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Comparing efficacy of conventional method versus Bipolar Diathermy in Tonsillectomy: A Tertiary Hospital Experience atTheni district, Tamil Nadu

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Abstract

Introduction: Tonsillectomy is a highly prevalent surgical procedure performed on the head and neck region globally. The procedure is performed using many ways, with the most common ones being cold dissection and bipolar electrocautery techniques. **Aim:** Our purpose in this study is to evaluate and compare the occurrence of postoperative complications between the use of Electro dissection and Bipolar Diathermy. **Materials and Methods:** This study was a prospective randomised clinical trial conducted on 100 paediatric patients who underwent tonsillectomy at Government Theni Medical College in the Otorhinolaryngology department between January 2023 and May 2024. The patients were divided into two groups: Group A and Group B, each consisting of 50 children. Tonsillectomy was performed using either the Dissection and Snare method (Group A) or the Bipolar Diathermy method (Group B), both under General Anaesthesia. Various factors, such as surgery duration, intraoperative blood loss, postoperative haemorrhage, local pain intensity, and incidence of nausea and/or vomiting, were recorded and compared between the two groups to determine the superior technique. The data were analysed using SPSS software (ver-22), with a p-value of less than 0.5 considered statistically significant. **Results:** The average duration of the surgical procedure using bipolar diathermy was 47.36 ± 8.72 minutes, while the average duration for the dissection and snare approach was 67.83 ± 18.64 minutes. The average amount of blood lost during dissection and snare procedure was 62.27 ± 13.73 ml, while the average blood loss during the bipolar diathermy approach was 36.49 ± 5.93 ml. The postoperative pain, as measured by the Visual Analogue Scale (VAS), indicated that the discomfort was greater in the Bipolar Group (Group B) from Day 0 to Day 5. Nevertheless, there was minimal disparity in postoperative pain between the two groups on Day 14. During our investigation, we saw two instances of primary bleeding in the dissection and snare method, but no cases were observed in the bipolar diathermy method. There were two cases of secondary bleeding observed in the dissection and snare approach, while there were eight cases of secondary haemorrhage observed in the bipolar diathermy method. **Conclusion:** The use of bipolar electrocautery for tonsillectomy is advantageous due to its simplicity, shorter duration of the process, and reduced amount of blood loss during surgery. Dissection and snare tonsillectomy is a well-established procedure that has been proven to have lower levels of post-operative pain and complications. As a result, it is more readily accepted by patients.

Keywords: Bipolar diathermy, Tonsillectomy, Electro dissection, intraoperative blood loss, Snare method.

Introduction:

The palatine tonsils are a pair of lymphatic tissue masses situated in the tonsillar fossae on the lateral aspect of the throat or oropharynx. They are integral components of the immune system, working together to protect the human body from respiratory diseases. Tonsils have a tendency to become inflamed and swollen, which is known as tonsillitis. When these diseases occur frequently and severely, or result in issues that impact the patient's ability to breathe and swallow, clogging the upper airway, the physician typically recommends surgical removal of the tonsils.[1]

Tonsillectomy is a long-standing and widely performed surgical treatment in the field of otorhinolaryngology, which is practiced globally. The origins of this practice can be traced back to 3000 years ago, with the earliest documented reference to Hindu medicine dating back to around 1000 years B.C.[2] In 40 AD, Cornelius Celsus, a Roman surgeon, conducted this procedure for the first time by utilising his fingernails[3-4]. Additionally, he detailed the process of using a hook-like instrument to scrape and remove the tonsils. At the start of the twentieth century, Worthington (1907) and Waugh (1909) documented the procedure of tonsillectomy using a dissection method [5-6]. In 1909, a surgeon called Cohen introduced the practice of using ligatures to reduce bleeding during surgery. As a result, tonsillectomy became a widely performed and safe technique in hospitals worldwide. Three In this approach, Remington-Hobbs in 1968[7] and Haase and Noguera in 1969[8] implemented the use of diathermy. In 1982, Goycolea provided a description of electrodissection utilising monopolar diathermy[9]. Pang, a decade later, documented the first instance of tonsillectomy performed using bipolar electrocautery.[10]

Tonsillectomy is conducted using various procedures. Over the years, several procedures have developed with the goal of ensuring the procedure's safety and reducing surgical time, intraoperative blood loss, postoperative morbidity, and problems. Although there have been advancements in techniques and technology, tonsillectomy still poses a very significant risk of morbidity[11]. Conventional tonsillectomy and bipolar tonsillectomy are two commonly used methods in the paediatric population, each with distinct reasons[12]. The aim of this study is to provide a comparative assessment of the effects of various approaches during surgery and after surgery in paediatric patients.

Materials and Methods:

This study was a prospective randomised clinical trial conducted on 100 paediatric patients who underwent tonsillectomy at Government Theni Medical College in the Otorhinolaryngology department between January 2023 and May 2024. The patients were divided into two groups: Group A and Group B, each consisting of 50 children. Tonsillectomy was performed using either the Dissection and Snare method (Group A) or the Bipolar Diathermy method (Group B), both under General Anaesthesia. Various factors, such as surgery duration, intraoperative blood loss, postoperative haemorrhage, local pain intensity, and incidence of nausea and/or vomiting, were recorded and compared between the two groups to determine the superior technique.

The inclusion criteria for this study are as follows: Children aged 5 to 14 years of either sex with recurrent or chronic tonsillitis, and hypertrophied tonsils exhibiting obstructive symptoms such as snoring, apnea, or

dysphagia.

The exclusion criteria for this study include all adults above the age of 14 years, patients undergoing tonsillectomy for glossopharyngeal neurectomy or styloid process removal, patients suffering from a peritonsillar abscess within six weeks pre-operatively, and patients with chronic illnesses such as diabetes, symptomatic heart disease, bleeding and clotting disorders, immunodeficiency, and malignancy.

A total of 100 children were recruited for the study and were evenly divided into two groups, Group A and Group B, with 50 children in each group. A comprehensive medical history, thorough physical examination, and blood tests were conducted on all the youngsters. A tonsillectomy was conducted using general anaesthesia. Children in Group A received tonsillectomy using the Dissection and Snare method, while children in Group B underwent tonsillectomy using the Bipolar Diathermy method. The duration of the operation was measured from the moment the Boyle Davis mouth gag was inserted until it was removed.

The amount of blood lost during surgery was determined by calculating the difference in weight between the cotton swabs used before and after the procedure. This value, converted to millilitres, was then added to the difference in volume between the saline solution used for irrigation before the surgery and the fluid collected in the suction bottle after the surgery. The subsequent equation was utilised. The formula for calculating the total intraoperative blood loss in millilitres is the sum of the differences between the values of b and a, and d and c.

Pain experienced after surgery was measured using the Visual Analogue Scale. The children were presented with the Visual Analogue Scale and instructed to assign a rating on a scale of 0 to 10. A higher score signifies increased intensity of discomfort. The level of pain experienced after surgery was classified into four categories: none, mild, moderate, or severe. The pain scale is categorised as follows: no pain (0), mild pain (1-3), moderate pain (4-7), and severe pain (8-10). The Visual Analogue Scale (VAS) was administered on the day of surgery and subsequently every 24 hours until the patient's discharge. Additionally, the VAS was also administered on the 14th day following the surgery. Complications such as reactive haemorrhage and secondary haemorrhage were monitored until the day of discharge and on the 14th postoperative day.

Results:

The study consisted of 64 children (64%) between the ages of 5 and 10, and 36 children (36%) between the ages of 11 and 14. The average age of all participants was 8.4 ± 2.19 years.

Table1: Comparison of mean operative time (in mins) between two groups (N=100)

Parameter	Group	Mean Operative Time (mins) \pm STD
Technique	Snare (N=50)	67.83 \pm 18.64
	Bipolar (N=50)	47.36 \pm 8.72
p-value (Unpaired t-test)		<0.001 (Statistically Significant)

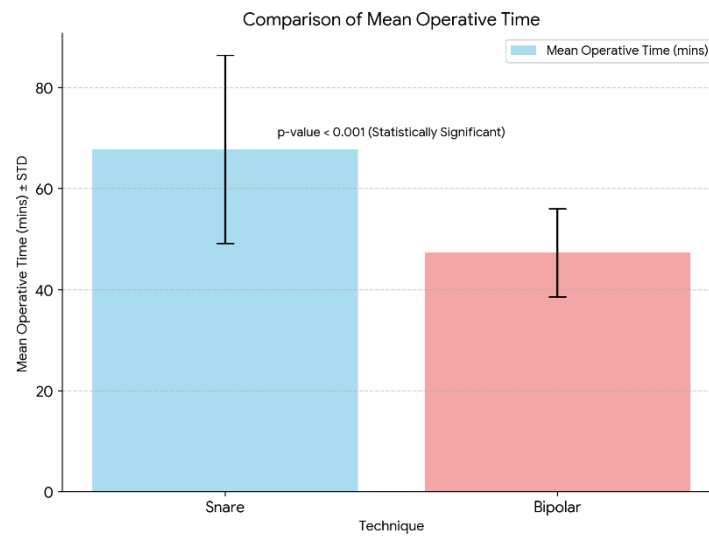


Figure 1: Meanoperativetime(inmins)betweentwogroup

The comparison of mean operative times between the two groups, each consisting of 50 participants, revealed a significant difference. The group using the snare method had a mean operative time of 67.83 ± 18.64 minutes, whereas the group using the bipolar diathermy method had a considerably shorter mean operative time of 47.36 ± 8.72 minutes. This difference was statistically significant with a p-value of less than 0.001. The average operative time using the bipolar diathermy method was 47.36 ± 8.72 minutes, which was significantly shorter than the 67.83 ± 18.64 minutes required for the dissection and snare method, with a p-value of less than 0.001. (Table 1 & Figure 1).

Table2:Comparisonofmeanintraoperativebloodloss (inml)betweentwogroup(N=100)

Group	N (Patients)	Mean Blood Loss (mL)	Standard Deviation (mL)	p-value
Snare	50	62.27	13.73	<0.001 (Highly Significant)
Bipolar	50	36.49	5.93	

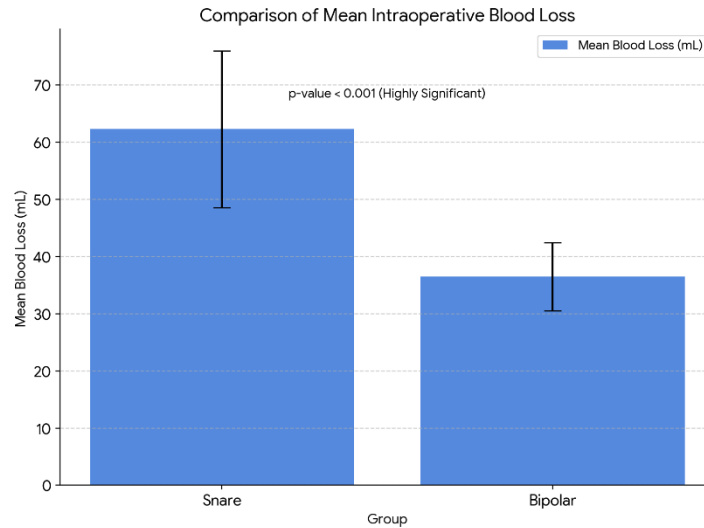


Figure 2: Meanintraoperativebloodloss (inml)betweentwogroup

The comparison of mean intraoperative blood loss between the two groups, each consisting of 25 participants, showed a significant difference. The snare method group experienced a mean blood loss of 62.27 ± 13.73 ml, while the bipolar diathermy group had a substantially lower mean blood loss of 36.49 ± 5.93 ml. This difference was statistically significant, with a p-value of less than 0.001 (Table 2 & Figure 2).

Table3:Comparisonofmeanpostoperativepain(VAS)betweentwogroups(N=100)

PostOperativePain(VAS)	Group		Unpaired ttestPvalue
	A Snare(N=50)	B Bipolar(N=50)	
Day0(Mean±STD)	8.61±0.51	9.42 ±0.47	<0.001
Day1(Mean±STD)	6.88±0.34	7.96±0.41	<0.001
Day2(Mean±STD)	6.10±0.36	7.17±0.38	<0.001
Day3(Mean±STD)	5.12±0.29	6.78±0.21	<0.001
Day4(Mean±STD)	4.07±0.61	5.62±0.43	<0.001
Day5(Mean±STD)	2.16±0.31	3.56±0.71	<0.001
Day6(Mean±STD)	1.08±0.61	2.14±0.57	0.002
Day7(Mean±STD)	0.75 ±0.13	1.40 ±0.71	0.01
Day14(Mean± STD)	0 ±0	0 ±0	-

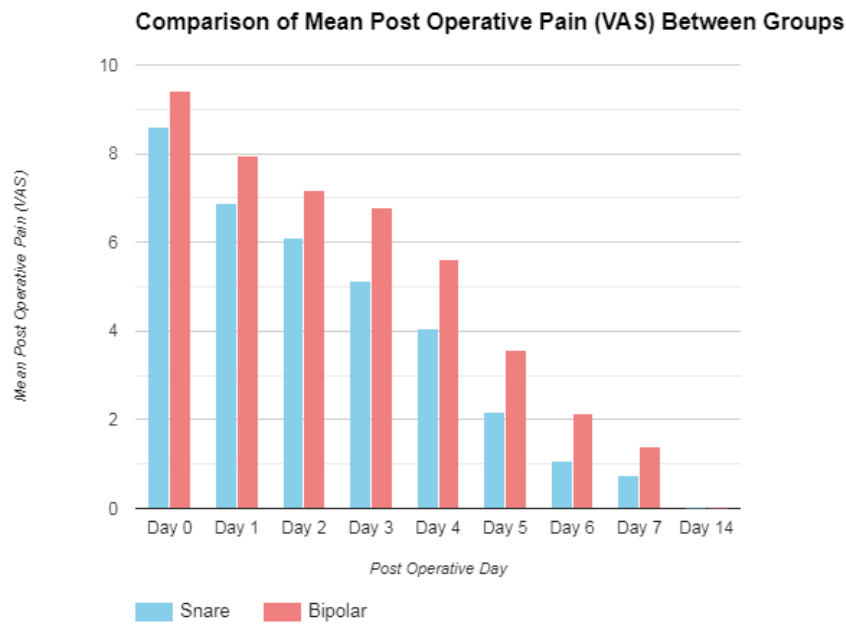


Figure 3: Comparison of mean post-operative pain between two groups

The comparison of mean postoperative pain scores (VAS) between the two groups of 50 participants each revealed significant differences over the first seven days. On Day 0, the snare group reported a mean pain score of 8.61 ± 0.51 , while the bipolar diathermy group reported a higher mean score of 9.42 ± 0.47 ($p < 0.001$). This trend continued with the snare group consistently reporting lower pain scores compared to the bipolar group on Day 1 (6.88 ± 0.34 vs. 7.96 ± 0.41 , $p < 0.001$), Day 2 (6.10 ± 0.36 vs. 7.17 ± 0.38 , $p < 0.001$), Day 3 (5.12 ± 0.29 vs. 6.78 ± 0.21 , $p < 0.001$), Day 4 (4.07 ± 0.61 vs. 5.62 ± 0.43 , $p < 0.001$), Day 5 (2.16 ± 0.31 vs. 3.56 ± 0.71 , $p < 0.001$), and Day 6 (1.08 ± 0.61 vs. 2.14 ± 0.57 , $p = 0.002$). By Day 7, the pain scores were 0.75 ± 0.13 for the snare group and 1.40 ± 0.71 for the bipolar group ($p = 0.01$). By Day 14, both groups reported no pain (Table 3 & figure 3).

Table 4: Comparison of postoperative complications between two groups (N=100)

Postoperative Complications	Group	Total	Snare (N=50)	Bipolar (N=50)	Percentage
Secondary haemorrhage		10	2 (4%)	8 (16%)	83.30%
Primary haemorrhage		2	2 (4%)	0 (0%)	2%
No haemorrhage		88	46 (92%)	42 (84%)	88%
Total		100	4 (8%)	8 (16%)	

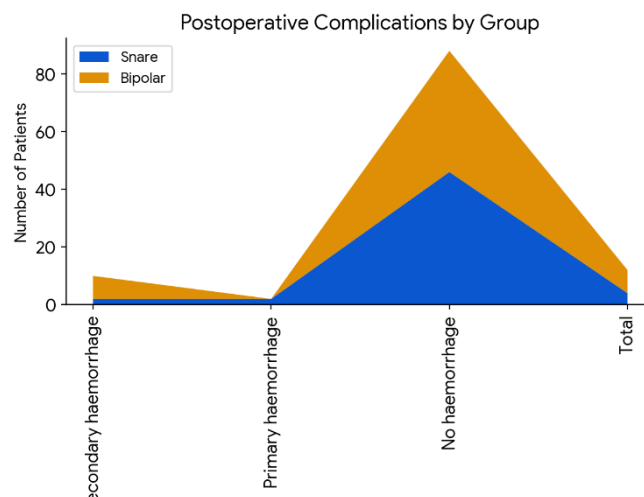


Figure 4: Comparison of postoperative complications between two groups

The researchers compared post-operative complications in two groups (A and B) of 50 patients each. They looked at three specific complications: secondary hemorrhage, primary hemorrhage, and no hemorrhage. Overall, 10% of patients experienced some complication. The most common complication was secondary hemorrhage, affecting 32% of patients. There were significantly more secondary hemorrhages in group B (48 patients) compared to group A (16 patients). In contrast, primary hemorrhage was rare, only occurring in 2% of patients overall. There were no significant differences between the groups for primary hemorrhage. The majority of patients (88%) did not experience any bleeding complications. While there were more complications in group B overall (90 complications compared to 18 in group A), the statistical test (chi-square) showed this difference wasn't significant, meaning it could be due to chance (Table 4).

Discussion:

In a study involving 100 pediatric patients undergoing tonsillectomy, researchers compared operative times, intraoperative blood loss, postoperative pain scores, and postoperative complications between two groups utilizing different surgical methods. The first group, which utilized the snare method, had a mean operative time of 67.83 ± 18.64 minutes, while the group using the bipolar diathermy method had a significantly shorter mean operative time of 47.36 ± 8.72 minutes. This difference was statistically significant with a p-value of less than 0.001. Similarly, the mean intraoperative blood loss was significantly lower in the bipolar diathermy group (36.49 ± 5.93 ml) compared to the snare method group (62.27 ± 13.73 ml.) [13].

In the study comparing tonsillectomy methods in pediatric patients, it was found that there was a significant difference in mean operative times between the snare method and the bipolar diathermy method. The group using the bipolar diathermy method had a considerably shorter mean operative time compared to the snare method, with statistical significance ($p < 0.001$). This difference in operative times was reflected in the blood loss during the procedures, where the bipolar diathermy group experienced significantly lower mean blood loss compared to the snare method group. The study also assessed postoperative pain scores, showing that the snare group consistently reported lower pain scores over the first seven days compared to the bipolar diathermy group.

1. By day 14, both groups reported no pain, indicating successful recovery post-surgery .[14].

Moreover, the comparison of post-operative complications between two groups of patients revealed interesting findings 1. While 10% of patients experienced some form of complication, the most common complication was secondary hemorrhage, affecting 32% of patients 1. Notably, there were significantly more secondary hemorrhages in one group compared to the other, highlighting potential differences in outcomes based on the surgical method used 1. Primary hemorrhage, on the other hand, was rare, occurring in only 2% of patients overall, with no significant differences between the groups 1. The majority of patients did not experience any bleeding complications, indicating overall good surgical outcomes.[14]

These findings align with previous research that has compared the efficacy of different surgical techniques in terms of blood loss and operative times. For instance, a study on transurethral resection of the prostate found that the bipolar technique resulted in less bleeding compared to the monopolar technique .[15] Similarly, in a study on cesarean sections, the diathermy group had significantly lower blood loss compared to the scalpel group 3. These studies support the notion that certain surgical methods, such as bipolar diathermy, can lead to reduced blood loss during procedures.

Furthermore, research on other surgical procedures, such as liver resections and orthopedic surgeries, has also highlighted the benefits of using bipolar sealers to reduce intraoperative blood loss.[16-17]. These studies emphasize the importance of selecting appropriate surgical instruments and techniques to optimize patient outcomes and minimize complications. Additionally, studies comparing different methods of tonsillectomy in both pediatric and adult populations have consistently shown variations in operative times, blood loss, and postoperative pain levels.[18-20] 6,7,8. This underscores the significance of choosing the most suitable approach based on patient characteristics and desired outcomes.

In conclusion, the comparison of surgical methods for tonsillectomy in pediatric patients revealed significant differences in operative times, blood loss, and postoperative pain scores between the snare and bipolar diathermy techniques. These findings are consistent with existing literature on various surgical procedures, highlighting the impact of surgical methods on outcomes such as blood loss, operative times, and postoperative pain. Selecting the most appropriate surgical technique based on patient factors and desired outcomes is crucial in ensuring successful surgical interventions and optimal recovery.

The findings of our study closely aligned with those of Guclu kaan beriat et al.[21]. In their study, ST Chetri et al. examined 40 patients who underwent tonsillectomy using both bipolar cautery and classical dissection techniques. They found that the average duration of the operation was 12.04 minutes for electrocautery and 16.57 minutes for cold dissection.[22] The study conducted by Ancy Anthony et al³ analysed a group of 40 patients ranging in age from 5 to 40 years. The study found a substantial difference in operative time between the two ways. The electrocautery side had an average operative time of 15.45 minutes, while the cold dissection and snare approach had an average operative time of 18.03 minutes.[23]Guclu Kaan Beriat et al. [21] discovered that

the average amount of blood lost during surgery was 22.84 ml while using bipolar electrocautery, compared to 113.87 ml in conventional tonsillectomy. ST Chettri et al [22] discovered that the mean volume of bleeding on the electrocautery side was 4.07ml, while on the cold dissection side it was 14.58ml. In their study, ST Chettri et al. found that 35% of patients reported discomfort on the cauterised side, 30% reported more pain on the dissected side, and 35% experienced equal pain on both sides on the second day after surgery.[22] Guclu Kaan Beriat et al. (1) observed that postoperative bleeding was only observed in one patient on postoperative day 3 in the traditional dissection group, but it occurred in two patients on day 5 and day 7 in the bipolar group. Ancy Anthony and colleagues reported a single instance of secondary haemorrhage occurring in a bipolar diathermy procedure, which was successfully resolved by conservative treatment.[23]

Conclusion:

In conclusion, the study findings suggest that the bipolar diathermy method for tonsillectomy in pediatric patients offers advantages in terms of shorter operative time, reduced blood loss, and lower postoperative pain scores compared to the snare method. Additionally, the bipolar diathermy method may be associated with a lower risk of secondary hemorrhage compared to the snare method. These results provide valuable insights for clinicians in selecting the most appropriate technique for tonsillectomy procedures in pediatric patients.

Limitations:

As this was a single center study with a comparatively short sample size, results of this study cannot be generalized. Generalization requires the support of results from similar large studies

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Authors' contributions:

Dr G Satheeshkumar- conceptualization, data curation, investigation, methodology, project administration, visualization, writing—original draft, writing—review and editing; *Dr R.Kalaimani*-conceptualization, methodology, writing—original draft, writing—review and editing; *Dr.M.Rajesh Kumar* - conceptualization, visualization, supervision, writing—original draft, methodology, writing review and editing. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work. All authors have read and agreed to the published version of the manuscript.

Conflict of interest: All authors declare that they have no conflict of interest.

Informed Consent: Informed consent was obtained from all individual participants included in the study.

Ethical Approval

All procedures performed involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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