March 2011

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Original Article

Harmonic Scalpel versus Electrocautery tonsillectomy: a comparative study in adult patients

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Abstract

Objective: To compare harmonic scalpel (HS) tonsillectomy with electrocautery (EC) tonsillectomy in terms of operating time, intra-operative blood loss, post-operative pain and secondary haemorrhage.

Methods: Sixty adult patients subjected to tonsillectomy only, were evaluated in this prospective study. The patients were stratified into 2 groups (30 each) based on the dissecting instrument used (HS vs. EC) at Aga Khan University Hospital Karachi Pakistan from June, 2006 to August, 2008.

Results: The mean operative time was less in electrocautery group (EC 3.57 ± 0.85 minutes Vs HS 4.20 ± 1.37 minutes; $p<0.05$). The mean intra operative blood loss was less in HS group (EC 3.43 ± 3.42ml Vs HS 2.40 ± 2.74ml; $p = 0.10$). Post operative pain was significantly lower in harmonic scalpel group as compared to electrocautery group on 1st, 2nd and 3rd postoperative day ($p < 0.05$). From 3rd postoperative day onwards, although harmonic scalpel group was slightly better in terms of pain on visual analog scale but it was not statistically significant. Secondary haemorrhage after tonsillectomy was less in HS (EC 10% Vs HS 3%; $p=0.61$).

Conclusion: Except lesser pain score in early postoperative period, the harmonic scalpel does not provide a major benefit over the more traditional method of electrocautery tonsillectomy.

Keywords: Harmonic scalpel tonsillectomy, Electrocautery tonsillectomy, Post operative pain, Secondary haemorrhage (JPMA 61:256; 2011).

Introduction

Tonsillectomy is one of the most common surgical procedures performed worldwide in children and young adults. The major indications are recurrent tonsillar infection or obstruction of the airway. Until the late 1960s; tonsillectomies were performed by cold surgical dissection where the tonsil was removed from its capsular plane by blunt and sharp dissection. In the 1970s, many surgeons found that hot electrocautery was safe, easy to perform and offered good control of intraoperative haemorrhage. In fact, electrocautery dissection is one of the most common procedures in the world of today[1,2] Despite advances in technologies, innovations in surgical technique and instrumentations for tonsillectomy, three areas- intraoperative blood loss, postoperative haemorrhage and postoperative pain- remain a considerable challenge for the surgeon and the patient. Surgeons and anaesthesiologists have searched for methods or medications that will reduce peri- and postoperative morbidity.[3-5] Several techniques, mostly based on electrocautery, have been developed as an alternative to traditional blunt dissection.[1] However, they all seem to work well for the removal of the tonsils and result in less postoperative bleeding, but they do not significantly reduce the postoperative pain.[1,6,7] As necessity is the mother of all inventions, instruments continue to lead to improvement in the efficacy, safety and cost of tonsillectomy. Ultrasonic harmonic scalpel, is one of these innovations which was introduced in 1993 (Ethicon Endo-surgery; Cincinnati) and which is becoming increasingly popular as a tonsillectomy device.

Ultrasonic harmonic scalpel has been effectively used for a variety of surgical procedures mainly intra-abdominal like Nissen fundoplication and cholecystectomies, intrathoracic and gynaecologic.[8] Moreover, it is an instrument that has been widely used in all surgical specialties with encouraging results. This device has been considered as one of the armamentarium for the tonsil surgery.

However, experience of its use in otolaryngology practice is limited There is no study from our region advocating use of harmonic scalpel for tonsillectomy. We compared harmonic scalpel and electrocautery, in terms of morbidity and operating time.

Patients and Methods

A randomized trial was carried out at Department of Otolaryngology and Head Neck Surgery, Aga Khan University Hospital Karachi, Pakistan. A total of 60 patients were included after calculating the sample size; with a one-sided 5 percent significance level and a statistical power of 80 percent. All patients above 18 years

of age regardless of gender with recurrent tonsillitis, obstructive sleep apnoea, history of quinsy, suspected malignancy were included in this study. Patients having bleeding disorders or significant chronic illness that would interfere with expected recovery were excluded from this study. Since harmonic scalpel was not routinely used in our institution, we only included adults for this trial as adults can more easily tolerate its complications. Moreover, one of our output variables was postoperative pain and its assessment is more objective in adults as compared to children. The duration of the study was from June, 2006 to August, 2008. All cases were performed by a single surgeon (MI), which was the reason for longer duration of this study.

All the patients undergoing tonsillectomy and meeting inclusion criteria were recruited in the study and informed consent was obtained. Patients were divided in two groups by using random numbers table. Patients undergoing harmonic scalpel tonsillectomy were labeled as group A and other patients undergoing electrocautery tonsillectomy were in group B. Patients were briefed about visual analog scale (VAS) for pain prior to surgery. Duration of surgical procedure was recorded from the time of insertion of mouth gag until the time of its removal at the end of procedure. Intra-operative blood loss was assessed by weighing standard tonsil swabs pre and post operatively. Each swab weighing more than 1g was considered containing 5cc of blood when fully soaked. Post operative pain was assessed at 6 hours after recovering from anaesthesia by means of a 10 point visual analog scale and same scale was also provided to the patient for pain scoring on daily basis till follow-up visit on 7th postoperative day. All patients were discharged on same antibiotic, analgesia (diclofenac sodium 50mg x tid) and standard instructions for diet. Any episode of post operative bleeding was also noted down along with rest of the information in the proforma. Data was analyzed on SPSS 16 software. For continuous variables like post operative pain (0 to 10 pain scale), operative time (in minutes) and intra-operative bleeding (in ml) student "t" test was applied. Chi square test was used for categorical variable (secondary haemorrhage). $p < 0.05$ was considered significant.

Results

Mean age of our patients was 28.07 ± 7.35 years with range of 18 to 42 years in harmonic scalpel group and 29.43 ± 1.22 years with range of 18 to 68 in electrocautery group (p value = 0.573). Of the 30 harmonic scalpel tonsillectomy patients, 16 were males and the remaining 14 were females. On the other hand there were 17 males and 13 females in electrocautery group (p value = 0.79) Regarding the indication of tonsillectomy, 28 out of 30 patients (93%) in harmonic scalpel group underwent tonsillectomy because of recurrent sore throat while one was operated for suspected malignancy and the other for sleep apnoea syndrome.

Two patients in electrocautery group had history of quinsy; three had suspected malignancy and the rest (84%) had history of recurrent sore throat.

The average operative time was lesser in electrocautery group. It was 4.20 ± 1.37 minutes for tonsillectomy with harmonic scalpel and 3.57 ± 0.85 minutes with electrocautery (p value <0.05).

With harmonic scalpel mean intraoperative blood loss was 2.40 ± 2.74 ml; with electrocautery, the mean intraoperative blood loss was 3.43 ± 3.42 ml. On applying t test no significant difference was observed.

Postoperative pain was lower in harmonic scalpel group as compared to electrocautery group on 1st, 2nd and 3rd postoperative day (Table). This difference was found statistically significant with p value of 0.001, 0.002 and 0.012 respectively. From 4th postoperative day, although harmonic scalpel group was slightly better in terms of pain on visual analog scale it was not statistically significant.

Table: Postoperative pain.

	6th hour	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day
Harmonic Scalpel	4.97	4.90	5.50	5.03	3.83	3.57	2.17	1.70
Electrocautery	5.43	6.27	7.07	6.18	3.97	3.50	2.19	1.97
p value	0.096	0.001	0.002	0.012	0.417	0.668	1.001	0.151

In case of secondary haemorrhage after harmonic scalpel tonsillectomy, only one patient came with bleeding to emergency on 8th day (3.3%). This patient did not require revision surgery and was managed conservatively.

Similarly, in cases of secondary bleeding after electrocautery tonsillectomy, the average time interval from surgery to haemorrhage was 3 days. Three patients (10%) came back with bleeding in this group and none of them required surgical intervention. There was no statistically significant difference between the two groups. (p value= 0.612).

Discussion

Every year, a very large number of tonsil operations are performed over the world. Although numerous articles have been published in the general surgery, thoracic surgery, and gynaecology literature on the harmonic scalpel,[9] reports in the otolaryngology literature that specifically address its use for tonsillectomy are limited specially in our part of world. We carried out our study to evaluate whether harmonic scalpel method has any significant advantage over the more commonly practiced method i.e., electrocautery. Many authors in literature advocate that, the HS instrument is safe and effective.[10,11]

In 2001, Walker and Syed prospectively evaluated 316 tonsillectomies, 155 of which were performed with harmonic scalpel.[12] Outcome parameters data-including the return to regular diet and activity and the use of pain medications-were obtained through questionnaires, interviews with surgeons and chart reviews. They compared harmonic scalpel with the electrocautery tonsillectomy and found HS associated with a significantly earlier return to normal diet and activity, a similar degree of postoperative blood loss and a lower rate of delayed bleeding (3.2 vs. 5.6%). These authors suggested for further studies to further evaluate this method for tonsillectomy.

The same year Sood and colleagues carried out harmonic scalpel tonsillectomy in 59 cases.[13] They assessed the operating time, intra-operative blood loss, postoperative pain, and delayed bleeding. Their findings in terms of postoperative pain were almost similar to ours, although their series had no controls. In some reports, the harmonic scalpel has not been shown to have an advantage over other methods regarding the duration of surgery.[12,14] In our study operating time was slightly longer for the HS (4.20 minutes) and shorter for EC method (3.57 minutes) and this was found to be statistically significant. Similarly in a study by Schrey A and others[14] the mean operative time reported for HS group was longer (32.3 minutes) while in EC group it was shorter (18 minutes). On the other hand, findings of less operative time (7 minutes) and decrease in intra-operative blood loss (0 ml) have been published by Gilbey and colleagues.[15] We believe from our experience that, as we gain more practice with the harmonic scalpel, we expect to become even faster and hence our operative time decreases.

There is general consensus in the published literature that HS tonsillectomy is associated with equivalent or less intraoperative blood loss than other techniques such as EC or cold dissection (CD). In previously published data, the amount of blood loss during Harmonic Scalpel tonsillectomy has been reported to range from no recordable blood loss to approximately 25ml.[13,16,17] Schrey and colleagues[14] carried out a study on children and adults. The intra operative blood loss they found was around 58 ml in EC and 24 ml in HS whereas; in our study it was 3.48ml and 2.40ml respectively. In general, they had more blood loss in both the methods than in our patients. Similarly, in a prospective study of 28 patients, Collison and Weiner[18] found HS tonsillectomy with significant less intra-operative bleeding. Roth et al[19] in a prospective study found that patients in the harmonic scalpel group experienced significantly less intraoperative bleeding (5.0 vs. 16.5 ml; $p < 0.0001$). Their results were almost consistent with ours.

A study by Sheahan et al[20] compared HS vs. EC (bipolar) in terms of post operative pain on 21 adult patients by VAS. Generally they showed no difference regarding pain between two modalities of treatment. However, patients in harmonic scalpel group experience more pain in 2nd week which was not used as a variable in our study. On the other hand, Collision and Weiner[18] also observed postoperative pain in their study and found that harmonic scalpel tonsillectomy has less post-operative pain specially in early post-operative days. These findings were reported statistically significant. Another study published in 2005 by Potts and colleagues,[21] on comparison of efficiency and post-operative morbidity associated with tonsillectomy procedures, indicated the potential advantage of HS over EC in terms of post-operative pain and early return to normal activity.

We were impressed by the lack of pain on the first few post operative days in harmonic scalpel group patients in our study. These findings might be of particular benefit to the patients who undergo a day case tonsillectomy.

The morbidity and mortality related with postoperative tonsillectomy bleeding are of major concerns to the otolaryngologist. Many of them have considered hot method as a cause for delayed bleeding.[22-24] On the other hand, harmonic scalpel tonsillectomy has been associated with rates of post-operative bleeding that are equivalent to or less than those of EC.[21,25]

In a prospective study of 28 patients comparing HS tonsillectomy to CD tonsillectomy, Collison and Weiner found secondary post-operative bleeding in 3 of 28 (10.7%) patients with HS.[18] Two of these patients were managed uneventfully while one had to undergo blood transfusion. The small number of cases was the limitation of their study. Similarly, in a retrospective study of 407 patients, Schrey and colleagues[14] found no statistically significant difference in overall postoperative bleeding rates, although secondary bleeding was more common in HS tonsillectomy. This is in contrast to our study, in which there was only one patient out of 30 in HS Vs 3 out of 30 in EC group who presented with secondary haemorrhage.

Only one secondary tonsillar bleed was recorded in

harmonic and diathermy group each by Sheahan et al.[20] Similarly, a retrospective chart review was carried out by Potts, Augenstein and Goldman[21] and they found significant decreased post-operative bleeding after using HS versus conventional EC.

There are many advantages to the harmonic scalpel system in tonsil surgery. The low temperature (50-100°C) of the scalpel prevents thermal damage to collateral tissues, thus postoperative pain is reduced, and certainly improves the postoperative tissue healing. Due to a relatively bloodless field, visibility in the surgical area is better. There is no electric energy transfer through the patient's body as in the cases of electrocautery and laser. Moreover, there is also no charring and no smoke in the field of surgery. One can easily conclude that the harmonic scalpel instrument is safe, very effective and causes minimal intra operative blood loss with less post operative pain.

Conclusion

Harmonic scalpel tonsillectomy resulted in lesser pain only in early postoperative period as compared to electrocautery method, but there was no significant difference in terms of intra operative bleeding, operating time and secondary haemorrhage. Further studies are required to confirm or invalidate our findings and to determine whether the harmonic scalpel has an advantage over electrocautery.

Conflict of Interest:

The authors declare no conflict of interest.

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