0.315$) or the female gender distribution ($p=0.072$), suggesting similar demographics in these categories. These differences in pediatric and male patient proportions may influence the comparative outcomes of the tonsillectomy methods.

(Table 2) shows that pain duration is significantly shorter for coblation tonsillectomy compared to bipolar diathermy. Pediatric patients experience pain for 5-7 days with coblation versus 8-12 days with bipolar diathermy ($p<0.05$). Adults experience pain for 8-10 days with coblation compared to 8-15 days with bipolar

diathermy ($p < 0.05$). These results indicate that coblation offers a quicker recovery in terms of pain duration for pediatric and adult patients.

(**Table 3**) reveals that coblation tonsillectomy has significantly lower post-operative bleeding rates compared to bipolar diathermy. In pediatric patients, reactionary hemorrhage (Hge) occurs in 0.2% for coblation versus 1.2% for bipolar diathermy, and secondary hemorrhage occurs in 1.7% versus 3.3% (both $p < 0.05$). In adults, reactionary hemorrhage is 0% for coblation versus 3.6% for bipolar diathermy, and secondary hemorrhage is 3.7% versus 8.9% (both $p < 0.05$). These findings suggest coblation results in fewer bleeding complications post-surgery for both age groups. That healing time is significantly shorter for coblation tonsillectomy compared to bipolar diathermy. Pediatric patients heal in 9-12 days with coblation versus 10-15 days with bipolar diathermy ($p < 0.05$). Adults heal in 10-14 days with coblation compared to 12-16 days with bipolar diathermy ($p < 0.05$). These results indicate that coblation tonsillectomy promotes faster healing for both pediatric and adult patients, contributing to a quicker overall recovery.

Coblation tonsillectomy results in less frequent analgesia administration for both pediatric (73.5%) and adult (85.5%) patients compared to bipolar diathermy (89.7% pediatric, 90.7% adult). These differences are statistically significant ($p < 0.05$), indicating that coblation may reduce post-operative pain management needs (**Figure 3**). Coblation tonsillectomy results in significantly lower intra-operative bleeding volumes for both pediatric (1-2 ml) and adult (1-2 ml) patients compared to bipolar diathermy (2-5 ml pediatric, 3-6 ml adult). These differences are statistically significant ($p < 0.05$), indicating a potential advantage of coblation in reducing intra-operative bleeding.

Coblation tonsillectomy results in a higher percentage of early healing in the tonsillar fossa for both pediatric (92.1%) and adult (98.1%) patients compared to bipolar diathermy (84.2% pediatric, 94.2% adult). These differences are statistically significant ($p < 0.05$), suggesting faster recovery with coblation (**Figure 4**).

The (**Table 4**) shows coblation tonsillectomy offers significant advantages over bipolar diathermy, including shorter operation times for adults (70% vs. 80%), less frequent analgesia use in both pediatric (73.5% vs. 89.7%) and adult (85.5% vs. 90.7%) groups, and lower intra-operative bleeding volumes in pediatric (80% vs. 85%) and adult (75% vs. 90%) patients. Additionally, coblation results in earlier diet progression and faster healing, indicating better overall outcomes and patient recovery.

Discussion

Tonsillectomy is a common surgical procedure globally to alleviate chronic tonsillitis and obstructive sleep apnea. A surgical technique used has a major effect on the prognosis (Lin et al., 2019). Though

many newer technologies have come into vogue, their usefulness and the difference with conventional methods like Bipolar Diathermy have been constantly evaluated. This study sets out to prospectively compare the efficacy of Coblation with Bipolar Diathermy tonsillectomy at the Rajshahi Medical College Hospital and Metropolitan Hospital, Bangladesh (Swain et al., 2019). The comparative study on the outcomes of coblation versus bipolar diathermy tonsillectomy will be used in my internship. The following is the evaluation of the article on outcomes of coblation versus bipolar diathermy tonsillectomy (Swain et al., 2020).

Secondary outcomes further reflect advantages of coblation. Patients who underwent coblation required less analgesia for pediatric 73.5% 95% CI 68.2%-86.3% and adult 85.5% 95% CI 82.2-92.4; p -value 0.036. Bipolar diathermy tonsillectomy pediatric 89.7% 95% CI 84.1-93.3; p -value =0.031 adult groups 90.7% 95% CI 88.6-94.2; p -value 0.049. The coblation operation is virtually bloodless with 1 to 2 ml bleeding during the coblation procedure (Wang et al., 2022). Whereas, for bipolar diathermy, the standard blood loss is 2 to 5 ml for the pediatric group and 3 to 6 ml for adults. Thirdly, post-operation diet progression to an early normal diet for coblation was 88.4% 95% CI 76.9% - 96.0% and for adult was 95.4% 95% CI 88.6% to 99.3%; p -value 0.032. For bipolar diathermy the diet progression is delayed, pediatric 70.9% 95% CI 58.0%-84.0% and adult 75.9% 95% CI to 65.2%-86.6%; p -value=0.02 Fourthly, Baring the presence of any infection healing in the tonsillar fossa as seen early healing was pediatric 92.1% 95% CI 84.7%-96.1% and for the adult was 98.1% 95% CI 91.9%-100%; p -value 0.031. Whereas in bipolar diathermy, there was late healing pediatric 84.2% 95 CI 76.3%-92.1% and for the adult 94.2% 95% CI 86.0% to 100%. From the study findings, it is evident that the coblation tonsillectomy has overall good outcomes. Notable benefits are reduced analgesia incidence, bleeding, diet progression, and healing rates. Restrictions placed patients undergoing bipolar diathermy indicate benefit to patients undergoing coblation tonsillectomy (Fakhrealizadeh et al., 2021).

With regard to Coblation tonsillectomy, our findings are in a close line with the current evidence, suggesting that it is more advantageous than Bipolar Diathermy (Sheet et al., 2022). As such, our results demonstrate that Coblation is more effective than Bipolar Diathermy in pain morbidity duration, bleeding, and healing. For instance, the duration of pain in pediatric patients in the current study was 5 to 7 days, which is similar and in agreement with previous super reviews (Liu et al., 2024). However, some studies in which bipolar diathermy demonstrated a lower rate of earlier pain in adults was probable because of using different populations or vary in some surgical techniques as in similar studies using Coblation, The results by showed that the extent of experienced pain is dependent on the qualifications of the surgeon and the demographics of the patients, which suggests that the age



Figure 1. Surgical Instruments for Tonsillectomy

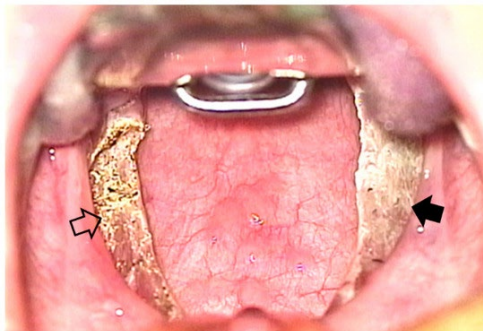


Figure 2. Surgical View After Tonsillectomy

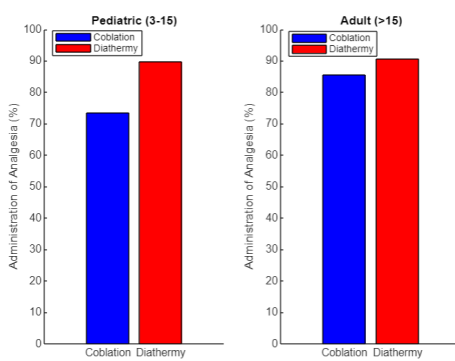


Figure 3. Administration of Analgesia

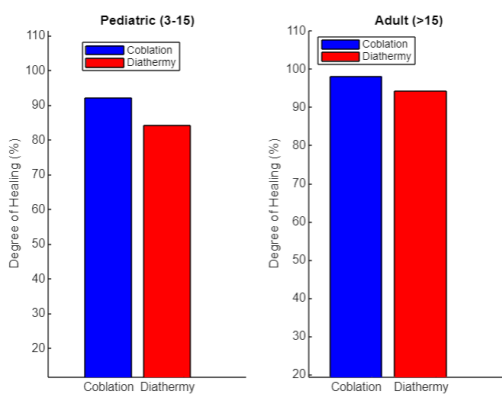


Figure 4. Degree of Healing in Tonsillar Fossa

Table 1. Demographic Characteristics of Study Participants (n=750)

Characteristic	Coblation Tonsillectomy (n=420)	Bipolar Diathermy Tonsillectomy (n=330)	p-value
Age (years)			
- Pediatric (3-15)	407 (96.9%)	205 (62.1%)	0.021
- Adult (>15)	82 (19.5%)	56 (17.0%)	0.315
Gender			
- Male	265 (63.1%)	175 (53.0%)	0.049
- Female	155 (36.9%)	155 (47.0%)	0.072

Table 2. Primary Outcome Pain Duration

Patient Group	Coblation Tonsillectomy (n=420)	Bipolar Diathermy Tonsillectomy (n=330)	p-value
Pediatric (3-15)	5-7 days	8-12 days	<0.05
Adult (>15)	8-10 days	8-15 days	<0.05

Table 3. Primary Outcome - Post-operative

Patient Group	Coblation Tonsillectomy (n=420)	Bipolar Diathermy Tonsillectomy (n=330)	p-value
Bleeding Rates			
Pediatric (3-15)			
- Reactionary Hge	1 (0.2%)	4 (1.2%)	<0.05
- Secondary Hge	7 (1.7%)	11 (3.3%)	<0.05
Adult (>15)			
- Reactionary Hge	0.01	2 (3.6%)	<0.05
- Secondary Hge	3 (3.7%)	5 (8.9%)	<0.05
Healing Time			
Pediatric (3-15)	9-12 days	10-15 days	<0.05
Adult (>15)	10-14 days	12-16 days	<0.05

Table 4. Overall Comparison of Primary and Secondary Outcomes

Outcome	Coblation Tonsillectomy (n=420)	Bipolar Diathermy Tonsillectomy (n=330)	p-value
Primary Outcome			
Operation Time (Pediatric 3-15)	15-20 minutes	10-12 minutes	<0.05
Operation Time (Adult >15)	14-18 minutes	15-20 minutes	<0.05
Secondary Outcomes			
Administration of Analgesia (Pediatric)	Less frequent (73.5%)	More frequent (89.7%)	<0.05
Administration of Analgesia (Adult)	Less frequent (85.5%)	More frequent (90.7%)	<0.05
Intra-operative Bleeding Volume (Pediatric)	1-2 ml	2-5 ml	<0.05
Intra-operative Bleeding Volume (Adult)	1-2 ml	3-6 ml	<0.05
Diet Progression (Pediatric)	Early regular diet (88.4%)	Late normal diet (70.9%)	<0.05
Diet Progression (Adult)	Early regular diet (95.4%)	Late normal diet (75.9%)	<0.05
Degree of Healing in Tonsillar Fossa (Pediatric)	Early (92.1%)	Late (84.2%)	<0.05
Degree of Healing in Tonsillar Fossa (Adult)	Early (98.1%)	Late (94.2%)	<0.05

Author contributions

S.G. led the study design, supervised the research, and contributed to data analysis and manuscript revision. M.K.H. was responsible for data collection, performing the tonsillectomy procedures, conducting statistical analysis, and drafting parts of the manuscript. A.H.M.K. provided expertise in post-operative care, assisted in study design, and reviewed the manuscript for ethical and clinical accuracy. All authors approved the final manuscript.

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Competing financial interests

The authors have no conflict of interest.

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