



COBLATION VERSUS COLD STEEL TONSILLECTOMY: PROSPECTIVE COMPARATIVE OBSERVATIONAL STUDY

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Abstract:

Background:

Coblation tonsillectomy is a relatively recently introduced surgical technique which attempts to bridge the gap between hot and cold tonsillectomy methods.

Objectives:

To compare the effects of both Coblation and cold steel tonsillectomy on the amount of blood loss intra operatively.

To compare the effect of Coblation tonsillectomy on the level of postoperative pain in comparison with cold steel method.

To study the effect of both techniques on the incidence of post tonsillectomy hemorrhage.

To evaluate the effect of Coblation tonsillectomy on the time taken for the dissection and on the healing process in compared with cold steel method.

Patients and methods:

A prospective randomized single blind controlled trial, carried out at Basrah Teaching Hospital between October 2020 and March 2021, which include 44 patients (24 female and 20 male) with female to male ratio is (1.2 :1). We include patients with history of recurrent tonsillitis age from (6-35) years and exclude those patients with blood dyscrasia, diabetes, hypertension, current steroid use, quinsy, heart disease and tonsillar hypertrophy due to neoplastic process.

Patients were randomly assigned to have one side of the tonsils to be removed by Coblation and the second by cold steel dissection.

Results:

Coblation was significantly faster to perform than cold steel dissection and produced significantly less intra-operative blood loss (p value <0.01). Subjective visual analogue scale analysis showed significant pain score difference on day0 between Coblation and dissection (p value <0.01) in favor of Coblation, while there is no significant difference in pain on day3,7,10-14. Also, the study showed that no significant difference in the healing process between the two side

Conclusion:

Coblation tonsillectomy is a safe procedure and does have superiority in improving intraoperative efficacy in term of intraoperative time and bleeding compared to cold dissection tonsillectomy.

Key words: Tonsillectomy, Cold Steel Tonsillectomy, Coblation Tonsillectomy.

Introduction:

COBLATION VERSUS COLD STEEL TONSILLECTOMY

Tonsillectomy, with or without adenoidectomy, is considered one of the common operations in otolaryngology the of field and usually otolaryngologists focus on training and performing it, with special emphasis on the need to know and train in methods of treating post-tonsillectomy complications.^{1,2}

Historically, we can say that tonsillectomy has been performed since the Hindu era in 1000BC, and through subsequent eras the

steps and instrumentation used in tonsillar surgery underwent a great evolution such as snare and guillotines. The cold steel techniques were developed in the 19th century.^{3,4}

Modern tonsillar surgical styles involves many techniques such as laser (CO₂, Nd:YAG and KTP), plasma coblation and harmonic scalpel.^{5,6} The post-surgical co-morbidities and problems directly affect quality of life following tonsillectomy in many ways like haemorrhage, surgical wound healing, nausea, postoperative vomiting and pain in addition to resumption of feeding.⁷

These the current study aims were attempted to evaluate and compare between the cold steel dissection and radiofrequency plasma coblation tonsillectomies according to these parameters intraoperative and postoperative bleeding and morbidity in addition to measuring the operative time and healing progress.

Patients and Methods:

Study Design: A prospective single-blind randomized controlled trial that was carried out at the Otolaryngology Department of

Basra Teaching Hospital during the period between October 2020 and March 2021.

Approval: The approval has been granted for this study by the Scientific Council of Otorhinolaryngology, Head and Neck Surgery / Iraqi Board for Health Specialization in Otorhinolaryngology, Head and Neck Surgery. Consent was obtained from each patient or child's guardian about the nature and aim of the intervention and the need for regular follow-up.

Patients Sampling:

A total of 52 patients of different sexes and age groups were enrolled in this study; they were admitted for elective tonsillectomy with a history of recurrent tonsillitis in the period between October 2020 and March 2021 at the Otolaryngology Department of Basra Teaching Hospital. The inclusion criteria for patients were those with a history of recurrent tonsillitis

that indicated tonsillectomy, i.e., seven episodes of acute tonsillitis per year, or five per year for two consecutive years, or three per year for three consecutive years.⁸ Exclusion criteria included patients with

blood dyscrasia, systemic diseases like diabetes or hypertension, as well as patients on current steroid usage, together with patients with quinsy, recent infections, and tonsillar hypertrophy due to neoplastic processes. A total of 8 patients, 3 females and 5 males, were excluded for the reasons mentioned above, so the remaining total was 44 patients (24 females and 20 males).

Data Collection:

Every patient enrolled in the study underwent a detailed history and clinical examination focusing on the throat. The data for each patient were collected and stored, and used later for calculating the results utilizing IBM® SPSS® software application Version 2.

Methods:

Before the beginning of the operation, the dissection side, the suction jar was empty and the gauze was weighed by a digital scale (fig.1). Those handmade gauzes were not used to ensure fixed size and weight, and a known amount of saline was put in a kidney dish (200 ml), which is the only amount utilized in cleaning the tube sucker. At the end of the operation, the remaining saline was sucked into the suction jar. The calculations were done using the following formula (Box 1) .⁹

Box 1 Formula for blood loss calculations

Weight of the gauzes before use = y g
Weight of the gauzes soaked with blood = x g
Weight of the blood lost =(x-y) g
Specific gravity of blood = 1.055 g/ml
Quantity of blood lost =(x-y) g/1.055 g /ml
Amount of fluid (blood + known quantity of saline) collected in suction bottle = z ml
Amount of saline sucked in the bottle = 200 ml
So, quantity of blood lost in suction bottle = z-200 ml
Total quantity of blood lost = (x-y/1.055) ml +(z-200) ml

After finishing the side dissected by cold steel method the suction jar was empty and blood loss from Coblation side was calculated also.

Amount of fluid (blood +saline) collected in suction bottle = R ml
Amount of saline used in the irrigation system = S ml
So, the quantity of blood lost by Coblation = R-S ml

Operations performed under general anesthesia. The induction begins with propofol

I.V. (2-3 mg /kg) as the induction agent together with a non-depolarizing muscle relaxant. All patients were intubated with an endotracheal tube and general anesthesia was maintained by inhalational anesthesia with isoflurane or sevoflurane, ensuring that there was no premedication with steroids, because sometimes the anesthesiologist gives steroids with the premedication that interferes with the results of the study (because it has

COBLATION VERSUS COLD STEEL TONSILLECTOMY

considerable effect on reduction of post-operative pain).¹⁰⁻⁻¹⁴

The Procedure was done while the patient in Rose position, after draping, the Boyel-Davis mouth gag and doughy plate of suitable size were applied carefully, A wooden plate and Draffin's bipods were established, then any saliva or secretion was wiped away by sterile gauze that was not counted with other gauzes. The side to be dissected by the cold steel method (right or left) was randomly selected. Then the tonsil was medialized with Denis Brown's tonsil-holding forceps. After that, a scissor was used to make an incision just medial to the anterior pillar. The incision started from the superior pole of the tonsil to the inferior one. A plane for dissection was made, and blunt dissection commenced with a Gwynn Evans dissector until the inferior pole. Then, using a Negus forceps, the pole was clamped and ligated. After dealing with the prominent bleeding vessel by ligation, it was ensured that no more bleeding existed and the pharynx and postnasal space were cleaned of any blood before starting with the other side. The time taken (from the first incision to complete hemostasis) was calculated by a valid timer..(fig.1).



Figure (1) Digital Scale with Timer

Then the other side was dissected using Coblation with a Smith & Nephew Arthrocare ENT Coblator II (USA). The tonsil was medialized with Denis Brown's holding forceps. Using the radiofrequency wand, the EVAC 70 XTRA HP Adenotonsillectomy Plasma Wand (EIC5874-01) handpiece, subcapsular dissection was performed along the tonsillar pillar mucosa, leaving the muscle intact. Dissection was carried out on the coblation mode setting of 7, and hemostasis was obtained on the coagulation mode setting of 3, which coagulates tissues at a lower temperature, and the tonsil was removed. The time taken for the coblation was also calculated. After recovery from anesthesia, the level of pain was assessed by a visual analog scale (VAS) because it is simple, easily understandable, and requires no training for the patient. In addition, it has been

used by many authors to estimate post-surgical pain after tonsillar surgeries.^{15,16} VAS is interpreted as mild (0-2), moderate (3-7), and severe (8-10), on days (0, 3, 7, and 10-14.¹⁷ If the patient is a child, he/she is instructed to point to the face that represents their level of pain, and if he/she is an adult, they are instructed to point to the number that represents their level of pain.¹⁸

A colleague with good knowledge in using VAS participated in pain rating, provided that neither he nor the participant knew which side was dissected by Coblation or cold steel methods. After recovery, the patients were kept under observation for vital signs, otalgia, and spitting of blood or frank blood, along with examination for palatal edema and/or hematoma, as well as the healing process at days 0, 3, 7, and 10-14. Pain relief with paracetamol, either orally or intravenously, in a dose of 15-20

mg/kg of body weight every 8 hours according to the level of pain perception, in addition to amoxiclav orally in a dose of 25 mg/kg of body weight every 12 hours, was prescribed for all participants. They continued on antibiotics during the following ten days and analgesia as needed. The above-mentioned parameters were written clearly in a special questionnaire designed to cover those topics.

Data were collected with IBM® SPSS® software, and calculations were done by the t-test and chi-square tests for the purpose of comparing two groups of the same sample before and after the intervention. A p-value or 2-tailed significance < 0.05 was considered statistically significant (when considering the null hypothesis that there is no difference between the two sides).

Results:

Forty-four patients enrolled in this study, of them 24 (54.55%) females and 20 (45.45%) males as shown in figure (2). The minimum age for patients was 6 years and their maximum age was 35 years with mean age of 16.5 years as seen in (Table I).

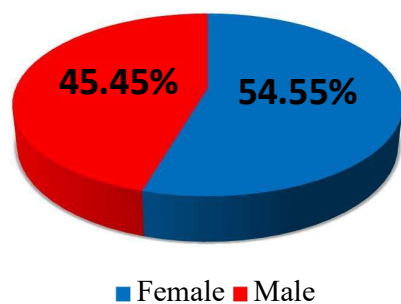


Figure (2) Sex Distribution

Table I Age Distribution

Age of Patients	
Minimum Age	6 years
Maximum Age	35 years
Mean Age	16.5 years
NO of Patients	44

COBLATION VERSUS COLD STEEL TONSILLECTOMY

The side selected for Coblation was randomly chosen from closed envelope. **Figure (3)** shows that 21 patients had their right-side tonsil removed by Coblation which represent 47.73%, while 23 patients had their left side tonsil removed by Coblation which represent 52.27%.

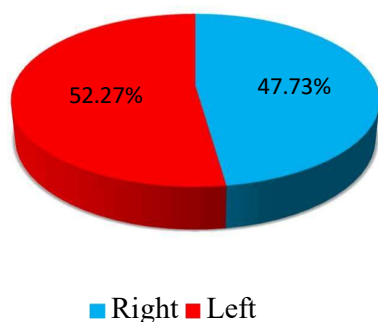


Figure (3) Selected Side for Coblation

Table II shows a significant reduction in duration of surgery in comparison between the Coblation tonsillectomy with Cold-Steel one with mean duration of (3.2) minutes for the first and (8.2) minutes for the latter.

Table II Operative Time taken for Coblation and Cold steel methods

	Duration of Coblation (min.)	Duration of Cold Steel (min.)
Maximum	5	11
Minimum	2	6
Mean	3.2	8.2

P value is 0.009

As seen from Table III, there is a significance reduction in amount of blood loss intraoperatively during the Coblation tonsillectomy comparable with Cold-Steel tonsillectomy. Mean blood loss 4.4 ml. and 32.1ml. respectively.

Table III Mean Intra Operative Blood Loss in ml.

	Blood loss with Coblation (ml)	Blood loss with Cold steel (ml)
Minimum	2	20
Maximum	10	70
Mean	4.4	32.1

The P value is 0.002

As shown in Table IV, on day zero, the percentage of patients with severe pain on the coblation side is 57%, which is less than the 84% on the cold steel side. On day 7, the

COBLATION VERSUS COLD STEEL TONSILLECTOMY

percentage of patients with moderate pain on the coblation side is 82%, which is higher than that on the cold steel side, and there is no reported severe pain in any patients on both sides. There is a significant difference in the level of pain post-operatively on day zero between the coblation and cold steel sides. After rejecting the null hypothesis (no difference between the two sides), the p-value is less than 0.01, which is considered significant. However, on day 7, while there is a difference in post-operative pain favoring the cold steel side, this difference is not statistically significant.

Table IV: Severity of Pain Post Operatively experienced on 0, 3, 7, 10-14 days

Day	Severity	Coblation	Percent	Cold steel	Percent	P-Value
0	Moderate	19	43 %	7	16 %	0.01
	Severe	25	57 %	37	84%	
3	Moderate	39	89 %	40	91 %	1.00
	Severe	5	11 %	4	9 %	
7	Mild	8	18 %	38	86 %	1.00
	Moderate	36	82 %	6	14 %	
	Severe	0	0	0	0	
10-14	Mild	44	100 %	44	100 %	

None of the patients had primary or secondary hemorrhage in both sides, they didn't have foreign body sensation, and none of them had high grade fever. There is no significant difference in healing process between the two sides when examine at 7th day post operatively as seen in Table V. All of patient resumed feed normally with some swallowing difficulties on day 5-7. No palatal hematoma in both sides.

Table V post-operative tonsillar fossa healing between the two sides

	Coblation	Percent	Cold steel	Percent
Total healing	8	18.2%	6	13.6%
25% slough	18	40.9%	18	40.9%
50% slough	14	31.8%	16	36.4%
75% slough	4	9.1%	4	9.1%
100% slough	0	0%	0	0%
Total number	44	100%	44	100%

Discussion:

Tonsillectomy is one of the most common surgical procedures, but despite its frequency and history, investigators continue to seek improvement in many factors relating to the performance of surgery and postoperative recovery from tonsillectomy.^{19,20} Needless to say, debate continues as to which technique yields the best outcome. Many methods for tonsillectomy have been explored to decrease postoperative pain and postoperative morbidity, which remain the major side effects of the operation.²¹

Coblation technology has recently surfaced as a potentially appealing option for adenotonsillectomy, operating at much lower surface temperatures (40–70°C) than electrocautery. It provides both ablation and dissection of tissue as well as hemostasis.^{19,22}

In the present study, we included a wide range of age groups ranging from 6 to 35 years, with exclusion of ages below 6 years due to the fear of poor cooperation with assessment. This is in agreement with Magdy et al.²³ and Zainon et al.²⁴, who included ages 7–47 years.

The number of enrolled patients in this study is similar to others like Tahyr et al. (25), Zainon et al.²⁴, and Alaqueedy et al.⁵, to achieve a reasonable significant comparison between different studies.

It is worth noting that the duration of the operation was significantly shorter (p-value

<0.01) in Coblation compared to cold-steel tonsillectomy. When reviewing Table II, we notice that the minimum time was 2 minutes and the maximum time was 5 minutes, while in cold steel, the minimum time was 6 minutes and the maximum time was 11 minutes. This difference in surgery time is due to the added time in the cold steel side for hemostasis by ligature. This reliable data was consistent with the results obtained in Tahyr et al., Magdy et al., and Zainon et al. studies.^{25,23,24}

It is worth noting that Table III showed the intraoperative blood loss statistically differed in favor of the Coblation method (p-value <0.01). The minimum blood loss was 2 ml and the maximum blood loss was 10 ml on the Coblation side, while the minimum blood loss was 20 ml and the maximum blood loss was 70 ml on the dissection side. The variation may be explained by the fact that Coblation surgery is a radiofrequency technique that cuts and coagulates tissue simultaneously, causing decreased intraoperative blood loss²⁶. These results are reported in harmony with those of Shapiro et al.²⁷, Philpott²⁸, Magdy et al.²³, and Zainon et al.²⁴. Blood loss of <15% of total blood volume (which is 70 ml/kg) leads only to a small increase in heart rate and no significant change in blood pressure. Therefore, although the intraoperative blood loss between the two sides is significant, it has no major effect on cardiovascular stability.²⁹

The feeling of pain may be difficult to assess or study because there is subject-to-subject variation, and it is a highly subjective symptom dependent on personal pain thresholds²⁵. Our study design enabled effective comparative assessment of pain and postoperative healing regarding Coblation versus dissection by using the patient as his or her own control, thus eliminating inter-patient pain threshold variability. However, one obvious drawback of our study design was that it could not test the time required to resume a normal diet and daily activities.

Regarding post-tonsillectomy pain, in the present study, we found evidence of a significant reduction in the level of postsurgical pain on day zero (p-value <0.01) for the Coblation side. This result is consistent with Nastasha Polites et al. and Zainon et al. studies.^{24,30} It is important to note that the significant difference in pain level is due to the fact that the tonsils removed by cold dissection showed intensive hemorrhage and hyperemia in tonsillar capsule tissues, in contrast to Coblation tonsillectomy, which allows for a more precise separation of the capsule from peritonsillar tissues with minimal skeletal muscle tissue damage and less mast cell degranulation in tonsillar capsules, indicative of minimal tissue damage.³¹ In contrast, Tahyr et al.²⁵, Magdy et al.²³, and Philpott et al.²⁸ studies found no significant difference in the level of

postoperative pain between the two sides on day zero.^{23, 25, 28} This may be attributed to personal variation in pain thresholds, and subjects may not be able to localize or appreciate the pain, especially in children. There is no significant difference in postoperative pain on days 3, 7, and 10–14 between the two sides; however, dissection is associated with a lower mean pain score, especially on day 7 (see Table 3.4). This result is supported by studies done by Tahyr et al., Magdy et al., and Philpott.^{25, 23, 28}

It is worth noting that we didn't face any condition of primary or secondary hemorrhage in any patients on either side in the current study, although the incidence of post-tonsillectomy bleeding reported by many authors ranges from 2.7% to 15.9%, with a mean lower than 10%. This may be explained by sample size diversity and surgical technique skill disparity or simply a fortuitous occasion.

^{32,33,34,35,36,37}

There was no significant difference in the healing process between Coblation and cold-steel sides, which is the same finding as Magdy et al.²³ However, Matin et al.,³⁸ conducting a study examining the throat on the 8th day, found that all the Coblation fossa fully healed with considerable granulation tissue compared with the dissection side, which is similar to the observation of Tahyr et al..²⁵

Furthermore, secondary infection may occur with the chance of

COBLATION VERSUS COLD STEEL TONSILLECTOMY

developing secondary hemorrhage, particularly when there is so much slough area. Therefore, it is advisable to prescribe antibiotics during the period after hospital discharge to prevent secondary post-tonsillectomy bleeding.^{39,40,41}

Therefore, the criteria mentioned above should be taken into consideration when one selects which type of surgical technique is advisable in the tonsillectomy procedure, depending on availability of instruments, surgeon expertise and practice, patient choice, and estimation of the procedure fee.

Conclusion and Recommendations:

According to the results of this study, we found that Coblation tonsillectomy is a safe procedure and does have superiority in improving intraoperative efficacy in terms of intraoperative time and bleeding compared to cold dissection tonsillectomy. The patient will benefit from minimal postoperative pain in the immediate post-surgery duration.

We recommend, according to the current study, the use of Coblation tonsillectomy as a safe and effective procedure for tonsillectomy. We also advise conducting future studies on a larger sample size to confirm our findings and to include both sides in the study.

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Work concept and design 1,2,3

Data collection and analysis 3

Responsibility for statistical analysis 1,2,3

Writing the article 1,2,3

Critical review, 1, 2,3

Final approval of the article 1,2,3

Each author believes that the manuscript represents honest work and certifies that the article is original, is not under consideration by any other journal, and has not been previously published.

Availability of Data and Material: The corresponding author is prompt to supply datasets generated during and/or analyzed during the current study on wise request.

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COBLATION VERSUS COLD STEEL TONSILLECTOMY

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