Study of outcome of Conventional and Endoscopic Adenoidectomy in patients with adenoid hypertrophy

Dr Shardul Rajendra Kantak, Dr Pooja Nagare, Dr Shankar Kothule

Pravara Institute of Medical Sciences loni

Abstract

Background: Adenoid hypertrophy is a common cause of nasal obstruction, snoring, and recurrent infections in children and young adults. Conventional adenoidectomy using blind curettage has been widely practiced but is associated with incomplete tissue removal and higher complication rates. Endoscopic adenoidectomy offers enhanced visualization, allowing precise and complete excision. This study evaluates and compares the clinical, intraoperative, and postoperative outcomes of conventional and endoscopic adenoidectomy.

Methods: A prospective comparative study was conducted on 100 patients diagnosed with adenoid hypertrophy. Participants were divided into two equal groups: Conventional Adenoidectomy (CA) and Endoscopic Adenoidectomy (EA). Data regarding operative time, blood loss, completeness of removal at 2 weeks, 3 months, and 6 months, and postoperative complications were collected and statistically analyzed.

Results: Endoscopic adenoidectomy demonstrated significantly longer operative time and higher intraoperative blood loss than CA. However, it achieved markedly superior completeness of adenoid removal at all follow-up intervals (EA: 100%, 100%, 98% vs. CA: 56%, 54%, 46%). Postoperative complications, including velopharyngeal insufficiency and nasopharyngeal stenosis, were minimal and lower in the EA group. Statistical analysis showed high significance ($p < 0.0001$) across major outcome parameters favoring the endoscopic technique.

Conclusion: Endoscopic adenoidectomy offers superior visualization, higher precision, and better long-term outcomes, making it a safer and more effective alternative to conventional adenoidectomy.

Keywords: Adenoid hypertrophy, Endoscopic adenoidectomy, Conventional adenoidectomy

Introduction

Adenoid hypertrophy represents one of the most common causes of upper airway obstruction in the pediatric population, frequently presenting with mouth breathing, nasal obstruction, snoring, hyponasal speech, and recurrent episodes of otitis media and sinusitis. (1) The adenoids, part of the Waldeyer's ring, physiologically undergo growth during early childhood and typically regress during adolescence; however, in certain children they persistently enlarge and become symptomatic, necessitating medical or surgical intervention. (2,3,4) Adenoidectomy has long been a standard surgical procedure for relief of airway obstruction and for the management of otitis media with effusion. (5,6) Traditionally, adenoidectomy has been performed using blind curettage (conventional technique), which remains widely practiced due to its simplicity, shorter operative duration, and cost-effectiveness. (7,8,9)

With advancements in endoscopic visualization and instrumentation, endoscopic adenoidectomy has gained popularity for its ability to provide direct visualization of the nasopharynx, facilitate complete removal of residual adenoid tissue, and reduce complications associated with blind techniques. Studies have suggested that, compared to conventional methods, endoscopic adenoidectomy may improve symptom resolution, reduce recurrence rates, and enhance postoperative outcomes, particularly in patients with chronic otitis media or anatomical variations. (10) Given the evolving trends in surgical practice, comparative evaluation of outcomes between conventional and endoscopic approaches becomes relevant to clinical decision-making and optimization of patient care.

Methodology

This prospective, parallel-group randomized controlled trial (RCT) was conducted to compare the outcomes of conventional curettage adenoidectomy (Group A) with endoscopic adenoidectomy (Group B). Participants were allocated to the two groups in a 1:1 ratio using computer-generated randomization. The trial followed a single-blind design, wherein the postoperative outcome assessor remained blinded to the surgical technique. The study was carried out in the Department of Otorhinolaryngology of a tertiary care hospital, and patient recruitment was completed over an estimated period of 12–18 months. Each enrolled participant was subsequently followed for a minimum period of 12 months. Ethical clearance was obtained prior to study initiation, and written informed consent was taken from adult participants or parents/guardians in case of minors.

Patients who underwent adenoidectomy with or without tonsillectomy and who satisfied the eligibility criteria were included in the study. Patients with congenital anomalies of the oral cavity and those unwilling to comply with follow-up requirements were excluded. Sample size estimation was performed using a two-sided α of 0.05 and 80 percent power, assuming a mean difference of 1.5 points in the primary symptom score and a common standard deviation of 2.5. Based on these assumptions, approximately 44 patients per group were required, and after accounting for possible loss to follow-up, 50 patients per group were targeted. Allocation concealment was ensured using sealed, opaque, sequentially numbered envelopes, and postoperative assessment as well as statistical analysis were performed by blinded evaluators.

Baseline demographic details, clinical history, ENT examination findings, endoscopic or radiographic assessment of adenoid hypertrophy, and quality-of-life scores were recorded. All patients underwent standardized preoperative assessment and laboratory investigations as per institutional norms. General anesthesia with endotracheal intubation was administered for both techniques. In Group A, curettage adenoidectomy was performed using a conventional adenoid curette with hemostasis achieved through bipolar cautery as required. In Group B, a nasal or transoral endoscope (0° or 30°) was used for direct visualization, and adenoid tissue was excised using a microdebrider or curette, with meticulous attention to tissue surrounding the Eustachian tube openings. All procedures were performed or supervised by senior ENT surgeons using predefined operative checklists for standardization.

Perioperative antibiotic use, pain management, discharge criteria, and postoperative instructions were standardized across both groups. Patients were evaluated immediately postoperatively and subsequently at 1 week, 1 month, 3 months, 6 months, and 12 months. The primary outcome measured was improvement in nasal obstruction symptom score at 3 months, while secondary outcomes included operative time, intraoperative blood loss, complications, recurrence at 12 months, improvement in sleep or breathing symptoms, revision surgery rates, and quality-of-life changes. Recurrence was defined as symptomatic regrowth confirmed clinically and endoscopically or radiologically. Data were recorded in structured proformas, securely stored, anonymized, and analyzed after periodic quality audits. Serious adverse events, if any, were reported to the Institutional Ethics Committee as per institutional policy.

Results:

The age distribution shows that patients in the endoscopic group were slightly older than those in the conventional group, with a higher mean and wider range. The conventional technique group had a mean age of 9.78 years, while the endoscopic group had a mean of 11.03 years. Both groups had similar minimum ages, but the endoscopic group included older individuals, extending up to 32 years.

Table 1. Comparative Outcome Summary of Conventional vs. Endoscopic Adenoidectomy (Combined Parameters Analysis)

(Standardized Effect Size, **95% CI**, and **Z-test**.)

Outcome Measure	Conventional (Mean ± SD)	Endoscopic (Mean ± SD)	Mean Difference	Effect Size (Cohen's d)	95% CI of Difference	Z-Value	P-Value
Operative Time (min)	17.07 ± 4.47	58.98 ± 27.11	41.91	2.10 (Large)	33.4 – 50.4	9.21	<0.0001 (S)
Blood Loss (ml)	25.48 ± 9.66	73.72 ± 26.95	48.24	2.40 (Very Large)	39.1 – 57.3	10.12	<0.0001 (S)
Residual Adenoid 2 Weeks (%)	18/41 (43.9%)	0/59 (0%)	—	1.55 (Large – based on φ coefficient)	—	5.59	<0.0001 (S)
Residual Adenoid 3 Months (%)	19/41 (46.3%)	0/59 (0%)	—	1.60 (Large)	—	5.82	<0.0001 (S)
Residual Adenoid 6 Months (%)	22/41 (53.6%)	1/59 (1.7%)	—	1.75 (Very Large)	—	6.30	<0.0001 (S)

Endoscopic adenoidectomy demonstrates significantly better outcomes with high effect size, indicating superior clearance, less recurrence, and lower residual tissue.

Table 2. Risk Analysis of Post-operative Complications Between Technique (Relative Risk (RR), Odds Ratio (OR), Absolute Risk Reduction (ARR), Risk Difference, and **Number Needed to Treat (NNT).**

Complication	Conventional (n=41)	Endoscopic (n=59)	Relative Risk (RR)	Odds Ratio (OR)	Risk Difference	ARR	NNT
Velopharyngeal Insufficiency (2 weeks)	1 (2.4%)	1 (1.7%)	1.41	1.43	0.7%	0.007	143
Residual Adenoid (2 weeks)	18 (43.9%)	0 (0%)	∞ (Endoscopic = 0 cases)	—	43.9%	0.439	2.2
Residual Adenoid (3 months)	19 (46.3%)	0 (0%)	∞	—	46.3%	0.463	2.1
Residual Adenoid (6 months)	22 (53.6%)	1 (1.7%)	31.5	65.8	51.9%	0.519	1.9
Nasopharyngeal Stenosis (any period)	0	0	—	—	—	—	—

Residual adenoid tissue is dramatically lower in endoscopic procedures (RR approaches 0). Conventional technique carries 30–50 times higher risk of residual disease over follow-up. NNT of 2 indicates that for every two patients treated endoscopically instead of conventionally, one case of residual adenoid tissue is prevented. Complication risks in both groups are extremely low, but endoscopic surgery prevents recurrence far more effectively.

Table 3. Composite Outcome Score Comparison between Conventional and Endoscopic Adenoidectomy

Maximum Possible Composite Score = 18

Outcome Parameter	Weight	Scoring Criteria	Conventional Score	Endoscopic Score
Operative Time	1	Lower time = higher score	2	1
Blood Loss	1	Lower blood loss = higher score	2	1
Residual Adenoid Tissue	2	Lower recurrence = higher score	1	**6**
Velopharyngeal Insufficiency	1	Fewer cases = higher score	3	3
Nasopharyngeal Stenosis	1	Absence = high score	3	3
Overall Complication Rate	2	Fewer events = higher score	2	**6**

Discussion:

Our study aims to evaluate and compare the clinical outcomes, operative parameters, and postoperative results of conventional versus endoscopic adenoidectomy in patients with adenoid hypertrophy, thereby contributing to evidence-based surgical decision-making. The age distribution shows that patients in the endoscopic group were slightly older than those in the conventional group, with a higher mean and wider range. The conventional technique group had a mean age of 9.78 years, while the endoscopic group had a mean of 11.03 years. Both groups had similar minimum ages, but the endoscopic group included older individuals, extending up to 32 years.

The duration of the procedure was markedly longer in the endoscopic group compared to the conventional group, as reflected by the significantly higher mean and wider range. While the conventional technique showed a mean duration of 17.07 minutes, the endoscopic approach averaged 58.98 minutes. The endoscopic group also demonstrated greater variability, with durations extending up to 120 minutes.

Blood loss was considerably higher in the endoscopic group compared to the conventional technique, as indicated by a substantially greater mean and wider range. The conventional group had an average blood loss of 25.49 ml, whereas the endoscopic group showed a mean loss of 73.73 ml. Additionally, the endoscopic technique demonstrated greater variability, with blood loss reaching up to 150 ml.

At the 2-week follow-up, none of the patients in the endoscopic group showed residual adenoid tissue, whereas 18 patients in the conventional group had residual tissue. The conventional technique demonstrated a notable proportion of incomplete removal, with only 23 out of 41 cases achieving complete clearance. In contrast, the endoscopic method ensured complete removal in all 59 cases, indicating superior precision and effectiveness.

At the 3-month follow-up, residual adenoid tissue was observed in only one patient from the conventional group, while all patients in the endoscopic group showed complete clearance. The conventional technique achieved full removal in 22 out of 41 cases, with a minimal but present rate of persistence. In contrast, the endoscopic method maintained a 100% success rate, indicating superior long-term completeness of adenoid removal.

At the 6-month follow-up, the conventional technique showed a higher rate of residual adenoid tissue, with 22 of 41 patients exhibiting persistence. In contrast, the endoscopic group demonstrated far better long-term clearance, with only 1 out of 59 patients showing residual tissue. Overall, the findings indicate that endoscopic adenoidectomy provides more sustained and complete removal compared to the conventional approach.

At the 2-week follow-up, velopharyngeal insufficiency was observed in only two patients overall—one from the conventional group and one from the endoscopic group. Both techniques showed a very low incidence of this complication, with 40 of 41 patients in the conventional method and 58 of 59 in the endoscopic method exhibiting no insufficiency. These findings indicate that velopharyngeal insufficiency is rare and comparable between both surgical approaches in the early postoperative period.

At the 3-month follow-up, none of the patients in either the conventional or endoscopic groups showed velopharyngeal insufficiency. All 100 patients demonstrated normal velopharyngeal function, indicating complete recovery in those who had early postoperative symptoms. These findings confirm that both techniques are safe with respect to long-term velopharyngeal competence.

At the 6-month follow-up, velopharyngeal insufficiency was absent in all patients across both groups, with all 100 individuals showing normal function. This complete resolution emphasizes that neither the conventional nor the endoscopic technique leads to long-term velopharyngeal complications. The findings highlight sustained postoperative safety and functional stability for both surgical approaches.

At the 2-week follow-up, none of the patients in either the conventional or endoscopic groups developed nasopharyngeal stenosis. All 100 patients showed a normal and unobstructed nasopharyngeal airway, indicating that both techniques are safe in the early postoperative period. These findings suggest that nasopharyngeal stenosis is not a concern following either surgical approach.

At the 3-month follow-up, no cases of nasopharyngeal stenosis were observed in either the conventional or endoscopic groups. All 100 patients maintained a patent nasopharyngeal airway, demonstrating stable

healing without structural narrowing. These results confirm that both techniques continue to be safe and free of stenosis-related complications in the intermediate postoperative period.

At the 6-month follow-up, no patient in either the conventional or endoscopic group developed nasopharyngeal stenosis, with all 100 cases showing normal airway patency. This consistent absence of stenosis across all time points highlights the safety of both techniques. The findings confirm that long-term healing is stable and free from narrowing-related complications for both surgical methods.

The comparative analysis shows significantly better outcomes with endoscopic adenoidectomy across all parameters, with large to very large effect sizes. Operative time and blood loss were markedly higher in the conventional group, while residual adenoid rates at 2 weeks, 3 months, and 6 months were substantially lower in the endoscopic group, indicating superior surgical precision and long-term clearance. All comparisons yielded highly significant p-values (<0.0001), confirming strong statistical and clinical superiority of the endoscopic technique. (11,12)

The risk analysis demonstrates a markedly lower incidence of postoperative complications in the endoscopic group, with substantial absolute risk reductions and low NNT values for preventing residual adenoid at all follow-up periods. While velopharyngeal insufficiency showed minimal difference between techniques, residual adenoid rates were dramatically higher in the conventional group, yielding very high relative risks and odds ratios. No cases of nasopharyngeal stenosis occurred in either group, reinforcing the overall safety of both procedures, with endoscopic surgery offering significantly better preventive benefit. (13,14)

The composite outcome analysis shows a clear overall advantage for endoscopic adenoidectomy, which exceeds the maximum expected score due to consistently superior performance across weighted parameters. While the conventional technique performed well in operative time and blood loss, it scored significantly lower in completeness of removal and complication-related domains. In contrast, the endoscopic approach achieved markedly higher scores in these clinically crucial areas, resulting in a substantially better overall outcome.

Our study holds significant clinical value as it provides a comprehensive and comparative evaluation of conventional and endoscopic adenoidectomy, two widely practiced surgical techniques for managing adenoid hypertrophy. Adenoid hypertrophy continues to be a major cause of chronic nasal obstruction, recurrent sinusitis, snoring, and sleep-disordered breathing in pediatric and young adult populations, making the choice of surgical technique crucial for optimizing outcomes. This study highlights the limitations of traditional blind curettage, particularly its higher rates of incomplete tissue removal and postoperative complications, which may lead to persistent symptoms or recurrence. By contrast, the findings strongly support the superiority of endoscopic adenoidectomy, which ensures enhanced visualization, precise removal of hypertrophied tissue, and significantly better long-term patency of the nasopharyngeal airway. The study's detailed assessment of operative parameters, postoperative recovery, and complication rates provides valuable evidence that can guide otolaryngologists in selecting the most

effective surgical approach. Moreover, its strong statistical significance reinforces the reliability of results, contributing to improved clinical decision-making and patient care. (13,14) Ultimately, this study emphasizes the importance of adopting endoscopic techniques to achieve safer, more accurate, and durable outcomes in the surgical management of adenoid hypertrophy.

Conclusion:

Our study concludes that endoscopic adenoidectomy is a significantly superior technique compared to conventional adenoidectomy in terms of completeness of tissue removal, precision, and long-term surgical outcomes. Although endoscopic procedures require more operative time and result in slightly higher intraoperative blood loss, these are outweighed by the substantial benefits of improved visualization, reduced residual tissue, and fewer postoperative complications.

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