ORIGINAL ARTICLE

Bipolar Diathermy versus Conventional Cold Dissection Method A Comparison of Mean Operative Blood Loss

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ABSTRACT

Background: Intra-operative hemorrhage is the most significant complication in tonsillectomy. No previous study has been doneto assess the efficacy of bipolar diathermy regarding intra-operative blood loss during tonsillectomy in local population so far.

Aim: To compare the mean intra-operative blood loss during tonsillectomy using bipolar diathermy versus cold dissection method.

Methodology: A Randomized Controlled Trial was carried out in the ENT Department, The Children's Hospital, Lahore within six months (1st February 2017-31st July 2017) on 100 patients divided in 2 equal groups i.e. patients to be operated with bipolar diathermy (group B) and operation with cold dissection procedure (group C). After taking consent from patient they were operated as the first case in operation list. Anesthetist was not aware of the type of procedure opted for a specific patient. After anesthetizing the patient, same type of surgery (tonsillectomy with bipolar diathermy & cold dissection) was performed on both group patients by same surgeon under same operative environment. Post-operatively patients were kept in recovery and then shifted to the ward. Operative blood loss was measured by direct method.

Results: Male predominancy was observed in the current study (male-female ratio in group B:1.5:1 and in group C:1.6:1) The Mean±SD of the ages were 10.78±3.25 years and 11.14±3.68 years respectively. The mean operative blood loss presents statistically significant difference between two groups B & C (P<0.05).

Conclusion: Bipolar diathermy is an effective and safe technique in pediatric patients. Advantages were observed in terms of shorter operative time and minimal intra-operative blood loss.

Keywords: Intra-operative blood loss, Tonsillectomy, Bipolar diathermy, Cold dissection method

INTRODUCTION

Tonsillectomy is one of the most common operations performed by otorhinolaryngologists in the pediatric population, in order to resolve upper airway obstruction and recurrent or chronic infections[1]. There are several existing techniques to perform tonsillectomy including cold dissection, Guillotine excision, Cryosurgery, ultrasonic harmonic scalpel removal, Radiofrequency, laser tonsillectomy, Coblation method, monopolar and bipolar diathermy dissections[2]. Bipolar diathermy is one of the newer techniques for tonsillectomy with lesser intra-operative blood loss and shorter operative time[2].

The concept of electro-dissection was first described by Goycloea in 1982 using monopolar diathermy and 10 years later Pang YT(1992) reported the first electro-dissection tonsillectomy using the bipolar forceps[3]. The surgical technique of bipolar diathermy or electro-cautery is similar to Coblation method or electro-dissociation. In both methods, an alternative current passes between the active electrodes on the tip of the device which causes the destruction of the target tissue adjacent to the electrodes[4]. In bipolar diathermy, direct contact between electrodes and tissue produces local temperatures of 400ºCto 600ºC resulting in the heating of intracellular contents and subsequent vaporization of the cell[5].

Intra-operative hemorrhage has been one of the most common and very serious complications during tonsillectomy, increasing both mortality and morbidity of the patient not only intra-operatively but post-operatively as well. [6-7]In a previous study conducted on 100 patients in Saudi Arabia, mean operative blood loss using diathermy was 25.37±3.11ml compared to 88.45±5.62ml in cold dissection with a p-value of 0.0151.[8]However in another study conducted on 30 patients, mean operative blood loss using bipolar diathermy was 7.38±2.81ml as compared to 11.73±2.86ml in cold dissection method with a p-value of ≤0.001[9].

The rationale to conduct this study is to check the efficacy of bipolar diathermy regarding intra-operative blood loss during tonsillectomy in our local population with different expertise and operative environment, since no previous study has been done here so far. Knowledge regarding intra-operative blood loss obtained through this study will be applicable to all the patients in general and patients with low hemoglobin in particular and also to devise a future policy to adapt bipolar diathermy as an effective alternative to cold dissection method in tonsillectomy.

METHODOLOGY

A Randomized controlled trial was carried out in the Department of ENT, The Children's Hospital, Lahore within six months (1st February 2017 to 31st July 2017). Through non-probability purposive sampling, 100 cases (50 patients in each group) between ages 5 years to 15 years of both gender (males and females) having sore throat with classical history of 7 or more episodes/year or 5 episodes/year for consecutive 2 years or 3 episodes/year for consecutive 3 years, willing for surgery were included in

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the current research. Whereas all those patients having unilateral enlarged tonsils and/or chronic Adenoiditis, disturbed liver profile or any bleeding disorder, based on INR report (cut-off value more than 1.2), rare blood groups or those having any congenital anomalies or those suffering from chronic sinusitis, allergic rhinitis or Asthma (based on history, physical examination, X-ray chest and X-ray PNS and history of any previous medication for Asthma) were excluded from current research work.

Sample size was calculated with 95% confidence level, 80% power of study, taking Mean±SD of operative blood loss in both groups i.e., 7.38±2.81 ml in bipolar diathermy group versus 11.73±2.86 ml in cold dissection group in patients undergoing tonsillectomy[3].

Patients fulfilling inclusion and exclusion criteria were enrolled from outpatient department. An informed consent was taken about the purpose, risk and benefits of the surgery. One hundred patients were randomized by simple draw method in 2 equal groups i.e. patients to be operated with bipolar diathermy (group B) and patients to be operated with cold dissection procedure (group C). These patients were operated as the first case in operation theatre list. Anesthetist was not aware of the type of procedure opted for a specific patient. After anesthetizing the patient, same type of surgery was performed on both group patients by same surgeon under same operative environment. Post-operatively, patients were kept in recovery and from there, shifted to the ward.

Operative blood loss was measured by direct method. Blood in suction bottle was measured along with difference in weight of dry and soaked standard size gauze pieces used during surgery & standardized formula was applied.[(9)]All this information was recorded in a pre-designed proforma.

AMOUNT OF BLOOD LOSS (ml) = Blood in suction bottle + (difference in weight of dry and soaked gauze pieces) g /1.055

The data was then entered in SPSS version 17 and analyzed. The variable to be analyzed was operative blood loss in B and C groups. Age and operative blood loss were presented as Mean±SD. Gender was presented in the form of percentage and frequency. Mean operative blood loss was compared in both groups by using t-test. P-value ≤0.05 was considered to be significant.

RESULTS

There were 100 patients in this study who underwent tonsillectomy with techniques of bipolar diathermy and cold dissection methods and were divided into two groups; group B and group C.

Majority(60%) of the samples of group B operated by bipolar diathermy were males, while 31 males (62%) and 19 females (38%) patients we operated by cold dissection (group C), presenting high male to female ratios in both B and C groups. 1.5:1 in group B and 1.6:1 in group C (Table 1). More than half of the patients belong to their second decade of life. Table 1 part II demonstrates the percentage of their ages. According to mean blood loss, 50 patients (100%) have mean blood loss between 5.23-40 ml in group B. While in group C, 18 patients (46%) have mean blood loss between 5.23-40.0 ml. Statistically significant difference between groups in mean blood loss was observed [P<0.05]. Detailed mean operative blood loss (ml) in both groups is presented in Table 1.

Table 1 presenting demographic view and Mean Operative Blood Loss

Part 1	**Gender wise distribution of B & C participants of groupsKey:** Group B Bipolar diathermy Group C Cold dissection procedure			
(n =100)				
	Group B (n = 50)		**Group C (n = 50)**	
Gender	**Number**	**Percentage**	**Number**	**Percentage**
Male	30	60.0	31	62.0
Female	20	40.0	19	38.0
MF ratio	1.5:1		1.6:1	
Part II	**Age distribution in both groups** Group B Bipolar diathermy Group C Cold dissection procedure SD Standard deviation			
(n =100)				
Age	**Group B (n = 50)**		**Group C (n = 50)**	
	Number	**Percentage**	**Number**	**Percentage**
4 – 8	12	24.0	19	38.0
9 – 13	27	54.0	12	24.0
14 – 15	11	22.0	19	38.0
Mean±SD	10.78±3.25		11.14±3.68	
Mean operative blood loss (ml)	**Group B**		**Group C**	
	Number	**Percentage**	**Number**	**Percentage**
5.23 – 40.0	50.0	100.0	18	36.0
40.64 – 80.0	-	-	20	40.0
80.10 – 127.72	-	-	12	24.0
Mean±SD	11.71±4.63		55.72±32.87	
P value <0.05				

DISCUSSION

Tonsillectomy is almost routine otolaryngological operation accomplished approximately 20-40% of surgical procedures in this discipline by different techniques[10,11,12]. These techniques have evolved over the time with the objective of declining the surgical time, reducing the morbidity, securing the operation and minimizing the complications associated with the procedure[10]. All these techniques have advantages as well as drawbacks, as reported by the surgeons from time to time, but none of them has been accepted as the single best technique universally[13,14]. Cold dissection and bipolar diathermy are the two most widely used techniques[14]. As a matter of fact, beginners learn the procedure utilizing the cold dissection method in most of the units. Thereon, depending upon the facilities available and individual preferences, surgeons opt for different techniques[14]. Ongoing research on the subject indicates that most of the newer techniques are still under assessment to be proven superior or otherwise.

Surgical technique and equipment have evolved tremendously over the centuries, aiming at decreasing operating time and intraoperative blood loss[15]. Excessive intraoperative blood loss is one of the significant risk factors for post-tonsillectomy hemorrhage[16,17].

Currently, cold dissection, monopolar 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 cold dissection technique[18].

The development of an alternative to cold-dissection surgery is electrocautery for removing tonsils represents the major advances in tonsillectomy of the 20th century. Electrocautery tonsillectomy shortens operating time and controls bleeding which assist tissue dissection.However, comparatively prompt severe post-operative pain and delayed wound healing time was noticed in electrocautery procedure[10].

Contrary to this, other studies have reported that the frequency of PTH with bipolar diathermy is not much different than with other techniques or even less and at the same time providing low intra-operative blood loss without an increase in complications[10,18,19].

Bipolar diathermy tonsillectomy has been compared with cold and monopolar hot knife dissection techniques and has been found a better choice on account of less bleeding, both intra and postoperatively, shorter recovery period and fewer days off from work and school[18].

Our study has also revealed frequency of PTH following bipolar diathermy tonsillectomy comparable to other studies.

The difference in hemorrhage rates between the two groups and surgeon grades did not reach statistical significance. Nonetheless, the trend towards a greater incidence of hemorrhage in the bipolar group and in procedures conducted by more junior surgeons during the trial raised concerns. The results of the National Prospective Tonsillectomy Audit and our interim results have led us to abandon the trial and disallow the use of bipolar dissection in tonsillectomies performed by junior staff members[20].

Intra-operative blood loss estimation was purely a subjective assessment by the surgeon and certainly is subject to argument. Loss of 5 ml of blood was noted during diathermy, more in older children, apparently due to more fibrosis and therefore poor vascular response. In our study, there is a significant reduction of blood loss also in bipolar diathermy group which was similar to other studies[10,21,22]. In children, reducing the blood loss is of utmost importance as high blood loss can lead a child to delayed recovery. Furthermore, total circulating blood volume is less in children. This appealing to any surgeons but they are particularly important when surgery involves the pediatric age group, especially the very young with obstructive sleep apnonea[23].

Advantages/strengths of Bipolar Diathermy: Bipolar diathermy dissection is the most commonly used techniques worldwide because of low intraoperative blood loss both intra and postoperatively. Moreover, shorter recovery period and fewer days off from work and school was another benefit informed by the patients.

ONCLUSION

Diathermy dissection technique allows a shorter operating time and low intra-operative blood loss without an increase in complications. The technique is an easy procedure to learn and the financial impact is affordable. It should be used with appropriate caution, and only after proper training. Frequency of post-tonsillectomy hemorrhage with this technique is comparable with the other technique i.e. cold dissection. The technique is specially recommended in the pediatric population owing to its low bleeding feature.

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