Review Article

Pediatric Tonsillectomy and Adenoidectomy: Surgical Techniques and Clinical Outcomes

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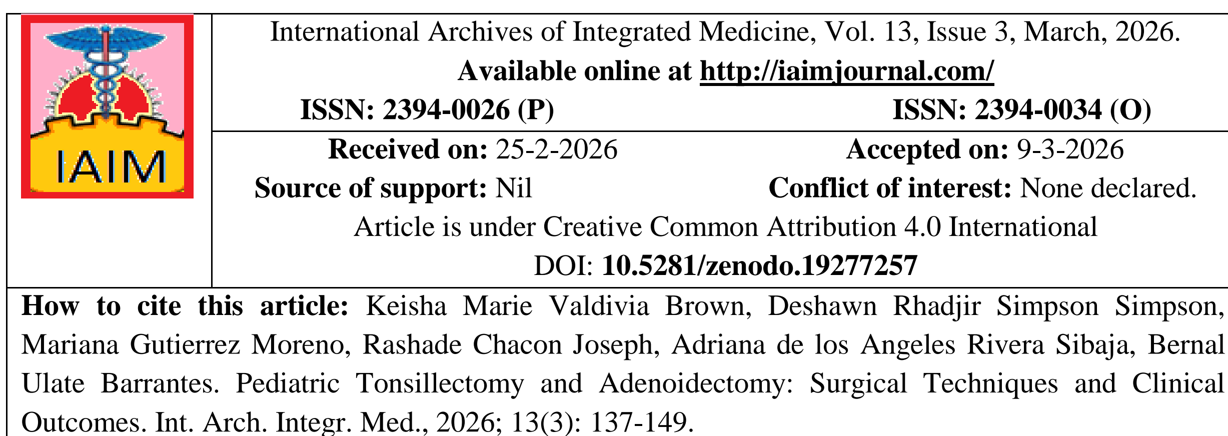

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Abstract

Pediatric tonsillectomy and adenoidectomy remain among the most frequently performed surgical procedures in children, primarily indicated for recurrent tonsillitis and obstructive sleep apnea. A comprehensive understanding of surgical anatomy is essential to optimize outcomes, as the palatine tonsils are closely related to the superior constrictor muscle and possess a rich vascular supply that influences intraoperative bleeding and postoperative hemorrhage risk. Similarly, the anatomical position of the adenoids within the nasopharynx explains their role in airway obstruction and middle ear dysfunction. Despite their immunological function within Waldeyer's ring, current evidence supports the long-term safety of surgical removal without significant impairment of immune competence. Indications for surgery are guided by established clinical criteria and validated symptom assessment tools. Adenotonsillectomy has demonstrated substantial reductions in apnea–hypopnea

index values and meaningful improvements in quality of life, behavior, neurocognitive performance, and growth in children with obstructive sleep apnea. However, persistent disease may occur in selected populations, requiring individualized follow-up and management. Advances in surgical techniques have improved perioperative safety and recovery. Cold steel dissection, electrocautery, coblation, harmonic scalpel, and intracapsular tonsillotomy each present distinct operative profiles. Intracapsular and energy-based approaches are generally associated with reduced postoperative pain, lower hemorrhage rates, and faster return to normal activities. In adenoidectomy, techniques incorporating direct visualization decrease residual tissue and revision risk compared to blind curettage.

Key words

Adenotonsillectomy, obstructive sleep apnea, recurrent tonsillitis, intracapsular tonsillotomy, postoperative hemorrhage, pediatric airway obstruction.

Introduction

Tonsillar and adenoidal hypertrophy constitutes one of the principal causes of pediatric obstructive sleep apnea and represents a significant global health burden. This condition affects a substantial proportion of children worldwide and remains one of the most frequent indications for surgical intervention in pediatric otolaryngology. In the United States alone, approximately 500,000 children undergo tonsillectomy each year, most commonly for obstructive sleep-disordered breathing [1, 2]. The prevalence of obstructive sleep-disordered breathing is not uniformly distributed across populations; rather, it disproportionately affects children who are overweight, Black, Hispanic, or economically disadvantaged. Importantly, this disorder extends beyond nocturnal respiratory impairment, as it is closely associated with neurobehavioral consequences, including attention deficits and learning difficulties, thereby amplifying its clinical and social impact [1].

Within this context, adenotonsillectomy has emerged as an intervention capable of modifying not only respiratory symptoms but also broader developmental outcomes. Evidence indicates that surgical treatment in children with obstructive sleep apnea contributes to improvements in growth parameters, developmental progression, and cognitive performance. Postoperative findings consistently demonstrate enhancements in quality of life, attention capacity, and reductions in anxiety and behavioral disturbances [3, 4]. The Childhood Adenotonsillectomy Trial (CHAT) further reinforced these observations by showing that early adenotonsillectomy leads to significant reductions in symptom burden, daytime sleepiness, and parent-reported behavioral concerns. Nevertheless, the trial also highlighted that changes in objective cognitive measures and metabolic indicators were comparatively modest, underscoring the complexity of outcome assessment in this population [1].

Parallel to the growing body of outcome data, surgical practice has undergone notable evolution. Traditional extracapsular excisional techniques have progressively been complemented, and in some cases replaced, by energy-based and intracapsular approaches. Among these, Coblation intracapsular tonsillectomy has gained prominence due to its association with reduced postoperative pain, faster recovery, and fewer complications. Intracapsular tonsillectomy is reported to be less painful than extracapsular techniques, particularly during the late postoperative period, and it is associated with a lower risk of tonsillar regrowth, factors that have positioned it as a preferred option in many pediatric cases [5, 6].

Despite these advances, the timing of intervention remains a subject of debate. The decision between early surgery and watchful waiting continues to generate controversy, particularly in children with nonsevere disease. While early surgical intervention may produce prompt improvements in symptoms and quality of life, evidence from the CHAT study suggests that supportive care and observation may be appropriate in selected cases [1]. Consequently, both the choice of surgical technique and the timing of intervention should be individualized, considering symptom severity, patient-specific characteristics, and the balance between potential risks and anticipated benefits [7].

The aim of this article is to analyze current surgical techniques in pediatric tonsillectomy and adenoidectomy and evaluate their clinical outcomes in order to support evidence-based and individualized management in children with obstructive sleep-disordered breathing and recurrent tonsillar disease.

Methodology

This manuscript was developed as a structured narrative review aimed at providing an updated and clinically integrated analysis of pediatric tonsillectomy and adenoidectomy, focusing on contemporary surgical techniques and their clinical outcomes. The review was conducted in accordance with the SANRA (Scale for the Assessment of Narrative Review Articles) framework and prioritized interpretative synthesis, surgical–clinical integration, and practical applicability rather than systematic quantitative pooling. Particular emphasis was placed on evidence-based indications, patient selection, perioperative considerations, comparative surgical approaches, postoperative outcomes, and complication profiles, with attention to age-related factors, comorbidities such as obesity and syndromic conditions, and variability in healthcare settings to enhance clinical relevance.

A comprehensive literature search was performed in PubMed, Scopus, and Web of Science, including peer-reviewed articles published in English or Spanish between January 2021 and December 2026. This timeframe was selected due to recent updates in clinical guidelines, advances in energy-based and intracapsular techniques, and emerging data on long-term outcomes and quality-of-life measures in pediatric obstructive sleep-disordered breathing. Foundational studies were incorporated when essential for historical and conceptual context. The search strategy combined MeSH and free-text terms using Boolean operators related to tonsillectomy, adenoidectomy, pediatric obstructive sleep apnea, recurrent tonsillitis, surgical techniques, postoperative complications, and clinical outcomes. The initial search yielded 156 records; after duplicate removal and title–abstract screening, 80 articles underwent full-text evaluation, and 36 studies were included in the final synthesis. Selection and evaluation were conducted independently by two authors, with disagreements resolved by consensus. Excluded sources comprised non–peer-reviewed publications, isolated case reports, letters to the editor, purely technical descriptions without outcome data, redundant datasets, and studies not directly addressing pediatric indications, surgical techniques, or clinical outcomes.

Eligible studies included randomized controlled trials, large observational cohorts, meta-analyses, expert consensus statements, and contemporary international guidelines from relevant pediatric and otolaryngology societies. Priority was given to multicenter studies, investigations with standardized outcome measures such as apnea–hypopnea index or validated quality-of-life scales, and research evaluating comparative effectiveness of surgical techniques. Extracted variables included study design, population characteristics, indication for surgery, surgical method, perioperative management strategies, complication rates, and short- and long-term outcomes. Methodological quality and internal

validity were assessed narratively, considering risk of bias, heterogeneity in outcome definitions, follow-up duration, and consistency across studies. When conflicting findings were identified, greater interpretative weight was assigned to higher-level evidence and guideline-supported recommendations. Given its narrative design, this review is subject to potential selection bias and does not provide pooled quantitative estimates. Artificial intelligence–based tools were used exclusively to assist in literature organization and structural coherence, whereas critical appraisal and final interpretation were conducted independently by the authors to ensure methodological rigor.

Surgical Anatomy and Pathophysiological Basis

The palatine tonsils are encapsulated lymphoid structures situated within the tonsillar fossa, also referred to as the tonsillar bed, and are anatomically bordered laterally by the superior constrictor muscle. This precise anatomical relationship is of critical importance during surgical intervention, as accurate identification of tissue planes is necessary to prevent inadvertent injury to adjacent muscular and vascular structures [8]. The tonsillar capsule, composed of a fibrous layer that separates the tonsillar parenchyma from surrounding tissues, provides a natural dissection plane that facilitates controlled removal during tonsillectomy [9].

A thorough understanding of the vascular anatomy further underpins safe surgical practice. The arterial supply of the palatine tonsils derives predominantly from the tonsillar branch of the facial artery, with additional contributions from the ascending palatine, lingual, and ascending pharyngeal arteries [10]. Given this rich and variable vascular network, meticulous intraoperative technique is required to minimize blood loss and reduce the risk of postoperative hemorrhage. Venous drainage occurs through a peritonsillar plexus, which may represent a significant source of bleeding both during and after tonsillectomy. Inadequate control of this venous network can contribute to post-tonsillectomy hemorrhage, a well-recognized complication that has been reported to occur more frequently in patients with a history of recurrent tonsillitis [11].

In parallel, the adenoids occupy a strategic position in the roof and posterior wall of the nasopharynx and maintain a close anatomical relationship with the orifices of the Eustachian tubes. This proximity has clinical implications, as adenoidal hypertrophy may impair middle ear ventilation and predispose to otitis media [12]. Moreover, enlargement of adenoidal tissue can obstruct the nasopharyngeal airway, thereby contributing to obstructive sleep apnea and other forms of sleep-disordered breathing, which represent common indications for surgical management [4].

Both the palatine tonsils and adenoids form part of Waldeyer's ring, a lymphoid tissue complex that also includes additional pharyngeal lymphoid aggregates and plays a central role in immune surveillance during early childhood. Although concerns have historically been raised regarding potential immune impairment following surgical removal, current evidence indicates that tonsillectomy and adenoidectomy do not result in significant long-term deficits in humoral or cellular immunity [12].

From a pathophysiological perspective, hypertrophy of the tonsillar and adenoidal tissues may lead to mechanical airway obstruction, thereby promoting sleep-disordered breathing and obstructive sleep apnea, which are among the primary indications for surgical intervention [4]. In addition to obstructive mechanisms, recurrent infectious episodes such as tonsillitis constitute another major driver for surgery. Studies have demonstrated a correlation between infection frequency and surgical outcomes, reinforcing the role of careful clinical assessment in determining the appropriateness of operative management [11].

Indications and Evidence-Based Patient Selection

The indications for tonsillectomy and adenoidectomy are grounded in well-established clinical criteria that aim to balance symptom burden, disease severity, and expected benefit. One of the most recognized indications is recurrent tonsillitis, traditionally evaluated using the Paradise criteria, which require a defined number of documented throat infections within a specified time frame to justify surgical intervention. These criteria have served as a cornerstone in clinical decision-making, promoting standardized assessment of infection frequency and severity. More recently, updated guidelines from the American Academy of Otolaryngology–Head and Neck Surgery Foundation have strengthened adherence to evidence-based recommendations, contributing to a reduction in unnecessary procedures and improving overall patient outcomes [13, 14].

In addition to recurrent infection, obstructive sleep-disordered breathing and pediatric obstructive sleep apnea represent primary indications for adenotonsillectomy. Surgical removal of hypertrophic tonsillar and adenoidal tissue is considered the first-line treatment in children with obstructive sleep apnea and has been shown to produce significant improvements in respiratory symptoms and quality of life [4]. Nevertheless, persistent obstructive sleep apnea may occur in up to 40% of patients following surgery, indicating that adenotonsillectomy, although highly effective, does not universally resolve the condition and may require adjunctive management strategies [15]. Importantly, the presence of obesity should not be regarded as a reason to delay surgical intervention, as adenotonsillectomy remains effective in children with adenotonsillar hypertrophy even in this population [16]. Beyond these principal indications, specific clinical scenarios may also warrant surgical management. Tonsillectomy is indicated in selected cases of peritonsillar abscess to reduce recurrence risk and alleviate symptoms. Similarly, in children with periodic fever, aphthous stomatitis, pharyngitis, and adenitis syndrome, surgical intervention has been shown to decrease episode frequency and improve quality of life [10].

Accurate assessment of symptom severity and its impact on daily functioning plays a pivotal role in determining surgical candidacy. Instruments such as the OSA-18 questionnaire allow clinicians to quantify symptom burden and evaluate the effect of sleep-disordered breathing on quality of life. Postoperative reductions in OSA-18 scores consistently demonstrate the clinical effectiveness of adenotonsillectomy in appropriately selected patients [4]. Complementarily, health-related quality of life measures shows significant postoperative improvement, with most children rapidly resuming normal activities, reinforcing the functional benefits of surgery [5].

While the procedure is generally safe, contraindications and risk modifiers must be carefully considered. Absolute contraindications include bleeding disorders and certain craniofacial anomalies that may increase surgical complexity or risk. Relative contraindications encompass severe comorbid conditions that heighten perioperative risk and necessitate individualized evaluation [10]. Additionally, factors such as obesity, craniofacial anomalies, and syndromic conditions including Down syndrome may modify the perioperative risk profile and require enhanced monitoring and tailored management strategies [16, 17]. These risk considerations directly influence perioperative planning and postoperative care. There is a growing trend toward same-day discharge in appropriately selected patients; however, children with severe obstructive sleep apnea or significant comorbidities should undergo overnight monitoring to mitigate the risk of respiratory complications [18].

Tonsillectomy Techniques

Cold steel dissection remains one of the traditional techniques for tonsillectomy and

involves the manual removal of the tonsillar tissue using a scalpel and scissors, followed by hemostasis achieved through suturing or vessel ligation. This approach allows precise identification of the capsular plane and minimizes thermal injury to surrounding tissues, thereby preserving adjacent muscular structures. However, it is generally associated with greater intraoperative bleeding compared to energy-based techniques, although effective hemostasis can be reliably obtained with appropriate ligation or suturing methods [8, 19].

In contrast, electrocautery techniques, whether monopolar or bipolar, utilize electrical current to both dissect tissue and achieve hemostasis simultaneously. While this dual function enhances operative efficiency, the associated thermal spread may cause significant injury to adjacent tissues, which has been linked to increased postoperative pain and a higher risk of secondary hemorrhage [20, 21]. Comparative analyses indicate that monopolar electrocautery is associated with lower postoperative hemorrhage rates compared to bipolar diathermy, highlighting differences within this modality itself [22].

Coblation represents a plasma-mediated tissue ablation technique that employs radiofrequency energy to generate a plasma field capable of dissolving tissue at lower temperatures. By reducing thermal spread, coblation minimizes collateral tissue damage and is consistently associated with less postoperative pain and faster recovery [5, 6, 21]. When compared with electrocautery, coblation demonstrates lower postoperative pain scores while maintaining similar intraoperative blood loss [23].

The harmonic scalpel operates on ultrasonic energy principles, using high-frequency vibrations to simultaneously cut and coagulate tissue. This mechanism allows effective hemostasis with reduced intraoperative bleeding and shorter operative times relative to several other techniques. Comparative studies show that postoperative pain and bleeding rates with the harmonic scalpel are similar to those observed with coblation and cold dissection, although operative duration tends to be shorter [24].

Intracapsular tonsillotomy, commonly performed with microdebrider assistance, involves partial removal of tonsillar tissue while preserving the tonsillar capsule. By maintaining the capsular layer, this technique reduces exposure of the pharyngeal musculature and is associated with less postoperative pain and faster functional recovery compared to extracapsular approaches. Additionally, it has demonstrated lower rates of postoperative hemorrhage and earlier return to normal activities [5, 6].

When these techniques are compared directly, differences emerge across key operative parameters. The harmonic scalpel is associated with the shortest operative time, followed by coblation and cold dissection [24]. In terms of intraoperative blood loss, both the harmonic scalpel and coblation result in less bleeding compared to cold steel dissection [23, 25]. Postoperative pain tends to be lower with coblation and intracapsular tonsillotomy than with electrocautery [6, 20]. Regarding hemorrhage rates, coblation and the harmonic scalpel demonstrate comparable postoperative bleeding profiles, whereas electrocautery, particularly bipolar diathermy, may be associated with an increased risk of secondary hemorrhage [22, 25]. Finally, although techniques such as coblation and harmonic scalpel require additional training and incur higher costs, they offer advantages in reduced postoperative pain and accelerated recovery, factors that may justify their broader adoption in selected clinical settings [5, 25].

Adenoidectomy Techniques

Traditional curettage remains one of the earliest and most widely practiced techniques for adenoidectomy; however, it is inherently a blind procedure, as removal of adenoidal tissue is performed without direct visualization of the

nasopharynx. This limitation increases the likelihood of incomplete excision, particularly in anatomically complex areas. Evidence has demonstrated a substantial rate of residual tissue following this approach, with one study reporting residual adenoidal tissue in 60.2% of patients, predominantly in the peritubal region [25]. Consequently, traditional curettage is associated with a higher probability of incomplete resection and an increased need for revision surgery when compared to more contemporary techniques [7].

In response to these limitations, suction electrocautery has been adopted as an alternative that enhances intraoperative control. By combining suction with electrocautery, this technique allows simultaneous tissue removal and hemostasis, resulting in reduced intraoperative blood loss relative to traditional curettage. The improved hemostatic profile is particularly advantageous in pediatric patients, in whom minimizing bleeding is a central operative goal. For this reason, suction electrocautery is frequently considered one of the preferred methods for adenoidectomy in contemporary practice [1, 7]. Further refinement in surgical precision has been achieved with endoscopic-assisted adenoidectomy. The use of endoscopic visualization permits direct inspection of the nasopharynx, thereby facilitating more complete and targeted removal of adenoidal tissue. Direct visualization significantly reduces the risk of residual tissue, as the surgeon can identify and excise remnant tissue intraoperatively rather than relying on tactile feedback alone [25].

Microdebrider-assisted adenoidectomy represents another technique that emphasizes precision. By employing a powered rotary instrument under visualization, this method allows controlled and accurate tissue removal and is associated with lower rates of residual adenoidal tissue compared to traditional curettage [7]. In addition, studies have shown that microdebrider-assisted approaches may reduce operative time and intraoperative blood loss, making them particularly suitable for pediatric populations [25].

Across all techniques, the risk of residual tissue and subsequent regrowth remains a relevant consideration; however, this risk is notably higher with traditional curettage due to its blind nature. Techniques that incorporate enhanced visualization, such as endoscopic-assisted and microdebrider-assisted adenoidectomy, demonstrate superior effectiveness in minimizing residual tissue and reducing the likelihood of regrowth [7, 25].

Complication profiles also vary according to the chosen method. Traditional curettage is associated with a higher incidence of incomplete resection and potential need for revision surgery. In contrast, suction electrocautery and microdebrider-assisted techniques generally demonstrate lower complication rates, particularly with respect to intraoperative bleeding and postoperative pain. Although endoscopic-assisted adenoidectomy improves completeness of removal, it may be associated with slightly higher intraoperative blood loss compared to suction electrocautery [7, 25].

Postoperative Management and Recovery

Postoperative management following tonsillectomy requires close attention to hemostasis and early identification of hemorrhagic complications. Post-tonsillectomy hemorrhage is classically categorized as primary, occurring within the first 24 hours after surgery, or secondary, developing after this initial period. Primary bleeding has been reported in approximately 0.2%–2.2% of pediatric cases, whereas secondary hemorrhage occurs in 0.1%–3.0%. Vigilant monitoring is particularly important after an episode of secondary bleeding, as the risk of rebleeding is highest within the subsequent 24 hours; notably, 84% of rebleeding events occur during this timeframe [26]. This temporal pattern underscores the need for structured observation protocols and timely intervention when indicated. Effective pain

control is another central component of postoperative care. Current recommendations support a multimodal analgesic approach, combining acetaminophen and nonsteroidal anti-inflammatory drugs as first-line therapy, with opioids reserved for rescue analgesia when necessary [27, 28]. This strategy aims to provide adequate analgesia while minimizing opioid-related adverse effects. In this context, the use of dexmedetomidine in combination with acetaminophen has demonstrated the potential to eliminate the need for postoperative opioids, thereby reducing the risk of respiratory complications associated with opioid administration [29].

Adjunctive administration of dexamethasone plays a complementary role in optimizing recovery. Owing to its anti-inflammatory, antiemetic, and analgesic properties, dexamethasone has been shown to significantly reduce postoperative pain, nausea, and vomiting, contributing to improved patient comfort and recovery trajectories. Importantly, its perioperative use is considered safe, with no significant increase in postoperative bleeding rates reported [30].

In contrast, the routine use of antibiotics after tonsillectomy remains controversial. Current evidence does not consistently support their standard administration, and antibiotic therapy should therefore be guided by specific clinical indications rather than applied universally [29]. This approach aligns with principles of antimicrobial stewardship and avoids unnecessary exposure. Supportive postoperative measures are equally relevant. Adequate hydration is essential to prevent dehydration and promote mucosal healing, and dietary advancement should proceed gradually, beginning with clear liquids and progressing as tolerated. Activity restriction is recommended during the initial recovery period, with a stepwise return to normal activities as symptoms improve [10].

Decisions regarding inpatient versus outpatient management should be individualized based on clinical risk factors. Admission is generally indicated for children with significant comorbidities, severe obstructive sleep apnea, or postoperative complications such as substantial bleeding. Conversely, outpatient management is appropriate for children without major risk factors, allowing recovery in a familiar home environment while maintaining clear instructions for monitoring and prompt evaluation if complications arise [10].

Clinical Outcomes and Complications

Adenotonsillectomy has consistently demonstrated substantial efficacy in resolving obstructive symptoms and improving objective polysomnographic parameters in children with obstructive sleep apnea syndrome. Significant reductions in the apnea–hypopnea index have been documented following surgery. One study reported a decrease in median apnea–hypopnea index from 13.4 events per hour preoperatively to 2.4 events per hour postoperatively, accompanied by improved oxygen saturation levels [4]. Similarly, another investigation observed a reduction in apnea–hypopnea index from 9.41 to 1.75 after surgery, reflecting marked clinical improvement [31]. In children with Down syndrome, adenotonsillectomy also resulted in significant decreases in apnea–hypopnea index; however, residual obstructive sleep apnea persisted in a subset of patients, highlighting the need for individualized follow-up and, in some cases, additional management strategies [32].

Beyond airway obstruction, surgical intervention has demonstrated benefits in reducing infection frequency. Partial intracapsular tonsillectomy has been shown to effectively decrease recurrent infections, with low rates of tonsillar regrowth and minimal postoperative complications [31]. Coblation intracapsular tonsillectomy similarly has been associated with improved health-related quality of life and reduced infection rates, while maintaining a low need for revision surgery [5].

These findings reinforce the therapeutic value of tissue-preserving approaches in selected pediatric populations.Improvements extend beyond respiratory and infectious outcomes to encompass behavioral and developmental domains. Significant reductions in OSA-18 questionnaire scores following adenotonsillectomy reflect meaningful improvements in quality of life and daily functioning. Enhanced neurocognitive performance and improved growth trajectories have also been observed, particularly in children with obstructive sleep apnea, likely attributable to restored sleep quality and improved nocturnal oxygenation [4, 33].

Despite these benefits, postoperative complications remain an important consideration. The incidence of postoperative hemorrhage varies according to surgical technique, with coblation and intracapsular approaches generally demonstrating lower bleeding rates compared to more traditional methods [4]. Identified risk factors for hemorrhage include younger age and severe obstructive sleep apnea, underscoring the importance of vigilant postoperative monitoring in higher-risk patients [10].

Pain trajectories also differ by technique and influence recovery. Intracapsular tonsillectomy is associated with reduced postoperative pain and more rapid recovery, thereby decreasing the likelihood of dehydration related to diminished oral intake [5, 6]. Standard pain management strategies typically rely on scheduled analgesics, and some studies report limited need for prolonged analgesic use [31].

Velopharyngeal insufficiency represents a rare but recognized complication that may affect speech outcomes when it occurs; however, its incidence is low with modern surgical techniques [10]. Severe complications, including airway compromise and anesthetic events, are uncommon but may arise, particularly in children with significant comorbidities or severe obstructive sleep apnea [31]. Accordingly, comprehensive preoperative evaluation and appropriate postoperative monitoring are essential to mitigate these risks and optimize overall clinical outcomes [10].

Long-Term Outcomes, Special Populations, and Future Directions

Long-term outcomes following adenotonsillectomy include consideration of adenoidal regrowth and the potential need for revision surgery. Intracapsular tonsillectomy has demonstrated a low revision rate of approximately 2.6%, with most reinterventions attributed to recurrent obstructive symptoms secondary to tonsillar regrowth. Identified factors associated with increased revision risk include age under two years at the time of initial surgery, severe obstructive sleep apnea, and the presence of significant comorbidities [5]. Similarly, coblation intracapsular tonsillectomy has shown sustained effectiveness with minimal need for revision procedures, further supporting its role in reducing postoperative complications and maintaining durable outcomes [34].

Although long-term immune function has not been directly addressed in the cited studies, the demonstrated safety profile of adenotonsillectomy and its consistent association with improved quality of life and reduced symptom burden suggest favorable long-term clinical outcomes [2, 4]. The absence of reported significant adverse immunological consequences in outcome-focused research further supports the procedure's overall safety in appropriately selected pediatric populations.Age-specific outcomes have also been evaluated. Powered intracapsular tonsillotomy and adenoidectomy performed in infants up to 36 months of age have shown safety and effectiveness comparable to those observed in older children, indicating that this approach is a viable option even in younger patients when clinically indicated [35].

In children with syndromic conditions or obesity, adenotonsillectomy remains effective. Studies in children with severe obesity have demonstrated

no significant differences in surgical outcomes across obesity classes, suggesting that obesity alone should not preclude operative intervention [36]. Moreover, individual clinical observations, including a reported case of an obese child with severe obstructive sleep apnea who experienced marked postoperative improvement, reinforce the procedure's effectiveness in this subgroup [16].

Enhanced recovery strategies have further contributed to optimizing postoperative outcomes. Protocols incorporating intracapsular techniques have been associated with reduced postoperative pain, accelerated recovery, and high parental satisfaction, with most children resuming normal activities within one week [5].

Emerging technologies, particularly coblation and powered intracapsular methods, are increasingly favored due to their reduced complication profiles, effective symptom resolution, and low revision rates [5, 34]. Nevertheless, further investigation remains warranted. Future randomized controlled trials and multicenter studies should focus on the generalizability of current findings, particularly in younger children and in those presenting with primary snoring or severe obstructive sleep apnea. Such research may also clarify practice variability and help identify patient subgroups most likely to benefit from early adenotonsillectomy [2].

Conclusions

A precise understanding of tonsillar and adenoidal anatomy, including capsular planes and vascular supply, is essential to minimize surgical complications and ensure safe and effective operative management, while current evidence supports preserved long-term immune function after adenotonsillectomy.

Recurrent tonsillitis and obstructive sleep apnea remain the primary indications for surgery, and evidence-based criteria combined with validated symptom assessment tools are critical for appropriate patient selection and individualized perioperative planning.

Modern surgical techniques, particularly intracapsular and energy-based approaches, are associated with reduced postoperative pain, lower hemorrhage rates, faster recovery, and low revision rates, supporting their increasing role in contemporary pediatric practice.

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