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Original Research Article

Comparison of efficacy and post-operative complications of adenotonsillectomy using coblation versus adenotonsillectomy using microdebrider and bipolar diathermy

Sethulakshmi Sureshkumar*, Nesva Pilaparambil Hamza, Abhilash Alex Francis

Department of ENT and Head and Neck Surgery, KIMS Al Shifa Superspecialty Hospital, Perinthalmanna, Kerala, India

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***Correspondence:**
Dr. Sethulakshmi Sureshkumar,
E-mail: sethu108sk@gmail.com

ABSTRACT

Background: Adenotonsillectomy is one of the widely performed surgical procedures in children worldwide, but there continues to be no universally accepted "ideal" method of tonsillectomy. This study is aimed to compare the outcome of coblation adenotonsillectomy versus microdebrider adenoidectomy with bipolar tonsillectomy in terms of efficacy and complication rate.
Methods: In this analytical observational study, 40 patients who underwent adenotonsillectomy were divided into two groups according to the technique of surgery adopted. Group A were the children who underwent coblation adenotonsillectomy and group B underwent microdebrider adenoidectomy with bipolar tonsillectomy. Comparison was made between intraoperative bleeding, the method of haemostasis, ease of haemostasis during surgery, post operative pain and comfort levels of the patient and also recurrence of symptoms after 3 months.
Results: Results of this study show that microdebrider adenoidectomy was found to have significantly higher intraoperative bleeding. The surgeons found it easier to attain hemostasis in the group who underwent coblation adenotonsillectomy. Postoperative pain, pain while feeding, difficulty in talking, higher rates of residual adenoid tissue were observed more in adenotonsillectomy using microdebrider and bipolar diathermy while ear pain, edema of the uvula were found to be slightly higher with coblation adenotonsillectomy.
Conclusions: Results of our study conclude that 'coblation adenotonsillectomy' has an advantage over 'adenotonsillectomy using microdebrider and bipolar diathermy' and was found to be more efficacious and safer with less morbidity and rapid recovery.

Keywords: Adenoids, Adenoidectomy, Diathermy, Tonsils, Tonsillectomy

INTRODUCTION

Adenotonsillar hypertrophy is one of the commonest diagnoses in children presenting to an otolaryngology practice. Consequences of adenoid hypertrophy include nasal obstruction, otitis media with effusion and sleep-disordered breathing. Tonsillectomy with or without adenoidectomy is one of the most common surgical procedures performed in children. Adenotonsillectomy is considered the first-line treatment for obstructive sleep apnoea in otherwise healthy children over two years of age with adenotonsillar hypertrophy. Other indications for adenoidectomy are chronic otitis media with effusion and Eustachian tube dysfunction, recurrent acute sinusitis with failure of medical treatment. [1]

For children with recurrent throat infection who are severely affected (i.e., ≥7 episodes in one year, ≥5

episodes in each of two years, or ≥3 episodes in each of three years), tonsillectomy is indicated. Tonsillectomy may be warranted in patients with peritonsillar abscess who have significant upper airway obstruction or previous episodes of recurrent pharyngitis or peritonsillar abscess.[1] Other indications of tonsillectomy (with or without adenoidectomy) includes tonsillar obstruction of the oropharynx that interferes with swallowing or that alters voice quality, malignant tumour of the tonsil, uncontrollable haemorrhage from tonsillar blood vessels, halitosis, refractory to other measures, chronic pharyngeal carriage of group A beta-haemolytic *Streptococci*.

Cold dissection (scalpel, guillotine, and snare) has been the traditional method used for tonsillectomies. The tonsil and its capsule are separated from the surrounding tissues using metal instruments and haemostasis is obtained through ligature of the blood vessels. Other relatively newer techniques are electrocautery, coblation, microdebrider, laser and harmonic scalpel. Each technique has its own merits and demerits. This study is done to assess and compare the outcome of two different methods of adenotonsillectomy. Group A underwent coblator assisted adenoidectomy with tonsillectomy and Group B underwent microdebrider assisted adenoidectomy with bipolar tonsillectomy. Outcome is measured in terms of efficacy and complications rates of the two different techniques. Children undergoing the surgery usually suffer mostly from obstructive symptoms due to adenotonsillar hypertrophy or symptoms of recurrent inflammation.

METHODS

This was an analytical observational study conducted in the Department of ENT and head and neck surgery, KIMS Al Shifa superspecialty hospital, Perinthalmanna, Kerala, India. After obtaining approval of this study by the institutional medical ethics committee, from October 2017 until November 2018, 40 children in the age-group 2 to 14 years undergoing adenotonsillectomy were included of which 20 children belonged to group A and the rest to group B. Written informed consent from the parents and assent from the children were obtained. Patients included in the study were those with complaints pertaining to and who fulfilled the clinical criteria for chronic adenotonsillits or adenotonsillar hypertrophy. Patients with Down's syndrome, craniofacial malformations or submucous cleft or with contraindications to general anesthesia and those who failed to report for regular follow up during the period of study were excluded from the study.

All patients with adenoid and tonsillar hypertrophy underwent thorough history taking and clinical examination, and who were in need of surgical management and satisfying the inclusion criteria were divided into two groups A & B. Group A underwent coblation adenotonsillectomy with procise max and evac 70 wands. Group B underwent microdebrider adenoidectomy with a medtronic xomed microdebrider and bipolar tonsillectomy with a bovie bipolar cautery apparatus. A preoperative diagnostic rigid nasal endoscopy with zero degree endoscope was done to assess the grade of the adenoid hypertrophy to help select the candidate for surgery. It also ruled out any nasal pathology. Nasal endoscopy is the gold standard diagnostic technique to evaluate adenoid size, inflammatory and infectious status, and its anatomical relationship with the nasopharyngeal orifice of eustachian tubes.[2,3] Careful history taking and examination of the oropharynx was done and the tonsillar enlargement was graded. Impedance audiometry was recorded of the patients selected for the study to rule out Eustachian tube obstruction. There were two independent surgeons; one surgeon performed adenotonsillectomy using coblation and the second surgeon performed adenoidectomy with microdebrider along with bipolar tonsillectomy.

Postoperatively all the patients were given the same oral antibiotics and oral analgesics depending on per kg body weight. Immediately after the surgery, the operating surgeon is administered a questionnaire to characterize the amount of intraoperative bleeding, the method of haemostasis and the ease of haemostasis. A second set of questionnaire is administered to the patient's bystander following surgery. On first post-operative day, the questionnaire assessed the child's severity of post-operative pain while eating, talking, and ear pain and graded them accordingly. Post-operative pain was recorded using Wong Bakers FACES pain rating scale. The ''FACES'' pain scale is a visual analogue scale that uses faces rather than a line to identify the level of pain or discomfort that the patient is experiencing.[4] Edema of the uvula, if present is noted by the investigator. The patients were discharged on the same day and were advised to come for review on 5th day and the same questions were asked again. Questionnaires regarding pain while eating, talking and ear pain were analyzed. Post-operative reactionary bleeding if present was noted and presence of any secondary hemorrhages were also noted and appropriate treatment given. On the first post-operative visit (i.e. fifth postoperative day) next questionnaire was administered to the patient's bystander. This proforma reanalysed the child's pain during eating and ear pain. It also recorded any episodes of bleeding, any delay in discharge or hospital readmission. Pain was graded on a Wong Bakers FACES pain rating scale. The third questionnaire to the patient's bystander was administered at 3 month follow up. This was to evaluate for any return of the preoperative symptoms and also to assess the regrowth of adenoids. Rigid nasal endoscopy is the chosen method to assess the grade of adenoids. Statistical analysis was carried out using SPSS version 20.0 (IBM SPSS, US) software with regression modules installed. Data was analyzed using percentage and ratio analysis with suitable diagrams and Chi square test.

RESULTS

The majority of the patients who underwent adenotonsillectomy were found in the 5-10 years age group and the mean age of the population studied was 7.17±2.56 years. In our study, statistically significant difference was observed in the intra operative bleeding while doing tonsillectomy compared to adenoidectomy surgery. (67.5%, p≤0.001) (Table 1).

In patients undergoing adenoidectomy, minimal or restricted ooze following the pack removal from the nasopharynx was found to be significant in group B (30%, p=0.03) (Table 2). However, there was no significant difference while comparison of bleeding after pack removal from the tonsillar fossa between the study groups (p=0.51) (Table 3).

Table 1: Characterisation of the bleeding following the pack removal from the nasopharynx and tonsillar fossa.

Bleeding following the pack removal	None N (%)	Minimal/ restricted ooze N (%)	Moderate/ diffuse ooze N (%)	Severe/ brisk arterial bleeding N (%)
Nasopharynx	33 (82.5)	7 (17.5)	0	0
Tonsillar fossa	13 (32.5)	27 (67.5)	0	0
Chi square value	20.46			
P value	<0.001			

Table 2: Characterisation of the bleeding following the pack removal from the nasopharynx.

Bleeding following the pack removal	None N (%)	Minimal/ restricted ooze N (%)	Moderate/ diffuse ooze N (%)	Severe/ brisk arterial bleeding N (%)
Group A	19 (95)	1 (5)	0	0
Group B	14 (70)	6 (30)	0	0
Chi square value	4.32			
P value	0.03			

Table 3: Characterisation of the bleeding following the pack removal from the tonsillar fossa.

Bleeding following the pack removal	None N (%)	Minimal/ restricted ooze N (%)	Moderate/ diffuse ooze N (%)	Severe/ brisk arterial bleeding N (%)
Group A	8 (40)	12 (60)	0	0
Group B	5 (25)	15 (75)	0	0
Chi square value	1.02			
P value	0.51			

Comparison of the ease of hemostasis showed a statistically significant difference indicating hemostasis was easier in group A compared to group B (p=0.001) (Table 4). Duration of surgery was found to be longer in group A compared to group B (p=0.0000) (Table 5). Mean scores of the Wong Bakers pain scale administered on the day of surgery for group A and group B were 2.40 and 2.60 respectively with a SD of 0.82 and 0.94 respectively. Comparisons of the mean scores between the two groups showed a p value of 0.47 which was not statistically significant (Table 6).

On the day of surgery, 50% patients in group A reported to have mild pain while eating following surgery compared to 70% patients in group B (p=0.197) 10% patients in group A experienced mild pain while talking on the day of surgery compared to 40% patients in group B which had a statistical significance (p=0.028) (Table 7).

Table 4: Comparison of the ease of haemostasis.

Ease of haemostasis	Group A N (%)	Group B N (%)
Extremely difficult	0	0
Difficult	0	0
Some effort	0	0
Usual	1 (5)	3 (15)
Easy	10 (50)	13 (65)
Very easy	9 (45)	4 (20)
P value	0.001	

40% patients in group A reported mild ear pain on the day of surgery compared to 10% patients in group B which was statistically significant. (p=0.028) (Table 8).

Total 10% patients in group A had edema of the uvula whereas in group B, only 5% patients had reported edema of the uvula (p=0.548). In this study, there were no reports of reactionary hemorrhage in either group. Mean scores of the Wong Bakers pain scale on postoperative day 5 for group A and group B were 0.10 and 0.30 respectively with a SD of 0.44 and 0.73 respectively.

Table 5: Comparison of duration of surgery.

Group	N	Mean (minutes)	SD (minutes)
A	20	131.55	10.536
B	20	105.15	13.382
P value	0.0000		

Table 6: Comparison between both the groups with Wong Bakers faces pain scale on the day of surgery.

Technique of surgery	Mean	SD	t value	P value
Group A	2.40	0.82	-0.17	0.47
Group B	2.60	0.94		

Table 7: Difficulty while talking on the day of surgery.

Talking	Group A	Group B
Comfortable	18	12
Mild pain	2	8
Severe pain	0	0
P value	0.028	

Comparisons of the mean scores between the two groups showed a p value of 0.30 which was not statistically significant. In this study, all the patients in both the groups were able to eat comfortably on the 5th day.5% patient in group A experienced mild pain on the 5th day while talking compared to 10% patients in group B. (p=0.548) 5% patients of each in group A and group B had edema of the uvula on the 5th postoperative day. There were no reports of secondary hemorrhage in either group.

Table 8: Ear pain on the day of surgery.

Ear pain	Group A	Group B
Absent	12	18
Mild pain	8	2
Severe pain	0	0
P value	0.028	

At 1 month follow up, patients in both the groups were evaluated for symptoms like snoring, mouth breathing, obstructive sleep apnoea, rhinorrhoea, earache, hard of hearing. No patients in either group had any recurrence of symptoms at 1 month follow up. 5% patients in Group B had recurrence of mouth breathing and rhinorrhoea at 3 months follow up. Size of the adenoid at 3 months follow up, was grade 1 in all patients of group A. In group B, one patient had grade 2 adenoid on rigid nasal endoscopy.

DISCUSSION

Several techniques for tonsillectomy exist and their relative effectiveness is debated. Surgeons should select the technique that in their own hands, offers the minimum morbidity.[5] It is of very much importance for the surgeon to lay special attention to the safety, accuracy and outcomes when choosing among different surgical techniques due to the large number of the adenotonsillectomies performed.[6] It is difficult to access the extension of adenoid into posterior nasal choana by conventional method and hence techniques which enable direct vision and handling are useful to improve the field of visualization. Remnant adenoid tissue may be leftover with risk of re-growth which may lead to symptoms persistence in the form of snoring or recurrent otitis media.[7] Intra operative bleeding of tonsillectomy in general was more than that of adenoidectomy and there was statistically significant difference with a p value of <0.001. Microdebrider adenoidectomy had higher intraoperative bleeding rates compared to coblation adenoidectomy. Koltai states that initially it appears that adenoidectomy with the shaver is a more haemorrhagic operation than with a classic curette, as the microdebrider removes small pieces of tissue with each oscillation, leaving a raw surface that bleeds during the rest of the procedure.[8]

However, Pagella, in their retrospective data analysis of the children subjected to endoscopic adenoidectomy mentions when continuous suction is used with the microdebrider, the blood is evacuated along with the tissue, leaving a clear and unobstructed view of the operating field. In their study they did not observe any increased primary or secondary bleeding related to the use of the microdebrider and was certain that they had achieved complete clearance of the nasopharynx in every patient.[9] In our study, statistically significant difference was observed in the intra operative bleeding while doing tonsillectomy compared to adenoidectomy surgery. (67.5%, p≤0.001) According to the national prospective tonsillectomy audit, primary tonsillar haemorrhage rate with coblation was 1% compared to 0.4% for tonsillectomy using bipolar diathermy forceps.[10] However, in our study, intraoperative bleeding rates were slightly higher in tonsillectomy using bipolar cautery.

Haemostasis was found to be easier in patients who underwent coblation adenotonsillectomy. This could be attributed to the fact that coblation had an in-built suction and cautery mode and haemostasis was achieved during the procedure and there was no need for use of swabs. The results of this study were again supported by other studies, done by Zhong et al who concluded that coblation tonsillectomy was fast and easy to perform with little intra-operative bleeding.[11] Glade did a retrospective study of 1997 pediatric patients who underwent adenotonsillectomy (745 coblation, and 1252 electrocautery tonsillectomies). Their analysis showed that patients who underwent surgery with coblation were

admitted to the ER with complaints of pain or dehydration at a significantly diminished rate, which indicates a decrease in postsurgical pain. They found no significant differences in the rates of primary hemorrhage for coblation and electrocautery tonsillectomy groups.[12] This was similar to the results obtained in this study. On studying the duration of surgery for both the groups we found that Group A needed 131.55±10.53 minutes for completion compared to 105.15±13.38 minutes for group B. P value of the comparison was 0.000 which was statistically significant. The longer duration of coblation adenotonsillectomy may be attributed to the learning curve associated with the novel technology and the more meticulous nature of the surgery. Chang et al compared operative time of coblation tonsillectomy versus bipolar tonsillectomy which was found to be similar (28.5±19.1 and 30.2±23.2 minutes respectively), with no statistically significant difference (p= 0.18).[13]

In this study, following adenotonsillectomy, patients in both group A and group B experienced pain, which was characterized as tolerable. Electrocautery tonsillectomy was found to be slightly more painful than coblation tonsillectomy for the patients on day 1. But the comparison of the mean scores between the two groups showed a p value of 0.47. Therefore there was no statistically significant difference in pain experienced by the patient on the day of surgery between the two groups. In the study by Chang comparing coblation tonsillectomy with electrocautery tonsillectomy, they have reported a mean score of 2.5 and 4.6 respectively for each method on day 1-2. They found electrocautery tonsillectomy to be more painful to patients compared with coblation.[13]

Pain while eating was more in the patients who underwent bipolar tonsillectomy compared to coblation tonsillectomy. But the p value obtained was 0.197 and was not statistically significant. A study by Timms and Temple demonstrated that patients who had coblation tonsillectomy complained of less postoperative pain and had more rapid healing when compared with a bipolar technique.[14] Pynnonen et al in a Cochrane review has observed that pain may be slightly less in the coblation group between days 1 and 3, the clinical significance of which is unclear.[1] Patients who underwent bipolar tonsillectomy had more difficulty while talking compared to coblation tonsillectomy group on post-operative day one. P value of the comparison was 0.028 which was statistically significant.

On the day of surgery, the group which underwent coblation adenotonsillectomy had more rates of ear pain compared to microdebrider adenoidectomy with bipolar tonsillectomy group and it was a statistically significant difference as indicated by the p value of 0.028. Philpott et al in a prospective randomized control trial, studied 92 adult patients, and compared coblation versus cold tonsillectomy and found no significant difference in postoperative pain, swallowing, otalgia, at 1, 3, 7, and 14 days.[15]

Coblation tonsillectomy had slightly more rates of edema of the uvula when compared to the group who underwent bipolar tonsillectomy but was not a statistically significant difference (p=0.548). These increased rates in coblation method could be attributed to the prolonged pressure of soft palate retraction using infant feeding tubes. Reactionary hemorrhage occurs within 24 hours following surgery due to slippage of knots, rebound rise in pressure etc. In this study, there were no reports of reactionary haemorrhage in either group. No patient in either group experienced a post-operative bleeding episode requiring clinical examination or readmission. The mention of blood-streaked sputum only was not counted as a postoperative bleed. Only the mention of bright red blood, regardless of whether it was confirmed by a health care professional was to be counted as a postoperative bleed. This criterion might have contributed to the no bleed rate in this study as the occurrence of blood-streaked sputum alone was not counted.

Mean scores of the Wong Bakers pain scale for group A and group B were 0.10 and 0.30 respectively with a SD of 0.44 and 0.73 respectively. Comparisons of the mean scores between the two groups showed a p value of 0.30 which was not statistically significant. In comparison, pain was more in the group who underwent microdebrider adenoidectomy with bipolar tonsillectomy than the coblation adenotonsillectomy group. Chang, in his study looking at 100 pediatric patients in a prospective randomized blinded study, found patients who underwent coblation tonsillectomy had less pain at days 1, 3, and 5 after surgery when compared with electrocautery.[13]

Stoker et al in his prospective, controlled single-blind study comparing coblation tonsillectomy with conventional electrosurgery reports the rates of ear pain (during first 14 days) to be 51% and 64% in the respective groups but did not find a statistically significant difference. (p value=0.221).[16] One patient each in group A and group B (5%) had edema of the uvula. No edema of the uvula was reported in the remaining 19 patients in both groups (95%) on post-operative day 5 (p=1.0). The rates of uvular swelling (on day 16) in the study by Stoker et al were 7% and 16% respectively in coblation tonsillectomy and conventional electrosurgery, but the p value was 0.313 and was also not statistically significant.[16] Whereas, in a limited prospective randomized study of 34 pediatric patients, Shah indicated no significant difference in pain, recovery scores, and return to normal diet and activity between electrocautery and coblation techniques of tonsillectomy in their study.[17]

Secondary hemorrhage occurs >24 h after surgery, sometimes as late as 14 days after surgery and is associated with the normal separation of eschar from tonsillar fossa. In this study, there were no reports of secondary haemorrhage in either group. According to the national prospective tonsillectomy audit, secondary haemorrhage rate with coblation was 3.6% compared to

4.3% for tonsillectomy using bipolar diathermy forceps.[10] In a Cochrane review, Pynnonen et al states the risk of secondary bleeding was greater in the coblation group with a risk ratio of 1.36 (95% CI 0.95 to 1.95; 2118 participants; 25 studies; low-quality evidence).[1] According to the study by Glade , analysis of all patients showed no significant differences in the rate of secondary hemorrhage for coblation and electrocautery tonsillectomy groups.[12]

It is also worth mentioning the study by Belloso which was a prospective observational cohort study of over 100 children which showed a substantially diminished rate of secondary haemorrhage with coblation tonsillectomy versus cold dissection in paediatric patients. (0.95% vs. 4.77%, p=0.05).[18] This is in contrast to the findings of Noon and Hargreaves who compared the rate of postoperative hemorrhage in adult coblation tonsillectomy versus dissection with bipolar coagulation in 65 patients in a retrospective study. They found a significantly higher percentage of bleeding in the coblation group (22.2% vs. 3.4%) and coblation tonsillectomy was subsequently abandoned in their department.[19]

Gallagher et al in their study, found those who had tonsillectomies via coblation were 3.9 times (95% CI, 1.6-9.2) (p=0.001) more likely to have complications than patients who had tonsillectomies via electrocautery (95% CI, 1.8-10.3) (p=0.001) But they did not get a statistically significant difference in odds ratio between tonsillectomy by coblation or electrocautery and complications: 0.9 (95% CI, 0.6-1.4) (p=0.638).[20] Zhong et al states, coblation offers significant advantages in the postoperative period, with rapid return to normal diet and reduction in postoperative pain.[11] Chinpairoj, in their animal experiments have demonstrated that coblation produces less tissue injury and faster wound healing than conventional electrosurgery, and the wound healing with coblation exhibited faster epithelialization and a lesser extent of inflammation and granulation tissue formation than with electrosurgery.[21] Trials by Temple and Timms showed a statistically significant decrease in postoperative pain, more rapid healing of the tonsil fossa, less inflammatory reaction, and an early return to normal diet and daily activities in coblation tonsillectomy compared to bipolar diathermy.[14] Interestingly, the study conducted by Divi and Benninger also found that there was no learning curve for the coblation procedure when examining postoperative bleeding which they attributed could be due to surgeons' familiarity with the anatomy and technique of tonsil surgery, which is not altered by the use of a new tool.[22] Adenoid hypertrophy has a tendency to recur after surgery. The recurrence rate has been found to be highly variable between studies. Lundgren's series put the recurrence rate between 4-8%, while Hill's series showed a variation between 23.7-50%.[23,24] In this study, at 3 months follow up, adenoid was of grade 0 and only fibrosis was found in the nasopharynx for all patients in group A. In group B, one patient had grade 2 adenoid on rigid nasal endoscopy (5%) which was indicative of adenoid regrowth. P value of the comparison was 0.31 and there was no statistically significant difference. On comparing direct costs it was found that group A incurred a higher direct cost compared to group B. Coblation technology becomes expensive due to the different wands involved. The absence of any complications in our study population could be explained by the smaller sample size, careful surgical technique, comprehensive patient education and regular follow-ups. Major limitation of this study is its small population size. It is attributed to the shorter time frame of the study and the fact many of the children with adenoid hypertrophy were improving with medical management and the number of children being posted for surgery were less.

CONCLUSION

Majority of the children who underwent adenotonsillectomy were between 6 to 10 years and belonged to male gender. The results of this study show that microdebrider adenoidectomy was found to have significantly higher intraoperative bleeding compared to coblation adenoidectomy. The surgeons found it easier to attain hemostasis in the group who underwent coblation adenotonsillectomy. Postoperative pain, pain while feeds, difficulty in talking, higher rates of residual adenoid tissue were observed more in patients who underwent microdebrider adenoidectomy with bipolar tonsillectomy; while ear pain, edema of the uvula were found to be slightly higher with coblation adenotonsillectomy. However operative time was found to be more for coblation adenotonsillectomy group and the cost of surgery was also high for the same. In conclusion, coblation adenotonsillectomy was found to have less complication rates and better outcome when comparing the different variables of the study. But it should be duly noted that a larger scale study will be needed to obtain more statistically significant results. Surgeon should consider bleeding and pain as significant postoperative morbidities and should choose the modality that best minimizes the occurrence of both consequences. The results of our study finally conclude that 'coblation adenotonsillectomy' has an advantage over 'adenotonsillectomy using microdebrider and bipolar diathermy' and was found to be more efficacious and safer with less morbidity and rapid recovery. Cost of the coblation wands remains a major limitation precluding its use in many centers in developing countries.

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