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Research Article
Diathermy

Comparison between Bipolar Diathermy and Coblation assisted tonsillectomy in Children patients

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Introduction: Tonsillectomy is one of the commonly performed otolaryngological operations. Coblation assisted tonsillectomy is the latest technique of tonsillectomy. This technique is said to be associated with less intraoperative bleeding and less postoperative morbidity. **Materials and Methods:** This study was a prospective, interventional, non-randomized study enrolling pediatric patients undergoing tonsillectomy with planned overnight admission. Surgical technique (MES vs RFA) and its relation to time to discharge on postoperative day one were compared. The total number of patients who underwent tonsillectomy was 60 patients (30 of them by bipolar diathermy technique, 30 by Coblation assisted technique). **Result:** Incidence of postoperative bleeding was almost similar in both groups. In the Diathermy group, only one patient and the Cobalation group, only two patients had a secondary hemorrhage that was managed conservatively and did not need surgical intervention. The total mean duration of surgery for the bipolar diathermy method was 12.33±5.31 minutes which was more than the mean operative time for the method, which was 8.01±4.83 minutes for the coblation method. On the other hand, the mean intraoperative blood loss for the bipolar diathermy method was 43.21±13.32 ml, and for the coblation method, the mean intraoperative blood loss was 28.12±11.73 ml. **Conclusion:** We recommend using coblation over bipolar diathermy for tonsillectomy in adults based on the lower levels of postoperative pain and similar morbidity.

Keywords: Bipolar Diathermy, Coblation assisted tonsillectomy, Postoperative pain score

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Introduction

Tonsillectomy is one of the oldest and most frequent procedures performed by otolaryngologists. It was not until the beginning of the twentieth century that Worthington and Waugh described the modern tonsillectomy technique by dissection. [1]. Cautery use in tonsillectomy was first defined in 1962. Further, Andrea defined the first microsurgical bipolar cautery technique3 in 1993. A variety of techniques performs tonsillectomy. These techniques have evolved over the years, aiming to make the procedure safe and decrease surgical time, intraoperative blood loss, postoperative morbidity, and complications. [2]. Despite the developments in techniques and technology, tonsillectomy still carries a relatively high risk of morbidity. Conventional tonsillectomy and bipolar tonsillectomy are the standard techniques used in the paediatric population with different indications. [3].

But, nowadays, bipolar electrocautery is one of the most standard procedures as it is easy to perform and helps reasonable control of bleeding. Apart from that, new instruments like harmonic scalpel, light amplification by stimulated emission of radiation (LASER) have also been used to perform a tonsillectomy. [4]. The main aim of the tonsillectomy with these instruments is to reduce bleeding and pain. However, there is not any such instrument causing a total reduction of bleeding and pain. [5]. Certainly, otolaryngologists would want to investigate the feasibility of any new instrumentation that would decrease the morbidity of tonsillectomy, even if it were relatively expensive. [6]. Coblation tonsillectomy was initially introduced in 2001. A significant number of articles have been published either to confirm its efficacy or to reject that because of unsatisfactory or unproven outcomes with undesirable cost-effectiveness. [7]. However, more studies are still required to reveal a clear conclusion. [8]. Even though some former studies showed reduced postsurgical pain and no significant morbidities like postoperative bleeding, they were not considered due to their small sample size. A study observed the healing process of the tonsillar bed in 10 patients and concluded that the coblation method would be preferable to bipolar dissection. [9]. A recent study defended the use of coblation surgery because of decreased bleeding and pain, but cases in the study were only 14 patients. [10].

Another study in the UK found no benefits for the coblation method comparing with conventional tonsillectomy, indicating that traditional tonsillectomy is superior to the coblation method. [11]. The NICE guidelines have suggested that coblation is probably associated with decreased postoperative pain comparing with bipolar diathermy; however, the outcomes may be different for that of the monopolar diathermy or cold dissection. [12]. Our study aimed to compare coblation and traditional tonsillectomy regarding the postoperative morbidities and time required to regain the normal diet and activity with more cases.

To compare the Bipolar Diathermy and Coblation assisted tonsillectomy in children patients for chronic tonsillitis or tonsillar hypertrophy on intraoperative morbidity and postoperative morbidity.

Materials and Methods

Setting: This study was conducted at the Department of ENT, Adesh Medical College and Hospital, Shahbad.

Duration and type of study: 6 months and Prospective, Interventional, Randomised study.

Sampling methods: A randomized study by chit method.

Inclusion Criteria

01. Children aged 5 to 14 years of either sex with recurrent/chronic tonsillitis.
02. Hypertrophied tonsils with obstructive symptoms such as snoring, apnoea, or dysphagia.

Exclusion Criteria

01. All adults above the age of 14 years.
02. Patients undergoing tonsillectomy for glossopharyngeal neurectomy, styloid process removal.
03. Patients suffering from peritonsillar abscess within six weeks preoperatively.
04. Patients with chronic illnesses, e.g. diabetes, symptomatic heart disease, bleeding and clotting disorders, immunodeficiency, and malignancy
05. Patients with significant comorbidities such as underlying neurological disease, Down syndrome, or an inability for the child to communicate pain.

Method of study

Surgical technique (MES vs RFA) and its relation to time to discharge on postoperative day #1 were compared. The total number of patients who underwent tonsillectomy was 60 patients (30 of them by bipolar diathermy technique, 30 by Coblation assisted technique).

Data collection procedure: Parents and patients of assenting age were consented and enrolled, and primary demographic data were collected preoperatively. Data included age on the day of surgery, sex, indication for tonsillectomy, surgical technique, length of stay (time from surgery completion to discharge), time of discharge, and perioperative complications. The attending surgeon on the case decided upon the choice of the surgical instrument. All patients underwent a standard extracapsular tonsillectomy to standardize the analysis of the two groups.

Surgical procedure: In diathermy tonsillectomy, the upper pole of the tonsil was grasped with a tonsil holding forceps and pulled medially. Using a toothed dissecting forceps, the initial mucosal incision was made 1 mm medial to the anterior pillar in the loose areolar tissue between the tonsil capsule and the anterior pillar avoiding injury to the fibers palatoglossal muscle. During dissection, any bleeding points found were quickly cauterized for 2-3 seconds with bipolar diathermy forceps with a power setting of 20 watts and packed with cotton balls. The cautery point was carefully applied close to the tonsil. The bleeding points found in the tonsillar bed were also cauterized in the same way. To minimize thermal injury to the muscles of the tonsillar bed, cautery was selectively used only to cauterize the bleeding points and not the entire fossa. After controlling the bleeding, the fossa was packed with cotton balls, and a similar procedure was repeated on the other side. [13].

In coblation, tonsillectomy is done under general anesthesia with orotracheal intubation. The same wand achieved hemostasis in coagulation mode. Operating time was measured from the anterior pillar incision or beginning of dissection until complete haemostasis of the tonsillar fossa was achieved. Before starting the surgery, a good amount of gauze and ribbon gauze was taken, weighed, and sterilized. The weight was always kept constant at 20 g. The suction bottle, including the rubber tube, was cleaned and emptied before starting the operation.

A known quantity of saline (150 ml) was taken in the bowl and used for intermittent suction to prevent blockage of the suction tube. [14].

All the patients were shifted to the recovery suite and observed for 1 hour, and transferred to the respective wards. Pulse and other vital signs were monitored on a half-hourly for the first 4 hours and then on an hourly basis for the next 4 hours. Intravenous antibiotic (co-amoxiclav or ceftriaxone) was prescribed according to the weight. Intravenous fluids in the form of 5% dextrose or dextrose saline were given according to the weight for the first 24 hours after surgery. Once the tonsils were snared off, they were squeezed thoroughly into the gauze (which was again taken from the measured pad), and the tonsils discarded. Care was taken to see that the linen was not soiled with blood. All the packs and gauzes were kept on a physical balance for weighing.

After ligating the bleeders, the nostrils and nasopharynx were sucked. Then all the saline taken in the bowl was sucked into the suction bottle. The suction tube was raised above the level of the suction bottle to ensure that all the fluid was emptied into the suction bottle. The quantity was then measured by pouring it into the measuring cylinder. Thus, all the blood loss was collected either in the suction bottle or cotton and gauze. All the soiled gauzes and cotton balls together with new cotton balls are placed on the physical balance and weighed. The difference in weights is the weight of blood lost in cotton and gauze. This was converted into milliliters by dividing the weight by specific gravity, which is 1.055. All the patients were discharged on the seventh postoperative day with appropriate dietary advice, proper postoperative instructions, and a prescription of syrup co-amoxiclav or cefixime and syrup ibuprofen with paracetamol according to the weight for three days. They were reviewed after three days in the ENT outpatient department. The symptoms of throat pain, fever, and food intake were noted. The patients were reviewed again after seven days and advised to resume normal activities.

Scoring system: Postoperative pain was recorded using the Visual Analogue Scale. Children were shown the Visual Analogue Scale and were asked to rate from 0- 10. A higher score indicates greater pain intensity. The postoperative pain intensity was categorized as none, mild, moderate, or severe. No pain (0), mild pain (1-3), moderate pain (4–7), and severe pain (8–10).

The Visual Analogue Scale was used on the day of surgery and every 24 hours until discharge and the 14th postoperative day.

Ethical Consideration and permission: After approval from Institutional Ethics Committee for Medical Research at Adesh Medical College and Hospital, the study was initiated.

Statistical analysis: The data analysis was done using MS excel. Categorical variables were presented in number and percentage (%).

Results

In table 1, there is a total of 60 children, 19 in the age group of <5 years, 23 children (38.3%) in the age group of 5-10 years, and at least one 30% in the age group of 10-14 years old.

Table 1: Distribution of age group

Age-group	No.	%
<5	19	31.6
5-10	23	38.3
10-14	18	30
Total	60	100

Table 2: Distribution of sex

Sex	No.	%
Male	37	61.6
Female	23	38.3
Total	60	100

In table 2, out of 60 patients, 7 (61.6%) were male, and 18 (38.3%) were female.

Table 3: Incidence of postoperative haemorrhage

Incidence	Bipolar Diathermy	Cobalation method
No haemorrhage	19	20
Primary haemorrhage	10	8
Secondary haemorrhage	1	2
Total	30	30

In table 3, the incidence of postoperative bleeding is almost similar in both groups. In the Diathermy group, only one patient and the Cobalation group, only two patients had a secondary hemorrhage that was managed conservatively and did not need surgical intervention.

Table 4: Duration of surgery and blood loss between groups

Parameter	Bipolar Diathermy	Cobalation method
Mean duration of surgery in min.	12.33±5.31	8.01±4.83
Mean intra operative Blood loss (ml)	43.21±13.32	28.12±11.73

In table 4, the total mean duration of surgery for the bipolar diathermy method was 12.33±5.31 minutes which was more than the mean operative time for a method which was 8.01±4.83 minutes for the coblation method. On the other hand, the mean intraoperative blood loss for the bipolar diathermy method was 43.21±13.32 ml, and for the coblation method, the mean intraoperative blood loss was 28.12±11.73 ml. This shows that blood loss in the bipolar diathermy group was more than the intraoperative blood loss in the coblation method.

In table 5, Postoperative pain score.

Post-op days	Bipolar Diathermy	Cobalation method
1st	6.01±1.87	5.03±1.63
2nd	5.89±2.12	4.71±1.56
3rd	5.37±2.01	4.32±1.44
4th	4.91±1.98	4.01±1.57
5th	4.33±1.72	3.74±1.63
6th	4.17±1.57	3.53±1.32
7th	3.85±1.63	3.12±1.47

In table 5, postoperative pain score averaged around 3–6 on a 1–10 points scale in children who could understand and respond to such assessment, i.e., 75% of patients. Such assessment was not possible in younger children. However, crying and reluctance to take food were taken as signs of significant pain (5%), whereas staying quiet and keen on taking food were considered as pain-free children (20%).

In symptomatic patients, postoperative pain needed attention between days 3 and 5, more in children.

In table 6, The number of patients reporting pain score >5.

Post-op days	Bipolar Diathermy (Number)	Cobalation Method (Number)
1st	12	8
2nd	11	9
3rd	14	7
4th	12	4
5th	9	2
6th	8	2
7th	8	7

In table 6, the postoperative pain assessed using VAS showed that the pain was more in the Bipolar Diathermy Group the Cobalation Method from Day 1 to Day 4. There was not much difference in postoperative pain in both groups on Day 7.

Discussion

Tonsillectomy remains one of the most common surgical procedures performed in the world. One of the most significant complications is postoperative hemorrhage. [15]. Episodes of post-tonsillectomy hemorrhage are unpredictable and potentially life-threatening. Post-tonsillectomy bleeding occurs in approximately 1 of 20 children independent of individual patient characteristics. However, the exact incidence of postoperative tonsillar bleeding is very difficult to determine. The statistics in the literature range from 0% to 20%. [16].

Surgical techniques and equipment have evolved tremendously over the centuries to decrease operating time and intraoperative blood loss. [17]. Excessive intraoperative blood losses are one of the significant risk factors for post-tonsillectomy hemorrhage. [18]. Cold dissection, hot knife dissection, and bipolar diathermy dissection are the most commonly used techniques worldwide, and intraoperative blood loss is far less with electrocautery than with challenging dissection techniques. [19].

A new technique for tonsillectomy should be: Comparable to or better than existing techniques; safe to use; have a short learning curve, and be cost-effective. In particular, such a new technique would preferably be associated with less postoperative pain, less intra-operative blood loss, a quicker return to regular diet and activity, and a lower risk of both reactive and secondary haemorrhage. [20]. The present study consisted of 23 (38.3%) females and 37 (61.6%) males, similar to previously reported gender distributions by Hultcrantz E et al., including paediatric cases. [21]. In the present study, patients ranged from 15 to 40 years (mean 24.4 years), and paediatric cases were excluded because pain scores and symptom records tend to be unreliable.

In our study, Diathermy group only one patient, and in the Cobalation group, only two patients were reported with secondary hemorrhage. All these patients were managed conservatively and did not need surgical intervention. The literature review revealed that bipolar diathermy tonsillectomy did not carry the risk of secondary bleeding different from other standard techniques. [22]. Koltai PJ has reported incidence of postoperative bleeding as 1.7% with bipolar diathermy tonsillectomy compared to 3.4% with cold dissection, carrying no statistical significance. [23].

Whereas Gendy S and colleagues have reported a higher incidence of secondary hemorrhage with bipolar dissection (2.3%) than cold dissection (1%) in a study including 545 children. [24]. Similarly, Arya AK et al., after conducting a prospective national audit, concluded that hot tonsillectomy techniques are associated with a substantially high risk of secondary bleeding. [25]. All the patients were back to normal life activities two weeks following surgery, including those who had a secondary bleed. 80% of the children population returned to routine daily activities, including school, playing, etc., by day 8 to 10 following surgery. In our study, the mean duration of surgery in the Diathermy group was 12.33 min compared to 8.01 min in the Cobalation group, which was statistically significant.

Lister MT demonstrated that the total duration of operating time per tonsil for all ablations averaged 4.5 min, with a range of 3.9–11.4 min, which is almost similar to our study. [26]. Temple RH et al. demonstrated that the mean operation time was 7.81±2.56 min, consistent with our research. [27]. Our results were similar to the study performed by Shah SA et al. studied 40 patients who underwent bipolar cautery and classical dissection tonsillectomy on each side of the tonsil and reported a mean operation time for electrocautery cold dissection was 12.04 min and 16.57 minutes. [28].

The mean intraoperative blood loss was 43.21±13.32 mL in the Diathermy group compared with 28.12±11.73 mL in the Cobalation group. Mohamed Sharif et al. found out the average intraoperative blood loss with diathermy was 37 ml. Polites N et al. observed < 20 mL to no blood loss in their study on Cobalation group tonsil volume reduction. [29]. Wang J et al. demonstrated that the operative blood loss for Cobalation group tonsil reduction is estimated to be less than 23 mL. [30].

Given the minimal blood loss with temperature-controlled Cobalation group tonsil reduction, less stringent precautions for airway protection seem reasonable, and the less invasive laryngeal mask airway appears to be a safe alternative to endotracheal intubation. Perioperative blood loss is an essential consideration in patients with coagulopathies, especially in small children where total circulating blood volume is smaller. None of the patients in our study underwent any damage to adjacent structures (anterior pillar, uvula, and soft palate) preoperatively.

In our study, the postoperative Secondary hemorrhage rate for the Diathermy group was one compared with the Cobalation group was 2. There were few cases of Primary postoperative bleeding in both the study. Timms MS et al. [31]. Reported a primary hemorrhage rate of 1.7% (1 child) in the Cobalation group requiring hemostasis in the theatre while both groups secondary hemorrhage due to infection, which was treated conservatively with intravenous antibiotics. In our study, postoperative pain scores averaged around 3–6 on a 1–10 points scale in children. In a study reported by Businco LR et al., pediatric patients experienced pain for a mean period of 1.7 days following ablation and 7.1 following conventional tonsillectomy. In pediatric patients undergoing ablation, virtually all patients (27 of 28 children) were pain-free by the 3rd postoperative day.

However, patients who underwent conventional tonsillectomy experienced pain beyond the 6th postoperative day in all adults and 30 out of 40 children undergoing tonsillectomy. [32]. In a study reported by Mitic S et al., patients who underwent the Cobalation group had less pain from the 1st day of surgery, needed fewer analgesics, and were pain-free earlier than the conventional tonsillectomy group. [33]. According to Maddern BR et al., there is no correlation between the number of analgesics consumed and the pain experienced by the child, as dispensing analgesics by the parents rather corresponds to the doctor's prescription than the child's pain. [34]. Younis RT et al. concluded coblation technique offers significant advantages in the postoperative period, with rapid return to a normal diet and a drastic reduction in analgesic requirements following the surgery. [35].

Diathermy dissection tonsillectomy is less expensive but is associated with more postoperative pain in several studies. The postoperative pain after electrocautery dissection of tonsillectomy using bipolar cautery could be due to the higher power setting, duration, and frequency of the cautery application, as explained by Young JR et al. [36]. The use of electro dissection needles or forceps for the complete dissection could result in more thermal injury and tissue damage delaying the healing and increased pain after surgery. This was shown in the studies by Solares CA et al. [37].

Limitations of the current study include the small study size, randomization of instrument choice, and quantification of postoperative oral intake as a metric for safe discharge from the hospital.

In addition, bias may have been introduced because patients might have recorded an instance of 'minimal hemorrhage' or minor bleeding rather than active bleeding and not visited the hospital despite their doctors' recommendations. Further study with more significant patient numbers may enhance this finding. Attending surgeon preference was the primary determinant in instrument choice. Factors such as surgical indication, patient age, and level of training of the resident surgeon all factored into the decision. Although efforts were also made to standardize the postoperative pain management protocol, inconsistencies in pain control necessitated the ethical addition of narcotic analgesics in some patients.

Conclusion

We can conclude that coblation tonsillectomy is an easy to learn safe procedure with significant advantages in improving the quality of postoperative recovery compared to that following the cold dissection technique. But cost-effectiveness of the dissection method outweighs the benefits of coblation at present in the Indian scenario. We recommend coblation over bipolar diathermy for tonsillectomy in adults based on the lower levels of postoperative pain and similar morbidity.

What does this study add to existing knowledge?

The significant advantage of this study is coblation in the postoperative period is less pain leading to an early return to daily activities; fewer secondary infections in tonsil bed, and lesser incidence of delayed haemorrhage.

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