Intracapsular versus extracapsular coblation tonsillectomy

Original Article

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ABSTRACT

Objectives: The aim of study is to evaluate and compare between using coblation in intracapsular tonsillectomy (preserving the capsule) and extracapsular tonsillectomy (total).

Patients and Methods: The study was conducted on 50 patients with symptomatic tonsillar hypertrophy such as recurrent sore throat, snoring, difficulty of swallowing and recurrent follicular tonsillitis proved by ENT specialist. The study was conducted from February 2022 to December 2022 at the Department of Otorhinolaryngology, Al-Azhar University Hospitals, Cairo, Egypt. Group A formed of 25 patients underwent intracapsular coblation tonsillectomy, and Group B formed of 25 patients underwent extracapsular coblation tonsillectomy. Intraoperative and postoperative blood loss was measured plus time of surgery and postoperative pain.

Results: Fifty patient included in our study underwent adenotonsillectomy, 22 patients were males and 28 patients were female. In two groups, (Group A = 25 patients, Group B = 25 patients). Our results show highly statistically significant differences (*p-value* < *0.001*) between studied groups as regard blood loss. According to pain score, VAS in the first 4 days related to Group A was (5.0 ± 2.5) and in Group B was (7.5 ± 1.5) without statistically significant difference. The percentage of normal activity after one week related to Group A was (2.0 ± 1.0) and in Group B was (4.0 ± 2.0) with statistically significant difference.

Conclusion: Although the intracapsular coblation tonsillectomy consumes more operative time and intraoperative blood loss than the extracapsular technique, but it had superiority in the diminishing the postoperative pain especially after one week and the complications especially postoperative bleeding and infection.

Key Words: Coblation, pain score, tonsillectomy.

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INTRODUCTION

Acute tonsillitis in children is one leading cause for visits to the healthcare facilities. Tonsillectomy ± Adenoidectomy is one of commonest performed ENT surgery. Tonsillectomy can be performed using variable techniques including cold dissection, electrocautery, microbipolar cautery, and more recently, radiofrequency, coblation, microdebrider, laser, and harmonic scalpel[1,2].

Coblation is becoming a more popular techniques used in tonsillectomy. It includes dissection of tonsillar tissue at low temperatures, resulting in less pain and discomfort than some other techniques[3].

Extracapsular tonsillectomy means complete removal of the tonsil that leads to exposure of the muscle and blood vessels that lie within the tonsillar bed. However, intracapsular tonsillectomy involves removal of tonsil tissue without removing the capsule. So coblation tonsillectomy can be divided into extracapsular tonsillectomy or total tonsillectomy and intracapsular tonsillectomy or partial tonsillectomy (tonsillotomy)[2].

The complete removal of the tonsil and its capsule (i.e., extracapsular tonsillectomy) is the most common tonsillectomy procedure performed in the United States, although it may increase the risk for hemorrhage compared to intracapsular tonsillectomy (due to greater access to the vascular supply to the tonsils), on the other hand intracapsular tonsillectomy shows less post operative pain and bleeding[2].

A study by Windfuhr JP *et al*. in 2011, compared coblation with conventional tonsil dissection, coblation revealed several advantages, including shorter operation time, less intraoperative blood loss, lower injuries to the surrounding tissues, milder postoperative pain[4].

The aim of the current study is to evaluate and compare between coblation in intracapsular tonsillectomy (preserving the capsule) and using it in extracapsular tonsillectomy (total).

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PATIENTS AND METHODS:

A prospective study conducted on 50 patients with symptomatic tonsillar hypertrophy such as recurrent sore throat, snoring, difficulty of swallowing and recurrent follicular tonsillitis proved by ENT specialist. This study was conducted from February 2022 to December 2022 at the Department of Otorhinolaryngology, Al-Azhar University Hospitals, Cairo, Egypt. Informed consent was obtained by patient's relatives for the operation and data analysis.

Inclusion criteria were both sexes, only children with symptomatic chronic tonsillitis and tonsillar hypertrophy according to American guidelines, children with sleep disorders due to tonsils hypertrophy, and aged patients above 3 years old.

Exclusion criteria were patient with known bleeding tendency, coagulopathy disorders, patients using aspirin 1 week before surgery or contraindication for general anesthesia and patient with recent attacks within 2 weeks.

Patients were subjected to the following: detailed history taking and clinical examination, all procedures performed were carried under general anesthesia with preoperative routine investigations. In both groups, the procedure was done using the coblator technique. These patients were divided into 2 equal groups as:

• **Group A:** 25 patients underwent intracapsular coblation tonsillectomy.

• **Group B:** 25 patients underwent extracapsular coblation tonsillectomy.

Patients will be recorded for operative time, operative and post-operative complications.

Intra capsular coblation tonsillotomy

Patient were subjected to General Anesthesia (GA) via an orotracheal tube. Then the child was placed in supine in the Rose position and Boyle-Davis mouth gag was inserted, Tonsils were dissected from the surface inward with the wand set at Coblate 9 setting. The wand skims the tonsil surface with continuous saline irrigation. Ablation was performed without penetrating the tonsillar capsule. Retraction of the tonsillar pillars was done to define the margins for near complete ablation. When the capsule was approached, the wand was turned down to Coblate 6 setting. Thin layer of tonsillar tissue was left to protect the capsule. In case of bleeding the wand was used in the Coagulator 5 setting for homeostasis.

Extracapsular coblation tonsillectomy

Patient were subjected to General Anesthesia (GA) via an orotracheal tube. Then the child was placed in supine in the Rose position and Boyle-Davis mouth gag was inserted, Coblate setting of 6 were used for dissection of tonsillar tissue. The tonsil was pulled and dissected with the capsule; the active surface electrodes should face the tonsil rather than down into the fossa in order to minimize injury to the constrictor muscles. In case of bleeding, we use Coagulate 5 setting for hemostasis.

Main outcome measures

Compare between the extracapsular coblation tonsillectomy and intracapsular coblation tonsillotomy, several operative postoperative parameters will be assessed.

• Intraoperative blood loss, the amount of blood included was calculated by subtracting the amount of saline used for irrigation from the total collected fluid volume.

• Time of surgery.

• Post-operative bleeding.

• Evaluation of post-operative pain. Visual analogue scale (VAS) to evaluate postoperative pain: A score of 1 means "no pain", while a score of ten is "maximal pain".

• Post-operative infection.

• Return to normal daily activity.

Statistical analysis

Sample size was 50 patients. Data were analyzed using Statistical Package for Social Sciences (SPSS), software program (version 20). Qualitative variable was recorded as frequencies and percentages and was compared by chi-square test. Quantitative measure was presented as means ± standard deviation (SD) and was compared by Student's t test. *P value < 0.05* will be significant.

RESULTS

Fifty patients included in our study underwent Tonsillectomy, 22 patients males and 28 patients female. In two groups, (Group A = 25 patients, Group B = 25 patients). Group A underwent intracapsular coblation tonsillectomy, and Group B underwent extracapsular coblation tonsillectomy. The mean age of Group A was (6.57 ±2.8) ranging from 3 to12 years. In Group B the mean was (7 ±2.8) ranging from 3 to 12 years as shown in (Table 1).

Table 1: Comparison between studied groups as regard demographic date

		Group A (N = 25)		Group B (N = 25)		Stat. test	*P-value*
Age	Mean ±SD	6.57 ± 2.8		7 ± 2.8		T = 0.59	*0.553 NS*
	Range	3 – 12		3 //- 12			
Sex	Male	9	36%	13	52%	2.961	*0.564 NS*
	Female	16	64%	12	48%		

X^2: Chi-square test. NS: *p-value > 0.05* is considered non-significant.

The operative time was calculated only from the beginning of tonsil removal till complete removal of tonsil and control of bleeding, while other factors as preparation, anesthesia and time for adenoid removal were excluded to be accurate and specific. The mean operative time in Group A was (11.1 ±7.4) min and in Group B was (7.6 ±1.75) min. There was longer operative time in Group A than Group B. which was statistically significant (*p-value < 0.05*) as shown (Table 2).

Table 2: Operative time in each group

		Group A (N = 25)	Group B (N = 25)	Stat. test	*P-value*
Operative time(min)	Mean ±SD	11.1 ± 7.4	7.6 ± 1.75	T = 2.55	*0.015 S*
	Range	5 – 33	5 – 10		

T: Independent sample T test. S: *p-value < 0.05* is considered significant.

Intra-operative blood loss in the Group A was (10.7 ± 2.8) ml. and in Group B was (5.0 ± 1.3) ml. So, there was statistically significant difference (*p-value <0.05*) between studied groups as regards intra-operative blood loss as shown in (Table 3).

Table 3: Intra-operative bleeding

Intra-operative bleeding		Group A (N = 25)	Group B (N = 25)	Stat. test	*P-value*
Blood loss (ml)	Mean ±SD	10.7 ± 2.8	5.0 ± 1.3	T= 27.08	*< 0.001 HS*
	Range	11.5 – 8	7 – 3.5		

T: Independent sample T test. X^2: Chi-square test. S: *p-value < 0.05* is considered significant.
HS: *p-value < 0.05* is considered highly significant.

According to pain score, VAS in the first 4 days related to Group A was (5.0 ± 2.5) and in Group B was (7.5 ± 1.5) without statistically significant difference, but the percentage of normal activity after one week related to Group A was (2.0 ± 1.0) and in Group B was (4.0 ± 2.0) with statistically significant difference as shown in (Table 4).

Table 4: Postoperative visual analogue score for pain

Visual analogue score (VAS)		Group A (N = 25)	Group B (N = 25)	Stat. test	*P-value*
1st day	Mean ±SD	5.0 ± 2.5	7.5 ± 1.5	T= 0.915	*0.783 NS*
	Range	3 – 8	6 – 9		
After 1 week	Mean ±SD	2.0 ± 1.0	4.0 ± 2.0	T= 5.12	*0.013 S*
	Range	0 – 3	2 – 6		

T: Independent sample T test. X^2: Chi-square test. S: *p-value < 0.05* is considered significant.
HS: *p-value < 0.05* is considered highly significant

According to postoperative follow-up findings, there are patients had infection at operative bed about 4 cases of group B and only 2 cases of group A, there are also patients had soft palate injury as 3 cases of group B and only one case of group A, and about preservation of tonsillar pillars postoperatively there are deformed pillars only in 5 cases of group B without recorded cases of deformed tonsillar pillars for group A as shown in (Table 5).

Table 5: Postoperative follow-up period

Postoperative follow-up period	Group A (N = 25)	Group B (N = 25)
Infection	2 (8 %)	4 (16 %)
Soft palate injury	1 (4 %)	3 (12 %)
Tonsillar pillars preservation	0 (0 %)	5 (20 %)

According to return to normal daily activity, the percentage of normal activity in the first 4 days related to Group A was (59.2 ± 9.05) and in Group B was (48.53 ± 5.16) without statistically significant difference, but the percentage of normal activity after one week related to Group A was (88.5 ± 11.1) and in Group B was (62.3 ± 8.2) with statistically significant difference as shown in (Table 6).

Table 6: Return to normal life style

Return to normal lifestyle		Group A (N = 25)	Group B (N = 25)	Stat. test	*P-value*
First 4 days (%)	Mean ±SD	59.2 ± 9.05	48.53 ± 5.16	T= 0.988	*0.051 NS*
	Range	50 – 72	45 – 60		
5-7 days (%)	Mean ±SD	88.5 ± 11.1	62.3 ± 8.2	T= 2.145	*0.021 S*
	Range	75 – 100	55 – 70		

T: Independent sample T test. X^2: Chi-square test. S: *p-value < 0.05* is considered significant.
HS: *p-value < 0.05* is considered highly significant

DISCUSSION

Coblation tonsillectomy is a recently becoming more popular technique for tonsillectomy in children and is now being used by some otolaryngologists. According to Timms and Temple (2002), the use of this new technique in tonsillectomy received a considerable research interest[5, 6].

Coblation tonsillectomy is introduced to compete with other surgical techniques to improve the surgical outcome. This includes faster healing, less pain, rapid recovery of swallowing function, and fewer incidences of complications. Several studies were done to demonstrate the advantages and disadvantages of coblation tonsillectomy[6].

In our study the mean age of Group A was 6.57 ±2.8 ranging from 3 to12 years. In Group B the mean was 7 ±2.8 ranging from 3 to 12 years. The demographic data was comparable to a study conducted by Abdelmaksoud *et al*. in 2021 that showed age of patients ranged from 5 to 16 years. Mean age for the first and second groups was 9.4 and 10.1, respectively. There were 23 males accounting for 46% totally and 27 females accounting for 54% totally[7].

At our study, the mean operative time in Group A was 11.1 ±7.4 min and in Group B was 7.6 ±1.75 min. There was longer operative period in Group A than Group B. So, difference between studied groups regard operative time was statistically significant (*p-value < 0.05*). Intra-operative blood loss in the Group A was (10.7 ± 2.8) ml. and in Group B was (5.0 ± 1.3) ml. So, there was statistically significant difference *p-value <0.05*) between studied groups as regards intra-operative blood loss.

In comparison to our study, a total of 1,918 patients were evaluated. Intraoperative blood loss was <5 mL in >90% of the patients, with no patients experiencing >20 mL of blood loss. The postoperative bleeding rate was consistent with the literature (n = 87, 4.5%). Of the patients with bleeding following surgery, five (5.7%) experienced primary bleeding and 82 (94.3%) secondary bleeding. Postoperative bleeding that ceased spontaneously and did not require intervention was present in 56 (2.9%). The number of patients who actually required intervention to control postoperative bleeding was 31 (1.6%). The majority of cases presented by secondary bleeding occurred by postoperative day 7[5].

Another study showed that the estimated intraoperative blood loss presented by Abdelmaksoud *et al*. in 2021 was found significantly different between treatment groups, with a mean of 6.7 m L (SD, 6.4) for CETT and a mean of 4.8 mL (SD, 7.8) for CIT (*p = .011*)[7].

Our study showed significant improvement in the postoperative recovery in children who undergo intracapsular coblation tonsillectomy, when compared with children who undergo extracapsular coblation tonsillectomy.

Another study confirmed the same point of view. Di Rienzo Businco & Omrani reported that coblation was

associated with less pain and quick return to normal diet and daily activity when compared with traditional surgery[8].

A randomized study was performed by Arya and his colleagues in children in which coblation were done in extracapsular approach on one side and intracapsular on the other. And there was no difference in pain in the first 24 h. These results are different from those of this study, as there was no improvement in pain scores observed until days 5 or 6[9].

In a meta-analysis study presented by Daskalakis and colleagues in 2021 showed that there is significant difference between these two methods in terms of late postoperative pain with the intracapsular technique being less painful (SMD (standardized mean difference) − 0.78, 95% CI [− 1.03, − 0.53]). However, there was no significant difference in early postoperative pain (≤ 48 h) between the two techniques (SMD − 0.18, 95% CI [− 0.47, 0.12])[10].

In a randomized controlled study of coblation versus electrocautery tonsillectomy by Chang, the pain scores in the first and second days was 2.5 for patients subjected to intracapsular coblation; in this study, the pain score in the first and second days was 2.8 in the intracapsular coblation group. Also, Chang recorded the pain score in the fifth and sixth days 1.5 compared to 1.7 in this study for intracapsular coblation patients in both studies[11].

On the other hand, the extracapsular coblation group from this study had scores that were better than the electrocautery group from Chang's study at first and second days (2.8 vs 4.6) and fifth and sixth days (3.2 vs 3.8). Although extracapsular coblation is not as favorable in recovery as intracapsular coblation on the fifth and sixth days, the results from this study still support that extracapsular coblation patients continue to have favorable recovery profiles compared with traditional electrocautery tonsillectomy. That shows the advantage to coblation over electrocautery tonsillectomy. As it is less thermal injury to the tonsillar fossa, any technique that minimizes tissue injury including cold dissection or very low power bipolar electrocautery will show recovery advantages when compared with a high thermal injury technique such as high-power monopolar electrocautery[11].

Although pain in the in the first couple of days after tonsillectomy can be related to different tissue injury profiles of various surgical devices, delayed pain beyond 5 days postoperatively may be related more to the presence or absence of the capsule and therefore how much of the fossa is exposed to the oropharynx. Although pain in the in the first couple of days after tonsillectomy can be related to different tissue injury profiles of various surgical devices, delayed pain beyond 5 days postoperatively may be related more to the presence or absence of the capsule and therefore how much of the fossa is exposed to the oropharynx. Intracapsular techniques that spare the capsule and leave it as a "biological covering" may thus reveal some additional advantages at later times of assessment that would have been missed if compared against a subcapsular low-injury technique early in the postoperative period[10].

According to pain score in our study, VAS in the first 4 days related to Group A was (5.0 ± 2.5) and in Group B was (7.5 ± 1.5) without statistically significant difference (*P-value=0.783*), but the percentage of normal activity after one week related to Group A was (2.0 ± 1.0) and in Group B was (4.0 ± 2.0) with statistically significant difference (*P-value=0.013*).

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As after mentioned, a preponderance of studies has indicated an advantage to Coblation over electrocautery tonsillectomy. Less thermal injury to the fossa may be the primary reason for this advantage. This author suspects that regardless of the particular tonsillectomy technique, most pain within the first 2 days after tonsillectomy can be attributed to injury to the tissue of the tonsil fossa. Any technique that minimizes tissue injury including cold dissection or very low power bipolar electrocautery will demonstrate recovery advantages when compared with a high injury technique such as high-power monopolar electrocautery. In addition to the device or instrument used, the dissection skills of the surgeon may also play a role in minimizing tissue injury. Surgeons instinctively recognize this fact, and this author suspects that this is the main reason why there is so much controversy with respect to tonsillectomy techniques and devices with heated discussions whenever the topic is discussed at academic meetings[5].

According to postoperative follow-up findings in our study, there are patients had infection at site of injury about 4 cases of group B and only 2 cases of

group A, there are also patients had soft palate injury as 3 cases of group B and only one case of group A, and about preservation of tonsillar pillars postoperatively there are deformed pillars only in 5 cases of group B without recorded cases of deformed tonsillar pillars for group A.

So that, this study recommends that studies of recovery after tonsillectomy should include both early (days 1 and 2) and later (days 5 and 6) time points of assessment. Ideally, this study should have also included an even later time point (days 9 and 10) to demonstrate complete recovery back to baseline, although that was not the main objective of this study.

CONCLUSION

Both intracapsular and extracapsular coblation tonsillectomy show good results. Although the intracapsular coblation tonsillectomy consumes more operative time and intraoperative blood loss than the extracapsular technique, but it had superiority in the diminishing the postoperative pain especially after one week and the complications especially postoperative bleeding and infection.

CONFLICT OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Adoga AA, Okwori ET, Yaro JP, Iduh AA. Pediatric otorhinolaryngology emergencies at the Jos University Teaching Hospital: study of frequency, management, and outcomes. Ann Afr Med. 2017;16(2):81–4.

2. Walton J, Ebner Y, Stewart MG, April MM (2012) Systematic review of randomized controlled trials comparing intracapsular tonsillectomy with total tonsillectomy in a pediatric population. Arch Otolaryngol–Head Neck Surg 138(3):243–249.

3. Shapiro NL, Bhattacharyya N (2007) Cold dissection versus coblation-assisted adenotonsillectomy in children. Laryngoscope 117(3):406–410

4. Windfuhr JP, Chen YS, Propst EJ, Güldner C. The effect of dexamethasone on posttonsillectomy nausea, vomiting and bleeding. Braz J Otorhinolaryngol2011;77(3): 373–9.

5. Parsons SP, Cordes SR, Comer B. Comparison of posttonsillectomy pain using the ultrasonic scalpel, coblator, and electrocautery. Otolaryngol Head Neck Surg 2006;134:106 –13.

6. Timms M, Temple R, 2002. Coblation tonsillectomy: a double blind randomized controlled study. J LaryngolOtol 116(6):450–452

7. Abdelmaksoud, Aida A., Ahmed G. Abdelreheem and Usama K. Tayee. "Intracapsular coblation tonsillotomy versus extracapsular coblation tonsillectomy." The Egyptian Journal of Otolaryngology 37 (2021): 1-4.

8. Omrani M, Barati B, Omidifar N, Okhovvat AR, Hashemi SAG, 2012. Coblation versus traditional tonsillectomy: a double blind randomized controlled trial. J Res Med Sci 17(1):45

9. Arya A, Donne A, Nigam A. Double-blind randomized controlled study of coblation tonsillotomy versus coblation tonsillectomy on postoperative pain in children. Clin Otolaryngol 30(3):226–229

10. Daskalakis D, Tsetsos N, Karagergou S, Goudakos J, Markou K, Karkos P. Intracapsular coblation tonsillectomy versus extracapsular coblation tonsillectomy: a systematic review and a meta-analysis. Eur Arch Otorhinolaryngol. 2021 Mar;278(3):637-644.

11. Chang KW. Randomized controlled trial of Coblation versus electrocautery tonsillectomy. Otolaryngol Head Neck Surg 2005; 132(2): 273–280.