

Comparative study of surgical outcome of coblation versus conventional tonsillectomy

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Abstract:

Background: Tonsillectomy is a basic procedure for ENT surgeons worldwide. This field has shown remarkable evolution in the field of introduction of newer equipments for tonsillectomy. However, more conclusive data is required to evaluate the various methods of tonsillectomy. Coblation tonsillectomy was first introduced in 1998. Subsequently, there have been many researches to find out the ideal suitable method for tonsillectomy, however no conclusion has been made to say what is called the 'gold standard' for tonsillectomy. In developing countries like ours the use of newer methods is still under nascent stage. Among the newer methods coblation has found its promising place. So here in our study we have compared the two methods of tonsillectomy i.e. the coblation technique and the dissection and snare method of tonsillectomy.

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I. Objectives:

To compare the coblation and conventional tonsillectomy techniques (through dissection and snare method) on the following basis:

Intraoperative:

- Operating time
- Intraoperative blood loss

Postoperative :

- Postoperative pain or any other complication(if any)
- Time to return normal diet and activity
- Postoperative morbidity(primary and secondary hemorrhage)

Materials and methods:

This prospective study took place in Jawaharlal Nehru Medical College ,AMU ,Aligarh between december 2019 and december 2021 to compare the operating time, intraoperative blood loss, post-operative pain, post-operative bleeding (if any), and time required to return to a normal diet and activities while using coblation and dissection –snare method. A total of 50 patients were taken and on the right tonsil snare method was applied while coblation was done on the left side. Patients were blinded about the method used for removal of tonsils. Most patients were of chronic tonsillitis .

- **INCLUSION CRITERIA -**
- Patients of both genders(Male as well as female)
- Patients over the age of three years
- Chronic Tonsillitis patients.
- Tonsillar hypertrophy related with obstructive symptoms.
- **EXCLUSION CRITERIA -**
- Patients under the age of three years.
- History suggestive of bleeding disorders/ coagulopathies/ bruising etc.
- As part of a procedure such as a palatopharyngoplasty or styloidectomy etc

PREOPERATIVE EVALUATION AND INVESTIGATIONS-

All of the individuals in the study underwent a thorough History taking ,clinical assessment and underwent the necessary tests.

- A thorough clinical assessment
- DNE- Diagnostic nasal endoscopy was conducted on all admitted patients.
- Blood testing on a regular basis [CBC, kidney function tests, blood sugar and serum electrolytes, triple test]
- ECG and chest x-ray [PA view]
- Pre-anaesthetic check-up on a regular basis[PAC]
- After a thorough examination, the patients were randomly assigned to have a tonsillectomy, with one tonsil removed by coblation and the other tonsil removed by dissection and snare.

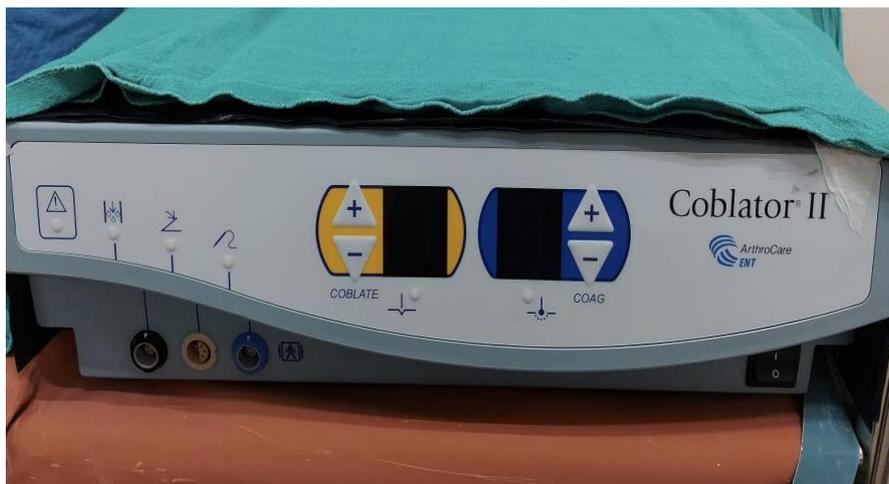
The right tonsil was removed utilising dissection and snare in this study, while the left was removed using the coblation procedure.

II. Procedure:

Patient consent was obtained, but the technique employed for each tonsil was blinded for the patient. All patients had sufficient mouth opening with class 1 and class 2 on mallapatti scoring.

On the operating table, the patient was positioned supine. Prescriptions were administered, and the patient was intubated with an orotracheal tube. Rose's position was maintained. Prepared part was painted and draped. Draffins bipods and Magauren plate were used to insert and stabilise a Boyle Davis mouth gag. Tonsils on both sides are visualised., Dennis Browne tonsil holding forceps were used to retract the right tonsil in place medially. To remove the tonsil from the plica semilunaris, an incision was made on the mucosal reflection of the tonsil. The tonsil was dissected from its higher pole to its lower pole using traction and counter traction and blunt dissection with a tonsillar dissector and anterior pillar retractor, and then crushed and severed with the Eve's tonsillar snare. The left tonsil was removed with a coblator wand [EVAC® 70 Xtra coblation wand] set to 7 and 3. In a similar manner, the tonsil was removed from its bed.





DURATION OF SURGERY

The time lapse between the initial incision stroke and haemostasis was noted to calculate the duration of surgery for the individual method.

INTRAOPERATIVE BLOOD LOSS

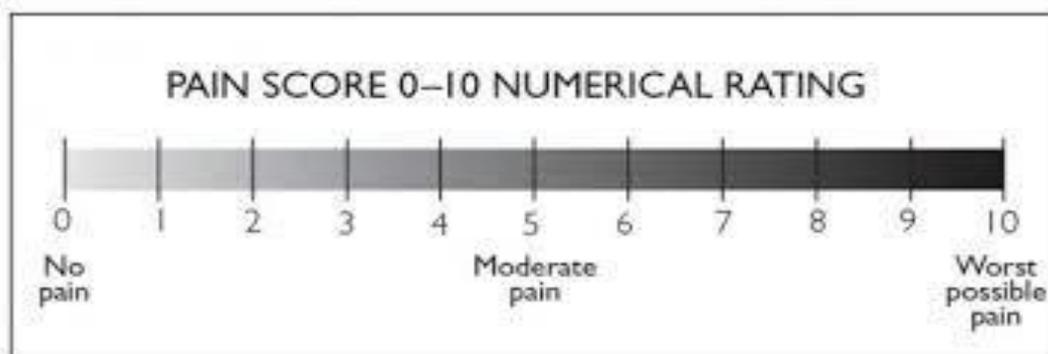
For Coblation and dissection and snare, blood losses were calculated independently. Blood loss was determined in coblation tonsillectomy by subtracting the amount of saline used with the blood in suction jar, whereas blood loss in dissection and snare tonsillectomy was calculated by directly measuring the amount of blood in suction jar. Soaked blood in the pack (kept in the tonsillar fossa) was likewise included in both estimates. A standard 10 x 10 cm sterile gauze roll made by our OT staff was measured pre and post soakage using a physical balance. The difference in both quantities was the amount of blood loss, which was divided by 1.055^[1] (approximate specific gravity of blood) to obtain the result in millimetres. All gauze rolls were measured in this manner and IOBL was calculated. Each gauze roll corresponded to about 3 to 5 ml.

CALCULATION:^[1]

Weight of gauze roll pre-op	x gm
Weight of gauze roll soaked with blood	y gm
IOBL(through gauze)	x-y
Total IOBL (in ml through gauze)	x-y/ 1.055

POST – OPERATIVE PAIN

The post-operative pain was measured using a visual analogue scale with a minimum of zero and a maximum of ten. On the third day, the patient was discharged, and he/she was contacted for follow-up. As a result, the post-operative pain was calculated individually on days 1, 3, and 7 for both sides.



REMUCOSALISATION OF THE TONSILLAR FOSSA/ TONSILLAR FOSSA HEALING

On day 7 and day 15 post-operatively, the amount of whitish coat or the slough covering the tonsillar fossa was measured. Using the direct visualisation technique the surface area occupied by the slough was calculated with respect to the surface area of the entire tonsillar fossa. The grading used in my study is the tonsillar fossa wound healing score that was also used by Magdy et al^[12] in his study for the comparison of post operative wound healing. The following is the means of assessment in my study:

TABLE 1A

% of slough as a measure of healing of tonsillar fossa	Grade used in my study
No slough	0
Upto 25% slough	1
Upto 50% slough	2
Upto 75% slough	3
Upto 100% slough	4

POST OPERATIVE PILLAR INJURY AND/OR UVULAR EDEMA (POD-1)

Post operative pillar injury or inflammation and uvular congestion or edema was inspected by direct visual examination by using an LED light source and tongue depressor on both sides and charted.

III. Results :

Statistical analysis:

The data as analysed via the SPSS [statistical software]. Besides the descriptive methods for comparison (mean± S.D.) various other parametric and non-parametric tests have been used for comparison of data obtained in the study. To compare the duration of surgery, intra-operative loss of blood and the post operative pain score between conventional and coblative settings the Mann-Whitney test was used. For the comparison of remucosalisation of tonsillar fossa and the presence of uvular and pillar injury the chi square tests were used.

In this study the mean time taken in conventional tonsillectomy was 10.54 minutes whereas in coblation tonsillectomy it was 16.54 minutes. On comparison of the two groups using Mann-Whitney test the p value came out to be <0.001 which is statistically significant. Mean blood loss in the conventional method was 30.56 millilitres which was more when compared to 15.56 millilitres in coblation tonsillectomy. On comparison p value came out to be <0.001. The post operative pain severity score evaluated using the visual analog scale on post operative day 1, 3 and 7 was evaluated and mean score was calculated to be 7.46, 6.28 and 3.52 respectively in conventional tonsillectomy and 4.02, 3.06 and 2.14 respectively in coblation tonsillectomy. The results were statistically significant with p value less than 0.001. The time taken by patients to return to normal diet and activity came out to be 7.16 days(mean value) with maximum subjects returning to normalcy within 7 days. The tonsillar fossa healing was evaluated via direct visualisation of tonsillar fossa when patient were called for follow up on day 7 and day 15. The results were found to have a p value of >0.001.

AGE DISTRIBUTION

Table 1

AGE GROUP	NUMBER OF PATIENTS[N]
3 YR TO 5 YR	3
6 YR TO 10 YR	15
11 YR TO 15 YR	9
16 YR TO 20 YR	10
21 YR TO 25 YR	8
>25 YR	5

GENDER DISTRIBUTION

Table 2

CATEGORY	NUMBER OF PATIENTS
FEMALE CHILD [<10 YRS]	9
MALE CHILD [<10 YRS]	9
FEMALE	18
MALE	14

DURATION OF SURGERY

Table 3

MODE OF OPERATION	N	MEAN TIME SPENT IN SURGERY (in minutes)	P value	STANDARD DEVIATION
CONVENTIONAL(R)	50	10.54	<0.001	3.296
COBLATION(L)	50	16.54	<0.001	2.384

BLOOD LOSS DURING SURGERY

Table 4

MODE OF OPERATION	N	MEAN BLOOD LOSS DURING SURGERY (in millilitres)	P value	STANDARD DEVIATION
CONVENTIONAL (R)	50	30.56	<0.001	6.923
COBLATION (L)	50	15.56	<0.001	2.779

MEAN POST-OPERATIVE PAIN SCORES IN THE 1ST /3RD /7TH POST-OPERATIVE DAY

Table 5

POST-OPERATIVE DAY	N	MEAN SCORE IN CONVENTIONAL(R)	MEAN SCORE IN COBLATION(L)
1 ST	50	7.46	4.02
3 RD	50	6.28	3.06
7 TH	50	3.52	2.14

REMUCOSALISATION OF TONSILLAR FOSSA
[POST-OPERATIVE DAY 7]

Table 6

TONSILLAR FOSSA REMUCOSALISATION ASSESSMENT SCALE	% OF PATIENTS ON CONVENTIONAL SIDE(RIGHT)	% OF PATIENTS ON COBLATION SIDE(LEFT)
COMPLETE HEALING	16	18
25% SLOUGH/COAT	38	42
50% SLOUGH/COAT	36	32
75% SLOUGH/COAT	10	8
100% SLOUGH/COAT	0	0

COMPARISON OF REMUCOSALISATION (DAY 7)
[via PEARSON CHI-SQUARE TEST]

The fossa healing on day-7 was compared using Pearson chi square test for conventional and coblation tonsillectomy. The Pearson chi –square value was 0.388 and the p –value was 0.943(>0.001)

REMUCOSALISATION OF TONSILLAR FOSSA
[POST-OPERATIVE DAY 15]

Table 7

TONSILLAR FOSSA REMUCOSALISATION ASSESSMENT SCALE	% OF PATIENTS ON CONVENTIONAL SIDE(RIGHT)	% OF PATIENTS ON COBLATION SIDE(LEFT)
COMPLETE HEALING	54	70
25% SLOUGH/COAT	42	30
50% SLOUGH/COAT	4	0
75% SLOUGH/COAT	0	0
100% SLOUGH/COAT	0	0

COMPARISON OF REMUCOSALISATION (DAY 15)
[via PEARSON CHI-SQUARE TEST]

The fossa healing on day-15 was compared using Pearson chi square test for conventional and coblation tonsillectomy. The Pearson chi –square value was 4.032 and the p –value was 0.133(>0.001).

POST-OPERATIVE UVULAR EDEMA AND PILLAR INJURY- POD 1

Table 8

MODE OF OPERATION	N	NUMBER OF PATIENTS WITH PILLAR INJURY OR UVULAR EDEMA
CONVENTIONAL	50	22
COBLATION	50	10

On interpretation of result via chi-square test the Pearson chi-square value came out to be 6.618. with p-value 0.01 which is statistically significant.

POST OPERATIVE BLEEDING-(REACTIONARY OR SECONDARY HEMORRHAGE) :

In this study there was no any kind of bleeding episode in any post operative day

IV. Conclusion :

Coblation tonsillectomy is most likely to be beneficial in terms of blood loss, post operative pain and healing of tonsillar fossa.

DISCUSSION:

In my study a total of 50 patients were subjected to tonsillectomy where the right side of the tonsil was removed using conventional(dissection and snare) method and the left tonsil was removed using coblation method. Such study design where the patients are their own controls have also been used by Karathia NM et al, IOSR and Noordzij's study etc.

I have compared my study with various studies of Karathia NM et al^[10], an Indian Journal of otolaryngology study, Noordzij's study^[4], IOSR(International Organisation of Scientific Research) ^[5], Sasindran et al^[6], Oghan F et al, Omrani et al, Magdy et al and a few others as well.

1. TIME SPENT IN SURGERY:

In this study the mean time spent in surgery was calculated from the time at which incision was given upto when homeostasis was achieved. It came out to be more in the side of coblation(16.64min) and lesser in side of conventional tonsillectomy(10.54 min) in my study.

STUDY	COBLATION (MEAN TIME)	CONVENTIONAL (MEAN TIME)
OUR STUDY	16.64 minutes	10.54 minutes
MAGDY ET AL(MEDIAN RANGE)	10minutes to 30 minutes	7 minutes to 35 minutes
DIPANKAR LODH ET AL	9.7 ± 2.3 minutes	18.4 ± 4.1 minutes
INDIAN JOURNAL OF OTOLARYNGOLOGY	15 minutes	11minutes
KARATHIA NM ET AL	13.4 minutes	20.4 minutes
SASINDRAN ET AL	13.4 minutes	20.4 minutes
IOSR 2017 STUDY	11.80 minutes	16.40 minutes

These results are at par with other studies of Indian journal of otolaryngology September 2012 where the time taken for conventional method was 11min and time duration for coblation was found to be 15 min.^[24]

In the study by Magdy et al^[12] where he compared coblation tonsillectomy with dissection and ligation surgery in a prospective, double-blind, randomised, clinical trial where the time noted was noted at the point when incision was given upto when homeostasis was achieved. In his study the results were equivocal for both coblation and dissection and ligation method. In his study the median range of operative time was 7 min to 35

min for conventional method and the median range of operative time was 10min to 30 min for coblation method.^[12]

In IOSR study 2017 the mean time for conventional tonsillectomy was found to be 11.80 minutes while in coblation tonsillectomy the time taken was 16.40 minutes.^[24]

In a study by Dipankar Lodh et al 2020^[13] which was a comparative study of coblation versus dissection tonsillectomy of 50 patients that were divided into two groups randomly. Then one group underwent coblation(group 1) while the other underwent conventional tonsillectomy using dissection and snare method (group 2). The mean duration of surgery in group 1 was found to be 9.7 ± 2.3 minutes and in group 2 this 18.4 ± 4.1 minutes. Here also the mean duration was measured from the point at which incision was given till complete haemostasis was achieved. The values in this study were statistically significant.

However, in some studies like the Karathia NM et al 2020 study and Sasindran et al study(conventional-20.4 min;coblation-13.4 min) the results were opposite.

In Sasindran et al ^[6]study the time lapse between placement of mouth gag to its removal was taken into account. In this study time spent while doing a dissection and snare tonsillectomy was 20.4 min while in coblation tonsillectomy it was 13.4 min. This study was conducted in 50 patients that were divided into a group of 25 each. First twenty five patients underwent dissection and snare and rest twenty five underwent coblation tonsillectomy.

This variation in duration could be due to various factors like surgeon's preference, expertise, type of instrument or its quality and other factors that might affect the procedure. In our institute there is lesser prevalence of coblation tonsillectomy when compared to conventional one.

2. MEAN BLOOD LOSS DURING SURGERY:

STUDY	CONVENTIONAL (MEAN LOSS OF BLOOD)	COBLATION (MEAN LOSS OF BLOOD)
OUR STUDY	30.56 millilitres	15.56 millilitres
KARATHIA NM ET AL	25.57 millilitres	3.40 millilitres
ISOR STUDY	43.4 millilitres	18.74 millilitres
SASINDRAN ET AL	43 millilitres	18.9 millilitres
MALAYSIAN STUDY 2014	57.40 millilitres	11.80 millilitres
DIPANKAR LODH ET AL	28.2 ± 6.31 millilitres	10.62 ± 3.23 millilitres

In this study the mean blood loss during surgery was calculated and came out to be more in conventional tonsillectomy which was 30.56 millilitres than coblation tonsillectomy where the blood loss was 15.56 millilitres.

My inferences were found to be consistent to studies of Karathia NM et al, the IOSR 2017 study, Sasindran et al study and Indian journal of otolaryngology September 2012 study.

In the study by Karathia NM et al 2020 the group of coblation tonsillectomy revealed a mean blood loss of 3.40 millilitres whereas the group that underwent convention tonsillectomy by the cold steel method recorded a blood loss of 25.57 millilitres..

In the similar study of IOSR the recordings were 43.4 millilitres for conventional cold steel tonsillectomy and 18.74 millilitres for coblation tonsillectomy suggesting far lower blood loss in case of coblation tonsillectomy.^[2]

In Sasindran et al study the blood loss in the conventional group of patients was found to be 43 millilitres and the mean blood loss in coblation tonsillectomy was found to be 18.9 millilitres.

In the Malaysian study 2014 by Zainon et al the mean blood loss during surgery in the conventional group was 57.40 millilitres and in the coblation group it was 11.80 millilitres.^[7]

In Dipankar Lodh et al 2020 study the group 1 that underwent the coblation tonsillectomy recorded a mean operative blood loss of 10.62 ± 3.23 millilitres whereas the group 2 that underwent conventional cold steel tonsillectomy recorded a mean operative blood loss of 28.2 ± 6.31 millilitres with a t – test value 12.77 and p value being statistically significant.

The similar results were also obtained in Omani et al study that is the blood loss was lower for the coblation tonsillectomy

3. Post operative pain score :

STUDY	MEAN POST OPERATIVE PAIN SCORE(CONVENTIONAL)	MEAN POSTOPERATIVE PAIN SCORE(COBLATION)
OUR STUDY (1 ST /3 RD /7 TH DAYS)	7.46/6.28/3.52	4.02/3.06/2.14
DIPANKAR LODH ET AL(1 ST /3 RD /7 TH DAYS)	8, 6 and 4	4, 4 and 3
IOSR STUDY(7 TH DAY)	3.52	2.74

The mean post operative pain scores in this study were compared on day 1, 3 and 7. In this study the mean pain score for conventional tonsillectomy was 7.46, 6.28 and 3.52 respectively on 1st, 3rd and 7th day while it was 3.72, 3.06, 2.14 respectively for post coblation tonsillectomy on the 1st, 3rd and 7th day.

In Dipankar Lodh et al 2020 study the post operative pain scores were evaluated by using the visual analog scale. In their study the patients were called for follow up on day 1, 2 and 10. The mean post operative pain score on day 1, 3 and 7 for group 1 of coblation tonsillectomy was 4, 4 and 3 respectively. The post operative pain score for the other group 2 for conventional cold steel tonsillectomy was 8, 6 and 4 respectively. The mean average score for group 1 over the 10 days was found to be 3.66 and the mean post operative pain score in group 2 of conventional tonsillectomy was found to be 6. The lower post operative pain score was found to be statistically significant with p value <0.001.

Similar comparison was done in the study by Sasindran et al, however there was no difference on the pain score on these days but lesser pain was observed within 6 hours and 5 days after operation.

In the IOSR study 2017 the post operative pain was assessed in which the mean pain score on the 7th day was found to be 2.74 on coblation and 3.52 on conventional side.

The possible reason for these findings could be due to lesser heat production by a coblator wand as compared to cautery and lesser adjacent tissue damage. Lower pain scores result in easier and earlier return to normal diet.

Timms MS et al in his study reported lower scores in case of coblation tonsillectomy.^[8]

According to Karathia NM et al study on 1st, 2nd, 5th and 10th day the post operative pain scores were in favour of coblation than conventional study with p values being statistically significant.

4. REMUCOSALISATION OF TONSILLAR FOSSA

The amount of slough formation which is a protective mechanism of the body to avoid any infection of the bed and promote healing intrinsically has been evaluated in this study on day 7 and day 15 using the table. The results in my study was evaluated using chi-square tests and inference was made that there was comparatively earlier healing in side of coblation. However, in my study these results were statistically insignificant as the p value was >0.001.

A similar study was conducted by Magdy et al over group A representing patients with dissection and ligation tonsillectomies and coblation tonsillectomies. The patients were followed up on the post operative days 7 and 15 to assess the tonsillar fossa healing both clinically and histopathologically. In this study there was no significant difference in the healing of tonsillar fossa. On comparison of the histopathological specimens there was marked inflammatory infiltration and vascular congestion in tonsils removed via dissection and ligation technique. Coagulative necrosis was seen in all post coblation extracted tonsil specimens with mean injury depth of 89.2 ±23.2.

To talk about various other studies like the IOSR study the healing was found more on the coblation side with results being statistically significant.

According to study by Karathia NM et al the all patients had mild to moderate degree of slough on the right side which was the conventional side and moderate to severe degree of slough on left side corresponding to the coblation side. Results were obtained in favour of coblation study.

In Dipankar Lodh et al 2020 study the percentage of slough covering the tonsillar fossa was estimated and compared on the 1st, 2nd and 10th postoperative day. The percentage of tonsillar bed that was found to be covered by slough on 1st, 2nd and 10th post operative day was in group 1 found to be 85%, 76% and 49% whereas in group 2 of cold steel tonsillectomy the area carpeted by slough on the 1st, 2nd and 10th post operative day was 45%, 48% and 32% respectively. This difference was found to be statistically significant with p value of <0.001.

Temple RH et al in their study described that coblation resulted in better healing with early return to normal diet and activity.^[9]

5. ADDITIONAL COMPLICATIONS:

On comparison of my results regarding the additional complications of uvular oedema and pillar injury the rate was much higher in the conventional group than in the coblation. There have been relatively fewer studies comparing the adjacent tissue injury but some of them like in the edema uvula was observed in cold methods more.

These results may be because the coblative removal of tissue is largely precise with lesser injury to underlying muscle and adjacent structures.

Haemorrhage be it primary or secondary was not seen in our study. According to Noon et al there was more incidence of haemorrhage in coblation tonsillectomy.^[3]

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