Comparison of Surgical Outcome of Bipolar Scissors with Conventional Cold Dissection Tonsillectomy

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ABSTRACT

Background

The tonsillectomy is the most common Ear, Nose, and Throat (ENT) surgical procedure. Different methods have been used to improve the outcome of the surgery. One such method is tonsillectomy performed with bipolar scissors. In our scenario, the comparison of bipolar scissors tonsillectomy with conventional cold dissection has not been done.

Objective

To compare the surgical outcomes of bipolar scissors tonsillectomy and conventional cold dissection tonsillectomy.

Method

A prospective randomized study was conducted in 40 patients who underwent tonsillectomy on one side using bipolar scissors and on the other side using conventional cold dissection. Intraoperative blood loss, operation time, postoperative pain, and postoperative hemorrhage were all analyzed in both surgical techniques.

Result

The median operative time was 10 minutes for bipolar scissors compared with 12 minutes for conventional cold dissection, with a p-value of 0.390 which was not statistically significant. The median blood loss was 48 mL on the bipolar scissors side and 60 mL on the conventional cold dissection side, with a p-value of 0.232 which was also not statistically significant. The overall postoperative hemorrhage rate was 12.5%. Of these, 4 (10%) occurred on the bipolar scissors side (left side mainly) and 1 (2.5%) on the conventional cold dissection side (also left side), with a p-value of 0.002 which was statistically significant. There was no statistically significant difference in the pain scores between the two methods in both rest and swallowing ($p > 0.05$).

Conclusion

The bipolar scissors did not show any benefit over conventional cold dissection in terms of surgical time, intraoperative blood loss, or postoperative pain. However, postoperative hemorrhage was more common with bipolar scissors. Therefore, conventional cold dissection remains a safe technique for tonsillectomy in adult patients.

KEY WORDS

Intraoperative blood loss, Operation time, Postoperative hemorrhage, Postoperative pain

INTRODUCTION

Tonsillar disease is one of the most common disease condition in the field of otorhinolaryngology. It is accompanied by disease conditions such as recurrent tonsillitis, chronic tonsillitis, peritonsillar abscess, hypertrophy leading to dyspnea or dysphagia, mouth breathing, snoring, apnea, etc. Treatment for tonsillar disease is carried out by the administration of antibiotics or the performance of tonsillectomy.[1]

Many techniques have been developed for performing tonsillectomy and, they can be grouped into cold and hot methods. Cold methods include dissection and snare, guillotine excision, cryosurgery, harmonic scalpel, microdebrider and plasma mediated ablation. Hot methods include LASER (Light Amplification by Stimulated Emission of Radiation tonsillectomy), monopolar and bipolar diathermy dissection, and coblation.[2] Though various newer tonsillectomy techniques have been developed, the conventional cold dissection method is still the most popular one. However, many surgeons prefer electrocautery over the cold dissection method because it reduces intraoperative bleeding, even though postoperative pain and recovery time may be longer with electrocautery.[3,4]

The conventional cold dissection method is one of the most commonly used method of tonsillectomy but intraoperative and postoperative bleeding are major complications with this method.[5] So, various studies were conducted to compare the outcome of tonsillectomy with the cold dissection method and other newer methods, but not with bipolar scissors till now in our scenario.

Tonsillectomy by using bipolar scissors is a relatively new technique that has a dual function: it cuts and coagulates at the same time. This combines the benefits of both cold scissor dissection and electrosurgical techniques, allowing for rapid and easy tonsil removal with minimal bleeding.[5] So the comparison of bipolar scissors with cold dissection gives us insight into the pros and cons of this new technique in our scenario.

METHODS

This was a prospective cohort study conducted from November 7, 2019 to November 6, 2020 in the Department of Otorhinolaryngology, Dhulikhel Hospital, Kathmandu University Hospital, Kavre, Nepal. Ethical clearance was obtained from the Institutional Review Board (IRC 231/19). Informed consent was obtained from the patient before conducting the study. The inclusion criteria were as follows: age ≥ 18 years, recurrent tonsillitis (paradise criteria), i.e., at least seven episodes in the previous year, at least five episodes in each of the previous two years, and at least three episodes in each of the previous three years; after the second attack of peritonsillar abscess; and streptococcal carriers, who may be the source of infection to others. The exclusion criteria were: bleeding disorders; during menstruation; suspicious of malignancy of tonsil; acute upper respiratory tract infection; hemoglobin level < 10 g/dL; and comorbidity like uncontrolled diabetes mellitus and hypertension.

Sample size was calculated using Epi Info version 7.2. The formula used was: $N=Z^2 PQ/d^2$ (Confidence interval =95%), where Z=1.96 and d=5. So, N=40 (sample size).

Patients who underwent tonsillectomy and met the inclusion criteria were included in the study. At the initial visit, the patient's history was taken and a physical examination was done.

Informed written consent was obtained prior to surgery. The patient was randomized to have one tonsil removed using a bipolar scissor and the other using the conventional cold dissection method. This method was chosen to limit confounding variables, as patients acted as their own control.

Patients were blinded about the technique to remove each tonsil. For the determination of site during the tonsillectomy, the lottery system was used just prior to surgery. The letters "B" and "C" were used to represent the bipolar scissor and conventional cold dissection methods, respectively. If "B" came first, then the bipolar scissors were used on the right side. If "C" came first, then the conventional cold dissection method was used on the right side.

All the surgery were performed under general anesthesia. For the bipolar scissor tonsillectomy, the scissor used in our study was power star bipolar scissors from Ethicon®. The scissors had a 10 mm exposed tip and were set at 20 watts. As shown in Figures 1 and 2, the two blades are insulated from each other to form the active electrode of the bipolar instrument. The inner surface of one blade has a ceramic coat, while the other blade has a clear, surface hardening coat. The handles and part of the outer surface of the blades are covered with plastic. A diathermy machine is used to supply the electrical current.

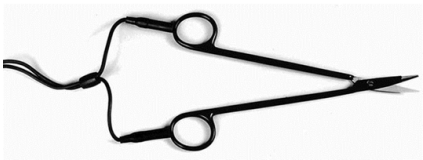

Figure 1. Bipolar scissor

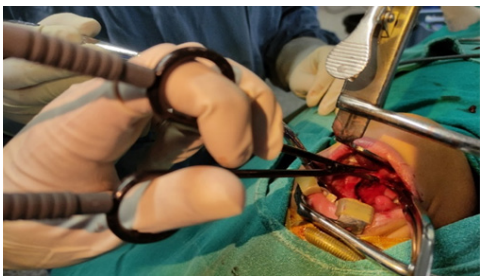

Figure 2. Showing tonsillectomy with bipolar scissors

For conventional cold dissection, the tonsillar snare and dissector were used to perform surgery. Hemostasis was maintained with normal saline and hydrogen peroxide-soaked gauge pieces.

During the intraoperative period, the operative time taken to perform the operation was measured from the start of the first incision up to the removal of a tonsil.

For the assessment of blood loss, we did soak the gauge piece and found that 1 gram of fully blood-soaked gauge piece measured as 5 ml. Therefore, 1 gm = 5 ml was taken as a standard during our study. Any blood found in the suction machine was added to the amount measured.

In the postoperative period, the degree of pain was measured on both the sides, at rest as well as during swallowing, using a visual analog scale at 24 hours, 48 hours, 72 hours, 4th day, 5th day, 6th day, 7th day, and 14th day after surgery.

All patients received the same antibiotics (ampiclox, which is a combination of ampicillin and cloxacillin), analgesics as demanded by patients, betadine gargle diluted with water in a 1:1 ratio, and hydrogen peroxide gargle diluted with water in a 1:10 ratio during their hospital stay. All patients were discharged on the 7th postoperative day with the same oral antibiotics, analgesics, and gargle.

The patient was then followed up after 7 days. On that day, we assessed for postoperative complications such as pain and postoperative bleeding at any time after being discharged from the hospital.

Data storage and statistical analysis were done using the International Business Machines Corporation (IBM) Statistical Program for Social Sciences (SPSS) 25. An independent t-test was used to analyze continuous variables such as operating time, intraoperative bleeding, and postoperative pain between the bipolar scissors and cold dissection techniques. Postoperative hemorrhage was calculated using the chi-square test. The level of statistical significance was set at $p \leq 0.05$.

RESULTS

There were a total of 40 patients enrolled in the study. The following observations were made during the study:

The maximum number of tonsillectomies were performed in the 18-28 years age group (n=26).

There were 11 patients in the 29-38 years age group, and only Two (5%) and one (2.5%) patients in the 39-48 and > 48 years age groups, respectively.

The median age was 29 years, with a minimum age of 18 years and a maximum age of 54 years. Of the 40 patients, 26 (65%) were female and 14 (35%) were male. The female to male ratio was 1.86:1. Regarding the indications for tonsillectomy, 39 (97.5%) patients underwent the procedure for recurrent tonsillitis, which was the most common indication. One patient (2.5%) had recurrent peritonsillar abscess.

For the surgical methods of tonsillectomy, 22 (55%) patients on the right side underwent bipolar scissor tonsillectomy and 18 (45%) underwent conventional cold dissection tonsillectomy and vice versa on left side. We did not find any difficulties in tonsillectomies irrespective of size.

The median operation time for bipolar scissor tonsillectomy was 10 minutes and for conventional cold dissection tonsillectomy it was 12 minutes. The maximum time required for bipolar scissor tonsillectomy and conventional cold dissection tonsillectomy was 40 minutes and 25 minutes, respectively. The minimum time required for bipolar scissors and conventional cold dissection for removal of tonsil was 3 minutes each. The operation time required for bipolar scissors was slightly less than conventional cold dissection. There was no statistically significant difference in operation time between the two groups (p=0.390).

The median amount of blood loss in the bipolar scissor tonsillectomy side was 48 mL and in the conventional cold dissection tonsillectomy side was 60 mL. The maximum amount of blood loss in the bipolar scissor side and conventional cold dissection side was 165 mL and 315 mL, respectively. The minimum amount of blood loss on the bipolar side and conventional cold dissection side was 5 mL and 15 mL, respectively, as shown in Figure 3. There was no statistically significant difference in the amount of blood loss between the two groups (p = 0.232).

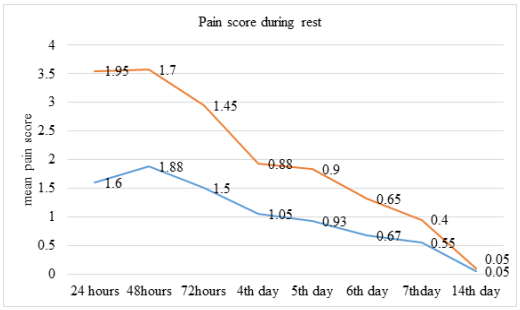

Figure 3. Pain score during rest in both the surgical procedures (n=40)

Among 40 patients, 5 (12.5%) had postoperative secondary hemorrhage. Of these, 4 (10%) were on the bipolar scissor side (mainly left side) and 1 (2.5%) on the conventional cold dissection side (also left side). Two bipolar scissor side and one cold dissection side had grade 2 hemorrhage whereas two bipolar scissor side had grade 1 hemorrhage, which were controlled conservatively. There was a statistically significant difference in postoperative hemorrhage between the two groups (p = 0.002).

The mean pain score at rest on the bipolar scissor and conventional cold dissection sides at 24 hours, 48 hours, 72 hours, 4th day, 5th day, 6th day, 7th day, and 14 days is shown in Figure 3. There was no statistically significant

difference in pain score during rest between the two groups ($p > 0.05$).

The mean pain score during swallowing on the bipolar scissor and conventional cold dissection sides at 24 hours, 48 hours, 72 hours, 4th day, 5th day, 6th day, 7th day, and 14 days is shown in figure 4. There was no statistically significant difference in pain score during swallowing between the two groups ($p > 0.05$).

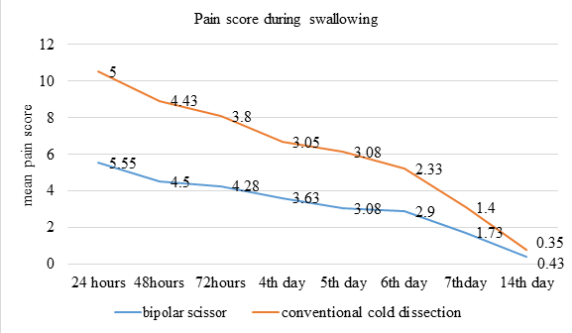

Figure 4. Pain score during swallowing in both the surgical procedures (n=40)

DISCUSSION

The total number of patients enrolled in our study was 40. Patients aged ≥ 18 years who were undergoing tonsillectomy for recurrent tonsillitis (97.5%) or recurrent peritonsillar abscess (2.5%) were included in our study. The reason for more cases of recurrent tonsillitis in our study is because it is the most common indication for tonsillectomy.

As per the literatures, there are different methods of tonsillectomy, such as blunt dissection, guillotine excision, cryosurgery, ultrasonic removal, LASER tonsillectomy, monopolar and bipolar diathermy tonsillectomy, and thunderbeat methods. These methods have been used in attempts to achieve decreased morbidity, but none of them have completely abolished the complications.[2,6-10]

More recently, a new technique for tonsillectomy using bipolar scissors has been described by different authors.[9-12] The bipolar scissors provide hemostasis by cutting and coagulating at the same time, but it has to be used cautiously because some authors question their safety and efficacy.[6]

In our study, we performed tonsillectomy on one side using bipolar scissors and on the other side using conventional cold dissection. This allowed each patient to serve as their own control, which reduced the confounding variable of individual perception of pain. This is because individual perception of pain has a wide range of confounding variables, such as age, sex, race, anxiety, and individual tolerance to pain.[9,13,14]

Based on the findings of this study, the median age of patients was 29 years. The highest number of tonsillectomies was performed in the age group of 18-38 years, where 37 (83%) of the patients were included. This finding is similar to studies performed by Shrestha et al. and Lee et al., where the highest number of patients requiring tonsillectomy belonged to the age group of the 2nd to 3rd decade.[9,15] The reason for the predominance of this group is that this group of the population is more educated than the older population and they are more aware and concerned about tonsillar disease, so they are more likely to seek permanent treatment for the condition.

Regarding gender distribution, 26 were female and 14 were male in our study, for a male:female ratio of 1:1.86. This finding is similar to the study performed by Raut et al5, where the male:female ratio was 1:2.6. The reason for the predominance of female patients in our study is due to the fact that there are more female than male patients in our community, where our hospital is located.[16]

In our study, out of the 40 patients, 22 (55%) underwent bipolar scissors tonsillectomy on the right side and 18 (45%) on the left side and vice versa. This is because we used a lottery system to determine which side each patient would receive each type of tonsillectomy.

The median time required for the removal of tonsil by bipolar scissor was 10 minutes and by conventional cold dissection was 12 minutes. The mean time required for removal of tonsil by bipolar scissor was less than the conventional cold dissection method, but there was no statistically significant difference between the two groups ($p = 0.390$). Our study differs from the study performed by Raut et al., who studied in 183 patients with mean operative time was 13 minutes for bipolar scissors tonsillectomy compared with 20 minutes for the cold dissection method ($p < .001$) which showed a statistically significant difference between the two methods.[5]

The less intraoperative time in the bipolar scissors side is due to its dual function of cutting and coagulating at the same time, which makes it easier to remove the tonsil and results in less intraoperative bleeding with a clear surgical field.[6]

Our study showed that the median amount of blood loss on the bipolar side was 48 mL, while the median amount of blood loss on the conventional cold dissection side was 60 mL. The median amount of blood loss was less on the bipolar side, although there was no statistically significant difference between the two groups ($p = 0.232$). Our study differs from the study performed by Raut et al. which showed median intraoperative blood loss was 5 mL for bipolar scissors tonsillectomy and 115 mL for cold dissection tonsillectomy ($p < .001$) which found a significant difference between the two groups but they did not use same patient as their own control.[5] Although not statistically significant, in our study the median amount of blood loss was less on the bipolar scissors side due to its good hemostasis properties during surgery, as it has very good coagulation properties.[6,17]

Regarding postoperative hemorrhage in our study, only secondary hemorrhage was observed. The overall incidence of postoperative hemorrhage was 5 (12.5%). Of these, 4 (10%) were on the bipolar scissor side (mainly left side) and 1 (2.5%) on the conventional cold dissection side (also left side). Two bipolar scissor side and one cold dissection side had grade 2 hemorrhage whereas two bipolar scissor side had grade 1 hemorrhage. All cases of hemorrhage occurred between 5 and 10 days. All cases were managed with intravenous antibiotics, chemical cauterization with 30% trichloroacetic acid (TCA) in the bleeding area, and hydrogen peroxide gargle 1.10 diluted form. Four out of 5 cases bled during their hospital stay, and 1 patient bled after being discharged from the hospital and required readmission. There was a significant difference between the two groups ($p = 0.002$). Our results are similar to a study performed by Meulen et al., which showed significantly higher postoperative hemorrhage with bipolar diathermy tonsillectomy than with cold steel tonsillectomy.[18] However, our results differ from a study performed by Raut et al., which showed no significant difference between the two groups with $p > 0.05$.[5]

The cause of the increased rate of hemorrhage with bipolar scissors is unclear, but it could be due to more extensive tissue damage.

Regarding gender distribution, secondary hemorrhage in our study was seen only in males, which is similar to a study performed by Sarny et al., which showed that bleeding episodes in males were more frequent and more severe.[19] The reason behind this finding could be incidental or by chance only, without any scientific reasons.

The pain score was higher on the bipolar scissors side than on the cold dissection side during rest and during swallowing, although it was not statistically significant. The pain score in our study is comparable to the study performed by Raut et al., which showed no statistically significant difference between the bipolar scissors and the conventional cold dissection group ($p > 0.05$).[5] However, the reason for the higher mean pain score in the bipolar scissors side could be due to thermal tissue damage caused by temperatures that reach 400°C, and difficulty in controlling the depth of heat coagulation in the bipolar scissors side. In contrast, in the conventional cold dissection side, there was maximum preservation of oral mucosa and minimum damage to tissues.

Regarding the safety of bipolar scissors, we did not encounter any injury to nearby structures, such as the soft palate or tongue, during our study. This is similar to the findings of the studies performed by Shrestha et al. and Patel et al.[9,20] This is because we used a modified pair of scissors with only 10 mm of the tip exposed, and all other parts of the scissors were insulated. Therefore, we did not encounter any such injuries. In contrast, standard designs of bipolar scissors used for tonsillectomy are more likely to cause such injuries, as seen in the study conducted by Raut et al., which reported minor burns to the tongue adjacent to the lower pole of the tonsil, cheek, etc.[5]

There are certain limitations to this study. First, it would have been better if the same surgeon had performed all of the surgeries, rather than different surgeons. Second, pediatric populations were not included in the study. Third, the study would have been stronger if a larger sample size and a multi-institutional study had been conducted.

CONCLUSION

The bipolar scissors, when compared with conventional cold dissection, did not show any benefit in terms of surgical time, intraoperative blood loss, or postoperative pain. However, postoperative hemorrhage was more common with bipolar scissors than with conventional cold dissection. Therefore, conventional cold dissection remains a safe technique for tonsillectomy in adult patients.

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