Comparison Between Harmonic Scalpel and Cold dissection Tonsillectomy at Shree Birendra Hospital: A Retrospective Study

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ABSTRACT

Introduction: Tonsillectomy is the commonest surgery performed by otorhinolaryngologist worldwide. The use of harmonic scalpel is on the rise for tonsillectomy. The aim of this study was to compare the operative time, intra-operative blood loss and post-operative pain between harmonic scalpel and cold dissection tonsillectomy.

Methods: This was a retrospective study of 50 patients who underwent tonsillectomy by harmonic scalpel and cold dissection techniques at Shree Birendra Hospital, Kathmandu from July 2018 to July 2019. Operative time, amount of blood loss and post-operative pain was compared between the techniques. Pain was assessed by numeric rating scale (NRS) while bleeding was assessed by specially tailored gauge piece of size 5 x 5 cm. P value of less than 0.05 was considered as significant.

Results: The intra operative blood loss in harmonic scalpel technique (21.89 ± 8.89 ml) was significantly less than in cold dissection technique (49.74 ± 19.69 ml) ($p = 0.001$). Similarly, post- operative pain during first and second days were significantly less in harmonic scalpel technique compared to cold dissection technique ($p < 0.05$). On the basis of personal judgment of the patients, 68% in harmonic scalpel group had less pain compared to 32% in cold dissection group. Operative time between both the techniques was similar with a p value of 0.49.

Conclusions: Harmonic scalpel is relatively safe and handy instrument that reduces intra-operative blood loss and post-operative pain compared to cold dissection method.

Key Words: cold dissection, harmonic scalpel, intra-operative blood loss, tonsillectomy

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DOI: 10.3126/mjsbh.v21i1.40287

Submitted on: 2021-10-08

Accepted on: 2022-04-17

INTRODUCTION

Tonsillectomy is one of the commonest surgeries performed worldwide. It is the surgical procedure of removing the tonsil. It is divided into two stages which include removal of tonsil and control of bleeding. The most common complication is bleeding (intra-operative and post-operative period) and pain. With time, various surgical techniques such as cryosurgery, laser, and electro dissection have been developed to minimize the bleeding and post-operative pain.

Harmonic scalpel is an ultrasonically activated surgical device which can coagulate and cut vessels and tissues at a very low temperature. In 2000, Ochi et al, described the first use of the ultrasonic scalpel in human tonsillectomy.[1] The harmonic scalpel is a hand-held device with a blade tip that vibrates at 55,500 cycles per second. It acts on tissues in two ways. Firstly, it cuts by cavitational fragmentation and mechanical disruption of tissues. It then coagulates by coaptation. Coaptation is a process that occurs by the transfer of mechanical energy to tissues which leads to breaking of tertiary hydrogen bonds to denature protein and form coagulum.[2] Cold dissection method was formerly the most common and standard procedure practiced by otolaryngologists in tonsillectomy for many years.[3] It includes removal of the tonsils by use of a dissector and inferior pole is amputated with a wire loop called a snare.

The goals of any technique are to minimize morbidity and mortality, good hemostatic control and early recovery of the patient with rapid return to normal diet and activity. So far, no definite consensus has been achieved and debate still remains regarding optimal techniques with the lowest morbidity. The aim of this study was to compare harmonic scalpel and cold dissection tonsillectomy in terms of operative time, intra-operative blood loss and early post-operative pain.

METHODS

This was a retrospective, comparative study of prospectively maintained database of all patients undergoing tonsillectomy in ENT-Head and Neck Surgery department, Shree Birendra Hospital, Chhauni, Kathmandu, Nepal. The study period was from July 2018 to July 2019. A total of 50 patients were included in this study. The study was approved by Institution Review Board (IRB). The patients diagnosed as recurrent tonsillitis and tonsillar hypertrophy was included in the study. Patients less than 14 years and patients with acute infection, obstructive sleep apnea syndrome, any nasal pathology, cleft palate, bleeding disorders or any chronic illness were excluded from the study. Patients unable to give informed consent and individuals who had difficulty communicating their pain levels were also excluded from the study. The surgery was performed under general anesthesia with orotracheal intubation. All surgeries were performed by a single surgeon. Tonsillectomy was performed in each patient by two techniques and the side of harmonic scalpel or cold dissection technique. Coagulation when required for hemostasis in both groups was performed with bipolar electrocautery set at 15 watts. Operative time and amount of blood loss was assessed on each side. We measured the length of the operating time from the moment the initial dissection was made until the moment the Boyle Davis gag was removed. Intra operative blood loss was measured by using specially made gauge piece of size 5 x 5 cm for tonsillectomy. The amount of blood loss was measured as 5 ml if gauge piece was completely soaked and it was 2.5 ml if it was partially soaked. A numeric rating pain scale (NRS) was used to assess the intensity of pain where 0 meant no pain and 10 meant most severe pain. The first assessment of pain was done at three hours post surgery, prior to giving any analgesics. Pain was also assessed during first and second postoperative day (Early postoperative period by convention) in the morning at 6 am before giving analgesic. Patients were also asked to identify the more painful side based on their personal judgment. All the parameters of these two techniques (Types of procedure done on each side, operating time, intra-operative blood loss, and early post-operative pain) were documented in the proforma which was later retrieved from the medical records and retrospectively compared. Each patient was prescribed with injectable Co-amoxyclav and analgesic (paracetamol and ibuprofen) as per demand by patients. All patients were discharged on the second postoperative day if it was uneventful. Data was entered in Microsoft Excel and statistical analysis was done with SPSS version 22. P values of less than 0.05 were considered as significant.

RESULTS

Out of 50 patients (100 tonsils), harmonic tonsillectomy was performed on 34 tonsils on left side and on 16 tonsils on right side. Similarly, cold dissection tonsillectomy was done on left side among 16 tonsils and on right side among 34 tonsils.

Table 1. Demographic data of patients (n = 50)

Gender	Frequency	Percent
Male	33	66%
Female	17	34%
Age		
< 20 years	8	16%
21-30	14	28%
31-40	28	56%

Table 2. Indications of tonsillectomy (n = 50)

Indications	Frequency	Percentage
Recurrent tonsillitis	38	76%
Tonsillar hypertrophy	12	24%
Total	50	100%

Table 3. Operating time in harmonic scalpel and cold dissection techniques (n = 50)

Technique	Mean time(minute)	Standard deviation	p value
Harmonic scalpel	8.48	4.58	0.49
Cold dissection	8.14	2.01	

Among 50 patients, 33 were males and 17 were females. The youngest was 14 years old and the oldest was 35 years old with a mean age of 28.84 years (Table 1).

Out of 50 patients enrolled in this study; indication of tonsillectomy in 38 patients was recurrent tonsillitis. The remaining 12 patients were diagnosed as tonsillar hypertrophy (Table 2).

The length of operating time was 3-20 minutes (Mean 8.48 minutes) with the harmonic scalpel and 4-12 minutes (Mean 8.14 minutes) in cold dissection method (Table 3). The operating time was more in harmonic scalpel method as compared to cold dissection method. However, it was not statistically significant (p = 0.49). Only two patients (4%) required cautery for hemostasis on harmonic scalpel group.

Intra-operative blood loss ranged from 10-45 ml (mean 21.89 ml) with harmonic scalpel and 17.5-82.5 ml (Mean 49.74 ml) in cold dissection method which was statistically significant (p = 0.001) (Table 4).

Table 4. Intra-operative blood loss (n = 50)

Technique	Mean blood loss (ml)	Standard deviation	p value
Harmonic scalpel	21.8	8.89	0.001
Cold dissection	49.74	19.69	

Table 5. Post-operative pain score (n = 50)

Post-operative periods	Technique	No of tonsils	Mean pain score	STD	P value
3 hours post-op day	Harmonic scalpel	50	6.58	2.10	0.19
	Cold dissection	50	7.20	2.57	
First post-op day	Harmonic scalpel	50	4.04	3.03	0.016
	Cold dissection	50	5.54	3.05	
Second post-op day	Harmonic scalpel	50	2.70	2.70	0.010
	Cold dissection	50	4.08	4.08	

Early post-operative pain using NRS scale within first three hours after surgery was lesser in harmonic scalpel side but was not significant statistically (p = 0.19). On first and second post-operative day, there was less post-operative pain on harmonic scalpel side as compared to cold dissection side which was statistically significant (p < 0.05) (Table 5).

On the basis of personal judgment of the patients identifying the more painful side, 68% (34/50) in harmonic scalpel group had less pain compared to 32% (16 / 50) in cold dissection group (Figure 1).

DISCUSSION

Tonsillectomy is the most common surgical procedure performed by ENT surgeons. However, it carries a high risk of hemorrhage and post-operative pain. Both of these complications are associated with impaired quality of life of the patients by causing difficulty in swallowing and prolong hospital stay.[4]

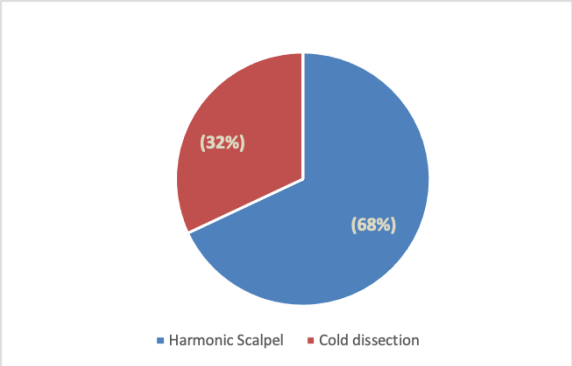

Figure 1. Pie chart showing less pain among harmonic scalpel group compared to cold dissection group.

Several studies have been conducted to identify the safest method in terms of reducing the complications and allowing a more rapid return to normal diet and activity of the patient. Harmonic scalpel is a newly innovated device. Only a few studies have been conducted to compare it with other surgical methods in terms of safety and efficacy. To assess the amount of blood loss we had used specially designed gauze pieces of 5 x 5 cm which is smaller than other studies.[5,6] In the study conducted by Lachanas et al, mean intra-operative bleeding in harmonic scalpel was significantly lower than cold dissection.[7] In another study conducted by Collision et al mean intra operative blood loss in harmonic scalpel and cold dissection was 6.2 and 58.8 ml which was statistically significant ($p<0.001$).[8] In our study also, mean intra-operative bleeding was significantly lesser in harmonic scalpel (21.8 ± 8.89 ml) compared to cold dissection side (49.74 ± 19.69) which was statistically significant (p value = 0.001). Similar findings were also observed in other studies.[9–12] The significant reduction in intra-operative bleeding in harmonic scalpel group may be attributed to the low temperature coagulation by this method.

In our study, mean operative time was longer in harmonic scalpel (8.48 ± 4.58 minutes) side as compared to cold dissection side (8.14 ± 2.01). However, it was not statistically significant ($p = 0.49$). In a study done by Karimi et al, mean operative time was statistically lower in harmonic scalpel than in cold dissection side ($p < 0.001$).[9] In a previous study done by Lachanas et al and Shinhar et al, mean operative time was also significantly lesser in harmonic scalpel side.[7,13] However in a study by Collision et al and Alexiou et al no difference in operating time was noted between harmonic scalpel and cold dissection side.[8,10] Harmonic scalpel device was new for our setup and lack of experience in handling it may have prolonged the surgery time. With experience, the length of time required to perform the harmonic scalpel procedure also decreased in our study in the later samples. However, in other studies the operating time was affected by factors such as adenoidectomy, cauterization and ligations.

In our study post-operative pain as per the numeric rating pain scale (NRS), in the early three hours postoperative period was clinically less in harmonic scalpel side than in the cold dissection side but statistically insignificant ($p = 0.19$). A study by Collision et al and Akural et al also reported less postoperative pain within three hours after surgery in harmonic scalpel side with a statistically significant p value of 0.0042.[8,10] In our study post-operative pain in first and second day were less in harmonic scalpel side and it was statistically significant ($p < 0.05$). Similarly, on the basis of personal judgment of patients, pain in early postoperative period was also less in harmonic scalpel side than in the cold dissection side. This finding was similar to other studies.[7–9] A study done by Alexiou et al and Sugiura et al found no significant differences in post-operative pain between harmonic and cold dissection sides.[11,12]

The decreased pain intensity in harmonic scalpel group may be attributed to minimal tissue damage with this method. Higher post-operative pain in cold dissection method may be attributed to poor visualization due to bleeding, use of ties or bipolar cautery causing more tissue damage. However, pain assessment can be affected by different variables such as age, gender, anxiety and pain thresholds.[14] To minimize the effect of these variables and for more accurate assessment of intensity and localization of pain, we chose two surgical methods on each side in a single patient and also children were not included in the selection criteria.

Our research has few limitations. Firstly, the sample size was relatively small so study with larger sample size could be conducted to yield better results. Secondly, in other studies, pain was assessed for long term, up to fourteen post- operative days whereas, in our study it was assessed only for a short term up to second post-operative day.

CONCLUSIONS

Harmonic scalpel is a relatively safe device. It is superior compared to cold dissection method in terms of intraoperative blood loss and post-operative pain. By selecting the best technique, we can reduce

the morbidity as well as the operating time thereby decreasing the waiting list of surgical cases. It will ultimately lead to better patient satisfaction. Despite favorable results of harmonic scalpel technique, the higher cost has limited its use in surgical specialties.

To cite this article: Karki R, Mahaseth RK, Dutta VB, Bhattarai S. Comparison Between Harmonic Scalpel and Cold dissection Tonsillectomy at Shree Birendra Hospital: A Retrospective Study. MJSBH. 2022;21(1):37-41.

Conflict of Interest: None declared

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