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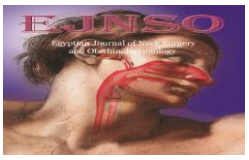

Comparison of Endoscope-Assisted Coblation Adenoidectomy to Conventional Curettage Adenoidectomy in Terms of Postoperative evaluation of middle ear pressure

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Abstract:

Objective: To compare the outcomes of endoscopic coblation adenoidectomy (EACA) and conventional curettage adenoidectomy (CCA), particularly in their effects on middle ear pressure postoperatively utilizing tympanogram.

Patients and Methods: A imminent comparative non-randomized ponder was conducted involving 80 patients undergoing adenoidectomy aged 5–14 years. Tymanograms were recorded on postoperative day one and day seven to assess middle ear function. Parameters analyzed included tympanometric type distribution, middle ear pressure, and compliance changes over time.

Results: In the immediate postoperative period, the conventional curettage adenoidectomy (CCA) group exhibited a higher frequency of Type B and C tympanogram patterns compared to the endoscope-assisted coblation adenoidectomy (EACA) group, indicating more pronounced Eustachian tube dysfunction. By day 7, improvements were noted in type B in both groups and all cases of type C in EACA group and some cases of CCA group, and other cases of CCA group improved after one month.

Conclusions: Endoscopic coblation adenoidectomy offers superior postoperative outcomes in terms of middle ear function recovery and reduced intraoperative complications. Encourage considers with bigger test sizes and longer follow-ups are suggested to approve these findings.

Keywords: Adenoidectomy, Conventional, Endoscopic, Coblation, Eustachian tube dysfunction, curettage

Introduction

Adenoid hypertrophy (AH) frequently affects children and manifests through clinical signs like persistent mouth breathing, nasal congestion, snoring, sleep-disordered breathing, and a hyponasal voice quality. It is also recognized as a contributing factor in recurrent sinus infections, chronic otitis media, and middle ear effusion. Among pediatric surgical interventions, adenoidectomy remains one of the most routinely performed procedures globally. The most frequent indications for this surgery include chronic upper respiratory tract infections, persistent otitis media with effusion, and obstructive sleep apnea. [1] For over a century, conventional curettage

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adenoidectomy (CCA) has been the traditional technique, executed without direct visualization using an adenoid curette. However, this blind approach may leave residual adenoid tissue behind and is linked to increased postoperative complications, such as Eustachian tube dysfunction, accidental damage to adjacent structures, and postoperative bleeding. [2]

An ideal adenoidectomy technique should be safe, quick, easy, and provide decreased postoperative complications and morbidity. Recently, adenoidectomy can be carried out with a few strategies such as microdebrider, radiofrequency ablation, electrocautery bipolar coagulation and Coblation procedures. [3] Coblation innovation has developed as a possibly engaging innovation for adenoidectomy. Working at much lower surface temperatures (40–70°C) than electrocautery, it empowers removal and tissue dismemberment, as well as hemostasis. [4]

Eustachian tube dysfunction (ETD) can create due to surgical injury, edema in encompassing tissues and clots in the early period taking after adenoidectomy surgery performed with curettage procedure. [5]

This ponder pointed to compare ECA and CCA in terms of their postoperative impacts on middle ear function. By analyzing tympanometric estimations on postoperative day 1 and day 7, to decide which procedure way better protected middle ear ventilation. These considerations may give insights into optimizing surgical approaches for adenoidectomy to further understand outcomes.

Patients and methods:

Study Design:

This ponder was planned as a imminent comparative ponder conducted at Assuit College Hospital between February 2022 to the end of February 2024, after getting endorsement from the Therapeutic Morals Committee, clinical trial NCT05291312, Faculty of Medicine, Assiut College. Patients aged 4-15 years old underwent adenoidectomy due to chronic nasal obstruction, recurrent otitis media, or sleep-disordered breathing were included. The exclusion criteria were patients with congenital craniofacial abnormalities, previous adenoidectomy, patients who need tonsillectomy to make accurate results about adenoidectomy only and chronic otitis media effusion enduring more than three months, or any history of middle ear surgery.

Grouping:

Eighty patients were randomly assigned into two groups (40 cases each) after meeting inclusion and exclusion criteria.

1. Endoscope-Assisted Coblation Adenoidectomy (EACA) Group – Adenoidectomy was performed using a 0° or 70° rigid endoscope (2.7 mm) for enhanced visualization, and Coblation was used for tissue removal at a controlled temperature to minimize thermal injury.
2. Conventional Curettage Adenoidectomy (CCA) Group – Adenoidectomy was performed using a standard curette without endoscopic guidance. Hemostasis was achieved using gauze packing.

All methods were performed beneath common anesthesia by experienced otolaryngologists.

Surgical techniques:

After performing oro-tracheal intubation, mouth opening was achieved using the Boyle-Davis mouth retractor. Patients were positioned supine, with a slight head flexion used for the EACA group and slight head extension for the CCA group. A 10 ml plastic feeding

tube was inserted through one side of the nasal passage and retrieved via the oropharynx to retract the soft palate and stabilize the uvula. During surgery, both the adenoid region and soft palate were examined manually using the index finger to identify any submucosal cleft palate or pulsatile masses.

In the EACA group, the patient's head was maintained in slight flexion. The procedure was performed using the Coblator II system and Evac 70 wand (ArthroCare, Sunnyvale, CA), which allowed for simultaneous tissue dissection and ablation. Power settings were adjusted to 8 for ablation and 6 for Coblation. The adenoids were removed transorally utilizing a flexible wand equipped with saline irrigation and suction, under direct endoscopic visualization. A 2.7 mm rigid endoscope with either a 0 or 70-degree lens (Karl Storz, Tuttlingen, Germany) was introduced through the nasal or oral route, respectively. The dissection was carried out until complete removal of the adenoids, including tissue located near the Eustachian tube opening. This technique allowed for full excision without damaging the adjacent mucosa or Eustachian tube. In most cases, packing was not necessary. When bleeding occurred, hemostasis was achieved by briefly applying the coblator tip to the bleeding site for one to two seconds.

During surgery in the CCA group, the adenoid region and soft palate were manually examined using the index finger to detect any signs of a submucosal cleft palate or pulsatile anomalies. The adenoids were then excised using a traditional adenoid curette. To verify the completeness of the excision, the surgical site was re-evaluated either through digital palpation or by employing a laryngeal mirror. Once removal was confirmed, the nasopharyngeal area was irrigated with saline solution using a 20 mm syringe. A gauze pad soaked in 2% lidocaine combined with adrenaline at a 1:200,000 concentration was firmly placed in the nasopharynx, and pressure was maintained for five minutes to ensure hemostasis was achieved.

Postoperative Care :

Patients were allowed to resume oral intake approximately four hours following surgery, adhering to the dietary guidelines typically recommended after adenoidectomy.

Discharge was carried out on the same day, usually within 4 to 6 hours of observation in the recovery unit. Postoperative management for both groups included a course of antibiotics—either amoxicillin-clavulanate or clarithromycin for those with penicillin sensitivity. Pain control was maintained using paracetamol at a dosage of 15 mg/kg, administered three times daily. Additionally, nasal saline spray was prescribed for use over one week to support mucosal healing.

Assessment Parameters :

In order to assess the differences between Coblation and conventional adenoidectomy techniques, both intraoperative and postoperative variables were systematically measured and analyzed for each participant within the respective study groups.

Tympanometric evaluation:

Tympanograms were performed for both ears of all patients using an AT235H impedance tympanometer (Interacoustics, A/S, Assens, Denmark) to measure middle ear pressure values (MEPV). Preoperative measurements were compared with those taken on postoperative days one, seven and follow-up was done to these cases with ETD after one month to evaluate the immediate impact of surgery and early recovery.

Tympanometry was conducted at a 226 Hz probe tone, with pressure variations between +200 and -400 daPa. Peak pressure values for both ears were recorded and analyzed. Eustachian tube dysfunction (ETD) was defined as MEPV ≤ -100 daPa (Type C tympanogram, Jerger classification). MEPV data from 80 ears in the CCA group and 80 ears in the EACA group gather were analyzed and compared inside and between groups.

Intra-operative Assessment Data:

- Intra-operative time: The time taken for the surgical procedure was measured from the insertion of the mouth retractor to the point at which hemostasis was fully achieved. This duration was then compared across both study groups.
- Amount of Bleeding: The extent of intraoperative blood loss was determined by weighing the gauze pads used during the procedure and calculating the volume of blood collected in the suction canister. Blood loss was quantified by subtracting the preoperative weight of the gauze from the postoperative weight (assuming 1 gram = 1 mL), and by deducting the volume of saline used for irrigation from the total fluid collected in the suction bottle.
- Trauma to Surrounding Structures: Any intraoperative injury to adjacent anatomical structures—such as the Eustachian tube, pharyngeal muscles, uvula, nasal turbinate, or nasal septum—was carefully documented.

Postoperative Assessment Data :

- Post-operative pain: Early postoperative pain, measured 6-hour post-surgery, was surveyed utilizing a visual analogue scale (VAS). Guardians were given with a numerical pain evaluation scale. Families and patients were teaching on how to utilize the pain appraisal scale, and patients were asked to state pain scores every day for seven days some time recently taking analgesics.
- Recovery time: Recovery duration was determined based on how many days the patient required to resume regular daily activities. This was subjectively reported by the patient or their guardians during the scheduled follow-up visit on the seventh postoperative day.

Follow up Evaluation:

- Assessment of Complete Adenoid Removal: All patients underwent an endoscopic re-evaluation one month after surgery, using a 0-degree endoscope to inspect the nasopharynx for any remaining adenoid tissue. To standardize the comparison, residual tissue was categorized into two primary levels:
  - Grade I (Minimal): Tissue remnants limited to the area above the Eustachian tube opening.
  - Grade II: Tissue located between the upper margin of the Eustachian tube and a hypothetical line drawn from the nasal cavity's roof to the posterior wall. This category was further divided into:
  - Grade IIa (Moderate): Tissue partially blocking the Eustachian tube but not reaching the posterior choana.
  - Grade IIb (Severe): Tissue obstructing the Eustachian tube and simultaneously occluding the posterior choana.

Statistical analysis:

All data were processed and statistically analyzed using SPSS software (version 20; IBM Corp., Armonk, NY, USA). Continuous variables were represented as mean values accompanied by standard deviation (SD), and comparisons

between groups were made using the student's t-test. Categorical variables were presented as frequencies and percentages, with the Chi-square (χ^2) test applied for analysis. A confidence level of 95% was adopted, and statistical significance was set at a P-value less than 0.05.

Results:

The study included a total of **80 pediatric patients** diagnosed with adenoidal hypertrophy. These participants were randomly assigned into two equal groups, each comprising **40 individuals**. Group I underwent endoscope-assisted Coblation adenoidectomy (EACA), while Group II received conventional curettage adenoidectomy (CCA).

None of the patients underwent concurrent tonsillectomy.

Demographic data:

The demographic distribution of the study population was as follows:

Sex Distribution: In Group I, there were 25 males (62.5%) and 15 females (37.5%). In Group II, there were 17 males (42.5%) and 23 females (57.5%). Analysis showed no significant statistical disparity between the compared values (p = 0.073).

Residence: In Group I, 17 patients (42.5%) resided in rural areas, while 23 (57.5%) were from urban areas. In Group II, 21 patients (52.5%) were from rural areas, and 19 (47.5%) were from urban areas. Analysis showed no significant statistical disparity between the compared values (p = 0.370).

Age Distribution: The mean age was 7.63 ± 2.25 years in Group I and 7.00 ± 2.33 years in Group II.

Tympanogram evaluation:

In group I, bilateral ETD was detected in seven cases in day one, and type B wasn't detected in any case in group I, and follow up tymanogram was done in day seven, we detected improvement in cases with ETD totally Fig.(2).In group II, we detected bilateral ETD in 17 cases, type B was detected in two cases in day one, and follow up tymanogram was done in day seven, we detected bilateral ETD were in seven cases, and type B improved totally; follow-up tymanogram was done to these cases with ETD after one month, they were totally improved Fig. (3&4). Analysis showed no significant statistical disparity between the compared values (p value 0.012) (Table 1).

Postoperative data:

- According to healing time after surgery in days, mean ± SD 7.48 ± 0.75 in group I, and 9.23 ± 0.73 in group II. Analysis showed no significant statistical disparity between the compared values (P value <0.001).
- **According to residual tissue adenoid:** in group I, there were three cases with grade1; two of them had recurrent symptoms. In group II, there were ten cases with residual adenoid tissue, eight of them with grade 1 and two with grade 2 (a); four of them had recurrent symptoms (table 3) Fig. (5&6). Analysis showed no significant statistical disparity between the compared values (P value 0.034).
- **Postoperative Bleeding:** No secondary bleeding was observed in either group. According to postoperative bleeding, there were no cases in group I but, there were three cases with reactionary postoperative bleeding in group II. There was no secondary postoperative bleeding in both groups. Analysis showed no significant statistical disparity between the compared values.
- According to VAS after surgery, there were mean ± SD 6.93 ± 0.80 in group I, and 8.85 ± 0.95in group II. Analysis showed no significant statistical disparity between the compared values (P value <0.001)

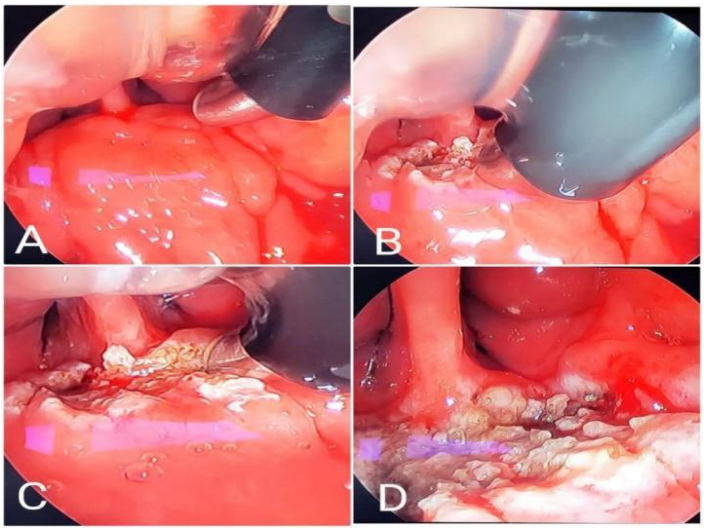

Fig. (1): Steps of endoscopic assisted Coblation adenoidectomy by utilizing 70-degree, 2.7 mm inflexible endoscope passing through the oral cavity.

Table (1): post-operative tympanogram among the studied groups

Tympanogram	Group I (n= 40)		Group II (n= 40)		P-value
	No.	%	No.	%	
Day 1:					
Type A	33	82.5%	21	52.5%	
Type B	0	0.0%	2	5.0%	0.012*
Type C	7	17.5%	17	42.5%	
Day 7:					
Type A	40	100.0%	33	82.5%	
Type B	0	0.0%	0	0.0%	0.012*
Type C	0	0.0%	7	17.5%	

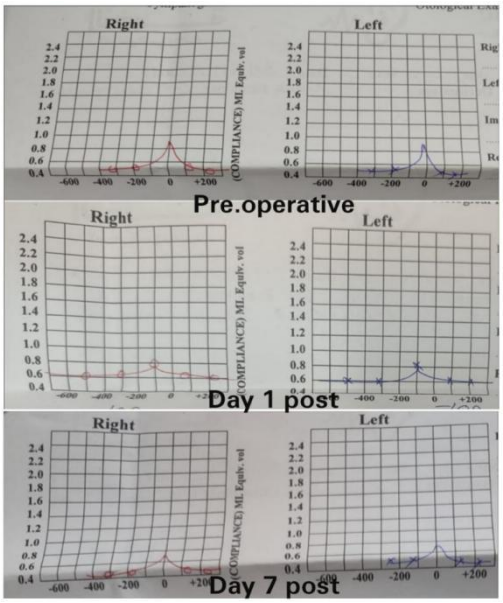

Fig. (2): Preoperative and postoperative tympanogram in day one show ETD and improved in day seven in a case of ear fullness symptom diagnosed in one patient in Group I.

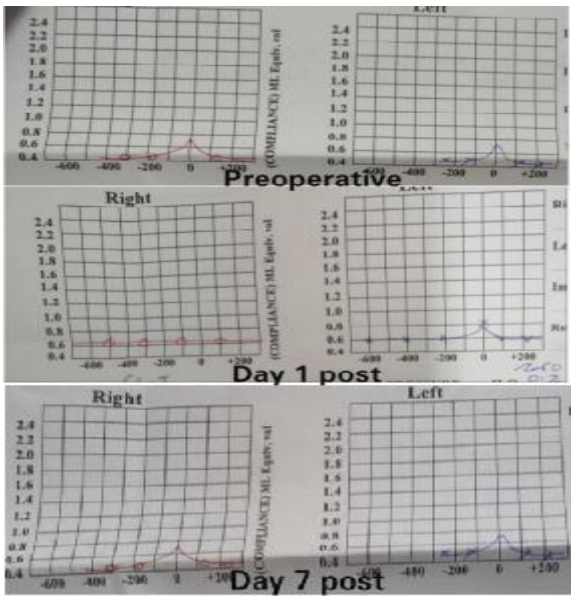

Fig. (3): Preoperative and postoperative tympanogram in day one show type B in right ear and improved in day 7 in a case of one patient in Group II.

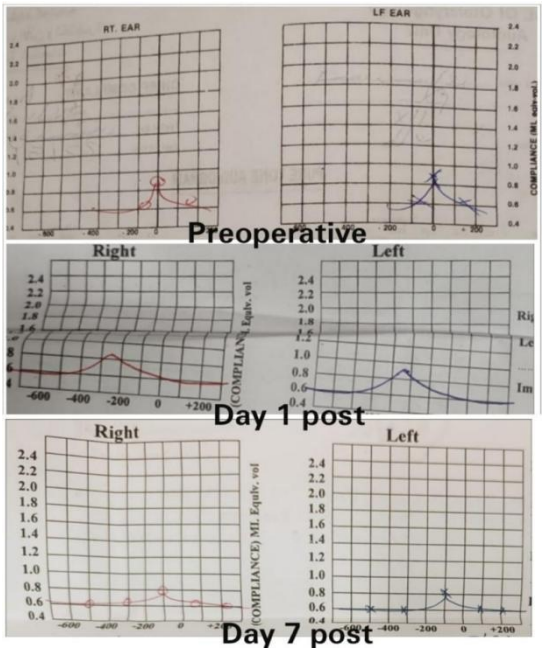

Fig. (4): Preoperative and postoperative tympanogram in day one in a case with ear fullness symptom show ETD and make another tympanogram in day seven also show ETD in Group II**.**

Residual tissue adenoid	Group I (n= 40)		Group II (n= 40)		P-value
	No.	%	No.	%	
Residual tissue adenoid:					
Positive	3	7.5%	10	25.0%	0.034*
Negative	37	92.5%	30	75.0%	
Grade:					
Grade 1	3	7.5.0%	8	20.0%	1.000
Grade 2 (a)	0	0.0%	2	5.0%	
Symptoms:					
No symptoms	2	5.0%	4	10.0%	0.559
ETD	1	2.5%	6	15.0%	

Table (3): Residual tissue adenoid in the studied groups.

Fig. (5): Before and after surgery of Coblation adenoidectomy.

Fig. (6): Before and after surgery of curettage adenoidectomy.

Discussion:

Adenoidectomy, whether conducted on its own or alongside procedures such as tonsillectomy or myringotomy remains one of the most frequently performed interventions in the field of otolaryngology.[1] The traditional curettage technique has been the standard approach for more than a hundred years. [6]

Despite its long-standing use, this method is carried out without direct visualization, which increases the likelihood of incomplete adenoid removal. Consequently, patients may face a greater risk of complications such as postoperative bleeding, Eustachian tube dysfunction, or accidental damage to adjacent structures. Therefore, an ideal adenoidectomy method should prioritize safety, technical simplicity, and minimal postoperative morbidity.

With the continuous evolution of surgical technology, several alternative methods for adenoid removal have been introduced in recent years, including the use of microdebriders, electrocautery, bipolar coagulation, radiofrequency ablation, and coblation.[7] These advanced techniques typically require endoscopic guidance to ensure precision and safety. Among them, Coblation has gained widespread acceptance due to its innovative nature and clinical effectiveness.[8] Unlike traditional electrocautery, Coblation functions at relatively low surface temperatures (approximately 40–60°C), allowing for efficient tissue disintegration and coagulation while minimizing thermal damage to surrounding structures. [9]

Although numerous studies assess adenoidectomy techniques by factors like residual tissue, surgical duration, amount of bleeding in operations, pain, and cost-effectiveness, fewer have specifically examined the function of the Eustachian tube. [3,8,10-11]

This ponder was planned as an imminent comparative ponder conducted at the Otolaryngology Department, at Assuit College Hospital between February 2022 to the end of February 2024. It included 80 pediatric patients (aged 5–14 years) with adenoid hypertrophy, divided equally into two groups:

Group I (n = 40): Patients who received endoscopic-assisted coblation adenoidectomy (EACA).

Group II (n = 40): Patients who received conventional curettage adenoidectomy (CCA).

Demographic analysis showed no significant statistical disparity between the compared values in age or gender distribution, consistent with findings from previous studies by **Businco et al**.,[12] and **Selvan et al.**[13]

Our study showed that EACA led to improved Eustachian tube function when relative to CCA. On postoperative day 1, seven patients in Group I had bilateral ETD, while no cases exhibited

a type B tympanogram. By day 7, all ETD occurrences in Group I had resolved. In contrast, Group II had 17 cases of bilateral ETD and two cases of type B tympanograms on day 1. By day 7, ETD persisted in seven cases, though type B tympanograms had resolved. These results indicate a significant statistical disparity between the compared values ($p = 0.012$).

One potential reason is that CCA, being a blind procedure, may inadvertently cause injury to the Eustachian tube opening, resulting in swelling and temporary dysfunction. Additionally, saline irrigation used in CCA to achieve hemostasis may contribute to postoperative ear fullness and tympanometric changes. In contrast, Coblation under direct endoscopic visualization minimizes inadvertent injury to the Eustachian tube region. These findings are consistent with those reported by **Gulsen& Cikkrikci, 2020** [14], who also found superior Eustachian tube function outcomes following EACA compared to CCA.

The operative time was notably extended in Group I (17.43 ± 2.09 min) compared to Group II (11.85 ± 1.69 min) ($p < 0.001$). However, blood loss during operations was considerably reduced in Group I (11.68 ± 1.54 ml) compared to Group II (45.90 ± 2.10 ml) ($p < 0.001$). These findings align with studies by ***Kim et al.*** [15] and ***Veronica 2018*** [16], which also reported significantly reduced blood loss in Coblation adenoidectomy compared to conventional curettage.

Healing time was also significantly shorter in Group I (7.48 ± 0.75 days) compared to Group II (9.23 ± 0.73 days) ($p < 0.001$). Faster recovery in the Coblation group may be due to reduced postoperative inflammation and tissue damage.

Residual adenoid tissue was detected in three patients (7.5%) in Group I and ten patients (25%) in Group II, showing a significant difference ($p = 0.034$). Among these, recurrent symptoms were reported in two patients from Group I and four cases from Group II. These results align with earlier studies by ***Verocina 2018*** [16]**,** which demonstrated higher rates of complete adenoid removal in coblation adenoidectomy compared to conventional curettage.

Postoperative bleeding, no cases of postoperative bleeding were observed in Group I, whereas three patients of reactionary bleeding documented in Group II. There were no cases of secondary bleeding in either group. Similar findings were reported by ***Aref et al. 2022*** [17], who found a higher incidence of postoperative bleeding in the CCA group relative to the EACA group, though analysis showed no significant statistical disparity between the two groups.

Pain after adenoidectomy was evaluated using the Visual Analog Scale (VAS). Group I had significantly lower VAS scores (6.93 ± 0.80) compared to Group II (8.85 ± 0.95) ($p < 0.001$). The lower pain scores in EACA may be attributed to the controlled nature of Coblation, which minimizes tissue trauma compared to blind curettage. Additionally, excessive neck flexion during CCA may contribute to postoperative discomfort.

Advantages and Limitations of Coblation Adenoidectomy:

The findings of this study indicate that Coblation adenoidectomy offers several advantages over conventional curettage, including: better preservation of Eustachian tube function, reduced intraoperative blood loss, lower postoperative pain, shorter healing time, less residual adenoid tissue postoperatively.

However, Coblation adenoidectomy has certain limitations, including: higher procedural cost due to the need for Coblation wands and endoscopic equipment, longer operative time

compared to curettage. Challenges in endoscope manipulation in patients with nasal septal deviation. [18]

Conclusion

EACA offers significant advantages over CCA, including improved postoperative Eustachian tube function, reduced residual adenoid tissue, decreased intraoperative blood loss, lower postoperative pain, and faster recovery. These benefits suggest that EACA is a safer and more effective technique for adenoidectomy, particularly in cases requiring precise tissue removal.

However, the higher cost and longer operative time associated with EACA should be considered when selecting the appropriate surgical technique. Further research with larger sample sizes and extended follow-up durations is suggested to better evaluate the long-term effects of Coblation adenoidectomy.

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