ORIGINAL ARTICLE

Coblation Tonsillectomy Versus Dissection Tonsillectomy: A Comparison of Intraoperative Time, Intraoperative Blood Loss and Post-Operative Pain

Izny Hafiz Zainon, Rosdan Salim, Mohd Khairi Md Daud

Universiti Sains Malaysia, Otorhinolaryngology, School of Medical Sciences, Health Campus, Universiti Sains Malaysia, Jalan Raja Perempuan Zainab 2, Kota Bharu, Kelantan 16150, Malaysia

SUMMARY

The objective of this study was to compare the intraoperative time, intraoperative blood loss and post operative pain between coblation tonsillectomy and cold tonsillectomy in the same patient. A prospective single blind control trial was carried out on 34 patients whom underwent tonsillectomy. The patients with known bleeding disorder, history of unilateral peritonsillar abscess and unilateral tonsillar hypertrophy were excluded. Operations were done by a single surgeon using cold dissection tonsillectomy in one side while coblation tonsillectomy in the other. Intraoperative time, intraoperative blood loss and post operative pain during the first 3 days were compared between the two methods. Results showed that the intraoperative time was significantly shorter (p<0.001) and intraoperative blood loss was significantly lesser (p<0.001) in coblation tonsillectomy as compared to cold tonsillectomy. Post operative pain score was significantly less at 6 hours post operation (p<0.001) in coblation tonsillectomy as compared to cold tonsillectomy. However, there were no differences in the post operative pain scores on day 1, 2 and 3. In conclusion, coblation tonsillectomy does have superiority in improving intraoperative efficiency in term of intraoperative time and bleeding compared to cold dissection tonsillectomy. The patient will benefit with minimal post operative pain in the immediate post surgery duration.

KEY WORDS:
Tonsillectomy; surgical procedure

INTRODUCTION

Tonsillectomy is one of the most common surgical procedures performed worldwide. In a case of recurrent acute tonsillitis, it has been reported that watchful waiting results in a higher cost compared to tonsillectomy[1]. As regard to the surgical technique, improving the intraoperative efficiency and reducing post operative morbidity are the most common parameters in assessing the best method in this procedure. Cold dissection tonsillectomy, also known as dissection tonsillectomy or cold knife technique has remained the standard procedure for decades. Hemostasis of the surgery is obtained with either ligation technique or by using electrocautery. Coblation tonsillectomy has recently surfaced as a potentially appealing technology developed for this procedure. Coblation methods use ablation (or radio frequency ablation) to remove tissue and for hemostasis. However its advantage among other tonsillectomy methods is still debatable in many literatures.

In comparing coblation diathermy and cold dissection tonsillectomy, many studies have been done in comparing those parameters. Shapiro et al. reported that there were lesser intraoperative time and blood loss in coblation tonsillectomy compared to cold dissection tonsillectomy[2]. However there was no significant difference between post operative pain noted in both groups. In another prospective, randomized clinical trial by Polites *et al.* there was a significant reduction in post operative pain in coblation tonsillectomy compared to cold dissection tonsillectomy[3]. Belloso *et al.* also claimed that there was reduced rate of post tonsillectomy bleeding in coblation group compared to cold dissection[4]. In two retrospective studies by Divi *et al.* and Glade *et al.* showed that there was no difference in post operative bleeding rates[5,6]. However Noon & Hargreaves reported the notably high post operative haemorrhage rate of 22.2% in a retrospective series of 36 patients undergoing coblation tonsillectomy in their centre[7]. In one of the meta analysis by Burton & Doree, there was still inadequate evidence to determine whether coblation tonsillectomy is better or worse than other methods of performing the tonsillectomy procedure[8].

As there were still many controversial opinions in which methods of tonsillectomy may be superior to the other in view of intraoperative efficiency and reducing the post operative morbidity, further studies are still needed. In most of the previous clinical trials comparing coblation tonsillectomy with other methods, the assessment of intraoperative parameters and post operative morbidity were done between two different groups. Our study was performed via same patient acting as a control and a trial in using different methods in each side of the tonsil, in which he or she herself will give comparison in the parameters taken. This will expose to less confounding factors thus giving a more accurate result.

This article was accepted: 3 April 2014
Corresponding Author: Mohd Khairi Md Daud, Universiti Sains Malaysia, Otorhinolaryngology, School of Medical Sciences, Health Campus, Universiti Sains Malaysia, Jalan Raja Perempuan Zainab 2, Kota Bharu, Kelantan 16150, Malaysia Email: khairikck@usm.my

MATERIALS AND METHODS

The study was designed as a prospective single blind control trial. The word "single blind" refers to a testing procedure in which the administrators do not tell the subjects if they are being given a test treatment or a control treatment in order to avoid bias in the results. In this study patients did not know which mode of tonsillectomy to be done on which side of their tonsils.

Indications for tonsillectomy in this study included history of recurrent tonsillitis and tonsillar hypertrophy with obstructive symptoms. Patients who were less than seven years old, with known bleeding disorder, have history of unilateral peritonsillar abscess or unilateral tonsillar hypertrophy were excluded. The age of seven was chosen in view of ability of patient to cooperate in study. All patients who attended Otorhinolaryngology Clinic during the study period who had the indication for tonsillectomy and fulfilled the criteria for the study were included. The period of the study was from 1st July 2009 until 30th June 2010. Sample size was calculated based on two means formula with confidence interval of 95% based on study by Polites *et al* 2006.3 In this study, the sample size selected was 34.

During admission day, all patients and parents were taught how to fill the post operative pain score form. Operations were done by a single surgeon using a standard technique of both cold dissection tonsillectomy and coblation tonsillectomy. Intraoperative time taken and estimated blood loss for each techniques were documented. After six hours post operative, patients were reviewed in the ward and post operative pain score for that day were assessed by the surgeon and documented in pain score form. The post operative pain score form was given to the patients. All patients were discharged on the following day if there was no severe complication and given one week follow up in the clinic. During one week follow up, all post operative pain score form were collected and pain score for each side were documented. Any post operative complication also notified. All data were analyzed using SPSS version 18.0.

Cold dissection tonsillectomy means tonsillectomy procedure done using cold steel instrument via blunt dissection and hemostasis secured with bipolar diathermy. Where else coblation tonsillectomy means tonsillectomy done with coblation assisted procedure using EVAC T&A (ArthroCare ENT, Sunnyvale, CA) handpiece using subcapsular dissection. Intraoperative time was taken as starting from the beginning of tonsillectomy procedure until all hemostasis had been obtained on each side separately. Time taken was recorded in minutes. Intraoperative bleeding means estimated blood loss after tonsillectomy procedure completed and hemostasis obtained for each side. In this study, two suction jars were used. One suction jar was used mainly for adenoidectomy procedure and cold dissection tonsillectomy. If there is concurrent adenoidectomy procedure, after adenoidectomy done and hemostasis secured, estimated blood losses in this jar were calculated. For cold dissection tonsillectomy, estimated blood loss for the procedure was calculated by deducting the total blood loss with estimated blood loss after adenoidectomy procedure. The second suction jar was connected to coblator handpiece wand. Estimated blood loss for coblation tonsillectomy was calculated by deducting the total amount of blood in suction jar with estimated saline used for the surgery. Estimated blood loss will be group in count of 10 mls.

Postoperative pain was defined as pain assessed from six hours post operative till day three post operation. Pain score was obtained using standard visual analog pain score from 0 (no pain) to 10 (most severe pain). At 6 hours post operation, the patients were asked to fill in the assessment form in the ward and then on day 1, 2 and 3 at home. The feedback form was collected during first clinic follow up at day 7 after the operation.

All patients and parents or legal guardians were informed regarding the procedure with written consent. The study protocol was approved by Research and Ethics Committee, School of Medical Science, Universiti Sains Malaysia.

RESULTS

During the one year period, a total number of 34 patients were recruited in this study. Patients age ranged from 7 to 47 years old with a mean of 17.26 (SD 9.64). They were 12 male and 22 female. Paediatric age group (7 – 12 years old) were 14, adolescent (13 – 18 years old) were 6 and adult (19 years old and above) were 14 patients (Table I). The indication for tonsillectomy were chronic tonsillitis (70.6%, n=24), chronic tonsillitis with obstructive symptoms (17.6%, n=6) and adenotonsillar hypertrophy with OSA (11.8%, n=4).Thirteen patients (38%) have Friedman grade 3 tonsillar hypertrophy, 12 patients (35%) with grade 4, seven (21%) with grade 2 and two (6%) with grade 1. All of them underwent the tonsillectomy operation without any severe post operative complications and were discharged well on day one post operation. However, during post operative follow up, one patient defaulted. From all patients who came for follow up, four patients lost feedback form and no feedback on post operative pain feedback given.

Table II shows intraoperative time for both of the procedures. The intraoperative time for coblation tonsillectomy were ranging from 1 to 11 minutes with means of 4.21 minutes while it took about 4 to 14 minutes to complete cold dissection tonsillectomy with means of 7.24 minutes Paired T test showed a significant p value of < 0.001.

Table III shows intraoperative estimated blood loss for the procedures. The average blood loss in coblation tonsillectomy was 11.8 (± 17.14) while it was 57.4 (± 27.99) in cold dissection tonsillectomy. Again paired T test showed a significant p value of < 0.001.

Table IV compares post operative pain scores among coblation tonsillectomy versus dissection tonsillectomy. There was significantly less pain in coblation side ($p<0.001$) six hours after the operation. However, there were no differences of pain severity between the two methods at day 1, 2 and 3 postoperative.

Table I: Age group distribution

	Frequency	Percent
Paediatric (7-12 years old)	14	41.2
Adolescent (13-18 years old)	6	17.6
Adult (19 years old and above)	14	41.2
Total	34	100.0

Table II: Intraoperative time for coblation and cold dissection tonsillectomy procedures

	Range (minutes)	Mean (SD)	t-stat (df)	P value
Coblation Tonsillectomy	1 - 11	4.21 (± 2.14)	6.86	< 0.001
Cold Dissection Tonsillectomy	4 - 14	7.24 (± 2.16)		

Paired T test significant when p value less than 0.05

Table III: Intraoperative estimated blood loss for coblation tonsillectomy versus cold dissection tonsillectomy

	Range (mls)	Mean (SD)	t-stat (df)	P value
Coblation Tonsillectomy	0 - 80	11.8 (± 17.14)	9.32	< 0.001
Cold Dissection Tonsillectomy	20 - 130	57.4 (± 27.99)		

Paired T test significant when p value less than 0.05

Table IV: Comparison of post operative pain score among coblation tonsillectomy versus dissection tonsillectomy based on time

	Mean (±SD)		t-stat (df)	P value
	Cold Dissection	Coblation		
6 hours post operative	5.76 (±2.80)	3.00 (±2.67)	3.84	< 0.001
Post operative Day 1	4.38 (±2.34)	3.17 (±2.48)	1.91	0.062
Post operative Day 2	3.48 (±2.57)	3.24 (±2.23)	0.38	0.704
Post operative Day 3	2.17 (±2.25)	2.52 (±2.06)	-0.61	0.546

Paired T test significant when P value less than 0.05

DISCUSSION

Coblation tonsillectomy is still considered as one of the new techniques among tonsillectomy procedures and noted to be as the 'bridge' between cold and hot methods. This study was performed to compare the intraoperative efficiency and post operative morbidity particularly pain in the similar patient who act as test and control subject. With these measures, this study could have an overview which method is better comparatively.

Based on gender, the study showed about two thirds of cases, 22 out of 34 cases (64.7%) were females while the remaining 12 (35.3%) were males. Interestingly this distribution is seen in many other studies as well[9,10]. The patients' age were ranging from 7 years to 47 years old with mean of 17.26 years old. Divided in age group, there was equivalent in paediatrics and adult group (n=14) while adolescent only accounted about 17.6% (n=6) of cases. Here the study showed that incidence of tonsillectomy may vary according to age group. A similar finding regarding age distribution was also noted in a study in Denmark by Vestergard *et al*[11].

Pre operative examination of the oropharynx showed that most of the patients in this study had enlarged tonsil at least grade 3 (38%) and grade 4 (35%). These were the common findings in patients for tonsillectomy especially whose indication was adenotonsillar hypertrophy with obstructive sleep apnea (OSA) or recurrent tonsillitis with obstructive symptoms. Enlarged tonsil was a known cause for obstructive sleep apnea and Friedman et al. had published a trial that showed tonsil size, palatal position and also body mass index (BMI) were the main prognostic indicators in the treatment of sleep disorder breathing such as OSA[12]. Smaller tonsil size (grade 1 or 2) commonly presented in the patients who presented with history of recurrent tonsillitis only.

In view of the main objectives of the study to evaluate the intraoperative efficiency and post operative morbidity, the result showed that there were statistically significant difference in intraoperative time and intraoperative blood loss in coblation tonsillectomy side comparing with cold dissection tonsillectomy side (p value less than 0.05). Here, it was shown that by coblation tonsillectomy, time consumed intraoperatively could be reduced by nearly half of the time to complete tonsillectomy via cold dissection method.

Theoretically, coblation instrumentation uses a bipolar radio frequency waves that are transmitted by conductive solution (i.e normal saline or sodium gel) between the device and the target tissue. Here it can ablate the target tissue and also coagulate any bleeding point during the procedure, thus could really reduced the time and blood loss compared to cold dissection where usually surgeon had to dissect the tonsils first before using any hemostasis techniques such as ligation or electrocautery diathermy.

Most of the cases in the coblation tonsillectomy side had estimated blood loss less than 30 mls while in cold dissection method, the estimated blood loss varied from 20 to 130 mls. The mean of estimated blood loss in both methods also showed quite a big difference (coblation 11.8 mls vs cold dissection 57.4 mls). Furthermore, in majority of the cases that were labelled as less than 10 mls in coblation tonsillectomy side were actually bloodless field surgeries.

Generally, in comparing the overall post operative pain score between coblation and cold dissection tonsillectomy, there was no significant different between coblation and cold dissection side (p value 0.065). This may be due to a small sample size and also quite a number of dropped out who failed to give feedback in post operative pain score. However based on pain score on a daily basis (Table I), there was statistical difference in post operative pain score during 6 hours post operative on the day of surgery with mean of 3.00 in coblation tonsillectomy versus 5.76 in cold dissection tonsillectomy. From this result, it looks like patient did benefit in having less pain in coblation side in immediate post operative period. In the following days post operatively, there was slight difference in pain score which were not statistically significant. This also showed that post operative pain score in coblation tonsillectomy still equal and not inferior to cold dissection tonsillectomy.

In comparing the pain score within each group, there were significant changes of pain score in cold dissection method. This result indicated that after surgery, even though immediate post operative patient had high post operative pain score, the pain would be reduce to a significant level equal to coblation after few days post operatively. The cold dissection tonsillectomy was only involved with dissecting the tonsil from the tonsillar fossa and leaving a raw area for healing. Only minor site would have burnt for securing the hemostasis by diathermy. In contrast, the pain did not change much in the coblation group. Theoretically this would allow faster healing process due to minimal slough formation. As compared to coblation tonsillectomy, it would still form more slough compared to cold dissection method. However as the heat produced by coblation are only about 40 to 70 degree Celsius, the slough formation are usually less than the other hot techniques such as electrocautery or laser. Multiple studies worldwide had showed many results either similar or contradicted with this study. Friedman et al. (2003) noted that coblation tonsillectomy as well as coblation tonsillotomy did result in less intraoperative bleeding compared to cold dissection tonsillectomy, and experienced less numbers of pain days, less narcotic-use days and early return to normal diet and activity comparing to cold dissection tonsillectomy group[13]. Mitic *et al.* found that there was no significant difference in operation time (mean 25.6 minutes for cold dissection versus 26.6 minutes for coblation tonsillectomy)[14]. However their study showed that there was significant difference in post operative pain score for 10 days post operatively whereby coblation tonsillectomy had lesser pain score than cold dissection method (mean 6.2 versus 9.6).

Another randomized control trial in paediatric population by Shapiro et al. also mentioned that coblation tonsillectomy may improve intraoperative efficiency in term of lesser time (average of 5.0 minutes vs 7.8 minutes) and reduced intraoperative bleeding than cold dissection tonsillectomy[15]. In assessing post operative pain score, she reported that there was no difference between the two procedures. Philpott *et al.* reported that there were no significant differences in post operative pain score and otalgia[16]. Furthermore, he also claimed that patient in cold dissection tonsillectomy group experienced less pain in swallowing and earlier return to normal diet compared to coblation group (p 0.032). So he concluded that the use of coblation to perform tonsillectomy did not confer any symptomatic benefits to the patients over conventional cold dissection tonsillectomy. Parker et al. also reported that tonsillectomy undertaken in children with coblator did not have lower level of post operative pain as compared using steel method, however they did required less analgesic in first 12 hours post operatively[17].

A study by Polites *et al.* had a similar study design with this study[3]. They had recruited 20 patients who undergone tonsillectomy in her centre and all of them were randomly having one side of their tonsil removed by coblation while the other by cold dissection method. The rationale was by comparing the pain score in the same patient, it should give more objective differences in actual pain score. In her clinical trial, she assessed the post operative pain score for 14 days and reported that there were significantly less pain in coblation side during first three days post op. There were no differences after day 4 post operatively onwards. As similar to this study, the result did show that patient may benefit with lower post operative pain score in immediate post operative time by using coblation tonsillectomy method.

Setabutr *et al.* reported that the coblator is the most common single instrument used for tonsillectomy in the United States[18]. However, compared with generalists, pediatric otolaryngologists were less likely to use it.

CONCLUSION

Coblation tonsillectomy does have superiority in improving intraoperative efficiency in term of intraoperative time and bleeding compared to cold dissection tonsillectomy. The patient will benefit with minimal post operative pain in the immediate post surgery duration. In future studies, a bigger sample size would be useful to confirm our findings.

REFERENCES

1. Leupe P, Hox V, Debruyne F, Schrooten W, Claes NV, Lemkens N, Lemkens P. Tonsillectomy compared to acute tonsillitis in children: a comparison study of societal costs. B-ENT. 2012; 8(2): 103-111.
2. Shapiro NL, Bhattacharyya N. Cold Dissection Versus Coblation-assisted adenotonsillectomy in children. Laryngoscope. 2007; 117(3): 406-410.
3. Polites N, Joniau S, Wabnitz D, Fassina R, Smythe C, Varley P, Carney AS. Postoperative pain following coblation tonsillectomy: randomized clinical trial. ANZ J Surg. 2006; 76(4): 226-229.
4. Belloso A, Chidambaram A, Morar P, Timms MS. Coblation tonsillectomy versus dissection tonsillectomy: postoperative hemorrhage. Laryngoscope. 2003; 113(11): 2010-3.
5. Divi V, Benninger M. Postoperative tonsillectomy bleed: coblation versus noncoblation. Laryngoscope. 2005; 115(1): 31-3.
6. Glade RS, Pearson SE, Zalzal GH, Choi SS. Coblation adenotonsillectomy: an improvement over electrocautery technique? Otolaryngol Head Neck Surg. 2006; 134(5): 852-5.
7. Noon AP, Hargreaves S. Increased post-operative haemorrhage seen in adult coblation tonsillectomy. J Laryngol Otol. 2003; 117(9): 704-6.

8. Burton MJ, Doree C. Coblation versus other surgical techniques for tonsillectomy. Cochrane Database Syst Rev. 2007; 18(3): CD004619.
9. Hoddeson EK, Gourin CG. Adult tonsillectomy: current indications and outcomes. Otolaryngol Head Neck Surg. 2009; 140(1): 19-22.
10. Moloney JR, John DG, Jagger C. Age, sex, ethnic origin and tonsillectomy. J Laryngol Otol. 1988;102(7): 649-51.
11. Vestergaard H, Wohlfahrt J, Westergaard T, Pipper C, Rasmussen N, Melbye M. Incidence of tonsillectomy in Denmark, 1980 to 2001. Pediatr Infect Dis J. 2007; 26(12): 1117-1121.
12. Friedman M, Tanyeri H, La Rosa M, Landsberg R, Vaidyanathan K, Pieri S, Caldarelli D. Clinical predictors of obstructive sleep apnea. Laryngoscope. 1999 ;109(12): 1901-1907.
13. Friedman M, Losavio P, Ibrahim H, Ramakrishnan V. Radiofrequency tonsil reduction: safety, morbidity, and efficacy. Laryngoscope. 2003; 113(5): 882-887.
14. Mitic S, Tvinnereim M, Lie E, Saltyte BJ. A pilot randomized controlled trial of coblation tonsillectomy versus dissection tonsillectomy with bipolar diathermy haemostasis. Clin Otolaryngol. 2007; 32(4): 261-7.
15. Shapiro NL, Bhattacharyya N. Cold Dissection Versus Coblation-assisted adenotonsillectomy in children. Laryngoscope. 2007; 117(3): 406-10.
16. Philpott CM, Wild DC, Mehta D, Daniel M, Banerjee AR. A double-blinded randomized controlled trial of coblation versus conventional dissection tonsillectomy on post-operative symptoms. Clin Otolaryngol. 2005; 30(2): 143-148.
17. Parker D, Howe L, Unsworth V, Hilliam R. A randomised controlled trial to compare postoperative pain in children undergoing tonsillectomy using cold steel dissection with bipolar haemostasis versus coblation technique. Clin Otolarngol. 2009; 34(3): 225-31.
18. Setabutr D, Adil EA, Adil TK, Carr MM. Emerging trends in tonsillectomy. Otolaryngol Head Neck Surg. 2011; 145(2): 223-9.