

Comparison of Bipolar Diathermy and Suture Ligation for Haemostasis in Tonsillectomy

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ABSTRACT

Objective: To compare bipolar diathermy and suture ligation for haemostasis in tonsillectomy in terms of the amount of blood loss, number of ligatures applied, average time taken and incidence of postoperative haemorrhage.

Study Design: Randomized controlled trial

Place and Duration of Study: Multicenter study conducted in ENT Surgery Departments/Units of Public and Private Sector Hospitals of Lahore from 1st July 2017 to 31st July 2018.

Methodology: Sixty six patients were enrolled. Informed consent and demographic information was taken from all the patients. Patient himself was the control and the trial. One tonsil was treated with ligation technique (Group A) and other with bipolar diathermy technique (Group B). Both the tonsil side and the technique were randomized. The outcome in both groups was noted.

Results: The mean age was 12.39±7.41 years and male to female ratio was 0.8:1. The mean haemostasis time in group A was 14.32±2.81 minutes whereas in group B patients it was 10.62±1.76 minutes. The mean blood loss in group A patients was 42.82±13.360 ml whereas in group B patients was 28.015±8.619 ml. The incidence of post-operative haemorrhage was zero for both bipolar diathermy and suture ligation, which shows the safety of both procedures.

Conclusion: Bipolar diathermy is safe, effective, easier and faster technique for haemostasis in tonsillectomy than ligation technique

Keywords: Tonsillectomy, Bipolar Diathermy, Ligation Technique

INTRODUCTION

Tonsillectomy is surgical removal of palatine tonsils with its capsule from its attachment to muscular wall by dissecting in peritonsillar space.¹ Tonsillectomy is a very common surgery and represent approximately 20% to 40% of surgeries performed in the field of otolaryngology.²

Many techniques are used to perform tonsillectomy surgery including guillotine excision, blunt dissection, electro-surgery (monopolar cautery, bipolar cautery, laser), ultrasonic removal, cryosurgery, coblation and ligature tonsillectomy.³ Choice of the technique depends on surgeon's preference with each one trying to ensure reduction in morbidity and complications of the surgery.⁴⁻⁶ Because of its known postoperative haemorrhage and anaesthesia complications, tonsillectomy has been considered as a major surgery although, it is relatively a simple procedure.^{7,8}

Primary and secondary haemorrhage rates of 0.6% and 3% respectively and an overall 0.9% of patients returned to operating theatre for haemorrhage control was reported in the National Tonsillectomy Audit; an audit of more than 40000 patients in the United Kingdom hospitals from 2003 to 2004.⁹

Haemorrhage in tonsillectomy is classified according to the time into primary haemorrhage occurring at the time of surgery, reactionary haemorrhage occurring within 24 hours after surgery and secondary haemorrhage occurring after 24 hours from the surgery.^{9,10} Effective haemostasis is very important part of tonsillectomy and unsuccessful haemostasis can lead to persistent haemorrhage that can

lead to shock, increased operating time, aspiration of blood and delay in healing process.

Various techniques are used for haemostasis in tonsillectomy starting from gauze pack pressure in the tonsillar fossa, application of adrenaline pack, use of diathermy and application of ligatures to newer technique like Ankaferd blood stopper and ligature vessel sealing system.⁶

Electro-cautery and suture ligation are the two common means for controlling haemorrhage during and after tonsillectomy with variable results. Use of ligatures in tonsillectomy has been honoured technique of haemostasis, but it has the disadvantages of taking more time to control blood loss, so, more blood loss will occur and increase operation and anaesthesia time, moreover muscle fibers from tonsillar bed may get gripped with ligatures and cause more pain postoperatively.^{6,11} Secondary haemorrhage in ligation is due to loosening of knot and ligature while straining during coughing or vomiting.¹²

In United Kingdom, the use of diathermy for haemostasis remains controversial and 56% of otolaryngologist in UK don't use diathermy thinking that it can increase patient morbidity and increase postoperative haemorrhage rates.¹³ In bipolar diathermy, coagulation is localized to tissue present between the tips of diathermy forceps and lead to less damage to tissues in a controlled and precise fashion resulting in less pain postoperatively.¹¹

Many studies addressed tonsillectomy haemostasis with special concern to safety and speed of the technique but have produced conflicting results. In a published

prospective study conducted on 180 patients comparing silk ligation with bipolar diathermy it was concluded that less operative time is taken with bipolar diathermy method (15 minutes) as compared to tonsillectomy using silk ligation (30 minutes) for haemostasis. Chances of primary haemorrhage are equal but secondary haemorrhage is less with silk ligation.¹⁴

In another published prospective comparative study conducted on 250 patients it was concluded that less mean operative time (20 minutes) taken by bipolar diathermy as compared to silk ligation (30 minutes) and the incidence of primary bleeding was more with silk ligation while the secondary haemorrhage was significantly less with silk ligation.¹⁴

In tonsillectomy haemostasis, the favourite surgical technique would be the one that results in minimal postoperative pain, minimal bleeding, less operation time and allows the patient to return to their normal daily activities in the shortest period of time. With this aim in mind and in order to clarify the conflict produced by the previous studies, this study (comparison between bipolar diathermy and suture ligation for haemostasis in tonsillectomy); a prospective study is undertaken. As there are physiological, pathological and operative technique factors effecting the result of tonsillectomy and haemostasis,¹⁵ bipolar diathermy and suture ligation was done on the same patient in order to compare more accurately.

The rationale of this study is to determine the effectiveness of bipolar diathermy in decreasing postoperative bleeding (secondary haemorrhage) as its role in postoperative bleeding is still controversial. The local study which have been carried out in Pakistan demonstrate that haemostasis with bipolar diathermy is associated with more incidence of postoperative haemorrhage (secondary haemorrhage) with incidence rate of (13.33%) compared to (4.15%) with suture ligation method.¹²

This is contrary to study done internationally which states that there is no significant difference between the two methods regarding the postoperative haemorrhage.^{8,11}

Hence, this study would help in counter checking the effectiveness and safety of bipolar diathermy for haemostasis in tonsillectomy and if it is found to be safe and effective it would help reduce surgical and anaesthesia time, operation theatre time using sutures and will be cost effective.

MATERIALS AND METHODS

This randomized controlled trial study was conducted at ENT Department, Shaikh Zayed Hospital Lahore from 1st July 2017 to 31st July 2018 and comprised 132 patients (66 in each group). For two procedures bipolar diathermy and ligation, randomization was done by lottery method. Patient undergoing tonsillectomy was asked to pick the slip for procedure to be conducted for removal of tonsil either on right or on left side. The surgical procedure was written as ligation left or ligation right, similarly bipolar left or bipolar right. The slip was taken out by patient him/herself and the same procedure was followed on the side as written on slip and for the other tonsil the other procedure was applied. All patients of both genders, age between 4 -40 years of age, recurrent or chronic tonsillitis and enlarged tonsils that

cause difficulty breathing, swallowing and obstructive sleep apnea were included. All patient with bleeding diathesis or level of INR more than 1.5, anticoagulant, acute tonsillitis, undergoing adenotonsillectomy, co-existing upper or lower respiratory infection, anaemia and acute infection, undergoing some other surgical procedure e.g. myringotomy, hypertensive and suspicious of malignancy were excluded. Informed consent and demographic information was taken from all the patients. Patient himself was the control and the trial. One tonsil was treated with ligation technique (group A) and other with bipolar diathermy technique (Group B). Both the tonsil side and the technique were randomized. The outcome in both groups was noted. All the collected data was entered and analyzed on SPSS version 22. The collected data was analyzed statistically by using SPSS version 22.0. Operative time, amount of blood loss was analyzed by independent sample t-test to see the statistical significance in two groups. P-value less than or equal to 0.05 was considered significant. Chi-square test was used to analyze the frequency and incidence rate of postoperative primary and secondary haemorrhage. A p-value of ≤ 0.05 was considered as significant.

RESULTS

The mean age of the patients was 12.39 ± 7.41 years and mean blood loss of the patients was 35.42 ± 13.44 ml. The mean haemostasis time of the patients was 12.47 ± 2.98 minutes (Table 1). In this study, 30 (45.45%) patients were males whereas 36 (54.54%) patients were females. Male to female ratio of the patients was 0.8:1 (Fig. 1).

In our study the right side haemostasis tonsil, haemorrhage tonsil, blood loss tonsil and ligature tonsil was noted in 66 (50%) patients respectively whereas the left side haemostasis tonsil, haemorrhage tonsil, blood loss tonsil and ligature tonsil was noted in 66 (50%) patients respectively (Table 2).

The patients with left side haemostasis tonsil in group A was 35 (53%) whereas the patients with left side haemostasis tonsil in group B was 31 (47%). Similarly, right side haemostasis tonsil in group A was 31 (47%) whereas right side haemostasis tonsil in group B was 35 (53.0%). Statistically insignificant ($P > 0.05$) difference between the groups was found. The patients with left side blood loss tonsil in group A was 35 (53%) whereas left side blood loss tonsil in group B was 31 (47%). Similarly the patients with right side blood loss tonsil in group A was 31 (47%) whereas right side blood loss tonsil in group B was 35 (53%). Statistically insignificant ($P > 0.05$) difference was found between the groups. The patients with left side ligature tonsil in group A was 35 (53%) whereas in group B was 31 (47%). Similarly, the patients with right side ligature tonsil in group A was 31 (47%) whereas in group B was 35 (53%). Statistically insignificant ($P > 0.05$) difference was found between the groups (Table 3).

The mean value of haemostasis time in group A was 14.32 ± 2.81 minutes whereas in group B patients was 10.62 ± 1.76 minutes. Statistically significant ($P < 0.5$) difference was found between the study groups with haemostasis time. The mean value of blood loss in group A was 42.82 ± 13.360 ml whereas in group B patients was

28.015±8.619 ml, statistically significant (P<0.05) difference was found between the groups (Table 4).

There were one ligature noted in 3 (4.5%) in group A patients whereas in group B was 1 (1.5%) patients, two ligature noted in 56 (84.8%) in group A patients whereas in group B had no patient, three ligature noted in 7 (10.6%) in group A patients whereas in group B had not patient respectively. Similarly no ligature in group A had no patient whereas 65 (98.5%) patients in group B. Statistically significant (P<0.05) difference found between the groups (Table 5).

Table 1: Descriptive statistics of patients

Variable	Mean±SD
Age (years)	12.39±7.41
Blood loss (ml)	35.42±163.44
Haemostasis (minutes)	12.47±2.98

Table 2: Frequency distribution sides of haemostasis tonsils, haemorrhage tonsil, blood loss tonsil and ligature tonsil side (n=132)

Variable	No.	%
Haemostasis tonsil side		
Left	66	50.0
Right	66	50.0
Haemorrhage tonsil side		
Left	66	50.0
Right	66	50.0
Blood loss tonsil side		
Left	66	50.0
Right	66	50.0
Ligatures tonsil side		
Left	66	50.0
Right	66	50.0

Table 3: Comparison of haemostasis tonsil side, haemostasis (minutes) and Ligatures tonsil side in both groups

Variable	Bipolar Diathermy	Ligation	Chi value	P value
Hemostasis tonsil side				
Left	35 (53%)	31 (47%)	0.485	0.486
Right	31 (47%)	35 (53%)		
Blood loss tonsil side				
Left	35 (53%)	31 (47%)	0.485	0.486
Right	31 (47%)	35 (53%)		

Table 4: Comparison of haemostasis (minutes) with study groups

Variable	Group A	Group B	Ind. t test	P value
Hemostasis (minutes)	14.32±2.81	10.62±1.76	9.050	0.001
Blood loss (ml)	42.82±13.36	28.01±8.61	7.56	0.001

Table 5: Comparison of number of ligature with study groups

No. of ligature	Bipolar diathermy	Ligation
One	3 (4.5%)	1 (1.5%)
Two	56 (84.8%)	-
Three	7 (10.6%)	-
Nil	-	65 (98.5%)

Chi value = 129 P value <0.001

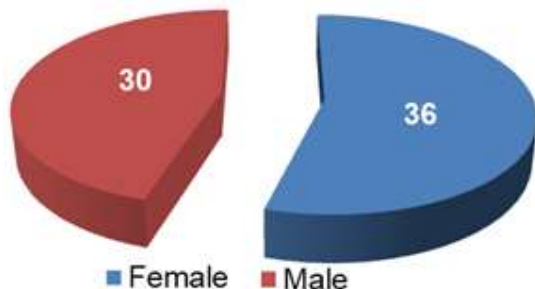


Fig. 1: Frequency distribution of gender

DISCUSSION

This present randomized control trail was carried out at ENT department in Shaikh Zayed Hospital Lahore to compare applying suture ligation and bipolar diathermy coagulation for haemostasis in tonsillectomy with variables of time taken to achieve haemostasis and amount of blood loss intraoperatively and numbers of ligatures applied and the incidence of post-operative haemorrhage (primary and secondary). Although it is one of the most commonly performed surgery in the world, tonsillectomy still raises more questions regarding its technique and complications.

Although tonsillectomy is considered simple and safe, yet surgeons are still keenly aware of its dreaded threat of complications particularly post-operative haemorrhage that may lead to aspiration and shock. So many studies have been conducted on tonsillectomy and haemostasis techniques and have created more controversies and more questions than answers.⁹⁻¹¹

In this study, statistically insignificant difference was found between the study groups with haemostasis tonsil side, blood loss tonsil side and the ligature tonsil side respectively (p=0.486). In our study, statistically significant difference was found between study groups with blood loss. According to this study the mean value of blood loss in group A was 42.82±13.360 ml whereas the mean value of blood loss in group B patients was 28.015±8.619 ml (p<0.001). Number of no ligature was also significantly lower in bipolar diathermy group than to ligation group (P<0.001). According to this study the haemostasis time was also significantly shorter in bipolar diathermy group than to ligation group. The mean value of haemostasis time in group A was 14.32±2.81 minutes whereas the mean value of hemostasis time in group B patients was 10.62±1.76 minutes (P<0.001).

Many studies have addressed this issue with particular regard to safety and speed of the technique but have produced conflicting results. In a published prospective study conducted on 180 patients comparing silk ligation with bipolar diathermy it concluded that less operative time is taken with bipolar diathermy method (15 minutes) as compared to tonsillectomy using silk ligation (30 minutes) for haemostasis. Chances of primary haemorrhage are equal but secondary haemorrhage is less with silk ligation.¹⁴

In a study performed by Watson et al¹⁶ no difference was found in severity and frequency of postoperative haemorrhage although the surgical time was significantly reduced with diathermy.

In another study done by Choy et al¹⁷ found that bipolar diathermy is easier and take less time to control bleeding and less operation and anaesthetic time. It is equally safe and effective as suture ligation and did not cause more post-operative pain.

One study by Sharma et al⁸ concluded that bipolar diathermy significantly reduced the time of operation and amount of blood loss as compared to suture ligation. Incidence of postoperative haemorrhage was less with bipolar diathermy and the pain postoperatively was comparable with suture ligation.

Reactionary haemorrhage was found to be more in tonsillectomy with ligation (1%) as compared to diathermy (0.3%) in studies conducted by Watson et al¹⁷, Malik et al¹⁸

and Carmody et al.¹⁹ This may be due to loosening or slipping of the ligature in the early post-operative period.

In another published prospective comparative study conducted on 250 patients it concluded that less mean operative time (20 minutes) taken by bipolar diathermy as compared to silk ligation (30 minutes) and the incidence of primary bleeding was more with silk ligation while the secondary haemorrhage was significantly less with silk ligation.¹²

The risk of haemorrhage with bipolar diathermy in tonsillectomy dissection and haemostasis was 3% in national prospective tonsillectomy audit.²⁰

A study was conducted by Hemant et al²¹ on 50 patients where bipolar diathermy dissection was compared with dissection with snare tonsillectomy. They concluded that bipolar diathermy dissection is associated with less blood loss, less operative time, less postoperative pain, early discharge from hospital and reduced morbidity.

Nunez²² reported a mean blood loss of 15.1 ml for the diathermy group and 33.7 ml for the dissection group.

On the other hand, a study by Anwar et al²³ documented that both suture ligation and coagulation diathermy for control of bleeders during the procedure performed by this method are equally effective.

Kujawski et al.²⁴ reported that there was no significant difference between the mean operating time for the diathermy and dissection groups being 36.9 minutes for diathermy and 35.9 for dissection technique using ligatures.

The local study which have been carried out in Pakistan demonstrate that haemostasis with bipolar diathermy is associated with more incidence of postoperative haemorrhage (secondary haemorrhage) with incidence rate of (13.33%) compared to (4.15%) with silk ligation method.¹⁴ This is contrary to a study done internationally which states that there is no significant difference between the two methods regarding the postoperative haemorrhage^{8,13} which have been approved by this study as well.

CONCLUSION

The bipolar diathermy is safe, effective, easier and faster technique for haemostasis in tonsillectomy than ligation technique in terms of blood loss, haemostasis, operative and anaesthetic time and requires less number of ligatures.

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