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Comparison of Conventional Curettage Adenoidectomy versus Endoscopic Powered Adenoidectomy- a Randomised Single-Blind Study.

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Abstract:	Globally adenoidectomy is increasingly being performed in isolation for children who have middle ear effusion or chronic otitis media, chronic rhinosinusitis and nasopharyngeal obstruction causing sleep apnoea and mouth breathing. Several techniques have been described lately including endoscopic powered adenoidectomy with debrider. The present study was undertaken to compare the effectiveness of endoscopic powered adenoidectomy (EA) with respect to conventional adenoidectomy (CA). It is a prospective study of 60 patients requiring adenoidectomy consisting of 33 males and 27 females randomized into group A with 30 patients undergoing conventional adenoidectomy with curette and 30 patients undergoing endoscopic powered adenoidectomy with micro-debrider. The demographic data (age, sex, adenoid hypertrophy grade assessed by Clemens and Mcmurray scale) in both groups were not statistically significant ($p > 0.05$). However, significant differences were observed in mean operative time of both groups (CA-29.12 ± 6.70, EA-37.80 ± 6.90 min, $p<0.05$). The intra-operative blood volume loss was 21.30 ± 5.80 ml, 28.24 ± 6.93 ml in CA and EA respectively. No significant difference was seen in post-operative pain assessed by Visual Analogue Scale (VAS) (p – 0.39). Complete removal of adenoids was seen in 83.3% cases with EA versus 53.3% with CA ($p<0.05$). The residual adenoids noted after the CA and EA in Grade I was 23.3% and 13.3% respectively while in CA, grade II with 16.7% and grade III with 6.7% cases had residual adenoids. Injury to surrounding structure was seen in 16.7% and 10% of CA and EA respectively. However, no difference in complication rate was observed between the study groups ($p>0.05$). We conclude that endoscopic powered adenoidectomy is more complete, accurate, with less post-operative pain and lower incidence of recurrence in comparison with conventional adenoidectomy.
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Title

Comparison of Conventional Curettage Adenoidectomy versus Endoscopic Powered Adenoidectomy- a Randomised Single-Blind Study

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Introduction

Conventional adenoidectomy (CA) was first described by Wilhelm Meyer in year 1885 after which it became second most frequent surgical procedure performed in pediatric otolaryngological practice even today [1,2]. Adenoidectomy is surgical removal of infected or hypertrophied adenoids, the lymphatic tissue situated in nasopharynx. Globally, adenoidectomy is increasingly being performed in isolation rather than with tonsillectomy as done earlier [3]. Commonly known indications of adenoidectomy include children who have middle ear effusion or chronic otitis media, chronic rhinosinusitis and nasopharyngeal obstruction causing sleep apnoea and mouth breathing [4].

In literature, various adenoidectomy procedures have been described, with powered instruments added lately [5]. The 'micro-debrider' primarily a sinus surgery tool has also been adapted to be used for adenoidectomy [5]. The micro-debrider is motor driven instrument that simultaneously allows continuous suction to surgical site with cutting action [6]. As such, it offers better visualisation of adenoid bed when coupled with endoscope and camera system. In a systematic review by *Saibene AM et al* on 1006 children with adenoid hypertrophy, endoscopic powered assisted surgical technique lead to minimising duration of surgery, intra operative bleeding, post-operative pain as well as speeding recovery time and ensuring precise and complete resection of adenoid tissue [7]. Conventional curettage method while being fast and inexpensive can potentially leave behind residual tissue. Supposed benefits of powered adenoidectomy have to be weighed against cost and operative time. However Indian studies comparing morbidity and operative time in endoscopic powered adenoidectomy versus conventional curettage are limited.

Hence, present study was undertaken to evaluate effectiveness of endoscopic powered adenoidectomy in terms of completeness of resection and frequency of residual/ recurrent adenoid tissue and to compare the endoscopic powered adenoidectomy (EA) with microdebrider versus conventional adenoidectomy with respect to results and complications.

Materials and Methods

Present study was a prospective randomised single blind study conducted in tertiary care teaching hospital in India for duration of 23 months (November 15 to October 17) after approval by Institutional Ethics Committee. Children with age of 5 years and above and less than 15 years requiring adenoidectomy for nasal airway obstruction with sleep disordered breathing, otitis media with effusion or recurrent otitis media, with clinical and radiological features of enlarged adenoids were included. Children with velopharyngeal insufficiency, craniofacial abnormalities, children requiring tonsillectomy in addition or those with previous adenotonsillectomy or sino-nasal surgery, were excluded from study.

The children who visited ENT OPD in study period and met above inclusion and exclusion criteria were subjected to X-ray neck (soft tissue) lateral view. After confirming adenoid enlargement radiologically, they were posted for surgery after a complete preoperative check-up. All the cases were randomized into two groups of 30 cases each. Group A consisted of cases who underwent conventional adenoidectomy using curettage method Group B included those who underwent endoscopic powered adenoidectomy. The caregivers of the patients were asked to consent for adenoidectomy by either method without informing them about specific technique either before or after surgery. A uniform price package was worked out for both groups.

Baseline evaluation including nasal endoscopy was done. The grade of adenoid hypertrophy was then assessed using the Clemens and Mcmurray scale [8] where Grade I has adenoid tissue filling 1:3 the vertical height of the choana, Grade II up to 2:3, Grade III from 2:3 to nearly all but not complete filling of choana and Grade IV with complete channel obstruction.

All surgeries were performed by principal author and co-authors themselves. General anaesthesia was used using oro-tracheal tube and laryngeal pack using Boyles Davis mouth gag along with infant feeding tube or red rubber catheter through nasal cavity to retract the soft palate. In conventional technique, adenoidectomy was done using suitably sized Beckmann adenoid curette (Kalelkar surgicals, India), placed trans-orally into nasopharynx. Adenoids were first palpated and medialised using index finger inserted orally. Adenoids were then curetted with sustained force after attempting to engage superior-most part by first palpating posterior end of septum with curette blade. Transoral packing gauze was used for 3 to 5 minutes to control any bleeding, which usually stopped spontaneously without need to cauterise adenoid area.

Adenoidectomy in group B was performed under endoscopic guidance with micro-debrider (Medtronic: Straightshot M4 model) in oscillating mode with saline irrigation using speed up to 2400 rpm to curette and shave off adenoid tissue using 120 degree adenoidectomy blade and straight blade as needed. Bipolar cautery was used to stop bleeding from raw surface of adenoid bed. 2.7mm and 4mm nasal endoscopes coupled with camera system (Karl Storz, Germany) were used for visualisation. Adenoids were removed superiorly till periosteum over body of sphenoid, posteriorly till pharyngo-basilar fascia, laterally till fossa of Rosenmuller, and inferiorly till Passavant's ridge.

Primary outcome measures evaluated were mean operative time, amount of intraoperative bleeding, completeness of removal of adenoid and collateral damage. Intra operative time was defined as time taken for completion of procedure from the time patient was handed over by the anaesthetist and included setting up of instruments, operative steps, packing and securing bleeding. The measurement ended when the patient was handed back to anaesthetist.

The amount of primary bleeding was assessed for both groups. For conventional adenoidectomy group, number of gauze pieces used for packing nasopharynx were counted. Each gauze was considered to correspond to blood loss of 10 ml. This was added to blood collected in suction. In endoscopic method, the blood volume loss was assessed by the contents in suction minus irrigation solution. Completeness of adenoid removal was assessed by nasal endoscopy at end of the procedure in both groups. Less than 20% residual adenoid was regarded as complete removal.

Post-operative parameters included assessment of post-operative pain and residual adenoids. Post-operative pain was assessed by using Visual Analogue Scale (0-100mm). VAS was arranged as 100-

mm straight horizontal line with two terminal points denoting no pain and worst pain possible [9]. The presence of residual adenoids was analysed by nasal endoscopy at the end of 3 months follow up period in both groups. The post-operative complications such as injury to surrounding tissue and excessive bleeding were also assessed.

The data was primarily assessed for normality of distribution in order to make necessary assumptions for applied statistical tests. Quantitative data was represented as mean ± SD. Categorical and nominal data was expressed in percentage. Student's 't-test' was applied for analysing quantitative data whereas for non-parametric data, Mann Whitney test was applied and for categorical data, $\chi 2$ test was used. The significance threshold of p value was set at <0.05. All analysis was carried out by using SPSS software version 21.

Results

Of 60 patients, most children were in age group was between 5-10 years (53%) and mean age in conventional group was 8.76 ± 3.45 years whereas in endoscopic group was 8.91 ± 3.21 years. Male predominance (55%) was noted in study participants. No noteworthy statistical difference was seen between two groups with regards to age and gender distribution. As per Clemens and Mcmurray scale, the majority of adenoid hypertrophy cases were of grade III (61.7%) followed by grade IV (28.3%) (Table 1).

Table 1

Mean intra-operative time was significantly longer with endoscopic procedure ($p<0.05$). Blood volume loss was seen more with endoscopic procedure, however the difference was statistically non-significant (p-0.08). Post-operative pain score calculated by Visual Analog Scale (VAS) was comparable between the two groups (p-0.39) (Table 2).

Completeness of resection

Table 2

Complete removal of adenoids was seen in 83.3% cases with endoscopic powered adenoidectomy as compared to 53.3% in conventional group ($p<0.05$) (Figure 1).

Figure 1

The residual adenoids noted after the surgery was of Grade I in 7 out of 14 cases (23.3%) and 4 out of 5 cases (13.3%) of conventional and endoscopic procedure respectively. While 16.7% and 6.7% cases had grade II and III adenoids respectively in conventional procedure (Table 3).

Table 3

Complications:

Injury to surrounding structure was seen in 16.7% and 10% of conventional and endoscopic procedure respectively. However, no difference in complication rate was observed between the two groups ($p>0.05$) (Table 4).

Table 4

Discussion

Adenoidectomy is one of the most common day care surgery performed in children since ages [10]. Although a relatively safe surgical procedure, most reported complication is post-operative bleeding with incidence of 0.5-8% [11]. Traditionally, adenoidectomy is being done with assistance of curette. Primary drawback of this method is that it is relatively blind and may lacerate choanae, torus tubaris nasopharyngeal mucosa or may leave behind obstructing tissue, particularly at eustachian tube orifices, high in the nasopharynx and at intranasal protrusions [12].

Use of powered instrumentation in adenoidectomy has led to refinement of technique. Micro-debrider while allowing effective removal of almost entire adenoid tissue, has certain limitations. It is difficult to manoeuvre and may not reach up to inferior nasopharynx when introduced intranasally [13,14]. However, it has shown better patient outcomes in several studies [10,15]. In present study, therefore, we compared conventional curettage adenoidectomy with endoscopic powered adenoidectomy (EA) with micro-debrider.

In present study, mean operative time was significantly longer with endoscopic procedure (37.8 vs 29.12 mins; $p<0.05$) (Table 2). In study by *Bradoo RA et al.* (n=32), it was observed that mean operative time in conventional group was 9 minutes while in endoscopic group, it was 14 minutes ($p < 0.05$) [16]. Higher mean operative time in powered technique is probably due to increased set-up time for instrumentation, endoscopic visualization, bit by bit removal of the adenoid tissue and time consuming haemostasis. This only adds approximately 9-15 minutes to surgery and may not influence the choice of technique except in high volume centres.

Intra-operative blood volume loss, was more with endoscopic procedure than curette. However, difference was statistically non-significant (28.24 vs 21.3; $p=0.08$) (Table 2). Average blood loss in study by *Datta et al.* in conventional group was 21 ml (range 10 – 50ml) compared to 31.67 ml (range 10-60ml) in endoscopic group which was statistically significant ($p<0.05$) [17]. Endoscopic surgery with debrider being a bit by bit approach with longer operative time, the raw bleeding surface is exposed for a longer time leading to increased bleeding.

Post-operative nasal endoscopy plays a crucial part in evaluation of complete removal of hypertrophied adenoid tissue especially in areas of eustachian tube orifices and intranasal protrusions and assessing intra-operative trauma caused by operative technique [10]. In present study, complete removal of adenoids was seen in 83.3% cases with endoscopic powered adenoidectomy as compared to 53.3% in conventional group ($p<0.05$) (Figure 1). This was consistent with previous similar studies [16, 17].

At third month of evaluation for residual adenoids, statistical significance was noted between both groups ($p< 0.05$) (Table 3). Residual adenoids have been reported following conventional adenoidectomy in several studies [18, 19]. The most common site of residue is the roof of the nasopharynx and lateral wall, as the curette is not able to reach farthest end of roof of nasopharynx which can lead to recurrence [19].

In endoscopic assisted adenoidectomy with debrider, entire nasopharynx can be visualised and accessed enabling complete removal [18]. Also if curved blade is introduced through the oropharynx, it can access most lateral portion of nasopharynx even behind Eustachian tube opening removing any remnant with precision. The movement of the microdebrider blade is relatively restricted especially in transnasal approach in small nostrils. Hence, curved blade is better for extraction. Several studies have reported better resection with lesser residuals by endoscopic technique. like *Bradoo et al* [16], *Havas and Lowinger* [18].

Post-operative pain, in terms of VAS was comparable between the two groups (EA: CA: 2.13 vs 2.65; $p=0.39$) (Table 2). *Datta et al.* showed consistent reports when two groups were compared with a pain score of 1.64 and 1.19 in conventional and endoscopic group respectively [17]. In their study, *Anand et al.* [5] reported endoscopic adenoidectomy to be superior to conventional adenoidectomy with regards to pain assessment.

Injury to surrounding structure was seen in 16.7% and 10% of conventional and endoscopic procedure respectively. No significant difference in complication rate was observed between two groups ($p>0.05$) (Table 4). Collateral damage following adenoidectomy is uncommon. However, there is always fear of trauma to Eustachian tube opening leading to subsequent scarring and tubal dysfunction. The mucosa in torus tubaris region was partially injured in 5 cases of curettage adenoidectomy in present study. In endoscopic group, however there was an increased incidence of nasal mucosal injuries (3 cases). Similar complications with conventional and endoscopic adenoidectomy have been reported by other authors [12, 17]. *Saleh et al.* reported 3 cases of tubal cartilage injury<0.5 cm, one case of posterior oropharyngeal wall tear and one case of inferior turbinate and septal mucosal tear with curettage [20].

The major disadvantages of the microdebrider are escalated costs mainly due to recurrent replacement of blades [21]. Also specimens gained by power-assisted instrumentation are too shredded to provide microscopic details necessary to make histopathologic diagnosis in suspected cases [22]. Lastly, acquiring proficiency in this technique requires more dexterity and experience [22].

Thus, endoscopic powered assisted adenoidectomy offers several benefits like reduced intraoperative blood loss, lesser post-operative pain, more complete resection, less collateral damage and lesser recurrence. However these benefits have to be weighed against higher cost and longer operative time involved. Also completeness of resection has to be weighed against hyper-nasalance and possible velopharyngeal insufficiency which goes with a more complete removal. In group B, one child had nasal regurgitation while 3 children had hypernasality of voice both of which resolved over 3 months. Considering this, conventional curettage still remains a safe and viable option especially in high volume centres and charitable setups where both cost and time are important factors.

Conclusion

Endoscope assisted powered adenoidectomy needs to be acknowledged as a safe alternative to conventional adenoidectomy. Adenoid removal with the endoscopic method is more complete, accurate, has less post-operative pain and there is lower incidence of recurrence in comparison with conventional adenoidectomy. However, it was not found to be a faster procedure contrary to some reports in literature. Conventional curettage still remains faster and cheaper and may be continued in high volume charitable centres especially being useful for the otolaryngology trainee.

Declarations

Funding: No funding was obtained for the conduct of the study.

Conflicts of Interests

The authors declare that there were no conflicts of interests whatsoever in the conduct or writing of this research.

Ethics Approval

Institutional Ethical Clearance was obtained for the study.

Consent to Participate

Informed consent was obtained from all participants.

Authorship Contribution

Study idea and design: Authors 1-2

Data acquisition: Author 2

Data analysis: Authors 1, 2

Manuscript: Authors 1-2

Critical review of the manuscript: Author 1

Final approval: Both authors

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Legends for Illustrations:

Figure 2 – Comparison of complete removal of adenoids in both groups

Legends for table:

Table 1: Demographic data of study participants.

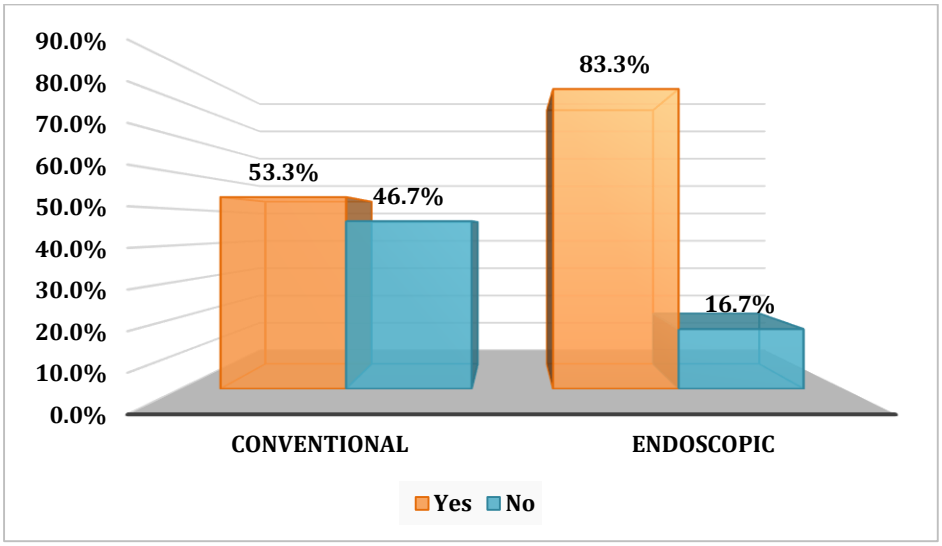
Table 2: Mean comparison of intraoperative time, blood volume and post-operative pain.

Table 3: Comparison of prevalence of Residual Adenoids after 3 months among study groups.

Table 5: Comparison of complication rate among study group

Figure

Figure 1 – Comparison of complete removal of adenoids in both groups



Table

Table 1- Demographic data of study participants

A. Age-wise distribution (n = 60)				
Age Group	**Group**		**Total**	**P value**
	Conventional	**Endoscopic**		
1-5 years	5 (16.7%)	6 (20.0%)	11 (18.3%)	1.0
5-10 years	17 (56.7%)	15 (50.0%)	32 (53.3%)	
> 10 years	8 (26.7%)	9 (30.0%)	17 (28.3%)	
Total	30 (100.0%)	30 (100.0%)	60 (100.0%)	
B. Mean age comparison (n=60)				
Variable	**Group**	**N**	**Mean ± SD**	**P-value**
Age	Conventional	30	8.76 ± 3.45	0.79
	Endoscopic	30	8.91 ± 3.21	
C. Gender-wise distribution (n= 60)				
Gender	**Group**		**Total**	**P-value**
	Conventional	**Endoscopic**		
Male	17 (56.7%)	16 (53.3%)	33 (55.0%)	1.0
Female	13 (43.3%)	14 (46.7%)	27 (45.0%)	
Total	30 (100.0%)	30 (100.0%)	60 (100.0%)	
D. As per Clemens and Mcmurray scale for adenoid hypertrophy (n=60)				
Adenoid Grade	**Group**		**Total**	**P-value**
I or II	3 (10.0%)	3 (10.0%)	6 (10.0%)	1.0
III	18 (60.0%)	19 (63.3%)	37 (61.7%)	
IV	9 (30.0%)	8 (26.7%)	17 (28.3%)	
Total	30 (100.0%)	30 (100.0%)	60 (100.0%)	

Table 2 – Mean comparison of intraoperative time, blood volume and post-operative pain

Table 3:

Variables	**Group**	**N**	**Mean ± SD**	**P- value**
Operative Time (minutes)	**Conventional**	30	29.12 ± 6.70	**<0.05**
	Endoscopic	30	37.80 ± 6.90	
Blood Volume loss (ml)	**Conventional**	30	21.30 ± 5.80	**0.08**
	Endoscopic	30	28.24 ± 6.93	
Post -operative Pain (VAS Score)	**Conventional**	30	2.65 ± 1.10	**0.39**
	Endoscopic	30	2.13 ± 1.09	

Comparison of prevalence of Residual Adenoids after 3 months among study groups: N (%)

Residual Adenoids (3 months)	Group		Total (n=60)	P-value
	Conventional (n=30)	Endoscopic (n=30)		
Grade I (Minimal)	7 (23.3%)	4 (13.3%)	11(18.3%)	**<0.05**
Grade II (Moderate)	5(16.7%)	1(3.3%)	6 (10.0%)	
Grade III (Severe)	2(6.7%)	0(0.0%)	2 (3.3%)	
Total	14 (46.7%)	5(16.7%)	19 (31.7%)	

Table 4:

Comparison of complication rate among study group: N (%)

Complications	Group		Total	P - value
	Conventional	Endoscopic		
Injury to surrounding structure	5 (16.7%)	3 (10.0%)	8 (13.3%)	**0.71**
Excessive Bleeding	0 (0.0%)	0 (0.0%)	0 (0.0%)	**NA**