ADENOID ASSESSMENT IN PAEDIATRIC PATIENTS: THE ROLE OF FLEXIBLE NASAL ENDOSCOPY

PAGELLA F[1], PUSATERI A[1], CHU F[1], CAIRELLO F[2], BENAZZO M[1], MATTI E[1], MARSEGLIA GL[2].

[1] *Department of Otorhinolaryngology - Foundation IRCCS Policlinico San Matteo, Pavia, Italy*
[2] *Department of Pediatrics, University of Pavia - Foundation IRCCS Policlinico San Matteo, Pavia, Italy*

Adenoid hypertrophy is the most common cause of nasal obstruction in paediatric patients. Over the years, various methods to assess the adenoid size were proposed such as the posterior rhinoscopy and the radiological examination of the nasopharynx. Nasal endoscopy was introduced for children in the 80's, and nowadays this is a known and diffuse method in routine practice. The purpose of this article is to describe the personal experience in the assessment of the adenoid size in children, with a particular regard to the flexible nasal endoscopy, and to analyse the literature reports. The personal technique is described in performing nasal endoscopy in paediatric patients, reporting advantages and possible disadvantages of the procedure. A retrospective analysis was conducted on 6036 children since 1999 to 2010. In most cases children fully collaborated to complete the exam. No major or minor complications (such as nose bleedings or other traumatic injuries) were observed. No topical intranasal decongestant, local or general anaesthesia were used in our series. In our opinion, nasal endoscopy in children is a reliable, safe, accurate, easily tolerated and dynamic diagnostic method to assess the adenoid size.

In paediatric patients, adenoid hypertrophy is described as the most common cause of nasal obstruction [1,2]. Various methods to assess the adenoid size were reported in the past such as the posterior rhinoscopy with a laryngeal mirror and the radiological examination of the nasopharynx. Flexible fiberoptic nasal endoscopy was introduced for children in the 80's, and nowadays this is a known and diffuse method in ENT routine practice as allows a direct visualization of the districts of interest and enables a correct diagnosis.

Nasal symptoms, including obstruction, mouth breathing, snoring, sleep apnoea and speech impairment (rhinolalia and changes in phoneme production) are common in paediatric patients [1,2]. Nasal obstruction in children is usually due to enlarged adenoidal tissue, but other causes should be considered: allergic rhinitis may also produce the "adenoidal face" usually attributed to adenoid hypertrophy [3]. Rhinosinusitis is a quite common finding in children; also nasal polyposis should be considered, though it is uncommon in the paediatric age and it is often related to cystic fibrosis [4,5]. A significant septal deviation has been found in 18% of children complaining nasal obstruction [6]. Other rarer causes of obstruction may be undiagnosed if a fiberoptic nasal endoscopy is not performed. Some authors reported that X-ray of the nasal cavity is as important as clinical examination in children complaining nasal symptoms [7]. Paradise et al. have chosen the radiological examination as a gold standard for the diagnosis of adenoidal hypertrophy because it well correlates with volume of adenoid tissue removed during surgery [8]. However, it should be considered that the execution of a radiography causes the exposition of the children to radiations [9]. The first nasal endoscopy in humans was performed by Hirschmann in 1901, with an Hopkins rigid scope. The development of the flexible scopes made the inspection of the nasal cavities possible also in children, and provided the detection of the obstructive factors, such as adenoid hypertrophy, septal deviation, rhinitis, choanal atresia, polyps and sinonasal tumors [4,5]. The rigid endoscopy is now established as the "gold standard" for nasal examination in adults, as it provides a better quality of the image, but it may be difficult to perform in awake children. On the other hand, the flexible fiberoptic scope is a safe instrument to explore

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Mailing address:
Fabio Pagella, MD. Department of Otorhinolaryngology,
University of Pavia and Foundation I.R.C.C.S.
Policlinico S. Matteo,
V. le Golgi 19, 27100 Pavia, Italy.
E-mail: tpagella@libero.it
Phone: +39 0382 526218

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the nasal cavities. Some authors suggest that nasal flexible fiberoptic endoscopy is the best method to evaluate the nasopharynx in children [5,10,11].

The purpose of this article is to describe the personal experience in the assessment of the adenoid size in children, with a particular regard to the flexible nasal endoscopy, and to analyse the literature reports.

MATERIALS AND METHODS

Patients' data were retrospectively reviewed in the "Ambulatory of diagnostic ENT endoscopy" (Department of Otorhinolaryngology and Department of Pediatrics, IRCCS Policlinico San Matteo, University of Pavia, Pavia, Italy) since January 1999 to January 2010. Only patients aged 2 – 18 years were included in our cohort.

A Pentax flexible endoscope FNL-10RP3 (diameter 3.5 mm) or FNL-7RP3 (diameter 2.4 mm) (Pentax Medical Company, Montvale, NJ, U.S.A.) was used with a light source and a light cable. Some of these endoscopies were video recorded with a camera connected to a video recorder-monitor set. Before the exam, if necessary, nasal secretions were removed either by nasal-blowing or by a gentle aspiration through a small flexible rubber tube. Another easy way to remove the secretions is to close children's mouth during the examination in order to get a forced nasal inspiration with the consequent cleaning of the nasal cavities. No topical intranasal decongestant was used to avoid a misdiagnosis of an inferior turbinate hypertrophy or generalized nasal mucosa congestion; moreover the National guidelines, proposed by the Italian Drugs Agency, permit the use of intranasal vasoconstrictor drugs in children only over 12 years old. No local or general anaesthesia was used. We preferred the presence of the parents of the child inside the examination room, for a better compliance of the patient. Most children fully collaborated during the nasal endoscopy; if necessary, the head of the patient was gently immobilized by the assistant/nurse during the performance. The entire procedure could be followed on the video screen and taped, which facilitated review and discussion of the disease along with the parents. The procedure enables the visualization of the entire nasal cavities and, in particular, key areas, such as the inferior and middle turbinate, the septum, the Ostio-Meatal Complex (OMC), the posterior fontanelle area, the Spheno-Ethmoidal Recess (SER) and the nasopharynx with the evaluation of the adenoid tissue. The child is lain supine on an examination couch. As a first step, the endoscope is introduced along the nasal floor so as to evaluate the volume of the anterior portion of inferior turbinate and the septum's morphology. Then, the endoscope proceeds between the inferior turbinate and the middle turbinate, thus permitting the investigation of the OMC; at this time, the endoscopic examinations proceeds over in order to evaluate the posterior fontanelle area, the SER, and finally the nasopharynx. The entire procedure is conducted in both nasal cavities.

The degree of obstruction by the adenoid tissue over the posterior choanae is estimated using the grading system proposed by Parikh: grade 1 for adenoid tissue not in contact with adjacent structures; grade 2 for adenoid tissue in contact with torus tubarius, grade 3 for adenoid tissue in contact with vomer, and grade 4 for adenoid tissue in contact with soft palate (at rest) [12]. However, other methods to perform a grading system of adenoid hypertrophy have been reported in literature [11,13]; among them the new method recently proposed by Josephon et al., [13] and, in the future, we would like to implement it in our clinical practice. Other issues usually noted during the examination, include inferior turbinate hypertrophy, septal deviation, rhinitis, rhinosinusitis, adenoiditis and other rare findings such as nasal polyposis, neoplasm and malformations.

A clinical examination of the ear and the oropharynx is obtained in all children. The tonsils are evaluated using Brodsky's grading scale based on tonsillar airway obstruction: 0 = no obstruction, +1 = <25% airway obstruction, +2 = 25–50% airway obstruction, +3 = 50–75% airway obstruction, and +4 = >75% airway obstruction [14,15]. During the endoscopy, if requested, an endoscopic visualization of the hypopharynx/larynx can be obtained by passing through the nasopharynx. Particular importance should be given during this step to the posterior extension of the palatine tonsils within the oropharynx, as long as both the laryngeal morphology and motility.

RESULTS

In the personal eleven-year experience (1999 – 2010), 6036 paediatric patients (aged 2 – 18 years, mean age 7.07 years, median 6 years, mode 4 years) were evaluated, detailed description of age and total number of patients are reported in Figure 1 (Figure 1).

The most common complains referred by the patients were: nasal obstruction, mouth breathing, snoring, rhinorrhoea, speech impairment, sleep apnoea, hearing impairment, otitis media. In all of these children we performed a complete nasal flexible endoscopy as described above. In most cases children fully collaborated to complete the exam.

The most common finding in our experience was adenoid hypertrophy, followed by inferior turbinate hypertrophy, adenoiditis and rhinosinusitis. Other rarer findings were nasal polyps, neoplasm and malformations. No major or minor complications (such as nose bleedings that required nasal packing or other traumatic injuries) were observed. No topical intranasal decongestant, local or general anaesthesia were used.

The usage of the monitor and of the video-recording system in our experience has shown to be effective in order to discuss with the parents the clinical situation of the children, to record and review the endoscopic examinations and to obtain an adequate training of the residents.

DISCUSSION

Adenoid hypertrophy is the most common cause of nasal obstruction in paediatric patients [1,2]. Various methods to assess the adenoid size were described such

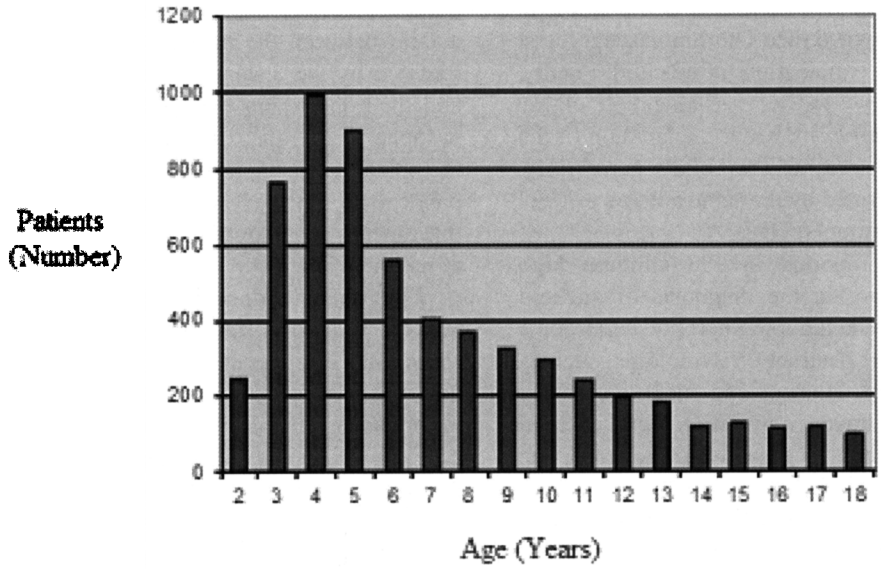

Fig. 1. *Distribution of the patient's age reported in a histogram. The mode is 4 years.*

Table 1. *Summarized view of the selected literature reports about nasal endoscopy in children. The articles are sorted by year of publication.*

Author	*Year of publication*	*Number of patients*	*Endoscope*
Wang [31]	1991	243	Flexible
Wang [6]	1992	180	Flexible
Wang [32]	1994	211	Flexible
Wang [33]	1995	371	Flexible
Wang [2]	1995	375	Flexible
Wang [19]	1997	817	Flexible
Kubba [5]	2001	48	Rigid
Tosca [34]	2001	128	Rigid
Cassano [11]	2003	98	Flexible
Parikh [12]	2006	29	Flexible
Yilmaz [23]	2008	152	Rigid
Kindermann [22]	2008	130	Flexible
Bitar [21]	2009	65	Flexible
Caylakli [35]	2009	85	Rigid
Lertsburapa [30]	2010	99	Flexible

as the posterior rhinoscopy with a laryngeal mirror and the radiological examination of the nasopharynx. Nowadays, nasal endoscopy is a well-known and diffuse method in routinely daily practice in evaluating a children; the fiberoptic examination of both nasal cavities and pharynx is the only way of examination that allows direct visualization of the districts of interest and enables the correct diagnosis [2,5,11,16–21]. A prospective study performed by Wang et al. in 180 children, confirmed that the size of the adenoid tissue, as shown at nasal endoscopy, correlated very well with the nasal obstruction complaints, as well as the condition of the nasopharyngeal orifice of the Eustachian tube significantly corresponded with the type of tympanogram. The authors also reported that nasal endoscopy gave more accurate information than standard lateral skull radiograph for the indication to

adenoidectomy. Moreover, this examination is possible in all cases, if performed by a skilled Otorhinolaryngologist and preceded by careful explanation to the child. Finally, thanks to the possibility of direct visualization of the image via a monitor, it allows a better explanation of the indication for adenoidectomy to the child's parents [6]. These results were confirmed by the same authors in 1997 in a larger cohort (817 patients) [19].

Kindermann et al. reported in 133 children high sensitivity and specificity in the diagnosis of adenoid hypertrophy using the nasal flexible fiberoptic endoscopy. In this study, some nasal obstruction symptoms, such as daytime noisy breathing, snoring and history of sleep apnoea, showed a significant correlation with adenoid hypertrophy. The agreement of results and the small rate of refusals (only in 2.3% of children the exam was not completed in their series) suggested that nasal endoscopy was a highly accurate, safe, dynamic and objective diagnostic method and was easy to perform in cooperative children [22]. A prospective study performed by Yilmaz et al. confirmed that nasal endoscopy was found (by the Spearman correlation) to be the best way to evaluate the candidate for adenoidectomy, and mirror examination, palpation and volume of tissue removed during surgery well correlated with nasal endoscopy findings [23].

Some literature's experiences reported the need of topical anaesthesia, general anaesthesia and/or vasoconstriction of the nasal cavity in performing this examination, especially in younger children, due to their poor cooperation [2,6]. However, in our opinion, a careful explanation to the child and a skilled endoscopist are the most important guarantors of a successful paediatric endoscopy; in addition, we never did perform anaesthesia (topical or general) and vasoconstriction.

For many years, the lateral radiological evaluation of the nasopharynx conformation and contents was performed in children in order to get clinical information about adenoid's size. Some authors reported that radiographs of the nasal cavity are as important as clinical examinations [7]. Radiographs have been chosen as the gold standard by Paradise et al. because they correlated well with volume of adenoid tissue removed during the adenoidectomy. Furthermore, they are objective, non-invasive tool of estimating the extent of the adenoid into the nasopharyngeal airway [8]. However, it is often difficult to carry out in infants, and in many cases there is no direct correlation between the entity of the obstruction evidenced by X-ray and the functional ailment [11]. Moreover, the risk of exposing children to radiation when using radiography should not be ignored [9]. Many methods of interpreting adenoid size by using the radiologic examinations have been devised [24–26]. Among them, the adenoid-to-nasopharyngeal (A/N) ratio was described by Fujioka et al., which is a ratio between the measurement of the adenoid tissue (defined by the distance between the basiocciput region and the convex most part of the adenoid pad) and the nasopharyngeal aperture (defined by the distance between the sphenobasiocciput to the posterior edge of the hard palate) [25]. The analysis reported by Vig. et al. suggested that lateral cephalograms had low sensitivity and high specificity [27].

Fiberoptic endoscopy should be a far superior test for diagnosis and is considered the current gold standard. The endoscopic examination allows a direct observation of the nasal cavities and of the nasopharyngeal space and, therefore, should allow more accurate diagnosis. Nevertheless, nasal endoscopy may present some disadvantages: mainly, it allows little opportunity for objective measurement as based on personal opinion, often causing low inter-observer agreement [1,28,29]. Unfortunately, no testing has been found in literature reporting the sensitivity and specificity of lateral cephalometric diagnosis of the adenoids against endoscopic diagnosis. Lertsburapa et al. analyzed in 99 children the correlation between the flexible fiberoptic nasal endoscopy and the intra-operative mirror nasopharyngoscopy. In this study, the endoscopic assessment highly correlated with the standard; however, endoscopy seemed to overestimate adenoid size [30].

For a summarized view of the literature experiences about nasal endoscopy in children, see Table 1 (Table 1).

CONCLUSION

Many years of experience in this field have provided evidence that endoscopy, by means of a flexible fiberoptic endoscopy, is the best tool to assess the adenoid size in paediatric age, compared with other methods usually chosen to evaluate anatomic conformation and nasopharyngeal cavity contents (i.e. posterior rhinoscopy, rhinomanometry, acoustic rhinometry, X-ray, CT, MRI). In our series of over 6000 paediatric patients, nasal endoscopy has been proven to be reliable, accurate, safe and easily tolerated. Moreover this examination provides the detection of others obstructive factors, such as septal deviation, allergic rhinitis, sinonasal polyps, rhinosinustitis, malformations and neoplasms, thus permitting a correct differential diagnosis and the eventual presence of concomitant clinical situations.

Therefore, nasal endoscopy is a reliable, safe, accurate, easily tolerated and dynamic diagnostic method to assess the adenoid size in children, if correct endoscopes are used under appropriate conditions.

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(Footnotes)

[a] Correspondence to: Fabio Pagella, MD. Department of Otorhinolaryngology, University of Pavia and Foundation I.R.C.C.S. Policlinico S. Matteo, V. le Golgi 19, 27100 Pavia, Italy. E-mail: tpagella@libero.it Phone: +39 0382 526218