Nasopharyngeal fiberendoscopy in children: a survey of current Italian pediatric otolaryngological practices

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Abstract

Background: Nasopharyngeal fiberendoscopy (NFE) is the gold standard diagnostic procedure for adenoidal disease, but there is no consensus concerning the optimal technical approach. The aim of this study was to investigate the attitudes of Italian otolaryngologists towards diagnostic NFE in children, and the most widely used methods.

Methods: Nine hundred randomly selected members of the two largest Italian otolaryngological scientific societies were e-mailed an anonymous web-based questionnaire containing 29 multiple-choice items regarding their opinions about, and use of NFE in children.

Results: Questionnaires were returned by 764 clinicians (84.9%). About 75% declared they used NFE, but 35% said they preferred alternative diagnostic methods. Most of the respondents considered NFE safe, but more than 80% judged it to be poorly or only fairly well tolerated. Almost all declared that they generally use flexible, small-diameter instruments, with the patient seated on a chair or a parent’s lap; 65% use gentle restraining methods. Fewer than 50% reported using a standardised hypertrophy grading system.

Conclusion: Italian otolaryngologists have a generally positive attitude towards using NFE in children. However, some have reservations, and there was no unanimous agreement concerning how it should be done. Given the medical advantages of NFE, it is essential to clarify the many still controversial aspects of the procedure by means of comparative studies and educational programmes.

Keywords: Endoscopy, Nasopharynx, Children, Adenoids, Otolaryngology

Background

Nasal obstruction due to recurrent or chronic adenoid-related nasopharyngeal and middle ear infections is frequent in children [1], and often requires an otolaryngological examination in order to assess whether the size of the adenoids and their possible lateral extension are reducing the patency of the ostium of the Eustachian tube, and evaluate the need for surgical treatment.

This can be done by means of nasopharyngeal fiberendoscopy (NFE), a mirror examination with posterior rhinoscopy, a lateral neck roentgenogram, or a standardised clinical questionnaire [2–4]. However, NFE is the gold standard for assessing the volume and surface of the adenoids in children with suspected adenoidal disease [5–7] because it is minimally invasive and repeatable, does not expose patients to harmful ionising radiation, and allows direct inspection of the nasopharynx with complete visualisation of the adenoids, thus making it possible to grade hypertrophy and investigate possible choanal or ostial obstruction [5]. It is also a useful means of dynamically evaluating the entire nasal district, including the ostiomeatal complex and sphenethmoidal recess, and investigating velopharyngeal closure during speech. This makes it possible to identify or exclude any concomitant nasal or rhinosinusal processes, including allergic rhinitis, nasal polyposis, chronic rhinosinusitis, choanal atresia or velar insufficiency, and allows precise surgical stratification in the case that medical treatment fails.
NFE should therefore be considered a first-level procedure in every otolaryngological facility that has pediatric patients [8]. However, some clinicians are still reluctant because it is not always easy to carry out in the case of younger children and, furthermore, there is no consensus concerning how it should be performed (particularly in relation to the type of instruments to be used) or the most appropriate technical approach to children of different ages or with different diseases. Consequently, it is not clear how, or how extensively NFE is used in everyday practice, particularly in the case of younger children.

The main aim of this study was to evaluate the attitudes of Italian otolaryngologists towards using NFE to diagnose adenoidal diseases in children, and verify the methods actually used in routine clinical practice.

Methods

Study design

This cross-sectional survey of the pediatric use of NFE by a representative sample of otolaryngologists belonging to the Italian Society of Otolaryngology and Head and Neck Surgery (SIOeChCF) and the Italian Society of Pediatric Otolaryngology (SIOP) was carried out between September 2012 and May 2013. The study was approved by our local ethics committee of University of Milan.

Study population

An anonymous questionnaire asking about opinions and practices relating to the pediatric use of NFE was sent to 900 Italian otolaryngologists whose e-mail addresses were selected by means of a computer-based randomisation list.

Questionnaire design and administration

The web-based questionnaire, which was anonymous but coded in order to be able to identify non-responders and ensure the elimination of multiple responses, was conceived by the first author (ST) and drawn up in collaboration with the co-authors before being pilot tested on a sample of 20 otolaryngologists in Milan, Italy. It required about 10 min to complete and guided the respondents through multiple-choice items divided into two main sections: one concerning their personal and demographic data (including gender, and the years of birth, graduation and specialisation); the other consisted of 29 items concerning their attitudes towards using diagnostic NFE in children, and the methods they use in routine clinical practice.

Statistical analysis

The data were descriptively analysed to assess the prevalence and distribution of all the variables. The continuous variables were expressed as mean values and standard deviations (SDs), and the categorical variables as absolute numbers and percentages. The categorical variables were dichotomously analysed at multiple levels. The Kruskal-Wallis equality-of-populations rank test and Fisher's exact test were used to determine whether attitudes toward NFE and the way it was carried out were related to the demographic data. After adjusting for the main confounders, univariate and multivariate logistic regression models were used to compute odds ratios (ORs) and standard errors (SEs) and 95 % confidence intervals (95 % CIs) in order to measure the strength of the associations. Statistical significance was set at \( p = 0.05 \). The data were analysed using STATA 10.0 software (StataCorp, College Station, TX).

Results

Questionnaires were returned by 764 of the 900 otolaryngologists (84.9 %), most of whom were males (589; 77.1 %), aged >50 years (395; 51.7 %), worked in northern Italy (455; 59.5 %), and practised in a hospital setting (397; 52.0 %) (Table 1).

Table 2 shows their attitudes towards NFE. About 75 % of the respondents declared that they used NFE, but 35 % said they still preferred alternative diagnostic

Table 1

Demographic characteristics of the otolaryngologists returning completed questionnaires

| Demographic characteristics | No. of respondents | Percent |
|-----------------------------|--------------------|---------|
| Total number                | 764                | 100.0   |
| Males                       | 589                | 77.1    |
| Age, years                  |                    |         |
| ≥50                         | 395                | 51.7    |
| 36–50                       | 322                | 42.1    |
| ≤35                         | 47                 | 6.2     |
| No. of otolaryngologists working in Northern Italy | 455 | 59.5 |
| Work setting                |                    |         |
| Hospital                    | 397                | 52.0    |
| University                  | 70                 | 9.2     |
| Private practice            | 297                | 38.8    |
| No. of years since graduation |                  |         |
| ≥31                         | 159                | 20.8    |
| 20–30                       | 314                | 41.1    |
| 11–19                       | 164                | 21.5    |
| ≤10                         | 127                | 16.6    |
| No. of years since specialising in otolaryngology |                  |         |
| ≥31                         | 67                 | 8.7     |
| 20–30                       | 302                | 39.5    |
| 11–19                       | 189                | 24.8    |
| ≤10                         | 206                | 27.0    |
Table 2 Otolaryngologists’ attitudes towards nasopharyngeal fiberendoscopy (NFE) in children

| Parameter | Possible answers | No. of respondents | Percent |
|-----------|------------------|---------------------|---------|
| Used to using NFE | 576 | 75.4 |
| Used to using alternative diagnostic tests | Clinical evaluation 175/269 65.0 | Standardised questionnaires 51/269 19.0 | Posterior rhinoscopy 34/269 12.7 | Nasopharyngeal X-ray 9/269 3.3 |
| Age of patients in whom NFE is considered feasible | All pre-school years 104 13.5 | >3 years 235 30.8 | 3–8 years 425 55.7 |
| Indications for NFE | Nasal obstruction 33 4.3 | Adenoidal facies 15 2.0 | Recurrent or chronic middle ear disease 62 8.1 | Rhinosinusitis 26 3.4 | All of the above 628 82.2 |
| Indications for in-patient NFE | Children with a genetic syndrome 42 5.5 | Uncooperative children 65 8.5 | Children aged <18 months in whom severe disease is highly suspected 84 11.0 | All of the above 283 37.0 | Children with genetic syndrome or aged <18 months in whom severe disease is highly suspected 290 38.0 |
| Percentage of children in whom NFE is not considered feasible | ≤5 % 448 58.6 | 6–24 % 249 32.6 | 25–50 % 46 6.0 | 49–74 % 11 1.5 | ≥75 % 10 1.3 |
| Percentage of children experiencing untoward effects | ≤5 % 718 94.0 | 6–25 % 44 5.8 | 26–50 % 2 <1 |
| Untoward effects | Nasal bleeding 579 75.8 | Traumatic lesions 64 8.4 | Syncope 90 11.8 | Desaturation 21 2.7 | Other 10 1.3 |
procedures to investigate adenoidal disease. About 65 % chose a clinical evaluation (history of recurrent nasopharyngeal and/or middle ear infection and/or sleep disordered breathing, perceived nasal obstruction, speech hyponasality, and the proportion of oral breathing) as the elective alternative method. More than half said they used NFE only in children aged 3–8 years, and nearly 60 % declared that they were able to complete the examination in more than 95 % of children. NFE was considered safe by most of the respondents as 94 % declared the occurrence of untoward effects (mainly nasal bleeding) in fewer than 5 % of cases; however, more than 80 % judged that it was poorly (about 52 %) or only fairly well tolerated (about 32 %). The majority had a positive opinion concerning the usefulness of NFE, and as many as 68 % defined it “a generally well-tolerated, minimally invasive examination that can be used in most children; very useful in clinical practice”.

Table 3 shows the methods of use. Almost all of the clinicians generally use flexible, small-diameter instruments, with the patient seated on a chair or a parent’s lap. About 65 % said they use gentle restraint (the method preferred by about 82 % is to have the patient sitting on a parent’s lap “with legs held between the thighs of the parent, who holds the child’s wrists over the abdomen with one hand and the child’s head against his or her chest with the other”). About one-third said that they did not use any topical drug before performing NFE, whereas 30 % said they used local vasoconstrictors.

More than half declared that they graded adenoidal hypertrophy on the basis of the percentage of adenoid-induced choanal obstruction and the patency of the Eustachian tube, and fewer than 50 % that they used a standardised grading system (mainly Cassano’s [5], which was chosen by 36 % of the respondents).

Table 4 shows the significant associations between the otolaryngologists’ attitude towards the pediatric use of NFE and their demographic data. The use of NFE in clinical practice was apparently influenced by gender, age, and geographical working area because the most frequent users were male clinicians aged <50 years working in northern Italy. However, logistic multivariate analysis showed that only gender adjusted for geographical working area remained significantly associated with the routine use of NFE (OR = 2.4, SE = 0.6, 95 % CI = 1.5–3.7; p < 0.001 for males).

Table 5 shows the significant associations between NFE methods and the demographic data. The choice of rigid endoscopes was only influenced by geographical working area as it was more frequent among the clinicians working in southern Italy (8.9 % vs 3.4 %; p = 0.003). Grading adenoidal hypertrophy on the basis of the standardised classifications was influenced by both geographical working area and the working setting: it was more frequent among the clinicians working in southern Italy (8.9 % vs 3.4 %; p = 0.003). Logistic multivariate analysis confirmed the significance of geographical working area adjusted for working setting (OR = 1.7, SE = 0.3; 95 % CI = 1.1–2.5; p = 0.006 for clinicians working in southern Italy).

None of the other demographic variables was statistically associated with attitudes towards NFE or the way in which it was carried out.

Discussion
This is the first study specifically designed to evaluate Italian otolaryngologists’ attitudes towards using NFE to diagnose children, and the way in which do so in routine clinical practice. The randomised selection of the
Table 3 Otolaryngologists’ methods of carrying out nasopharyngeal fiberendoscopy (NFE) in children

| Parameter                                           | Possible answers                  | No. of otolaryngologists | Percent |
|-----------------------------------------------------|-----------------------------------|---------------------------|---------|
| Recommended type of endoscope                       | Flexible                          | 720                       | 94.3    |
|                                                     | Rigid                             | 44                        | 5.7     |
| Recommended endoscope diameter                      | About 2 mm                        | 312                       | 40.9    |
|                                                     | About 3 mm                        | 369                       | 48.3    |
|                                                     | About 4 mm                        | 83                        | 10.8    |
| Recommended sterilisation                           | Disposable sheaths                | 574                       | 75.2    |
|                                                     | Disposable towels                 | 140                       | 18.3    |
|                                                     | Antiseptic solutions              | 50                        | 6.5     |
| Use of endoscope connected to a video recorder/monitor set | Yes                              | 588                       | 76.9    |
|                                                     | No                                | 176                       | 23.1    |
| Method of removing nasal secretions before NFE      | None                              | 184                       | 24.1    |
|                                                     | Urging child to blow his/her nose | 211                       | 27.6    |
|                                                     | Helping child to blow his/her nose| 117                       | 15.3    |
|                                                     | Nasal saline irrigation            | 44                        | 5.7     |
|                                                     | Aspiration                        | 208                       | 27.3    |
| Recommended position for NFE                        | Seated (alone or on parent's lap) | 714                       | 93.5    |
|                                                     | Lying on back                     | 50                        | 6.5     |
| Need for restraint                                  | Never                             | 221                       | 28.9    |
|                                                     | Only younger children             | 495                       | 64.8    |
|                                                     | Always                            | 48                        | 6.3     |
| Recommended method of restraint                     | Holding head gently               | 67/543                    | 12.4    |
|                                                     | Sitting on a parent’s lap         | 443/543                   | 81.6    |
|                                                     | Lying on back wrapped in a sheet  | 33/543                    | 6.0     |
| Restainers                                          | Only parents                      | 202/543                   | 37.3    |
|                                                     | Health workers, if parents unable to cooperate | 341/543 | 62.7 |
| Local pre-medication                                | None                              | 244                       | 32.0    |
|                                                     | Vasoconstrictors                  | 231                       | 30.2    |
|                                                     | Anesthetic                        | 169                       | 22.1    |
|                                                     | Lubricating ointment              | 120                       | 15.7    |
| Frequency of bilateral NFE                          | Never                             | 20                        | 2.7     |
|                                                     | Sometimes                         | 403                       | 52.7    |
|                                                     | Always                            | 341                       | 44.6    |
participants and the very small number who failed to respond makes it unlikely that the only respondents were otolaryngologists who used NFE. Consequently, it is reasonable to believe that the study population was truly representative of otolaryngologists working in Italy and the members of the two most important Italian otolaryngological associations. The high response rate may have been partially due to the fact that the questionnaire was presented during our most important national congresses.

Despite some differences related to age, gender and geography, the data indicate that the majority of the respondents use NFE in their pediatric clinical practice and have a generally positive attitude towards it because nearly 70% defined it as "a generally well-tolerated, minimally invasive examination that can be used in most children; very useful in clinical practice". As NFE has only recently been considered the preferred means of diagnosing adenoidal hypertrophy in children [5–7], it is not surprising that younger otolaryngologists use it more frequently than those aged >50 years.

It is worth noting that more than one-third of the respondents (mainly females aged >50 years) declared that they used alternative means of diagnosing adenoidal disease, including a clinical evaluation (65%), standardised questionnaires (19%), posterior rhinoscopy (about 13%), and nasopharyngeal radiography (about 3%). This is not surprising because, until recently, the many proposed methods of assessing adenoid size were not very accurate. In particular, the most widely used clinical scores aimed of predicting the severity of nasal obstruction [9, 10] is the nasal obstruction index (NOI), which is based on the proportion of oral breathing and speech hyponasality [10]. This was proposed by Paradise as a reliable and reasonably valid means of detecting the presence and degree of adenoidal hypertrophy in 1998 [10], but we have shown that it alone is less accurate than NFE in predicting the rate of adenoidal obstruction in children with perceived obstructed nasal breathing or recurrent/chronic middle ear disease, and should therefore be abandoned [7, 11].

About 3% of the responders said they used nasopharyngeal radiography as an alternative means of diagnosis, but it must be pointed out that its accuracy in assessing adenoidal hypertrophy (sensitivity 70% and specificity 52%) is much less than that of NFE [12]. Furthermore, it has been found that radiological measurements such as adenoidal thickness (the distance along a perpendicular line from the basiocciput to the adenoid convexity) and the adenoid-nasopharyngeal ratio (the ratio between adenoid thickness and the distance between the basiocciput and the posterior edge of the hard palate) do not correlate with obstructive symptom scores [8, 13].

**Table 3** Otolaryngologists’ methods of carrying out nasopharyngeal fiberendoscopy (NFE) in children (Continued)

| First anatomical landmark assessed          | Frequency |
|--------------------------------------------|-----------|
| Adenoids and nasopharynx                  | 562       | 73.7 |
| Osteometaal complex                      | 200       | 26.3 |

| Frequency of evaluation of anatomical structures other than adenoids during NFE |
|------------------------------------------------|
| Never                                      | 10        | 1.3 |
| Sometimes                                  | 348       | 45.5 |
| Always                                     | 406       | 53.2 |

| How adenoidal hypertrophy is graded          |           |   |
|---------------------------------------------|-----------|
| Percentage of choanal obstruction           | 252       | 33.0 |
| Percentage of choanal obstruction and          | 417       | 54.5 |
| patency of Eustachian tube orifice          |           |   |
| Adenoidal hypertrophy: yes/no              | 7         | 1.0 |
| Choanal obstruction: yes/no                | 88        | 11.5 |

| Standardised classification for grading adenoidal hypertrophy |
|-------------------------------------------------------------|
| None                                                        | 400       | 52.4 |
| Cassano’s classification [5]                                | 275       | 36.0 |
| Parikh’s classification [9]                                 | 65        | 8.5  |
| Other                                                       | 24        | 3.1  |

*with legs held between the thighs of the parent, who holds the child’s wrists over the abdomen with one hand and the child’s head against his or her chest with the other
However, some clinicians still advocate the use of radiological assessments in children with suspected adenoidal disease [2, 4, 14], especially in order to bridge the diagnostic gap in younger children who do not/cannot cooperate during an NFE examination [4]. Our findings indicate that there is some reluctance among Italian otolaryngologists to use NFE in small children, and most of them said that they only use it in older patients; only about 13 % (mainly ENT specialists working in hospitals in northern Italy) said they use NFE regardless of age. Furthermore, nearly one-third of the respondents (males aged ≥50 years) stated that they cannot complete an NFE examination in up to 25 % of patients. However, our experience [15] and that of others [3] indicates that NFE is feasible and tolerable in almost all children when it is carried out by a skilled otolaryngologist using a small-calibre flexible endoscope, and if every effort is made to find the best approach on the basis of the child’s age.

NFE is generally considered safe; almost all of the respondents said that fewer than 5 % of the procedures were associated with untoward side effects, mainly minor events such as nasal bleeding or traumatic lesions, and less frequently major events such as syncope (about 12 %) or desaturation (about 3 %). Thirty-eight percent excluded the possibility of using outpatient NFE in “children with a genetic syndrome” or “children aged <18 months in whom severe disease is highly suspected”. To the best of our knowledge, no specific guidelines have yet been published but, on the basis of our experience [15] and that of Pagella [3], we consider that NFE can generally be used in an outpatient setting even in young non-syndromic children.

In terms of the way in which is NFE is carried out, the responses to most of the items varied widely. The only items indicating almost unanimous agreement concerned the recommended type of endoscope (flexible),

### Table 4 Otolaryngologists’ attitudes towards nasopharyngeal fiberendoscopy (NFE) in children by demographic variables (only statistically significant relationships)

| Parameters                                | Demographic variables | P-value |
|-------------------------------------------|-----------------------|---------|
| Used to performing NFE                    |                       |         |
| Gender                                    | % of males            | % of females | 0.004  |
|                                           | 77.7                  | 66.2    |         |
| Age                                       | % aged ≥50 years      | % aged <50 years | 0.002  |
|                                           | 70.6                  | 80.3    |         |
| Geographical working area                 | % in northern Italy   | % working in southern Italy | 0.050  |
|                                           | 78.0                  | 71.8    |         |
| Used to performing alternative diagnostic tests |                     |         |
| Gender                                    | % of males            | % of females | 0.013  |
|                                           | 33.5                  | 44.8    |         |
| Age                                       | % aged ≥50 years      | % aged <50 years | <0.001 |
|                                           | 45.1                  | 28.6    |         |
| Years since specialisation                | % specialised for ≥20 years | % specialised for <20 years | 0.043  |
|                                           | 41.2                  | 33.7    |         |
| Used to performing NFE regardless of patient’s age |                 |         |
| Geographical working area                 | % working in northern Italy | % working in southern Italy | 0.043  |
|                                           | 56.2                  | 48.2    |         |
| Work setting                              | % in hospital         | % in university or private practice | 0.002  |
|                                           | 58.5                  | 44.5    |         |
| Unable to perform NFE in ≥5 % of patients |                       |         |
| Gender                                    | % of males            | % of females | 0.003  |
|                                           | 44.6                  | 30.9    |         |
| Age                                       | % aged ≥50 years      | % aged <50 years | 0.001  |
|                                           | 47.7                  | 35.2    |         |
the position of the patient during NFE (sitting alone or on a parent’s lap), and restraint (with the parent blocking the movement of the child sitting on his/her lap). Various means of carrying out NFE examinations have been proposed [3, 4, 16–19], but our own experience confirms that the methods indicated by the answers of our respondents are effective and well-tolerated by almost all children [15]. Some authors [18–21] advocate the use of a rigid nasal endoscope, but this may be less well tolerated as it is associated with a failure rate of up to 12% of children undergoing endoscopy in a supine position even after the administration of topical nasal anesthetics and decongestants [18, 19].

Only 32% of our respondents said that they do not administer any topical drugs before an NFE examination, whereas the others pre-medicate the nasal cavities with local vasoconstrictors (30%), an anesthetic (22%), or lubricating ointment (about 16%). We have previously reported that NFE can be successfully carried out in most patients without the aid of any of these [15] and, given that the use of topical decongestants has been proscribed by the Italian Medicines Agency in children aged <12 years [22], we suggest they should not be used.

There was also considerable heterogeneity in the way that adenoidal hypertrophy is graded: just over half of the respondents base the grading on the percentage of choanal obstruction and the possible impaired patency of the Eustachian tube orifice, whereas about one-third only use the former. Only about 48% said they used a standardised classification (mainly that of Cassano [5]), most of whom work in hospitals in southern Italy. This suggests the need for educational programmes supported by national otolaryngological societies aimed at promoting the use of standardised systems of scoring adenoidal hypertrophy in order to make medical reports comparable.

Table 5 Methods of carrying out nasopharyngeal fiberendoscopy (NFE) in children by demographic variables (only statistically significant relationships)

| Parameter | Demographic variables | % working in northern Italy | % working in southern Italy | P-value |
|-----------|-----------------------|----------------------------|----------------------------|---------|
| Used to using rigid endoscopes | Geographical working area | 3.4 | 8.9 | 0.003 |
| Used to using endoscopes connected to a video recorder/monitor set | Gender | 78.5 | 68.0 | 0.009 |
| | Age | % aged ≥50 years | % aged <50 years | 0.029 |
| | 80.4 | 73.5 |
| | Years since graduation | % graduated ≥30 years ago | % graduated <30 years ago | 0.035 |
| | 80.0 | 73.2 |
| Used to using NFE bilaterally | Geographical working area | 40.1 | 49.8 | 0.012 |
| Used to using standardised classification to grade adenoidal hypertrophy | Geographical working area | 42.8 | 54.6 | 0.002 |
| | Work setting | % in hospital | % in university or private practice | 0.050 |
| | 51.7 | 42.1 |
| Used to grading adenoidal hypertrophy according to Cassano’s classification [5] | Gender | % of males | % of females | 0.047 |
| | Age | % aged ≥50 years | % aged <50 years | <0.001 |
| | 25.2 | 39.3 |
| | Years since graduation | % graduated ≥30 years ago | % graduated <30 years ago | 0.001 |
| | 19.5 | 35.5 |
| | Years since specialisation | % specialised for ≥20 years | % specialised for <20 years | 0.024 |
| | 20.3 | 31.6 |
| Geographical working area | % working in northern Italy | % working in southern Italy | 0.001 |
Conclusions
The findings of this study seem to indicate that Italian otolaryngologists use NFE, and are quite confident about its effectiveness and safety in routine pediatric practice. However, there is some reluctance to using it in younger children, and no unanimous agreement about how it should be carried out. This lack of a standardised approach may account for failures in some patients, and encourage resort to alternative means of diagnosis that should actually be abandoned.

Given the medical advantages of NFE, it is essential to clarify the many still controversial aspects of the procedure by means of comparative studies and educational programmes supported by national health authorities.

Competing interest
The authors declare that they have no conflict of interest.

Authors’ contribution
ST conceived the study, participated in its design and coordination, performed statistical analysis and draft the manuscript; LP participated in study design and coordination, gave important contributions to data interpretation; PM, GS and PC participated in study coordination and helped to draw the manuscript. All the authors gave their final approval to the manuscript.

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