The Laryngoscope

Pediatric Inferior Turbinate Hypertrophy: Diagnosis and Management. A YO-IFOS Consensus Statement

Antonino Maniaci, MD; Christian Calvo-Henriquez, MD; Giovanni Cammaroto, MD; Carlos Garcia-Magan, MD; Vanesa Garcia-Paz, MD; Giannicola Iannella, MD; Ignacio Jiménez-Huerta, MD; Ignazio La Mantia, MD; Jérome R. Lechien, MD, PhD, MS; Samuel C. Leong, MD; David Lobo-Duro, MD, PhD; Juan Maza-Solano, MD, PhD; Ron Mitchell, MD; Andrea Otero-Alonso, MD; You Peng, MD; Thomas Radulesco, MD, PhD, MS; François Simon, MD; Natasha Teissier, MD; Salvatore Cocuzza, MD; Alberto M. Saibene, MD, MA

Objective: Pediatric inferior turbinate hypertrophy (PedTH) is a frequent and often overlooked cause or associated cause of nasal breathing difficulties. This clinical consensus statement (CCS) aims to provide a diagnosis and management framework covering the lack of specific guidelines for this condition and addressing the existing controversies.

Methods: A clinical consensus statement (CCS) was developed by a panel of 20 contributors from 7 different European and North American countries using the modified Delphi method. The aim of the CCS was to offer a multidisciplinary reference framework for the management of PedTH on the basis of shared clinical experience and analysis of the strongest evidence currently available.

Results: A systematic literature review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria was performed. From the initial 96 items identified, 7 articles were selected based on higher-evidence items such as randomized-controlled trials, guidelines, and systematic reviews. A 34-statement survey was developed, and after three rounds of voting, 2 items reached strong consensus, 17 reached consensus or near consensus, and 15 had no consensus.

Conclusions: Until further prospective data are available, our CCS should provide a useful reference for PedTH management. PedTH should be considered a nasal obstructive disease not necessarily related to an adult condition but frequently associated with other nasal or craniofacial disorders. Diagnosis requires clinical examination and endoscopy, whereas rhinomanometry, nasal cytology, and questionnaires have little clinical role. Treatment choice should consider the specific indications and features of the available options, with a preference for less invasive procedures.

Key Words: endoscopy, guideline, nasal breathing difficulties, pediatric otolaryngology, rhinitis.

Level of Evidence: 5

***Laryngoscope*, 00:1–8, 2023**

From the Young Otolaryngologists–International Federation of Otorhinolaryngological Societies (A.M., C.C.-H., G.C., G.I., I.J.-H., J.R.L., S.C.L., D.L.-D., J.M.-S., Y.P., T.R., F.S., N.T., A.M.S.), Paris, France; Department of Medical, Surgical Sciences and Advanced Technologies G.F. Ingrassia (A.M., I.L.M., S.C.), University of Catania, Catania, Italy; Service of Otolaryngology, Rhinology Unit (C.C.-H.), Hospital Complex at the University of Santiago de Compostela, Santiago de Compostela, Spain; Otolaryngology Unit (G.C.), Morgagni Pierantoni Hospital, Forlì, Italy; Department of Pediatrics (C.G.-M.), Hospital Complex at the University of Santiago de Compostela, Santiago de Compostela, Spain; Allergy Department (V.G.-P., A.O.-A.), Hospital Complex at the University of Santiago de Compostela, Santiago de Compostela, Spain; Otorhinolaryngology Department (G.I.), Sapienza University of Rome, Rome, Italy; Service of Otolaryngology, Pediatric Otolaryngology Unit (I.J.-H.), Gregorio Marañon University Hospital, Madrid, Spain; Department of Human Anatomy and Experimental Oncology, Faculty of Medicine, UMONS Research Institute for Health Sciences and Technology (J.R.L.), University of Mons, Mons, Belgium; The Liverpool Head and Neck Centre (S.C.L.), Aintree University Hospital NHS Foundation Trust, Liverpool, UK; Otolaryngology Service (D.L.-D.), Hospital Universitario Marqués de Valdecilla, Santander, Spain; Otolaryngology Service (J.M.-S.), Hospital Universitario Virgen Macarena, Sevilla, Spain; Department of Pediatric Otolaryngology-Head and Neck Surgery, Children's Health (R.M.), Children's Medical Center Dallas, Dallas, Texas, U.S.A.; Department of Otolaryngology-Head & Neck Surgery (Y.P.), Western University, London, Ontario, Canada; Department of Otorhinolaryngology and Head and Neck Surgery, APHM, IUSTI, CNRS, La Conception University Hospital (T.R.), Aix Marseille University, Marseille, France; Otolaryngology Service, Université Paris Cité, Hôpital Necker-Enfants Malades (F.S.), APHP, Paris, France; Pediatric Otolaryngology Department (N.T.), Robert-Debré Hospital, Paris 7 Denis Diderot University, Paris, France; and the Otolaryngology Unit, ASST Santi Paolo E Carlo, Department of Health Sciences (A.M.S.), Università Degli Studi Di Milano, Milan, Italy.

Additional supporting information may be found in the online version of this article.

Editor's Note: This Manuscript was accepted for publication on July 08, 2023.

Antonino Maniaci and Christian Calvo-Henriquez contributed equally to this manuscript.

Salvatore Cocuzza and Alberto Maria Saibene contributed equally to this manuscript.

The authors have no other funding, financial relationships, or conflicts of interest to disclose.

Send correspondence to Alberto Maria Saibene, Otolaryngology Unit, ASST Santi Paolo e Carlo, Via Antonio di Rudinì 8, 20142 Milan, Italy. Email: alberto.saibene@unimi.it

DOI: 10.1002/lary.30907

INTRODUCTION

Chronic nasal obstruction resulting from hypertrophy of the inferior nasal turbinate is a common disorder in the pediatric population that is often associated with adenoid hypertrophy or other rhinological comorbidities.[1–3] Several studies have shown that adenoidectomy alone may not improve nasal breathing in a high percentage of affected children.[4–6] In such cases, pediatric turbinate hypertrophy (PedTH) might represent a comorbidity amenable to surgical treatment. Previous guidelines have addressed medical but not surgical options in children.[7–9] Consequently, PedTH management remains a controversial topic, and many pediatric rhinologists express concerns about surgical management in this population.[9–12] One of the principal concerns reported by otolaryngologists about performing turbinate surgery is the lack of specific guidelines in children.[13]

The aim of this clinical consensus statement (CCS) is to offer the expertise of an experienced international group of otolaryngologists for the management of PedTH, as determined by a modified Delphi process, using widespread experience and the best currently available evidence.

METHODS

The CCS was developed according to the modified Delphi protocol proposed by Rosenfeld et al.[14] Given the nature of the study, specific approval from an internal review committee was not required. The focus of the CCS was to provide specific guidelines for the management of PedTH.

Panelists' Selection and Purpose of the Consensus Statement

The panel consisted of 20 contributors (17 rhinologists, 8 of whom are in pediatric otolaryngology practices, and 3 pediatric allergologists) from 7 different European and North American countries.

The development panel consisted of a chair (AM), an assistant chair (CCH), and a methodologist (AMS). The rhinologists were recruited from the rhinologist section of the Young Otolaryngologist-International Federation of Otorhinolaryngologists (YO-IFOS) on a voluntary basis according to their clinical and research interests in the CCS subject. The two pediatric allergologists were selected on the basis of their specialized training in the context of other ongoing research collaborations with the original group members. No authors reported potential conflicts of interest.

Literature Review

We performed a systematic literature review according to the Preferred Reporting Items for Systemic Reviews and Meta-Analyses (PRISMA) criteria in multiple databases (MEDLINE, EMBASE, Scopus, and Web of Science). The basic search query was [(pediatric OR child) AND ("turbinate hypertrophy" OR turbinoplasty OR turbinectomy OR "turbinate surgery")]. The research strategy adopted was used on May 3, 2022, to identify published studies in English, Italian, German, French, or Spanish that focused on patients with PedTH.

Ninety-six unique articles were identified through the database search. Seventy-five low-evidence articles were excluded based on Rosenfeld et al. CCS recommendations, limiting the selection to randomized-controlled trials, guidelines, and systematic reviews. From the remaining 21 articles, 14 were removed after full-text examination as they were not concerning PedTH. The remaining seven articles were prepared and distributed to all CCS authors for their review during a period of 1 month. The article selection process is summarized in the PRISMA flowchart (Fig. 1), and the list of selected articles is included in Appendix S1.

Clinical Statement Development and Modifications in the Delphi Survey

The chair and assistant chair generated the core clinical statements for the survey based on the literature review performed and the aims of the CCS. The statements were further expanded and elaborated on by the methodologist. A total of 34 statements were compiled based on the literature review and the study group's assessment of relevant clinical scenarios. The first draft of the survey was circulated among the panelists, who were asked to propose statements modifications or entirely new statements that they felt were useful for the scope of the CCS. All panelists were contacted both personally by chair or co-chair and by group emails to encourage participation and representation of all viewpoints. No modifications or new statements were proposed preliminarily. Consequently, a final 34-statement survey was developed and distributed to the authors via Google Forms (Google LLC, Mountain View, CA, USA). The 34 statements were subdivided into the following sections: definition, diagnostic workup, general treatment principles, surgical treatment, adjunctive medical therapies, and follow-up. We instructed all authors to complete the survey anonymously through the personalized and single-use link provided. Each author reported their level of agreement with a 9-point Likert scale (from strongly disagree[1] to strongly agree[9]) for each statement, with the option of voicing their opinions anonymously after voting for each item.

We defined the results for each statement as follows[14]:

- Strong consensus = mean score of ≥8.00 with no outliers (defined as any rating 2 or more Likert points from the mean in either direction);
- Consensus = mean score of ≥7.00 with no more than 1 outlier;
- Near consensus = mean score of ≥6.50 with no more than 2 outliers;
- No consensus = all other statements.

After the first survey round, 1 of 34 statements reached a strong consensus, 12 of 34 statements reached a consensus, 6 statements reached a near consensus, and 15 statements reached no consensus. Items with a mean score lower than 7 were dropped from the CCS. The remaining 19 near- or no-consensus items were rephrased based on anonymous comments from the authors for inclusivity and clarity. During the second survey round, 2 items reached a strong consensus, 6 items a consensus, 8 items a near consensus, and 3 items did not reach a consensus. Second-round items that did not progress toward a better consensus stage (i.e., from no consensus to at least near consensus, or from near consensus to at least consensus) were again dropped from the CCS. Thus, we prepared a third and final 6-item round after some rewording, in which 2 items reached a strong consensus and 4 items a near consensus.

RESULTS

All the panelists participated in the three Delphi rounds. Out of the initial 34 statements, 5 reached a strong consensus, 18 reached a consensus, 7 reached a

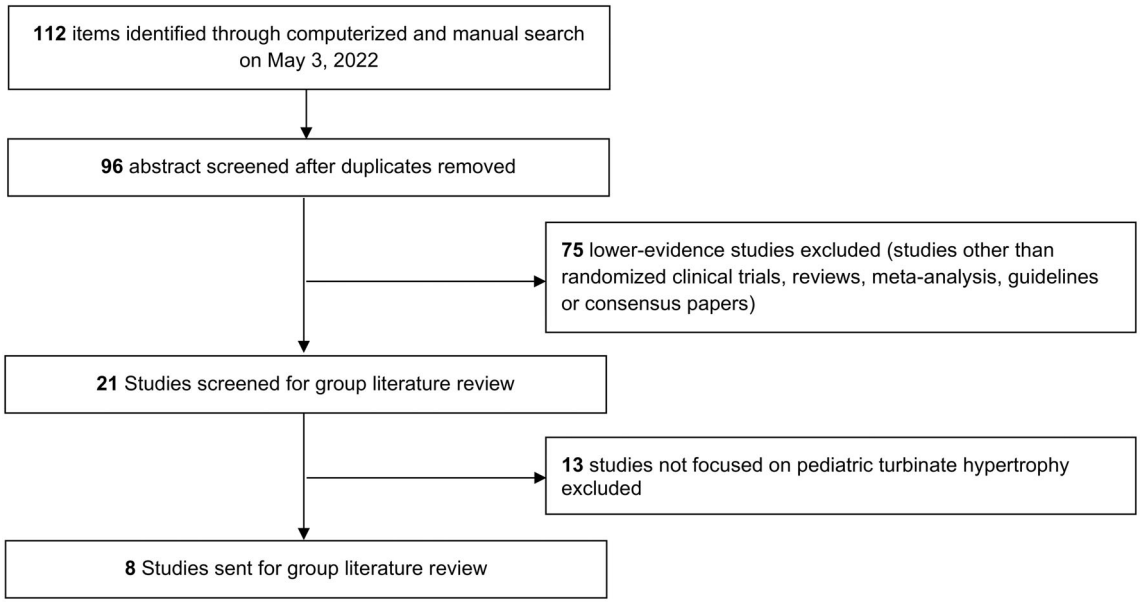

Fig. 1. PRISMA-style flowchart of the article selection process.

TABLE I.
Statements and Results from the Delphi Process for Items Reaching Consensus or Strong Consensus: Definition.

Item No.	Final Statement Version	Mean	Median	Outliers
1a	Pediatric turbinate hypertrophy (PedTH) is defined as an enlargement of the inferior nasal conchae, such that it causes or worsens nasal breathing problems	8.21	9	1
1b	There is no fixed turbinate-septum distance that defines a normotrophic turbinate	8.16	9	1
1c	Pediatric turbinate hypertrophy (PedTH) is mainly characterized by bilateral nasal obstruction. It can be reversible with nasal decongestants, and potentially accompanied by open mouth posture, and/or positive misting test	8.61	9	1

PedTH = pediatric turbinate hypertrophy.

TABLE II.
Statements and Results from the Delphi Process for Items Reaching Consensus or Strong Consensus: Diagnostic Workup.

Item no.	Final Statement Version	Mean	Median	Outliers
2a	Anterior rhinoscopy should be considered a first-level diagnostic tool for identifying turbinate hypertrophy.	8.32	9	1
2c	In PedTH patients, bilateral fiberoptic examination is recommended for identifying obstructive co-factors such as adenoid hypertrophy, posterior septal deviations, CRS, or LPR.	8.44	9	1
2d	Adenoid hypertrophy, septal deviation, craniofacial anomalies partially or completely obstructing the nasal fossae, CRS, allergic rhinitis, laryngopharyngeal reflux, or nasal polyps may represent obstructive co-factors accompanying PedTH.	8.72	9	0
2 h	Imaging techniques such as head X-ray, orthopantomography, CT, CBCT, and MR do not have a routine role in PedTH evaluation	8.11	9	1
2 k	A complete allergology workup is highly recommended in patients with PedTH and other signs and/or symptoms of atopy.	8.42	9	0

CBCT = cone-beam CT; CRS = chronic rhinosinusitis; CT = computed tomography; LPR = laryngopharyngeal reflux; MR = magnetic resonance; PedTH = pediatric turbinate hypertrophy.

near consensus, and 4 failed to reach any consensus. Appendix S2 describes the evolution of the statements from the first round to the third round of Delphi.

The final version of all 34 statements, along with their mean and median scores, and the number of outlier scores is shown in Tables I–V (strong consensus and consensus

TABLE III.
Statements and Results from the Delphi Process for Items Reaching Consensus or Strong Consensus: General Treatment Principles.

Item No.	Final Statement Version	Mean	Median	Outliers
3a	The first-level therapy for PedTH is medical and relies on INCS and saline irrigations.	8.31	9	1
3b	Patients and caregivers should be given proper instructions on how to perform INCS administration and saline irrigations to maximize effectiveness and improve compliance.	8.57	9	1
3c	Tentative medical therapy failure should be defined as no significant improvement in symptoms after a 3-month trial of correctly performed therapy.	8.31	9	0
3d	Pediatric turbinoplasty should not be offered as a treatment for pediatric chronic rhinosinusitis alone.	7.95	9	1
3e	Pediatric turbinoplasty may be offered to PedTH patients only after medical therapy failure.	8.33	9	1
3f	Pediatric turbinoplasty could be performed with other pediatric otolaryngology procedures (e.g., myringotomy, adenoidectomy, tonsillectomy, adenotonsillectomy, or functional endoscopic sinus surgery).	8.78	9	0
3 g	Pediatric turbinoplasty should be performed with minimally invasive techniques (such as coblator, radiofrequency or microdebrider-assisted inferior turbinoplasty), avoiding extensive turbinate mucosa removal as these procedures have demonstrated a good safety profile in children.	8.32	9	1
3 h	Surgical treatment for PedTH should be considered a beneficial adjunctive to medical therapies in cases of allergic rhinitis	7.68	8	1
3i	Surgical treatment should be considered only to improve outcomes for PedTH patients who did not respond to empiric medical therapy.	7.84	8	1

INCS = intranasal corticosteroids; PedTH = pediatric turbinate hypertrophy.

TABLE IV.
Statements and Results from the Delphi Process for Items Reaching Consensus or Strong Consensus: Surgical Treatment.

4b	INCS treatment after surgical PedTH treatment may consolidate or improve outcomes	8.44	9	1
4c	One year after the recurrence of pathology and refractoriness to topical treatments, a new surgical treatment could be offered to the patient	7	7	1
4d	Adenoidectomy and turbinate reduction surgery may be performed in the same surgical setting, provided correct indications for both procedures are met	8.5	9	1

PedTH = pediatric turbinate hypertrophy.

TABLE V.
Statements and Results from the Delphi Process for Items Reaching Consensus or Strong Consensus: Follow-up.

6a	Patients with PedTH satisfactorily responding to medical therapy alone should be offered adequate and personalized follow-up to define long-term treatments, INCS washout periods, and need for further treatments	8.11	8	0
6b	Short-term follow-up after pediatric turbinoplasty is recommended to allow for crusts toileting, healing process, and outcome assessments	8.22	9	1
6c	After proper healing from pediatric turbinoplasty, the patient should be evaluated between 1 to 3 months to assess therapeutic success, define the timing of other treatments and long-term therapeutic success, and schedule further follow-up	8.21	9	1

INCS = intranasal corticosteroids; PedTH = pediatric turbinate hypertrophy.

items, subdivided in the 5 survey sections with consensus items), Table VI (near consensus items), and Table VII (no consensus items). Statements are reported in the latest version in which they were proposed in the CCS.

The two highest scoring strong consensus items were "Pediatric turbinoplasty could be performed with other pediatric otolaryngology procedures" (mean score: 8.78, median score: 9; no outliers) and "Adenoid hypertrophy, septal deviation, craniofacial anomalies partially or completely obstructing the nasal fossae, chronic rhinosinusitis (CRS), allergic rhinitis, laryngopharyngeal reflux, or nasal polyps may represent obstructive co-factors accompanying PedTH" (mean score: 8.72, median score: 9; no outliers).

At the other end of the spectrum, the two lowest scoring items were "Adenoid hypertrophy is commonly

TABLE VI.
Statements and Results from the Delphi Process for Items Reaching Near Consensus.

Item No.	Final Statement Version	Mean	Median	Outliers
Diagnostic workup				
2b	Validated questionnaires (e.g., SN-5, CaratKids, or Ped-AR-QoL) can help define disease severity and treatment response for PedTH	7.74	8	2
2e	Adenoid hypertrophy is commonly accompanied by rhinitis as the adenoid increases in size	6.63	7	2
2f	The Camacho PedTH classification could be used to evaluate the inferior turbinate-septum space mostly in a research environment, despite retaining a clinical validation	6.68	7	2
2 g	Assessing potentially related conditions, such as secretory otitis media, excessive vertical growth of the face, temporomandibular joint disorders, and malocclusion, could be useful in PedTH patients	7.94	9	2
2j	In adequately collaborating patients, rhinomanometry performed before and after a topic decongestant test, may better define the obstructive role of PedTH, both in clinical and research contexts	7.58	8	2
Surgical treatment				
4a	Mucosal sparing surgical techniques (coblation, radio frequency, microdebrider-assisted, and outfracture) are favored over electrocautery, or turbinectomy, as the latter pose a higher long-term complication risk	8.11	9	2
Adjunctive medical therapies				
5a	A course of 2–4 weeks of saline irrigations performed 3–6 times per day may be recommended after pediatric turbinoplasty to improve healing and reduce synechiae formation	8	9	2

PedTH = pediatric turbinate hypertrophy.

TABLE VII.
Statements and Results from the Delphi Process for Items not Reaching Consensus or Near Consensus.

Item No.	Final Statement Version	Mean	Median	Outliers
Diagnostic workup				
2i	Rhinomanometry and acoustic rhinometry without decongestant could help objectivating nasal breathing problems, though it cannot discriminate obstruction due to PedTH from other potential causes	7.44	8	3
2 l	Nasal cytology could be helpful in diagnostic workup, especially in PedTH patients who have not responded to empiric medical therapy and could play a prognostic role in surgical treatment success	6.05	6	4
Adjunctive medical therapies				
5b	Allergic rhinitis signs or symptoms persisting after pediatric turbinoplasty represent a strong recommendation for an allergology re-evaluation for diagnostic and therapeutic purposes	8.1	9	3
5c	Unilateral PedTH represents an adequate surgical indication, provided a complete workup rules out other potential causes of unilateral nasal obstruction	7.78	8	3

PedTH = pediatric turbinate hypertrophy.

accompanied by rhinitis as the adenoid increases in size." (mean score: 6.63, median score: 7; 2 outliers), and "Nasal cytology could be helpful in diagnostic workup, particularly in PedTH patients who have not responded to empiric medical therapy, and could play a prognostic role in surgical treatment success" (mean score: 6.05, median score: 6; 4 outliers). Both of these statements were dropped from the CCS after the first round due to scoring less than 7.

DISCUSSION

Preliminary Considerations

This PedTH CCS is the first consensus document that systematically addresses the diagnostic and therapeutic workflow surrounding this common yet often overlooked condition. The resulting position should improve the care for children and offer guidance to otolaryngologists, for managing both difficult cases, or to associated specialties in referring patients for rhinology evaluation.

Due to the lack of strong literature evidence on the subject, it has to be noted that most of the statements introduce options to the practitioner instead of providing strict rules. Though this may limit the scope of this CCS, it should be apparent that, unless further evidence emerges, we must remain as cautious as possible in the pediatric population.

Definition

Given that a clear definition of PedTH was not found in the literature, reaching a consensus on the first three items (1a, 1b, and 1c) is indeed important. According to our CCS, PedTH is defined as an enlargement of the

inferior nasal conchae that causes or worsens nasal breathing problems, usually bilaterally, that is decongestant-reversible and potentially accompanied by open mouth posture, and/or by a positive misting test (misting of a mirror or metal surface as the patient breathes through the nose).

Diagnostic Workup

Though impaired nasal breathing has been shown to affect the quality of life in children,[15] there is significant heterogeneity among studies with regard to subjective severity assessment, little use of validated scales, and poor correlation with objective measures.[15–18] Therefore, it was unsurprising that the use of the Camacho classification,[19] rhinomanometry, and specific evaluation scales did not reach a consensus in this CCS. On the other hand, the panel position is that, although anterior rhinoscopy still retains its role in first-line evaluation, a bilateral fiberoptic examination is recommended for identifying obstructive cofactors (i.e., adenoid hypertrophy, the severity of which is independent of the degree of allergic rhinitis; posterior septal deviations; CRS; allergic rhinitis; craniofacial anomalies; laryngopharyngeal reflux; or nasal polyps). Consensus against the use of imaging techniques was also reached, due to their limited utility and concerns about unnecessary exposure to radiation.

To date, no standard method for evaluating turbinate hypertrophy in children is available.[7,8,21,22] Moreover, the literature shows a great deal of heterogeneity in the methods used in clinical assessment and the objective evaluation of surgical outcomes.[9,20–23]

In this CCS, it is interesting to note that pediatric rhinologists were not supportive of the use of rhinomanometry to assess nasal airflow, a technique that is more widely used in adults. A study by Welkoborsky et al. reported reproducible rhinomanometric measurements in 427 children for the objective assessment of nasal obstruction and to determine the effects of nasal decongestant drops.[24] Furthermore, published normative data are available for the decongestant test in children with turbinate hypertrophy.[3] However, defining normal flow values by age is challenging, as the results can be highly variable.[25] Laine-Alava et al. hypothesized that the increase in nasal airway size is not uniform during growth in school-age children and is typically completed at approximately 17 years of age.[26] Moreover, rhinomanometry can be time-consuming and cumbersome in children.[27]

The panel for this CCS supported allergological evaluation but not nasal cytology. The former is consistent with clinical practice guidelines for allergic rhinitis, which recommend allergy testing as both a useful diagnostic and prognostic tool for treatment response in cases of obstructive rhinitis.[20] The latter position is consistent with the highly debated role of nasal cytology. Although some evidence correlates nasal cytology with mucosal inflammatory status, several studies have argued against its usefulness.[28–31] Combining a complete endoscopic evaluation with an allergological evaluation in potentially atopic patients might allow for the identification of the etiology underlying PedTH or other comorbidities in a selected population. In this population, the comorbidities (such as chronic rhinosinusitis) or underlying etiologies (such as atopy) upon identification should be treated according to the respective guidelines to maximize treatment effectiveness and outcomes. It has to be noted that the statements included in this CCS do not include tests focused on identification of other less obvious etiologies such as vasomotor rhinitis and they do not propose different treatment options or timings for different etiologies, a point that should be further explored by clinical research.

General Treatment Principles

One of the strongest points of this CCS is the general consensus for the treatment of PedTH and indications for surgery. First-line management of PedTH remains medical, with nasal saline irrigation (NSI) and intranasal corticosteroids (INCS) as first-line options that promote thinning of the mucosa, and improve mucociliary clearance, and edema.[32] Properly administered, NSI and INCS should be prescribed for at least 3 months, before the medical therapy is assessed as unsuccessful, and prior to considering pediatric turbinoplasty.

Surgical Treatment

As confirmed by our CCS, the surgical treatment of PedTH should be considered a useful adjunct to medical therapies, as well as beneficial for patients with allergic rhinitis. Our CCS delineates how pediatric turbinoplasty should rely on minimally invasive techniques, which could be combined with other pediatric otolaryngology surgical procedures, as long as the respective eligibility criteria are met. Indeed, several surgical techniques employed by pediatric otolaryngologists for PedTH have been described. Radiofrequency, coblation, and microdebrider-assisted turbinoplasty (MAIT) currently represent the most common options.[9] Although no differences in objective results are reported in the literature, the rate of complications is higher in patients undergoing diathermy.[33] Therefore, due to the lack of quality of the selected research and of comparisons between the different approaches to date, it is difficult to make a formal recommendation in terms of outcomes; thus, safety and minimal mucosal damage are the primary treatment goals in children.[34–37] According to our CCS, pediatric turbinoplasty should be performed with minimally invasive techniques, including none to minimal turbinate mucosa removal, as such techniques have demonstrated improved safety profiles in children.[33]

Adjunctive Medical Therapies

This section was the only section not reaching consensus for any single item. The statement on duration and preferable methods of post-surgical nasal care for patients did not reach a consensus, most likely due to the multiple non-evidence-based protocols in use by various rhinological teams and the low quality of the existing literature on the subject. Secondly, the panel did not feel as recommending treatment of unilateral PedTH, as this

condition is not well-studied and likely to be secondary to other causes of nasal obstruction in children.

Lastly, allergological evaluation for symptom persistence did not reach a consensus, as some panel members felt that this evaluation should be carried out routinely before turbinoplasty, and patients failing therapy should restart a more thorough evaluation.

Follow-up

The panel agreed that appropriate follow-up of pediatric patients was important and should include a clinic visit between 1 and 3 months after turbinoplasty to evaluate therapeutic outcomes and to determine the potential timing of further treatment. The patient may indeed benefit, as defined by our CCS, from adjuvant treatment with nasal irrigations, INCS, and regular follow-up with nasal toilet. In the literature, a topic under debate concerns whether surgical treatment should be repeated in cases of recurrence, and our panel suggested that a second surgical intervention could be offered only after a minimum interval of 1 year had elapsed since the first surgery. Refractoriness of adjuvant topical treatments in the presence of eventual pathologic recurrence has been identified as a parameter for surgical retreatment.

It is also important that non-surgical patients (i.e., patients with PedTH satisfactorily responding to medical therapy alone) be offered an adequate and personalized follow-up to discuss long-term treatments, INCS washout periods, and the need for further interventions.

Limitations and Directions for Future Research

The results of this CCS are somewhat limited by the low overall quality of the currently available scientific evidence on this topic and are largely based on retrospectively collected data. Furthermore, given the lack of data, we were unable to provide more age specifications for the pediatric population, which is considered a continuum until adulthood in this article, though there are understandable differences in managing PedTH in younger children than during adolescence. Sticking to this age continuum through the CCS was again motivated by caution in a potentially fragile population whenever substantial evidence is not available. Indeed, we hope that this CCS might represent a call to action for developing studies differentiating treatment options in the pediatric population according to age or developmental status.

Analogously, given the overlap of PedTH symptoms with other comorbidities such as CRS or underlying etiologies as atopy, we are presently unable to provide specific guidance for tailoring PedTH in all patients (in terms of dose and time and potential use of surgery). When other major etiologies or comorbidities are present, this CCS should be integrated with the respective guidelines where available, to offer the best treatment options to patients. Specific studies exploring PedTH in patients with other comorbidities could allow for providing more tailored screening and therapeutic tools that we feel missing from the current body of the literature.

Similarly, there is an inherent need for prospective studies that investigate the more disputed areas of PedTH, such as the objective evaluation of treatment indications and outcomes. Outcomes from prospective studies would lead to a reduction in specialist consultations and, most importantly, avoid therapeutic failures in other common clinical scenarios of pediatric nasal breathing difficulties, where PedTH remains a frequently neglected comorbidity.

Last, this CCS did not explore if and when patients and family, after appropriate counseling, might be advised not to treat PedTH and proposed for simple follow-up. In these regards, we are missing important tools for assessing the severity of PedTH and current research does not offer enough information on the potential long-term issues of unrated PedTH. Developing *ad hoc* studies in patients where other comorbidities or underlying causes have been excluded could be key in obtaining such fundamental information for correct guidance of pediatric patients and their families, even for an apparently simple condition such as PedTH.

CONCLUSION

This CCS can be used to provide pertinent PedTH management suggestions until further prospective evidence allows for creating more specific guidelines. PedTH should be considered a nasal obstructive disease that is not necessarily related to the adult condition, but one that is frequently associated with other nasal or craniofacial disorders. Diagnosis relies on anterior rhinoscopy and endoscopy, whereas other tools such as rhinomanometry, nasal cytology, and clinical assessment questionnaires remain controversial in everyday practice. On the other hand, an allergology workup is of the utmost importance in children presenting symptoms or signs of atopy. The treatment choice should also take into consideration the specific indications and features of each technique, with a preference, if possible, for less invasive ones. In these regards, surgical treatment of PedTH should be offered, alone or performed in combination with other pediatric otolaryngology procedures, only after failure of adequate medical therapy.

BIBLIOGRAPHY

1. Komshian SR, Cohen MB, Brook C, Levi JR. Inferior turbinate hypertrophy: a review of the evolution of Management in Children. *Am J Rhinol Allergy*. 2019;33(2):212-219.
2. Ciprandi G, Tosca MA, Gallo F, et al. Turbinate hypertrophy in children with allergic rhinitis: clinical relevance. *Acta Biomed*. 2020;91(1-S):43-47.
3. Calvo-Henriquez C, Mayo-Yáñez M, Lechien JR, et al. Looking for a cutoff value for the decongestant test in children suffering with turbinate hypertrophy. *Eur Arch Otorhinolaryngol*. 2021;278(10):3821-3826.
4. O'Connor-Reina C, Garcia-Iriarte MT, Angel DG, et al. Radiofrequency volumetric tissue reduction for treatment of turbinate hypertrophy in children. *Int J Pediatr Otorhinolaryngol*. 2007;71(4):597-601.
5. Chen YL, Liu CM, Huang HM. Comparison of microdebrider-assisted inferior turbinoplasty and submucosal resection for children with hypertrophic inferior turbinates. *Int J Pediatr Otorhinolaryngol*. 2007;71(6):921-927.
6. Calvo-Henriquez C, Lechien JR, Méndez-Benegassi I, et al. Pediatric turbinate radiofrequency ablation improves quality of life and rhinomanometric values. A prospective study. *Int J Pediatr Otorhinolaryngol*. 2022;154:111050.
7. Roberts G, Xatzipsalti M, Borrego LM, et al. Paediatric rhinitis: position paper of the European academy of allergy and clinical immunology. *Allergy*. 2013;68(9):1102-1116.

8. Lucas Moreno J, Moreno Salvador A, Ortega BM. Patología alérgica de vías respiratorias superiores. *Protoc Diagn ter Pediatr*. 2019;2:133-148.
9. Jiang ZY, Pereira KD, Friedman NR, Mitchell RB. Inferior turbinate surgery in children: a survey of practice patterns. *Laryngoscope*. 2012; 122(7):1620-1623.
10. Calvo-Henriquez C, Martínez-Seijas P, Boronat-Catalá B, et al. Assessing the ability of children and parents to rate their nasal patency. A cross sectional study. *Int J Pediatr Otorhinolaryngol*. 2022;156:111094.
11. Karabulut B, Sahin-Onder S, Erkmen B, et al. Predictive fiberoptic endoscopic findings of upper airway in children with allergic rhinitis. *Int J Pediatr Otorhinolaryngol*. 2019;124:143-146.
12. Rejali SD, Upile T, McLellan D, Bingham BJG. Inferior turbinate reduction in children using holmium YAG laser-a clinical and histological study. *Lasers Surg Med*. 2004;34(4):310-314.
13. Calvo-Henriquez C, Tucciarone M, Lechien JR, et al. Turbinate surgery in pediatric patients: A worldwide survey. *Acta Otorrinolaringol Esp*. 2023; 74:93-100.
14. Rosenfeld RM, Nnacheta LC, Corrigan MD. Clinical consensus statement development manual. *Otolaryngol Head Neck Surg*. 2015;153(2):1-14.
15. Valls-Mateus M, Marino-Sanchez F, Ruiz-Echevarría K, et al. Nasal obstructive disorders impair health-related quality of life in adolescents with persistent allergic rhinitis: a real-life study. *Pediatr Allergy Immunol*. 2017;28(5):438-445.
16. Mendes AI, Wandalsen GF, Solé D. Objective and subjective assessments of nasal obstruction in children and adolescents with allergic rhinitis. *J Pediatr*. 2012;88(5):389-395.
17. Isaac A, Major M, Witmans M, et al. Correlations between acoustic rhinometry, subjective symptoms, and endoscopic findings in symptomatic children with nasal obstruction. *JAMA Otolaryngol Head Neck Surg*. 2015;141(6):550-555.
18. Hol MK, Huizing EH. Treatment of inferior turbinate pathology: a review and critical evaluation of the different techniques. *Rhinology*. 2000;38(4):157-166.
19. Camacho M, Zaghi S, Certal V, et al. Inferior turbinate classification system, grades 1 to 4: development and validation study. *Laryngoscope*. 2015;125(2):296-302.
20. Seidman MD, Gurgel RK, Lin SY, et al. Clinical practice guideline: Allergic rhinitis. *Otolaryngol Head Neck Surg*. 2015;152(1):1-43.
21. Valero A, Navarro AM, Del Cuvillo A, et al. Position paper on nasal obstruction: evaluation and treatment. *J Investig Allergol Clin Immunol*. 2018;28(2):67-90.
22. Leong SC, Kubba H, White PS. A review of outcomes following inferior turbinate reduction surgery in children for chronic nasal obstruction. *Int J Pediatr Otorhinolaryngol*. 2010;74(1):1-6.
23. Hellings PW, Klimek L, Cingi C, et al. Non-allergic rhinitis: position paper of the European academy of allergy and clinical immunology. *Allergy*. 2017;72(11):1657-1665.
24. Welkoborsky HJ, Rose-Diekmann C, Vor der Holte AP, et al. Clinical parameters influencing the results of anterior rhinomanometry in children. *Eur Arch Otorhinolaryngol*. 2022;279(8):3963-3972.
25. Principato JJ, Wolf P. Pediatric nasal resistance. *Laryngoscope*. 1985;95(9): 1067-1069.
26. Laine-Alava MT, Murtolahti S, Crouse UK, Warren DW. Guideline values for minimum nasal cross-sectional area in children. *Cleft Palate Craniofac J*. 2018;55(8):1043-1050.
27. Cilluffo G, Zicari AM, Ferrante G, et al. Assessing repeatability and reproducibility of anterior active rhinomanometry (AAR) in children. *BMC Med Res Methodol*. 2020;20(1):86.
28. Fokkens WJ, Lund VJ, Hopkins C, et al. European position paper on rhinosinusitis and nasal polyps 2020. *Rhinology*. 2020;58(29):1-464.
29. Parisi GF, Manti S, Papale M, et al. Nasal nitric oxide and nasal cytology as predictive markers of short-term sublingual allergen-specific immunotherapy efficacy in children with allergic rhinitis. *Am J Rhinol Allergy*. 2022;36(3):323-329.
30. Meltzer EO, Orgel HA, Rogenes PR, Field EA. Nasal cytology in patients with allergic rhinitis: effects of intranasal fluticasone propionate. *J Allergy Clin Immunol*. 1994;94(4):708-715.
31. Cassano M, Russo L, Del Giudice AM, et al. Cytologic alterations in nasal mucosa after sphenopalatine artery ligation in patients with vasomotor rhinitis. *Am J Rhinol Allergy*. 2012;26(1):49-54.
32. Succar EF, Turner JH, Chandra RK. Nasal saline irrigation: a clinical update. *Int Forum Allergy Rhinol*. 2019;9(1):S4-S8.
33. Calvo-Henriquez C, Capasso R, Martínez-Capoccioni G, et al. Safeness, subjective and objective changes after turbinate surgery in pediatric patients: a systematic review. *Int J Pediatr Otorhinolaryngol*. 2020;135:110128.
34. Bitar MA, Kanaan AA, Sinno S. Efficacy and safety of inferior turbinates coblation in children. *J Laryngol Otol*. 2014;128(2):S48-S54.
35. Siméon R, Soufflet B, Souchal DI. Coblation turbinate reduction in childhood allergic rhinitis. *Eur Ann Otorhinolaryngol Head Neck Dis*. 2010; 127(2):77-82.
36. Arganbright JM, Jensen EL, Mattingly J, Gao D, Chan KH. Utility of inferior Turbinoplasty for the treatment of nasal obstruction in children: a 10-year review. *JAMA Otolaryngol Head Neck Surg*. 2015;141(10): 901-904.
37. Araki S, Suzuki N, Sato H, et al. Endoscopic laser treatment for pediatric nasal allergy. *Diagn Ther Endosc*. 2000;6(4):189-192.