

A Prospective Randomized Comparative Study of Coblation-Assisted Adenotonsillectomy and Conventional Adenotonsillectomy

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Abstract

Background: In recent years, with the arrival of coblator, results of coblation adenotonsillectomy have been encouraging from many studies. There are various modalities to perform surgery diathermy, laser, cryosurgery, dissection and snare method, etc.

Materials and Methods: In our prospective study type, we included 50 children (4–14 year) and divided them equally: 25 conventional adenotonsillectomy versus 25 surgically treated with Coblation II system Arthrocare. We compared estimated blood loss during surgery, duration of surgery, the post-operative pain and post-operative bleeding, tonsillar fossa healing, and return of normal activity and diet.

Results: We found statistically significant differences ($P < 0.0001$) in these parameters in both surgical techniques: The intensity of pain is less in the patients treated with the Coblation method in all 3 follow-up days. In regard of intraoperative blood loss, in conventional method average blood loss was 48 ml whereas average blood loss in coblation method was 30 ml. The difference of average blood loss between the two techniques was 15–20 ml which was statistically highly significant ($P < 0.0001$). The post-operative tonsillar fossa healing was estimated by the amount of slough covered in tonsillar fossa and it was compared on the 1st, 2nd, and 7th post-operative day. In conventional side, mean area of slough covered was 38.8%, 47%, and 14.4%, respectively, and on coblation side, it was 79.6%, 84.4%, and 36%, respectively. Hence, slough formation is more in coblation side compared to conventional side.

Conclusion: This study revealed a significantly less intraoperative or post-operative complications and morbidity in coblation adenotonsillectomy in comparison with traditional method. These findings addressed coblation adenotonsillectomy as an advanced method.

Key words: Adenotonsillectomy, Coblation, Complications, Conventional

INTRODUCTION

Adenotonsillectomy, despite less performed surgery nowadays, still is a very common surgical procedure. There are various modalities to perform surgery (diathermy, laser, cryosurgery, and coblation). Among these, dissection and snare method is commonly done by ENT surgeons.

Other modalities are not used regularly considering the cost of equipment. With the arrival of coblator, results of coblation adenotonsillectomy have been encouraging from many studies. Unlike most operative procedures, which are closed primarily, tonsillectomy produces an open wound that heals by secondary intention.

The major post-operative morbidity problems are pain and hemorrhage.^[1] The pain is the result of disruption of mucosa and glossopharyngeal nerve fiber irritation followed by inflammation and spasm of the pharyngeal muscles that lead to ischemia and protracted cycle of pain; it does not completely subside until the muscle becomes covered with mucosa 14–21 days after surgery.^[2] The post-operative secondary hemorrhage is due to secondary infection of

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the tonsillar fossa resulting in disruption of vessels and bleeding.^[3] The various methods for tonsillectomy are dissection, guillotine, cryosurgery, monopolar and bipolar diathermy dissection, suction diathermy dissection, bipolar scissor dissection, ultrasonic removal, radiofrequency surgery, and laser surgery.^[4]

Any improvement in the above procedures should have the advantages of decrease in the operating time, reduction in the intraoperative and post-operative blood loss, and reduction in post-operative morbidity.

Coblation is a new technique that was started in 1997^[5] involves passing a radiofrequency bipolar electrical current through a medium of normal saline, resulting in a plasma field of highly ionized particles, which, in turn, breakdown intercellular bonds and thus melt tissue at around 70°C (in comparison with electrocautery which cuts tissues at 400°C). There are two different techniques for coblation tonsillectomy: (1) Subtotal, intracapsular ablation, in this technique some tonsil tissue may be left behind; (2) Total, subcapsular dissection of tonsils, in which the entire tonsil is removed by dissecting between the tonsillar capsule and the surrounding pharyngeal muscle [Image 1]. In concordance with other studies which state that subtotal tonsillectomy not be the best technique to use in chronic tonsillitis because tonsillar tissue is left behind and could result in recurrent infections, the subcapsular technique was adopted in this study to evaluate and compare the efficacy of coblation and conventional technique.^[6]

MATERIALS AND METHODS

The prospective study was carried out in the Department of Otorhinolaryngology, Jawaharlal Nehru Medical (JLN) Medical College and Hospital, Ajmer, from April 1, 2018, to March 31, 2019. Approval from the Institutional Ethics Committee was obtained.



Image 1: Coblation tonsillectomy

The study included 50 cases with age group 4–14 years who presented with indications of adenotonsillectomy. Patients were allocated into two groups alternately Group 1 (conventional adenotonsillectomy) and Group 2 (coblation done adenotonsillectomy). Each group included 25 patients each.

A written and fully explained consent stating the voluntary participation of subjects in the study was taken by the parents before the enrolment of the children. All cases selected for the study were evaluated using preformed pro forma. A detailed history was taken as to age, sex, socioeconomic status, occupation, nature and duration of symptoms, etc. All patients underwent thorough history and ENT examination. A battery of investigation including routine blood investigation, urine examination, X-ray soft-tissue nasopharynx lateral view with open mouth for adenoids, X-ray chest, and electrocardiogram. All patients had undergone a thorough pre-anesthetic evaluation before surgery including history and physical examination. All tonsillectomies were performed under general anesthesia using the same standardized anesthetic technique. Operation time, from insertion till removal of mouth gag, was recorded for each case, intraoperative blood loss was measured through volume of blood in suction bottle after the operation. Data including volume of blood loss operation time, time period needed to return to work and normal diet and post-operative hemorrhage if occurred, were gathered in both groups.

Statistical analysis of these results was done by the Student's *t*-test using SPSS software and *P*-value was calculated. The results were assessed within 95% reliance and at a significance level of $P < 0.05$ [Figure 1].

RESULTS

A total of 50 cases were included in the study which were alternately allocated in Groups 1 and 2, respectively.

There were 30 male children and 20 female children between 4 and 14 years. The two groups were matched in terms of sex and age distribution. Group 1 has 18 males and 7 females. Group 2 has 12 male and 13 females. Nineteen patients in both groups were between the age of 4 and 10 years and six patients in both groups were between 11 and 14 years of age [Table 1].

The mean duration is measured from giving incision over the tonsil up to achieving complete hemostasis, for coblation adenotonsillectomy, the mean duration was 52.8 min, and for conventional adenotonsillectomy, mean duration was 36.16 min. Thus, coblation method takes average of 15 min longer duration compare to conventional method which was statistically highly significant ($P < 0.0001$) [Figure 2].

Table 1: Demographic characteristics of the study population

Characteristics	Group 1	Group 2
Gender		
Female	7	13
Male	18	12
Age distribution		
4–10 years	19	19
11–14 years	6	6

Table 2: Post-operative pain VAS score

Post-operative day pain scale	Conventional	Coblation	t-value	P-value
1 st day	7.64±0.99	3.92±0.76	14.86	<0.001
2 nd day	6.040±1.10	3.56±0.96	8.50	<0.001
7 th day	4.08±0.81	2.96±1.04	4.25	<0.001

VAS: Visual analog scale

Table 3: Tonsillar fossa healing

Post-operative day tonsillar fossa healing	Conventional	Coblation	t-value	P-value
1 st day	38.8	79.6	-23.82	<0.0001 (HS)
2 nd day	47.000	84.40	-20.66	<0.0001 (HS)
7 th day	14.4	36.00	-6.66	<0.0001 (HS)

The total blood loss during the procedure was measured by weighing the swabs before and after the procedure separately on each side and that in the suction apparatus. The amount of blood lost on an average on the coblation side was 30 ml and on the conventional side was 48 ml which is statistically highly significant ($P < 0.0001$) [Figure 3].

According to 70% of patients, coblation method was less painful for the overall 7-day recovery period than conventional method and this was statistically significant ($P = 0.01$). Pain was observed by visual analog scale (VAS).^[7] The mean pain score for coblation averaged over 7 days was 2.96 and 4.08 for conventional technique. When pain scores were compared between the two techniques for each individual evaluation, the pain was consistently less on the coblation side, but the difference was small and not significant [Table 2].

There was no case of reactionary or secondary hemorrhage in any patient.

Each tonsillar fossa was assessed for healing at the time of each evaluation in terms of percent of slough covering over tonsillar fossa. Slough formation was early on the coblation

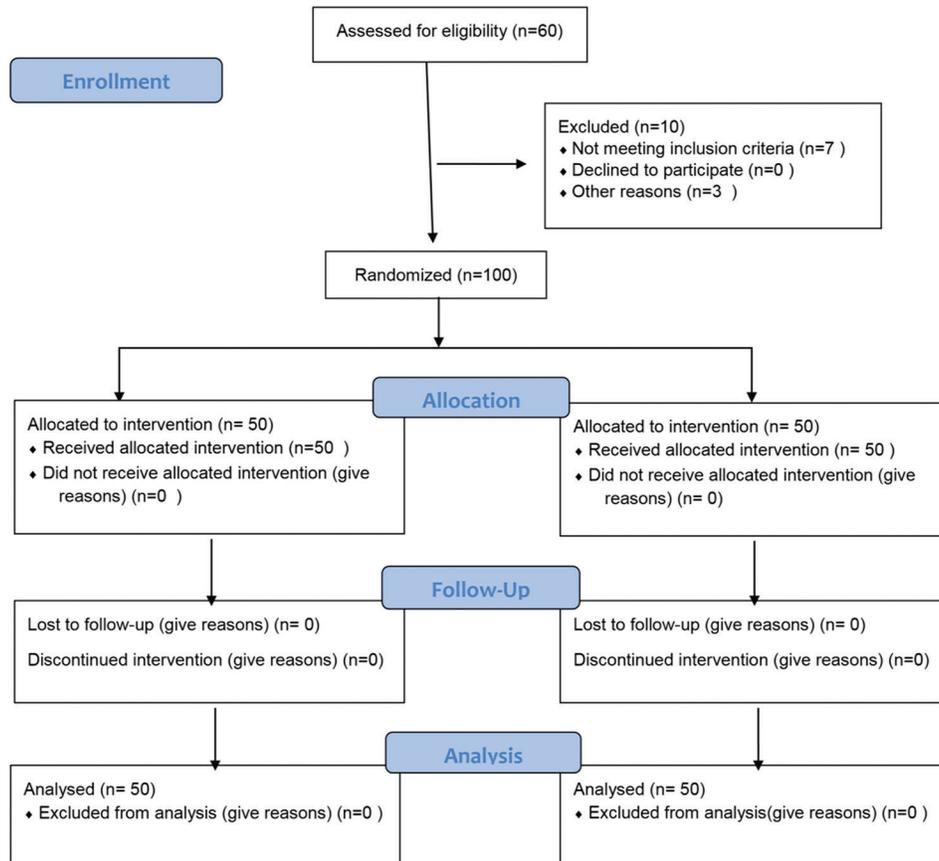


Figure 1: Consort flow diagram



Image 2: Tonsillar fossa healing 1st day

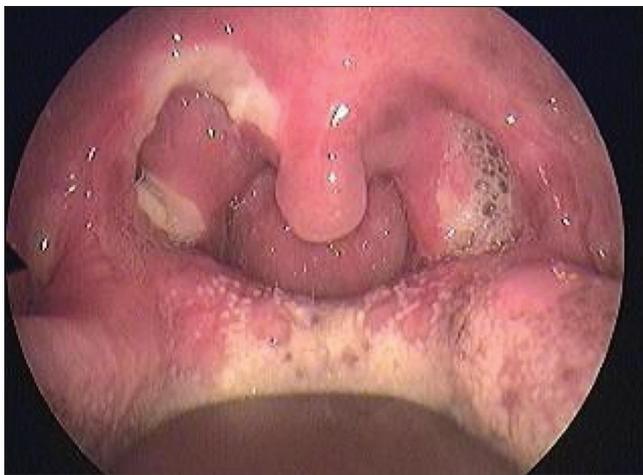


Image 3: Tonsillar fossa healing 7th day

side and remained there for a longer duration of time. The healing took longer on the coblation side [Table 3].

DISCUSSION

Coblation technique is a new advancement in technology and has shown to have promising results in adenotonsillectomy compared to conventional technique in terms of post-operative morbidity. Still, the argument about the outcomes of the two techniques continues.

In our study, the mean duration of surgery for coblation method was 52.8 min (ranging from 48 min to 60 min) and for conventional method was 36.16 min (ranging from 28 min to 45 min) supported by the previous study by Rakesh *et al.* (2012)^[1] who also found that coblation has longer duration. Omrani *et al.* (2012)^[2] described the duration of surgery in their studies showed evidence that coblation method had less duration compared to

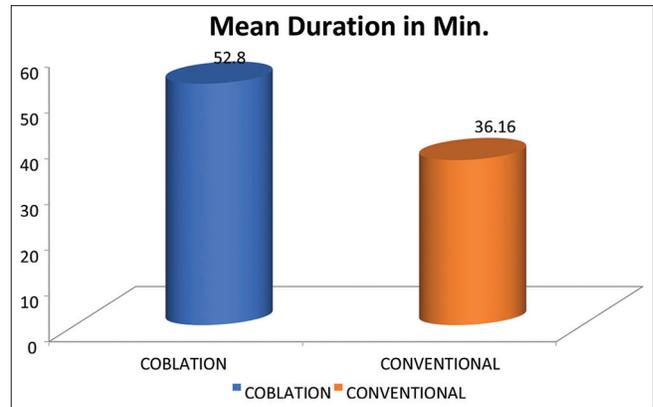


Figure 2: Bar chart showing duration of surgery in minutes

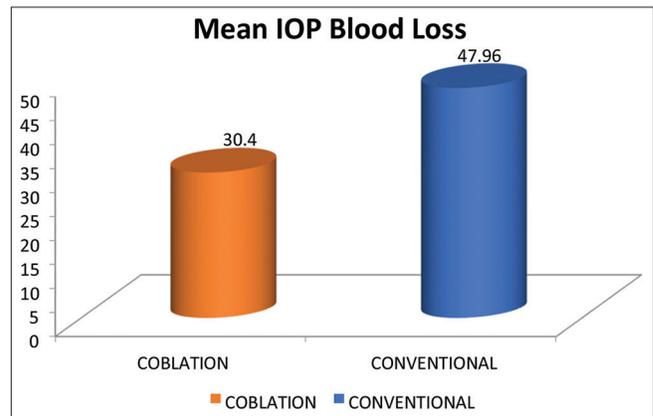


Figure 3: Bar chart showing intraoperative blood loss

conventional method [Figure 2]. In our study, coblation method takes longer duration compare to conventional method which was statistically highly significant ($P < 0.0001$).

The mean intraoperative blood loss in conventional method was 47.96 ml (ranging from 40 ml to 55 ml) and for coblation method was 30.4 ml (ranging from 20 ml to 40 ml) which is statistically significant ($P < 0.0001$). Our study was further supported by the previous study by Paramasivam *et al.*^[8] (2012) who described that conventional tonsillectomy was associated with greater blood loss. Further evidence was supported by a meta-analysis report by Vangelin *et al.*^[9] (2013) which showed that intraoperative bleeding was significantly less in coblation. Hong *et al.*^[10] (2013) conducted a study in pediatrics patients undergoing tonsillectomy and demonstrated that coblation tonsillectomy has lesser blood loss. Similar studies were done by Omrani *et al.* (2011) and Rakesh *et al.* (2012) [Figure 3].

Initial studies on coblation showed a significant decrease in post-operative pain scores comparing with conventional method. On the other hand, some studies reported no

significant reduction in pain with coblation surgery. In our study, the post-operative pain was measured using VAS scale and compared in both methods on the 1st, 2nd, and 7th post-operative day. For conventional method group, the mean post-operative pain scores were 7.64, 6.04, and 4.08, whereas in coblation method group, score was 3.92, 3.56, and 2.95, respectively, showed less pain in coblation method [Table 2]. This is supported by the previous studies like Polites *et al.* (2006)^[7] described that coblation tonsillectomy was significantly less painful and also less pain in the first 3 post-operative days and Timms *et al.*^[11] suggested significant benefit in post-operative pain levels in coblation method.

In our study, we found that pain was significantly less on the 1st, 2nd, and 7th post-operative day in coblation method compare to conventional method ($P < 0.001$).

The tonsillar fossa healing was delayed in cases where adenotonsillectomy was performed using coblation method by the presence of slough in the fossa on the 1st [Image 2], 2nd, and 7th post-operative day [Image 3]. Coblation causes early slough formation and delayed healing.

Temple *et al.*^[12] described that coblation has advantages in post-operative period and rapid return to normal diet. Noon *et al.*^[13] described significantly higher hemorrhage rate in coblation comparing with diathermy. Divi *et al.*^[14] in a retrospective study found no statistical difference between hemorrhage rates for coblation versus non-coblation tonsillectomy techniques. In our study, there was no reactionary or secondary hemorrhage in any patient.

CONCLUSION

From our study, we conclude that:

1. Coblation adenotonsillectomy is relatively easy technique to perform providing a near bloodless field and minimal surrounding tissue damage
2. The operative time required to perform coblation adenotonsillectomy was more than the conventional method. The longer time did not cause more intraoperative blood loss and post-operative pain
3. The intraoperative blood loss was significantly less in the coblation group than conventional group
4. Most importantly, post-operative pain scores were significantly lower in the coblation group on the 1st, 2nd, and 7th post-operative day. It helps the patients to resume their normal activities early
5. Healing was slightly delayed in the coblation group. To conclude, coblation adenotonsillectomy is easy to

perform and it is safer with significant advantages in terms of decrease in intraoperative blood loss and post-operative morbidity. However, the only deterring factor in the regular usage of coblation is the cost factor which has to be overcome.

ACKNOWLEDGMENT

All procedures performed in the presented study involving human participants were in accordance with the ethical standards of the Institutional Ethical Committee of JLN Medical College, Ajmer (Letter no. 2370/Acad-III/MCA/2016), and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

INFORMED CONSENT STATEMENT

Written informed consent was obtained from all individual participants included in the study in native language.

DECLARATION ON COMPETING INTEREST

Authors declare no conflicts of interest.

FINANCIAL SUPPORT/GRANT

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CONSENT FOR PUBLICATION

Written informed consent was taken.

AVAILABILITY OF DATA AND MATERIAL

Pro forma of the data taken is filled for every patient and is available with the first author for review.

CODE AVAILABILITY

Not applicable (no special software was used).

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