COMPARISON OF BIPOLAR ELECTROCAUTRY AND COLD STEEL DISSECTION METHODS FOR TONSILLECTOMY

Muhammad Ali, Atif Rafique, Majid Dastgir, Muhammad Rashid, Shahzad Maqbool, Sheraz Bashir

Combined Military Hospital Lahore

ABSTRACT

Objectives: To compare the efficacy and post-operative morbidity of bipolar electrocautry and cold steel dissection methods for tonsillectomy in pediatric population, in terms of operating time, peri-operative blood loss, post-operative pain and frequency of secondary hemorrhage.

Study Design: Randomized controlled trial.

Place and Duration: This study was conducted at department of ENT, Combined Military Hospital Kharian and Lahore between Jan 2009 to Jan 2012.

Patients and Methods: Total 146 patients between age 6 to 12 years were enrolled in this study but only 102 patients who fulfilled the desired criteria and had regular follow up were placed in two groups. They were divided into two equal groups of 51 each labeled as A and B. Patients in group A were operated for tonsillectomy by bipolar electrocautry while group B underwent tonsillectomy by cold steel dissection method. All patients in both groups were assessed for operating time, peri-operative blood loss, secondary hemorrhage and postoperative pain on Visual Analogue Score.

Results: In group A there were 27 males and 24 females while group B had 28 females and 23 males. Mean age of patients was 9.4 (SD ± 2.67) years. Patients in groups A had statistically significant lower operative time and blood loss than group B. While initial post-operative pain was not different in two groups. However late onset pain (pain on 7th and 14th day) and frequency of secondary hemorrhage was significantly higher in group A.

Conclusion: Bipolar electrocautry dissection method of tonsillectomy is better than cold steel dissection method in terms of operating time and peri-operative blood loss. Although initial post-operative pain was not much significant in two groups but incidence of late onset pain and secondary hemorrhage is higher in bipolar electrocautry group.

Keywords: Tonsillectomy, Pain, Electrocautry.

INTRODUCTION

Tonsillectomy is one of the frequently performed ENT procedures worldwide[1]. The first known tonsillectomy was performed by Cornelius Celsus with fingernails 2000 years ago. It was not until the beginning of the twentieth century that Worthington and Waugh described the technique of tonsillectomy with dissection method. In 1968, Remington-Hobbs used electrocautry for removal of tonsils[2].

Tonsillectomy has a post-operative course which encompasses significant morbidity and potential complications. Throughout the years, investigators and surgeons have developed new techniques for tonsillectomy aiming to decrease post-operative morbidity and complications. Ideally, tonsillectomy should be fast, bloodless and associated with rapid and uneventful recovery[3].

Different techniques for tonsillectomy have been described including cold steel dissection, monopolar and bipolar electrocautry, KTP laser, ultrasonic dissector coagulator, coblation and thermal welding. There remains debate as to the optimal method with the least patient morbidity. Two of the most common dissection techniques in the United States and even in Pakistan are cold dissection and electrocautry dissection. The use of electrocautry during tonsillectomy has been common practice since 1930. After the advent of non explosive mixtures electrocautry usage

Correspondence: Col Muhammad Ali, Classified ENT Specialist, CMH Lahore
Email: dralihashmient@gmail.com
Received: 17 May 2012; Accepted: 13 Jun 2013

became common with general inhalation anesthesia[4].

Electrocautry tonsillectomy with a monopolar blade allows minimal blood loss and a short operating time because simultaneous bleeding control and tissue dissection are possible. However, it is reported to cause relatively more severe post-operative pain and delayed wound healing than conventional cold tonsillectomy. These complications are due to the thermal tissue damage caused by temperature that reach 300°C. However bipolar electrocautry causes much less surrounding tissue injury as compare to monopolar cautry and is said to be superior in terms of peri-operative bleeding, operative time, post-operative pain and morbidity after tonsillectomy[5].

This study was undertaken in an attempt to compare the techniques of bipolar electrocautry and cold steel dissection in tonsillectomy. Details about post-operative pain, secondary hemorrhage, peri-operative blood loss, and operative time were sought.

METHODS

This was randomized controlled trial conducted at department of ENT Combined Military Hospital Kharian and Lahore between Jan 2009 to Jan 2012. Patients between 6 and 12 years of age of either sex undergoing an elective tonsillectomy, who consented to participate in the study, were included. Informed consent was taken on a specially designed form explaining the protocol of the study. As an institutional policy, anonymity and confidentiality of the participants and the collected data was ensured. Study design was approved by hospital ethics committee.

All the tonsillectomies were bilateral, and surgical indications were chronic tonsillitis, recurrent acute tonsillitis and symptomatic tonsillar hypertrophy. There was no diagnostic tonsillectomy for cancer suspicion.

The exclusion criteria were: patients undergoing emergency surgery, a history of tonsillar abscess within the previous month, patients using pain medication on a regular basis.

A total of 146 patients were enrolled in this study. Inclusion criteria were not met by 23 patients, where as 12 patients refused to be part of this study while 10 patients did not follow the protocol leaving 102 patients for trial. Patients were divided randomly using random numbers table into two equal groups of 51 labeled as A and B. Group A patients were operated by bipolar electrocautry dissection method, while group B were operated by cold steel dissection.

Patients were kept nil per oral 6 hours before operation, clear liquids were allowed until three hours before surgery. To ensure that all the patients received the same medications before and during the surgery, we used a standardized anesthetic protocol.

Surgeons of almost equal surgical competence performed tonsillectomy by electrodissection method using bipolar electrocautry in group A, while in group B it was done by cold steel dissection method. Operative time was measured in minutes from start of surgery till achievement of complete heamostasis. Blood loss in two groups was assessed in milliliters. Blood loss was estimated by calorimetric method. Before start of surgery cotton and ribbon gauze were weighed and sterilized. Suction bottle and rubber tube were also cleaned and emptied. Only measured amount of saline was kept for intermittent suction to prevent blockage. Oral secretions were reduced by premedication using glycopyrrolate 5 mcg/kg body weight. In group A there was immediate coagulation of bleeders. In group B heamostasis was mainly achieved by ligature and local pressure. All the soiled gauzes and cotton balls together with unused cotton balls were 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.

Pain was assessed post-operatively by using a 10 points "Faces" Visual analogue Score (1=No pain and 10= severe pain). All parents and children were shown the VAS preoperatively and its use was explained. Pain was recorded at 8, 12 and 24 hrs after extubation. Help of one nursing staff was also sought and trained in recording VAS. Post-operatively all children were given oral Ibuprofen at 5 mg/kg and Co-Amoxicalv at 50 mg/kg in three divided doses. Injection Ketorolac 0.5 mg/kg was kept for children who were repeatedly crying because of pain and having pain score more than 8. Additional requirement of analgesics was also recorded. All patients were reassessed on 7th and 14th post-operative day for pain score and incidence of secondary hemorrhage. Secondary hemorrhage was defined as any bleeding occurring after 24 hours of surgery irrespective of its amount.

All the data was recorded on a predesigned performa and analysis was done using SPSS version 17. Mean and standard deviation was calculated for age. Operative time, amount of blood loss and pain score was analyzed by independent sample t-test to see the statistical significance in two groups. Presence or absence of secondary hemorrhage was compared in two groups and were analyzed by Chi Square test for statistical significance. *p* value of less than 0.05 was considered significant.

RESULTS

In group A there were 27 males and 24 females while group B had 28 females and 23 males. Mean age of patients was 9.4 (SD ± 2.67). Both groups were compared for peri-operative bleeding, operation time, pain scores and incidence of secondary hemorrhage. Both operative time and blood loss during operation was significantly lower in group A as compared to group B. Average operative time in group A was 13.45 ± 3.15 minutes while it was 23.30 ± 7.30 minutes in group B (*p* value < 0.05). Amount of blood loss was also significantly lower in group A 10.04 ± 3.03 ml as compared to group B 24.8 ± 6.12 ml. There was no significant difference as far as early pain scores (pain within 24 hours) were concerned among two groups (Table-1). However patients in group A had significant higher pain scores then group B on 7th and 14th post operative day (Table-1) as evident by *p* value <0.05. Statistically significant secondary hemorrhage was seen in bipolar electrocautry dissection where 5.6% (n=11) patients developed it, while it was 3.06% (n=6) in cold steel dissection group (*p* value < 0.001).

DISCUSSION

Tonsillectomy is one of the commonly performed operations undertaken by otolaryngologists[6]. Its various forms has been practiced for centuries, and the older technique of cold-steel dissection remains a common practice worldwide[7]. With advances in technology and instrumentation, new techniques for tonsillectomy and hemostasis have been evolved by surgeons. The choice of technique often comes down to the surgeon's perceived benefits with regard to less intraoperative and post-operative bleeding, duration of the procedure and minimum pain in the post-operative period[8].

The first surgical electrocautry machine was designed by W.T. Bovie in 1928 to facilitate tumour removal and haemostasis in neurosurgery. In electrocautry, an electric current from a radiofrequency generator passes through the tissue between two electrode poles[9]. The heat generated (between 400°C - 600°C) cuts the tissue and simultaneously coagulates[10]. At lower temperatures, the heat causes cell drying and blood protein is coagulated, causing haemostasis. In monopolar, the current from the electrocautry enters the patient through the small area active electrode and exits safely through the large area neutral electrode. Bipolar electrocautry is undoubtedly safer than monopolar electrocautry as the current passes between the two prongs of the electrode without any significant flow through the patient. A neutral electrode is not required. The significant advantage of bipolar electrocautry is the reduction of tissue damage[11,12].

In bipolar electrosurgery, the cutting action is not based on vaporization or an advancing spark; rather it has molecular resonance, whereby the cutting current divides the tissue without sparking or charring. This system can also operate in a wet or dry field, and thermal artifacts and charring are not seen[13]. Bipolar electrodissection technique is also used for tonsillectomy with significant advantages of minimum intraoperative blood loss and tissue damage[14]. But many studies have also rejected the use of bipolar electrocautry tonsillar dissection because of increases postoperative morbidity and higher incidence of secondary hemorrhage[2,7,15]. Idea of our study was to compare the efficacy of bipolar electrodissection tonsillectomy with conventional cold steel dissection tonsillectomy. There are very few studies specifically designed to compare the rate of hemorrhage in bipolar electrocautry and cold' dissection tonsillectomy[2,16].

Table-1: Comparison of different parameters between the groups.

Evaluating Factor	Bipolar electrocautry (n=51)	Cold steel disection (n=51)	*p*-value
Bleeding (ml)	10.04 ± 3.03	24.8 ± 6.12	0.0001*
Time (mins)	13.45 ±3.15	23.30 ± 7.30	0.0001*
Pain as VAS			
8 hrs	5.04 ± 0.76	4.81 ±0.53	0.092
12 hrs	4.36 ± 0.69	4.13 ± 0.56	0.084
24 hrs	3.5 ± 0.66	3.33 ± 0.53	0.164
7th Day	2.93 ± 0.73	2.34 ± 0.60	0.001*
14th Day	1.46 ± 0.82	0.3 ± 0.63	0.001*

Values were expressed as mean ±sd, *significant

In our study average per-operative blood loss was 10.3 ± 2.85 ml in bipolar electrocautry group whereas it was 24.6 ± 6.12 ml in cold dissection group with *p* value of 0.001. These results were also reproduced in the studies carried out by Pang et al. and Ahmed et al, who reported average intraoperative blood loss of 4 ml and 10 ml respectively in bipolar electrocautry dissection method, clearly establishing bipolar electrocautry dissection is superior than cold dissection as regard to peri-operative blood loss during tonsillectomy[17,18].

Regarding operative time, bipolar electrocautry dissection method took 13.50 ± 3.0 mins on average as compared to cold dissection method which took 23.50 ± 7.10 mins, showing statistical significant difference in favor of bipolar electrocautry group. Similar results were stated in studies conducted by Ahmed et al and Bercin et al[18,19]. Less time in bipolar electrocautry dissection group is mainly because of immediate coagulation as compared to cold dissection method where more time is consumed first in packing of tonsillar fossa and use of monopolar coagulation for securing hemostasis.

Pain is the most common problem after tonsillectomy. Nunez et al reported that pain is the main reason for seeking outpatient medical attention in the first 2 weeks after tonsillectomy[20]. We found that although immediate pain was not significant in two groups but late post-operative pain was significantly more in patients who underwent tonsillectomy with bipolar electrocautry dissection method. The same result was documented by Robert et al who did a systemic review of literature comparing cold versus hot tonsillectomies techniques[15,21]. The main reason for this difference in pain score is because of more thermal damage caused during bipolar diathermy dissection procedure. Tay's study revealed significantly less pharyngeal pain on the electrodissection side in the first post-operative day in adult patients[5].

Late onset pain and delayed return to normal diet in patients of bipolar electrocautry

group likely resulted in higher incidence of secondary hemorrhage. Its incidence in our study was 5.6% and 3.06% in bipolar electrodissection and cold steel dissection groups respectively. This is supported by a study conducted by Gendy, where secondary hemorrhage was higher in the electrodissection technique 2.3% (12 patients) compared to 1% (6 patients) of the cold dissection technique[22].

CONCLUSION

Bipolar electrodissection method of tonsillectomy is an effective safe and rapid method of tonsillectomy with obvious advantages of less operative time, minimum peri-operative blood loss and without significant early post-operative pain when compared with cold steel dissection method. It has some disadvantages of late onset of pain and higher incidence of secondary hemorrhage. However it can be used in children with less blood reservoir and in heavy operation waiting cases.

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