ISSN: 2348 - 2117

International Journal of Engineering Technology and Computer Research (IJETCR)
Available Online at www.ijetcr.org
Volume 3; Issue 3; May-June 2015; Page No. 166-174

Comparative study between coblation and dissection tonsillectomy in children

Muhammad A. Sherwani

ENT Senior Specialist, Rizgary Teaching Hospital, Erbil-Iraq

E mail- dma977@yahoo.com

Abstract:
Tonsillectomy is one of the most frequently undertaken procedures in otolaryngology. Several techniques for this procedure have been described including blunt dissection, electrocautery, laser, coblation and ultrasonic dissection. The major postoperative morbidity includes pain and hemorrhage. Pain is the result of disruption of mucosa and glossopharyngeal and/or vagal nerve fibers followed by inflammation and spasm of the pharyngeal muscles that leads to ischemia and a protracted cycle of pain. The difference in mean pain scores for the two groups was very significant. With the coblation group there was a more rapid return to low pain scores than the dissection group. A noticeable difference was found in the day of return to a normal activity/ school: day (4.73) for coblation group (range 4-9), compared with day (7.52) for dissection group (range 6-9), (p value <0.05) (table 5, figure 4) the day of return to normal diet was correspondent to the day of return to normal activity/school. Coblation tonsillectomy offers less operative time, less intra operative blood loss, less post operative pain and faster return to normal diet and activity when compared with the dissection method.

Key Words: Coblation; dissection; tonsillectomy; children

1. Introduction

Tonsillectomy is one of the most frequently undertaken procedures in otolaryngology [1]. Several techniques for this procedure have been described including blunt dissection, electrocautery, laser, coblation and ultrasonic dissection [2]. There is still controversy over which is the optimal technique of tonsillectomy with the lowest morbidity rates. All the techniques have certain advantages and disadvantages. Any improvement of this procedure should decrease operating time, blood loss, postoperative hemorrhage, and particularly the postoperative morbidity. Unlike most operative procedures, which are closed primarily, tonsillectomy produces an open wound that heals by secondary intention [3].

The major postoperative morbidity includes pain and hemorrhage. Pain is the result of disruption of mucosa and glossopharyngeal and/or vagal nerve fibers followed by inflammation and spasm of the pharyngeal muscles that leads to ischemia and a protracted cycle of pain. This does not completely subside until the muscle becomes covered with mucosa 14 to 21 days after surgery. The postoperative pain can cause significant limitations in activities and diet [4, 5].

Post-tonsillectomy hemorrhage remains the most serious complication of tonsillectomy. Hemorrhage has been divided into two broad categories; primary, occurring <24 hour after surgery and secondary, occurring >24 hour, commonly 5–10 days after the operation [6, 7, 8]. Primary bleeding is generally considered to be related to surgical technique whereas Secondary or delayed hemorrhages are a consequence of infection in the tonsillar fossae [6]. Contractions of pharyngeal muscles are responsible for physiological clearance of the tonsillar bed, and infections are due to debris and food accumulation in those areas. Restriction of muscular action by pain or voluntary immobility interferes with the mechanism of physiological tonsillar fossa clearance, increasing the possibility of infection and consequent bleeding [9].Some authors consider all bleeding events, while others include only those events that require subsequent treatment under general anesthesia [10].

Aulus Cornelius Celsus, a Roman physician and writer, was the first to describe a surgical removal of the tonsils in the first century B.C., in 1906, William Lincoln Ballenger recommended complete removal of the tonsils with a knife while keeping the capsule intact. George Ernest Waugh of England is credited as the first to describe complete tonsil excision using careful dissection .In 1909 Samuel Crowe described using the Crowe-Davis mouth gag and performing careful sharp dissection for tonsillectomy [11].

Corresponding author: Muhammad A. Sherwani

The palatine tonsils consist of paired aggregates of lymphoid tissue. They are located in the pocket formed between the palatoglossus and palatopharyngeus muscles and the overlying folds of mucosa, which make up the anterior and posterior tonsillar pillars. With the lingual tonsils, the adenoids and the diffuse aggregates of pharyngeal submucosal lymphoid tissue they make up Waldeyer's ring, a complete circle of lymphoid tissue surrounding the entrance to the gastrointestinal and respiratory tracts. Histologically they consist of lymphoid tissue with aggregates of lymphocytes arranged in a follicular manner and embedded in a stroma of connective tissue. The stratified squamous mucosal covering of the tonsils extends irregular convoluted invaginations into the parenchyma forming pits or crypts. Microorganisms, desquamated epithelium and food debris are frequently present within the crypts and may be implicated in the development of acute and recurring inflammation [1].

Coblation (cold ablation, ionized field ablation, Plasma-mediated ablation, radiofrequency ablation or low-temperature Plasma excision), was first developed for use in orthopedic surgery [12] and introduced in ENT practice in late 1990s [13], it will not cause tissue temperature to exceed 60°-70° C as there is a space filled with saline between the ending tip and the tissue. It is in this plasma field that the ions responsible for destruction of intercellular bonds in tissues undergo dissociation. The principle action of radiofrequency energy is based on molecular dissociation rather than vaporization, as in diathermy. Thermal damage to the surrounding tissues is minimal owing to the relatively low temperatures developed during the procedure, coupled with continuous irrigation of the operative field with cold saline [14, 15].

2. Patients and methods

This prospective study was done on 120 patients, they were randomly selected for either coblation or dissection tonsillectomy techniques. Each group composed of 60 patients, the study period was 6 months from 1st August 2011- 31st January 2012 in ENT department of Rizgary Teaching Hospital - Erbil city.

Recurrent attacks of tonsillitis (seven attacks/year, or five attacks in two successive year or three attacks for three successive year) and obstructive symptoms related to tonsil hypertrophy were the indications for surgery in these patients. Exclusion criteria included patients with a history of bleeding disorders, asthma and age above 14 years, while patients with history of acute tonsillitis within three weeks prior to surgery have been postponed after taking appropriate treatment then enrolled in the study. Investigations were: blood group and Rh, packed cell volume, bleeding and clotting time and virological tests. All the procedures were carried out under general anaesthesia.

The surgical dissection technique was the same for both coblation and dissection tonsillectomy, and involved a subcapsular dissection for complete tonsil excision, with effort made to preserve as much pharyngeal mucosa as possible. In all patients, coblation tonsillectomy was performed using the ArthroCare ENT Coblator II surgery system with EVac 70 plasma wands (ArthroCare Corp., Sunnyvale, CA, USA). The wand comprises five active electrodes located at the distal end of the tip with the exposed portion of the shaft acting as the return electrode just proximal to the active electrodes. Settings were standardized at seven for coblation and three for coagulation. We have to mention that the EVac 70 plasma wand is expensive, so we recommended using it for three times by autoclaving to reduce the cost of operation.

Cold-dissection tonsillectomy was performed using curved Metzenbaum scissors to enter the peritonsillar space, blunt dissection to remove the tonsil from superior to inferior, and no. 2 silk used for ligation of the inferior pole. Hemostasis was obtained by ligation with no.1 silk; no electrocautery was used for haemostasis.

Each tonsillectomy technique was intra-operatively assessed for: operative time (i.e. time from first incision to complete haemostasis of the tonsillar bed); and amount of blood loss by measuring blood collected in the suction bottle after subtracting the volume of saline used for coblation method and care not to use swabs as much as possible. Postoperatively, all patients were discharged next day of surgery after being given similar prescriptions of antibiotics (oral Amoxi-clav,20-40mg/kg three times daily for seven days) and pain medication (paracetamol syrup), with doses based on body weight (10mg/kg for 4-6 times /day). Patients with hypersensitivity to penicillin had been given oral erythromycin 30-50 mg/kg four times/ day. Patients were given verbal as well as written instructions regarding medication at home along with guidance regarding food intake and general care. Furthermore they had been instructed to report early if patient is not feeding well or if there is an episode of bleeding or poor pain control. Postoperative sore throat,

feeding status and time taken getting back to school/normal activity and episodes of primary and secondary bleeding were recorded.

All the patients were followed up for 10 days after surgery. The questionnaire included a subjective assessment of post-operative pain, using a 10-point visual analogue scale (VAS) chart. The pain score charts consisted of a 10 cm linear scale with 10 gradations ranging from: 0 equating to no pain, to 10 equating to severe pain. The parents were given a copy of visual analogue pain score. The degree of pain of the throat was to be marked on the scale first thing each morning, before taking any analgesic medication. Dietary intake was measured with a 4 point visual analogue dietary scale (0; fluids only, 1; fluids and soft diet, 2; fluids and limited diet, 3; fluids and normal diet), which had been devised specifically for this study. Parents were asked to record what they felt was their child's best dietary intake on that postoperative day. The initial questionnaire sheets (intra-operative to 24 h) were retained by the author prior to discharge. The remaining sheets were retained by daily contacting with the parents by telephone. Patients were all seen in the outpatient department on the 10th postoperative day and examination of their throat was carried out with a subjective measure about the area of the tonsillar fossa that was healed or covered in slough and the questionnaire were completed.

Data were analyzed using the statistical package for social science (spss version 18).chi square test was used to compare between proportions. Student's t-test was used to compare between 2 means. A p value of equal or less than 0.05 was considered statistically significant. Fisher's exact test is used when the expected count of more than 20% of the cells of the row & column table was less than 5. ANOVA was used to compare between three means.

3. Results & Discussion

A total of 120 patients (children) were enrolled into this prospective study, with equal sex distribution (p value=0.353), age was ranging from 3_13years. There were 60 patient, 38(63.33%) male and 18(36.66%) female in coblation group (mean age: 6.13years).dissection group composed of 60 patient; 33 (55%) male and 27 (45%) female (mean age: 6.94 years) as shown in (table1 and 2). Mean operative time for coblation was 11 minutes (range 9-15), where as for dissection group was 21.87 minutes (range15-26), (p value<0.05) (Table 3, figure1 and 2). Mean Amount of blood loss in coblation group was 19.17ml (range10-30), which was 80.92 ml in dissection method (range25-140), (p value <0.05) (Table 4, figure 3). The difference in mean pain scores for the two groups was very significant. With the coblation group there was a more rapid return to low pain scores than the dissection group. A noticeable difference was found in the day of return to a normal activity/ school: day (4.73) for coblation group (range 4-9), compared with day (7.52) for dissection group (range 6-9), (p value <0.05) (table 5, figure 4) the day of return to normal diet was correspondent to the day of return to normal activity/school. When examining the throat at 10th post operative days, there was no difference in the healing of the tonsillar fossae, slough/granulation tissue was present in both dissection and coblation groups. There were no episodes of primary or secondary haemorrhage in dissection group where as one patient (1.7%) (P value 1.0) developed secondary haemorrhage in coblation group at 6th postoperative day from the right tonsillar fossa that necessitated removal of the clots under local anesthesia at hospital, and this was statistically not significant.

Table 1: Frequency distribution of operations according to sex

		Group				Total		P value
		Coblation		Dissection		No.	%	
		No.	%	No.	%			
Sex	Male	38	63.3%	33	55%	71	59.2%	0.353
	Female	22	36.7%	27	45%	49	40.8%	
Total		60	100%	60	100%	120	100%	

Table 2: Frequency distribution of operations according to the age groups

Age groups	Group				Total	
	Coblation		Dissection		No.	%
	No.	%	No.	%		
3-5	16	26.7%	19	31.7%	35	29.2%
5-9	39	65.0%	26	43.3%	65	54.2%
10-13	5	8.3%	15	25.0%	20	16.7%
Total	60	100.0%	60	100.0%	120	100.0%

Table 3: Duration of operations in minutes

Group	Mean duration of operation	Range of duration of operations
Coblation	11	9-15
Dissection	21.87	15-26

Table 4: Intraoperative blood loss in ml

Group	Mean intraoperative blood loss	Range of intraoperative blood loss
Coblation	19.17	10-30
Dissection	80.92	25-140

Figure 1: Mean duration of the two methods
(coblation & dissection tonsillectomy)

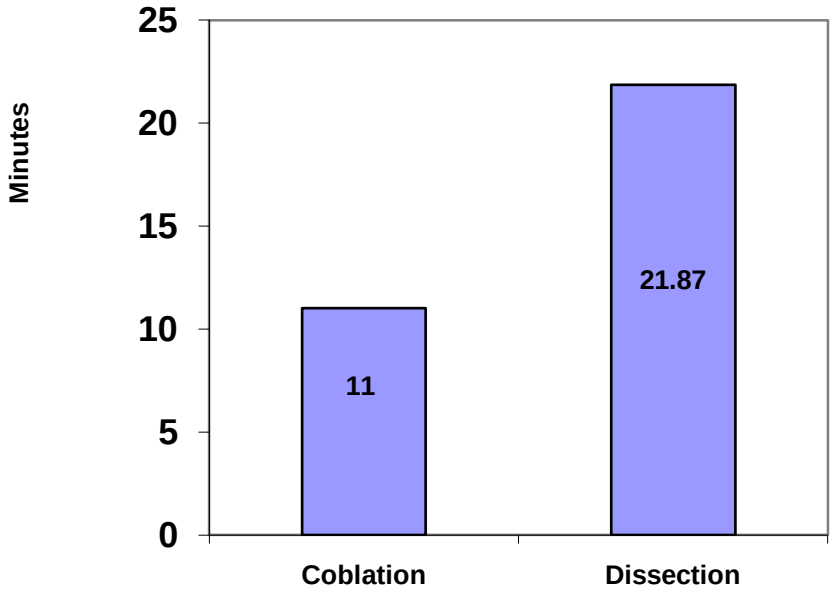

Figure 1: Mean duration of the two methods (coblation and dissection tonsillectomy)

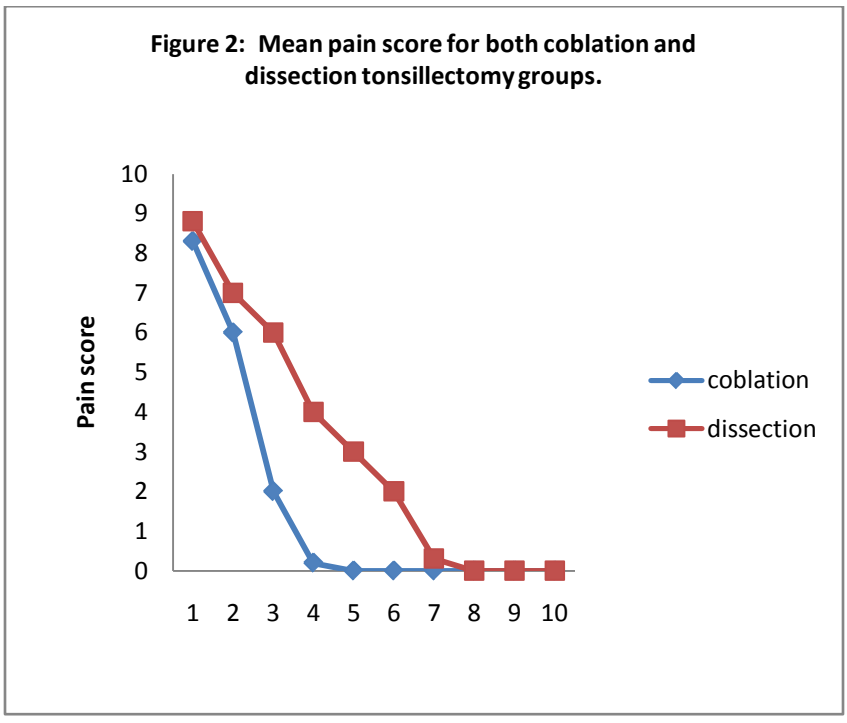

Figure 2: Mean pain score for both coblation and dissection tonsillectomy groups.

Figure 3: Mean intra oprative blood loss of the two groups(ml).

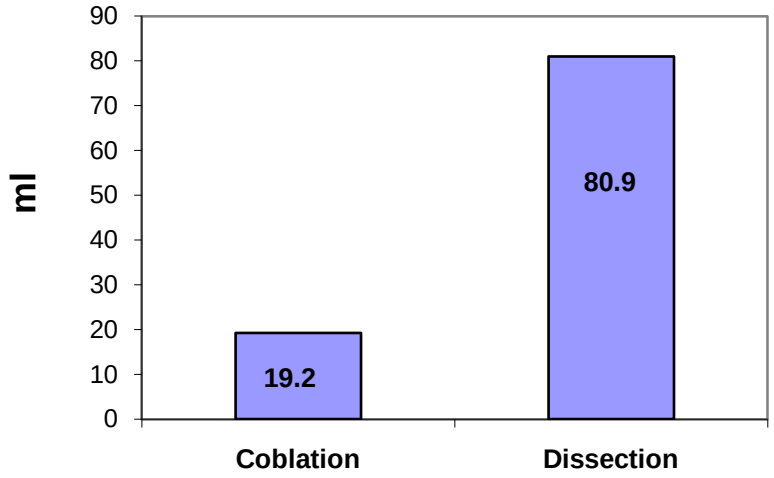

Figure 3: Mean intra operative blood loss of the two groups(ml)

Table 5: Duration of resuming normal activity

Group	Mean day of return to normal activity/ school	Range of day of return to normal activity/school
Coblation	4.7	4 - 9
Dissection	7.5	6 - 9

Figure 4: Duration of resuming normal activity.

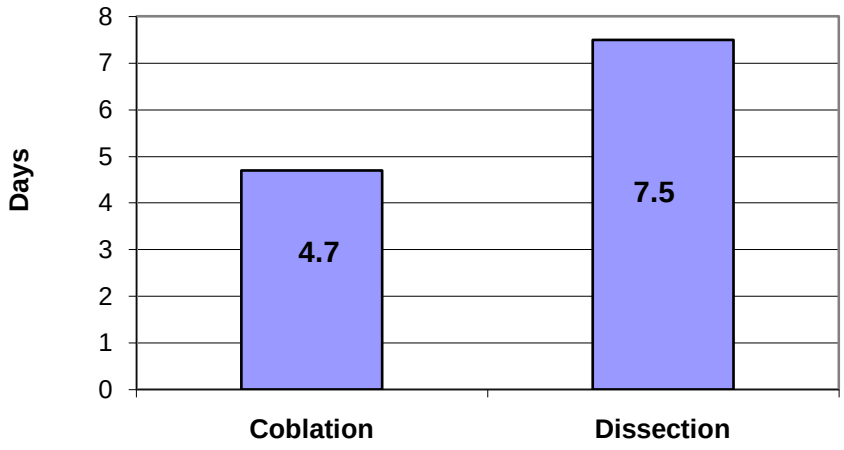

Figure 4: Duration of resuming normal activity

In this study, children who underwent coblation tonsillectomy reported less intraoperative blood loss and duration of operation, freedom from pain, ceased liquid-only diet, and returned to school/normal activity significantly more quickly than children who received dissection tonsillectomy. Several past studies have shown the potential for significantly improved recovery with the coblation tonsillectomy over electrocautery, but research comparisons of the coblation tonsillectomy and cold dissection are more limited in number [16]. In a study done by Matin M.A. in 2005, shows that coblation tonsillectomy has greater advantages of operative speed (mean: 12 minutes vs.20 minutes for dissection), intraoperative hemostasis (negligible blood loss vs. 50-100ml in dissection) and lowers postoperative pain scores or recoveries (day 3 vs. day8 for dissection) [17], this result is very close to our result. In another study done by Shapiro and Bhattacharyya in 2007 compared the intraoperative efficiency and postoperative recovery between dissection and Coblation tonsillectomy (age 2-16 years). It was shown that Coblation tonsillectomy offers better operative speed (coblation: 5 min vs. dissection 7.8 min) and intraoperative hemostasis as compared with dissection tonsillectomy. However, coblation tonsillectomy does not result in lower postoperative pain scores or recoveries despite these intraoperative advantages [18].

Businco and Tirelli in 2011 did a study, despite longer duration of the coblation technique (30-35 min vs.20-25 min for dissection), shows superiority of coblation on dissection tonsillectomy with Intra-operative bleeding during the coblation procedure tended to be half (~10 ml per case) of what had experienced using cold dissection (~20-25 ml per case), and the day of pain free was 4.8 vs. 9.4 for cold dissection, also coblation group stopped liquid diet sooner(day 5 vs. day 9) and lost fewer school days than dissection patients[16].

Roje et al in 2009, did a comparison study between the two technique, revealed the mean intra operative blood loss was 10.83 ml in coblation vs. 27 ml in the dissection group, Children operated on by coblation technique faster resumed normal physical activities in 2 *vs.* 4 days and these results was statistically significant [19].
This result was again supported by another study done by paramasivan et al in 2011(age group of 5-12 years), who concluded that coblation tonsillectomy was fast and easy to perform with little intraoperative bleeding. It offers significant advantages in the postoperative period, with rapid return to normal diet and reduction in postoperative pain [20].

All these are due to the technique of coblation which uses radiofrequency technology to cut and coagulate tissue simultaneously, this leads to decrease in operative time and also significant decrease in intra operative blood loss when compared with blunt dissection tonsillectomy with minimal lateral thermal damage occurs because it cuts at a lower temperature, so the degree of thermal injury to tonsil bed was minimized, with decrease in tissue trauma leading to decrease in post operative pain, faster return to normal diet and activity when compared to dissection tonsillectomy.

In another study that done by parker et al in 2009, with respect to postoperative pain and return to normal diet, pediatric coblation tonsillectomy did not offer significant advantage over cold steel dissection with bipolar haemostasis [21], also Philpott et al in 2003 evaluated postoperative pain, otalgia, swallowing and analgesia use at selected time points over 14 days and showed no significant benefits for coblation tonsillectomy over cold dissection in adults [22], this may be due to more fibrosis at the tensile bed and larger bleeder that require more use of coagulation with subsequent more lateral thermal damage, all these contribute to more postoperative pain and delay in return to normal diet and activity.

Fortunately there were no any episodes of primary bleeding, but one case (1.7%) presented with secondary bleeding at 6th postoperative day, which was statistically not significant, this event probably may be related to multiple use of the wand that decreases its efficacy and performance after each operation.

Several reports have described differences in proportions of secondary hemorrhage between adults and children, with adults showing greater susceptibility to delayed hemorrhage [9], some authors have suggested that the risk of postoperative haemorrhage is increased in patients undergoing coblation tonsillectomy. However, other investigators have not found this [15, 23] like Belloso et al, in their study in 2003 (included children and adult), they even found an overall lower incidence of secondary haemorrhage after coblation tonsillectomy, compared with blunt dissection using bipolar diathermy haemostasis (2.25% vs 6.19%) [9], also this is clear in the study of Businco and Tirelli (age 5-16 years), where no patient experienced a post- operative bleeding episode requiring a clinic visit or readmission [16].

In the study of Shapiro and Bhattacharyya, There was one postoperative hemorrhage in the coblation group on 6th postoperative day. This patient was treated with operative control of the bleeding, without blood transfusion [18].

Regarding postoperative healing of the tonsillar fossa, we did not find any difference between the two group, and this is supported by Magdy et al who did comparison of coblation with dissection-suture ligation (group A), monopolar electrocautery (group B) and CO2 laser (group C) in adult patients in 2007, there was no significant difference in healing between coblation and dissection–ligation tonsillectomies (group A) [23], while Matin M When examined the throat at 8 days post op, there was a large difference in the healing of the tonsillar fossa, with nearly all the coblation fossae fully healed and considerable slough/granulation tissue present in the dissection group [17], but in the study of paramasivan et al some amount of poor healing was observed with dissection technique [20].

The weaknesses of our study included relatively small sample size, non blinded subjects and investigators, and the pain due to adenoidectomy contribute to the postoperative pain.

4. Conclusion

Coblation tonsillectomy offers less operative time, less intra operative blood loss, less post operative pain and faster return to normal diet and activity when compared with the dissection method.

5. References

1. A larger double-blind randomized controlled study comparing these two surgical approaches in the pediatric population with exclusion of adenoidectomy operation and longer duration of follow up would be valuable.
2. We recommend the patient acts as his or her own control (one tonsil is removed by coblation and the other side by dissection method) for comparison of coblation and dissection tonsillectomy.

References:

1. Mckerrow W S. Diseases of the tonsil. In: Michael G, Nicolas S J, Ray C, Linda L, Jhon W., editors. Scott-Brown's otorhinolaryngology, head and neck surgery.7th ed. London. Hodder Arnold. 2008; 1:1219-1227.
2. Oko M O, Ganly I, Loughran S, Clement WA, Young D, and Geddes N K. A Prospective Randomized Single-Blind Trial Comparing Ultrasonic Scalpel Tonsillectomy with Tonsillectomy by Blunt Dissection in a Pediatric Age Group. Glasgow, United Kingdom: Otolaryngology–Head and Neck Surgery. 2005; (133): 579-584.
3. Back L, Paloheimo M, Ylikoski J. Traditional Tonsillectomy Compared with Bipolar Radio frequency Thermal Ablation Tonsillectomy in Adults. Arch Otolaryngol Head Neck Surg.; 2001 ;(127):1106-1112.
4. Tan A K L, Hsu P P, Eng S P, Sun Lu P K, Tan S M, Say J H, Coblation vs. electrocutery tonsillectomy: Posto-perative recovery in adults. Otolaryngology_head and neck surgery. 2006; (135):699-703.
5. Saengpanich S, Kerekhanjanarong V, Aramwatanapong P,Supiyaphun P. Comparison of Pain after Radiofrequency Tonsillectomy Compared with Conventional Tonsillectomy: A Pilot Study. J Med Assoc Thai. 2005; 88(12): 1880-1883.
6. Faramarzi A, Heydari S T. Prevalence of Posttonsillectomy Bleeding as Day case Surgery with Combination Method; Cold Dissection Tonsillectomy and Bipolar Diathermy Hemostasis. Iran J Pediatr. 2010 June; 20(2):187-192.
7. Windfuhr J P, Schloendorff G, Sesterhenn A M, Prescher A, Kremer B. A devastating outcome after adenoidectomy and tonsillectomy: Ideas for improved prevention and management. Otolaryngology–Head and Neck Surgery. 2009; 140: 191-196.
8. Raza Khan A, Aziz Khan, Ali F, Shah-e-din, Sahib Khan N. Comparison between silk ligation and bipolar cautery in tonsillectomy. Gomal Journal of Medical Sciences. 2007 Jan–June; 5 (1):13-16.
9. Belloso A, Chidambaram A, Morar P, Timms M S. Coblation Tonsillectomy versus Dissection Tonsillec-tomy: Postoperative Hemorrhage. Laryngoscope. 2003 November; 113: 2010-2013.
10. Niamatullah. Post tonsillectomy haemorrhage, result of 3 months follow-up. JPMI. 2003; 17(2):267-272.
11. Júnior J F N, Hermann D R, Américo R R, Stamm R G, Hirata C W.A Brief History of Tonsillectomy. International archives of Otorhinolaryngology. 2006; 10(4) (about 4 pages).
12. Burton M J, Doree C. Coblation versus other surgical techniques for tonsillectomy. Cochrane Database of Systematic Reviews. 2007; (3):1-29.
13. Javed F, Sadri M, Uddin J, Mortimore S, Parker D. A completed audit cycle on post-tonsillectomy

haemorrhage rate: Coblation versus standard tonsillectomy.2007; 127(3):300-304.
14. Parsons S P, Cordes S R, Comer B. Comparison of Posttonsillectomy Pain Using the Ultrasonic Scalpel, Coblator, and Electrocautery. Otolaryngology–Head and Neck Surgery. 2006; 134:106-113.
15. Mitic, S., Tvinnereim, M., Lie, E., at al. A pilot randomized controlled trial of coblation tonsillectomy versus dissection tonsillectomy with bipolar diathermy haemostasis. Clin. Otolaryngol. 2007,April 20; 32: 261–267.
16. Businco L D R, Guido Coen Tirelli G C. Pediatric Tonsillectomy: Radiofrequency-Based Plasma Dissection Compared to Cold Dissection with Sutures. [http://www.businco.it/studio].
17. Matin MA.Coblation tonsillectomy versus blunt dissection tonsillectomy. The ORION Medical Journal. 2006 Jan; 23:330-331
18. Shapiro N L, Bhattacharyya N. Cold Dissection Versus Coblation-Assisted Adeno tonsillectomy in Children. Laryngoscope. 2007, March; 117: 406-410.
19. Roje Z, Racic G, Dogas Z, Pisac V P ,Timms M. Postoperative Morbidity and Histopathologic Characteristics of Tonsillar Tissue Following Coblation Tonsillectomy in Children: A Prospective Randomized Single-Blind Study , Coll. Antropol. 2009; 33(1): 293-298.
20. Paramasivan V K, Arumugam S V, Kameswaran M. Randomised comparative study of adenoton-sillectomy by conventional and coblation method for children with obstructive sleep apnoea, ijporl. 2012. 02.049.
21. 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. Otolaryngol. 2009; 34: 225–231.
22. Philpott, C.M., Wild, D.C., Mehta, D. A double-blinded randomizes controlled trial of coblation versus conventional dissection tonsillectomy on postoperative symptoms. Clin. Otolaryngol.2005; 30: 143–148.
23. Magdy E A, Elwany S, El-Daly A S, Abdel-Hadi M, Morshedy M A. Coblation tonsillectomy: a prospective, double-blind, randomised, clinical and histopathological comparison with dissection–ligation, monopolar electrocautery and laser tonsillectomies. The Journal of Laryngology & Otology .2008; 122:282–290.