About the Authors

Ivry Zagury-Orly, MD, MMSc

Dr. Ivry Zagury-Orly is a resident, Division of Otolaryngology—Head and Neck Surgery, McMaster University, Hamilton, Ontario. He completed his medical degree from Université de Montréal, Montreal, Quebec, and obtained a Master's of Medical Sciences in Medical Education from Harvard University, Boston, Massachusetts. His research interests include medical education, pediatric otolaryngology, and otology.

Affiliations: Division of Otolaryngology—Head and Neck Surgery, McMaster University, Hamilton, ON

Jonathan MacLean, MD

Dr. Jonathan MacLean, is a pediatric otolaryngologist and associate professor, Division of Otolaryngology—Head and Neck Surgery, McMaster University, Hamilton, Ontario. He obtained his medical degree at Dalhousie University, Halifax, Nova Scotia. He then completed his Otolaryngology Head and Neck Surgery residency training at McMaster University in Hamilton, Ontario. He went on to complete a pediatric otolaryngology fellowship at Emory University in Atlanta, Georgia before returning to McMaster. His clinical interests are in pediatric head and neck surgery and pediatric airway disorders.

Affiliations: Division of Otolaryngology—Head and Neck Surgery, McMaster University, Hamilton, ON

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Understanding and Managing Adenotonsillar Hypertrophy in Pediatric Otolaryngology

Ivry Zagury-Orly, MD, MMSc
Jonathan MacLean, MD

Introduction

Adenotonsillar hypertrophy (ATH) is a common pediatric condition marked by the growth of lymphoid tissues within the Waldeyer's ring, which includes adenoids, palatine tonsils, and lingual tonsils. These tissues surround the upper airway and food passage, and play an immunological role, enlarging until about age 12, before gradually reducing during adolescence and adulthood.[1,2]

Untreated or poorly managed ATH can severely impact multiple health aspects of children.[3] It is the primary cause of upper airway obstruction and obstructive sleep apnea (OSA) syndrome in children, which disrupts sleep and can severely impair cognitive development, school performance and behaviour. Chronic mouth breathing from ATH can alter dental arches and facial growth, known as adenoid facies. More severe outcomes include increased pulmonary pressures and the potential development of pulmonary hypertension and cor pulmonale due to chronic hypoxia and CO_2 retention.

As a result, tonsillectomy, with or without adenoidectomy (T&A), has become one of the most frequently performed surgeries in North America, with over 530,000 operations performed annually on children under age 15.[4] This paper discusses the significant impact of ATH on pediatric health and the frequent need for surgical intervention. It covers the immunophysiology, influence of atopy, community-based assessments prior to specialist referrals, and an overview of available medical and surgical treatment options. Additionally, it outlines general indications for referring patients to otolaryngology.

Immunophysiology and Role of Atopy in Adenotonsillar Disease

The tonsils and adenoids, key components of the Waldeyer's ring, are central to immune defence in the aerodigestive tract.[5] Unlike other secondary lymphoid tissues, they lack afferent lymphatic vessels and are exposed directly to antigens via epithelial crypts that trap foreign materials, populated with immune cells like B and T lymphocytes, macrophages, and dendritic cells. This arrangement allows local and systemic immune responses by generating effector and memory lymphocytes. As children age, the immunological activity of these tissues gradually declines.

The specific role of atopy in ATH and associated disorders like OSA remains debated. Carr *et al.'s* study[6] using radioallergosorbent (RAST) tests, suggests that systemic atopy may not significantly influence ATH in pediatric sleep apnea, hinting at potential localized allergic reactions undetectable by systemic IgE assays. Costa *et al.*[7] found no direct link between atopy and ATH severity in mouth breathers, while Alexopoulos *et al.*[8] saw no significant correlation between eczema and either ATH or OSA prevalence, challenging the direct impact of atopy on these conditions.

In contrast, Cho *et al.*[9] provided evidence that local allergic reactions in adenotonsillar tissues might significantly contribute to ATH. They found that 68.6% of children had sensitization to at least one allergen in these tissues, higher than the 53.9% in serum, with inhalant allergens more common in adenoids and food allergens in tonsils. Children with local atopy also had a higher incidence of respiratory symptoms such as asthma and allergic rhinitis, highlighting the potential role of localized allergic inflammation in ATH and its symptoms. These findings illustrate the complex

relationship between atopic conditions and ATH, suggesting that localized immune responses in adenotonsillar tissues may be pivotal, requiring further focused research.

Clinical Evaluation

The initial assessment of adenotonsillar disease primarily depends on a thorough history and physical examination, as polysomnography (PSG)—the gold standard for diagnosing OSA—is often not readily accessible. Clinicians should collect detailed histories to detect symptoms such as snoring, mouth breathing and hyponasal speech, indicative of upper airway obstruction. Physical examinations focus on signs of ATH and features such as adenoid facies, including an open mouth, elongated face, high-arched palate, and dental malocclusion, which develop from chronic mouth breathing in children with prolonged adenoid hypertrophy.

Due to PSG's limited availability, alternative diagnostics like overnight pulse oximetry, and parental audio and video recordings during sleep can be used. These help identify desaturation patterns and capture episodes of apnea, aiding in quicker diagnosis and management of OSA or adenotonsillar hypertrophy. Before performing tonsillectomy and adenoidectomy, PSG is recommended for those with sleep-disordered breathing, under age 2, or with contributing conditions such as obesity or craniofacial abnormalities.

Routine labs, blood biomarkers and most radiographic evaluations, including lateral neck radiographs, are not typically advised for screening OSA or ATH due to their limited utility. However, specific imaging might be necessary for children with anatomical risks (e.g., craniofacial abnormalities). Management will depend on severity of symptoms, physical examination, age, and comorbidities.

Management Overview

Management of adenotonsillar disease and OSA in children entails both medical and surgical approaches, guided by the underlying cause. Acute adenotonsillar infections often require antibiotics effective against beta-lactamase-producing organisms, addressing symptoms through medication. Chronic conditions are generally managed surgically after other treatments fail.

For sleep-disordered breathing or confirmed OSA, anti-inflammatory treatments such as intranasal steroids and leukotriene receptor antagonists are used, targeting increased leukotriene activity noted in children with OSA. Studies demonstrate significant reductions in apnea-hypopnea index with treatments such as montelukast (from 9.2 to 4.2 events/hour),[10] and intranasal budesonide (from 3.7 to 1.3 events/hour).[11] There is no evidence for use of systemic steroids.[9] See **Table 1** for an overview of medical therapy.

Acute tonsillitis is managed with rapid strep antigen screening for accurate diagnosis, treating identified infections with penicillin or a clavulanic acid to combat beta-lactamase-producing pathogens.

Aside from medication, continuous positive airway pressure is the primary nonsurgical treatment for pediatric OSA. It involves delivering airway pressure through a mask to prevent airway obstruction, reduce sleep disturbances and ease breathing efforts. While adherence can be challenging, it can be improved with appropriate mask fitting, pressure adjustments and behavioural support interventions, such as desensitization or motivation enhancement programs led by specialists such as child psychologists or behavioural developmental pediatricians.[13]

Surgical interventions like tonsillectomy and adenoidectomy are generally reserved for recurrent infections or significant hypertrophy causing airway obstruction (see **Table 2** for general surgical indications and reasons for referral to otolaryngologist). T&A has shown significant improvements in behavioural and neurocognitive function, school performance and quality of life for up to 2 years post-surgery.[14]

Finally, environmental controls are imperative, including avoiding tobacco smoke, indoor pollutants and allergens to prevent airway issues. Weight loss is recommended for obese children with OSA but not for those with normal or low body weight. Overall, the approach to managing adenotonsillar disease and OSA involves a combination of targeted medical therapies and surgical intervention based on the severity of symptoms and underlying causes, with a focus on improving both nighttime and daytime clinical outcomes.

Medication	Primary Indication	Usage Details	Key Considerations
Intranasal Corticosteroids (INCS)	Mild-to-moderate OSA with nasal obstruction Adjunct or alternative to surgical intervention, or temporizing measure while awaiting other measures	Evaluate effectiveness after 4-6 weeks[13,15] Consider long-term use if beneficial (up to 6 months if prompt improvement[15])	Direct spray laterally inside the nostril to minimize contact with the nasal septum and reduce irritation.
Montelukast (Singulair)			Monitor for potential neuropsychiatric side effects, as outlined in medication warnings
Combination Therapy	Enhanced treatment effect for nasal obstruction and OSA	Follow individual medication guidelines; adjust based on therapeutic response	Combines the benefits of corticosteroids and montelukast for a synergistic effect on adenotonsillar reduction and symptom improvement

Table 1. Medical therapy for mild-moderate adenotonsillar disease; *courtesy of Ivry Zagury-Orly, MD, MMSc and Jonathan MacLean, MD.*

Surgery Type	Indication	Details and Specifics
Tonsillectomy (with or without adenoidectomy)	Obstructive sleep apnea (OSA)	First-line treatment for children over age 2 with adenotonsillar hypertrophy.[16] Associated with cardiovascular and cognitive morbidities if untreated.[17]
	Recurrent throat infection	Recommended for severely affected children (Paradise criteria[18]: ≥7 episodes in one year, ≥5 episodes in two years, or ≥3 episodes in three years), with each episode characterized by symptoms such as fever, cervical lymphadenopathy, tonsillar exudate, or positive culture for streptococci
	Peritonsillar abscess (PTA)	Recurrent PTA (>1) or severe recurrent pharyngitis in the context of a first episode of PTA, or persistent PTA (despite I&D)[19]
Adenoidectomy alone	Nasal obstruction	Indicated for severe obstruction due to adenoidal hypertrophy causing symptoms like mouth breathing and hyponasal speech. Moderate cases treated if symptoms present for ≥1 year unresponsive to conservative measures (i.e., 6-week trial of INCS).[15]
	Chronic sinusitis	Reasonable for children refractory to medical therapy, especially if considering endoscopic sinus surgery[20]
	Otitis media	Suggested in addition to tympanostomy tube (TT) placement for recurrent acute otitis media or chronic otitis media with effusion, who have previously had TT insertion.

Table 2. Common indications for surgical adenotonsillar treatment and referral to otolaryngologist; *courtesy of Ivry Zagury-Orly, MD, MMSc and Jonathan MacLean, MD.*

Conclusion

ATH not only impacts sleep quality in children but also affects their overall health and development, making timely and effective management crucial. This review underscores the importance of a comprehensive approach encompassing both medical and surgical strategies to address the multifaceted effects of ATH. By understanding the immunophysiology and exploring the role of atopy, as well as improving community-based assessments and referrals, clinicians can better identify and manage this prevalent condition. Surgical interventions such as tonsillectomy and adenoidectomy remain vital options, particularly in cases of significant obstruction or recurrent infections, demonstrating the need for tailored treatments based on individual patient characteristics and the severity of symptoms.

Correspondence

Jonathan MacLean, MD
Email: jmaclea@mcmaster.ca

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None declared.

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