Chronic nasal obstruction in children. A fiberscopic study*†

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SUMMARY

In this prospective study, fiberscopies were gently performed in 375 paediatric patients. The purpose of the study was to evaluate the nasal and nasopharyngeal anatomy and aetiologies of chronic nasal obstruction using fiberoptic examination in children. The essential advantage of this examination is that it allows a more thorough inspection of these cavities. The authors demonstrated that there exists a significant relationship between the relative size of the adenoid tissue and nasal obstruction complaints in children ($p < 0.001$). When the presence of adenoid hypertrophy was confirmed endoscopically, surgery proved to be highly efficacious in relieving chronic nasal obstruction.

Key words: children, chronic nasal obstruction, fiberscopy, adenoidectomy

INTRODUCTION

Chronic nasal obstruction (CNO) is one of the most common clinical complaints in children. It is usually compensated for by breathing through the mouth. It may also be a cause of significant disease including the development of maxillofacial deformities and cardiopulmonary problems such as pulmonary hypertension and cor pulmonale (White et al., 1989; Belenky, 1990; Brodsky, 1990).

There are many possible anatomical variations creating nasal respiratory insufficiency. The common causes of CNO in children have been described by many authors (Myer and Cotton, 1988; Shott et al., 1989; White et al., 1989; Brodsky, 1990) and include the presence of congenital malformation, trauma and inflammation. Chronic upper airway obstruction in young children secondary to hypertrophic adenoids and tonsils is a well-known entity (Schiffmann et al., 1985).

It is of crucial importance that in CNO a prompt diagnosis as well as an appropriate treatment be instituted following a thorough and reliable clinical investigation. Until now, there has been a debate on whether minimally-invasive and more reliable techniques than simple anterior rhinoscopy can be employed in the inspection of the nasal cavity and nasopharynx in children with CNO.

Video-nasopharyngoscopy is a most valuable method in documenting the anatomy and pathophysiology of the nasopharynx (Yanagisawa et al., 1989). The purpose of this study was to correlate nasal and nasopharyngeal anatomy and the aetiology of CNO using fiberoptic examination with video-recording in children. The attention was mainly focussed on the correlation of the relative size of the nasopharyngeal adenoid tissue and the post-operative result of adenoidectomy in children with CNO as shown by fiberscopy.

MATERIAL AND METHOD

Instruments

The flexible fiberoptic nasopharyngoscope of FNL (3.5*36 mm) and an Olympus BF type 3c10 (3.8*36 mm) with a TVR 4500 colour videocamera were used to examine the nasal cavity and nasopharynx. This made it possible to record and re-assess all examinations.

Patients

From December 1989 to December 1991, a total of 375 children (males: 227; females: 148) aged from 26 days to 14 years (mean age: 5.34 years) were included in this study. All patients were referred from the paediatric ENT out-patient clinic. Two hundred and eighty-four children had complaints of nasal obstruction (mouth-breathing with or without snoring). In the other 91 children, no complaints about nasal obstruction were present. In this sub-group (absent nasal obstruction complaint), fiberscopic examination of the nasal cavity and nasopharynx and/or larynx was performed because of clinical necessity. Children with an acute infection of the respiratory tract (accompanied by fever) were excluded from this study. All parents gave their consent and were invited to attend the examination of their child. This study was approved by the Local Ethics Committee.

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Anaesthesia

A cotton pledget soaked with a mixture of 1% Novesine (oxybuprocaine.HCl) and 0.05% Otrivin (xylometazoline) was applied for local anaesthesia and vasoconstriction 10 min before examination. Application of a vasoconstrictor was often necessary as children frequently presented with swelling of the nasal mucous membrane. Most children younger than one year and older than four years could easily be examined in this way. In children aged 1-4 years, a combination of Nembutal (pentobarbitone) suppository and Thalamonal (2.5 mg droperidol and 50 μg/ml fentanyl) by intramuscular injection was scheduled. The authors, however, always first tried to use local anaesthesia only.

Measurements

Endoscopies were gently performed to pass through either the floor of the nose or just under the middle turbinate. This gave an excellent view of the nasal mucosa, septum, turbinates and the presence of nasal discharge. Especially, the postnasal space was easily bypassed by the flexible fiberscope. The following clinical symptoms and fiberoptic signs were recorded:

1. *Evaluation of the nasal obstruction.* Nasal obstruction was classified into three different groups according to the complaints as reported by the child's parents: (a) *continuous*: with obvious mouth-breathing since birth or for more than three months; (b) *periodic*: with obvious mouth-breathing for less than three months or with intermittent periods of nose- or mouth-breathing; or (c) *absent*: usually with normal nose-breathing.
2. *Relative size of the adenoid tissue.* This was judged by fiberscopy according to the distance from the vomer to the adenoid tissue (Wang et al., 1992). Adenoid size was classified into three categories as small, moderate or large.
3. *Septal deviation.* Septal deviation was recorded only when an obvious bending of the septal cartilage and/or an impactive nasal spine was observed.
4. *Sinusitis.* A diagnosis of sinusitis was obtained only when pus was detected from one of the meatus and/or sinus involvement was confirmed by CT-scan examination.
5. *Assessment of the improvement of nasal obstruction after adenoidectomy.* All parents were given a questionnaire after their child's adenoidectomy. In the questions concerning the improvement of mouth-breathing, it was characterized as immediate, gradual or unchanged.

Statistical methodology

All statistical tests were carried out two-tailed at the 5% level of significance. The calculations were performed using the SPSS/PC$^+$ program on an IBM-compatible microcomputer. The Chi-square test was used to investigate the relationship between discrete variables. Tests were carried out to investigate the existence of a relationship between pairs of variables (e.g., between size and complaints).

RESULTS

Relation between nasal obstruction complaint and size of the adenoid

Four of the 375 children were excluded because there were no affirmative complaints of nasal obstruction. A high correlation existed between these two variables ($p < 0.001$). There was a higher incidence of large adenoids in the group with continuous nasal obstruction complaints (59.3%), and an obvious lower incidence in the groups with periodic (22.2%) and absent (8.0%) nasal obstruction complaints (Table 1).

Relation between nasal obstruction complaints and septal deviation

Only in 61 children (16.3%) there was a clear-cut septal deviation observed (Table 2). There was no significant correlation between these two characteristics ($p=0.575$). It appears that septal deviation only occurred in 15.5% of the children with continuous nasal obstruction.

Relation between nasal obstruction complaints and purulent sinusitis

Fourteen children with a clear-cut diagnosis of purulent sinusitis presented either continuous (42.9%) or periodic (57.1%) nasal obstruction (Table 3).

Table 1. Relationship between nasal obstruction complaints and the size of the adenoid.

size of the adenoid	nasal obstruction complaint (mouth-breathing)		
	continuous	periodic	absent
small	49 (25.3%)	43 (47.8%)	61 (70.1%)
moderate	30 (15.5%)	27 (30.0%)	19 (21.8%)
large	115 (59.3%)	20 (22.2%)	7 (8.0%)
subtotal	194 (100%)	90 (100%)	87 (100%)

Total: 371 children; Chi-square test $p < 0.001$.

Table 2. Relationship between nasal obstruction complaints and septal deviation.

septal deviation	nasal obstruction complaints (mouth-breathing)		
	continuous	periodic	absent
clear-cut	30 (15.5%)	18 (20.0%)	13 (14.9%)
none	164 (84.5%)	72 (80.0%)	74 (85.1%)
subtotal	194 (100%)	90 (100%)	87 (100%)

Total: 371 children; Chi-square test $p=0.575$.

Table 3. The relationship between nasal obstruction complaints and purulent sinusitis.

sinusitis	nasal obstruction complaints (mouth-breathing)		
	continuous	periodic	absent
clear-cut	6 (3.1%)	8 (8.9%)	0 (0.0%)
none	188 (96.9%)	82 (91.1%)	87 (100%)
subtotal	194 (100%)	80 (100%)	87 (100%)

Total: 371 children.

Result of adenoidectomy in the children with nasal obstruction

In 85 children with large or moderately sized adenoids, adenoidectomies with or without tonsillectomy and myringotomy were performed. Fifty-seven questionnaires (67.5%) were received (3 to 17 months after adenoidectomy, mean: 8.19 months). From Table 4, it follows that mouth-breathing was immediately or gradually improved after adenoidectomy (77.2%, 95% CI [66.3%; 88.1%]). Mouth-breathing was improved immediately (43.9%), gradually (33.3%) or not at all (22.8%). Furthermore, in the group with no change there was evidence of purulent sinusitis (n=1), septal deviation (n=1), and positive allergy test (n=2). No anatomical evidence was found in nine children (69.2%), for whom mouth-breathing was not improved after adenoidectomy.

Table 4. The consequence of adenoidectomy (with or without tonsillectomy) in 57 children with chronic nasal obstruction complaints.

size of the adenoid		improvement of mouth-breathing after adenoidectomy		
		immediately	gradually	no change
moderate	11 (100%)	5 (45.5%)	3 (27.3%)	3 (27.3%)
large	46 (100%)	19 (41.3%)*	17 (36.9%)**	10 (21.7%)
total	57 (100%)	24 (43.9%)	20 (33.3%)	13 (22.8%)

*: one of these children had tonsillectomy; **: two of these children had tonsillectomy.

DISCUSSION

Discovering the aetiology of nasal obstruction in children is almost daily practice in a paediatric ENT clinic. Only accurate diagnostic recognition can lead to an appropriate therapy. Nasal and certainly nasopharyngeal inspection in children is very difficult to achieve. The only previous non-traumatic method of assessment was by lateral X-ray of the rhinopharynx which very often was not easy to interpret. Nowadays, fiberscopy allows a good visibility of nasal and nasopharyngeal anatomy. It is a minor invasive technique which is very well tolerated by children. It is especially useful in the diagnosis of adenoid hypertrophy and has been recommended in the decision to perform an adenoidectomy (Wang et al., 1992).

CNO ranks very high in children as it is a common disorder. The exact prevalence is still unclear. However, the basic underlying pathophysiological mechanisms, clinical features, diagnosis and treatment of paediatric CNO may be virtually the same as those in adults. Nevertheless, there is an important difference in the development of nasopharyngeal adenoids in children compared to adults. From our fiberscopic data, clear-cut adenoid hypertrophy was observed in 59.3% (115 out of 194) of children with continuous nasal obstruction. Therefore, adenoid hypertrophy appears to be a constant factor causing nasal obstruction which cannot be improved by conservative therapy. It has been reported that the enlargement of adenoids is mainly observed in children aged between 2 and 7 years (Wang et al., 1992). Conversely, in children less than one year (n=21) there was a low incidence (14%) of adenoid hypertrophy. In addition, a normal endoscopy and/or allergy test was obtained in 57% (8 out of 14) of these very young children with nasal obstruction complaints. Nasal obstruction in a paediatric patient may be a manifestation of basic vasomotor reaction to abnormal internal or external stimuli (Belenky, 1990). It is also possible that a temporary nasal obstruction can be compensated rapidly by mouth-breathing which then becomes a habit especially in young children.

Septal deviation does not explain most of the nasal obstruction (Table 2; p=0.575). However, our data show that it was present in 15.5% of the group with continuous mouth-breathing and in 20% of the group with periodic mouth-breathing. The degree of nasal obstruction caused by septal deviation is very much dependent on the shape and position of the deviation. It also very often causes unilateral nasal obstruction. It is not too difficult to recognize by routine ENT examination. Purulent sinusitis and any factors causing insufficient nasal airflow do seem to contribute to nasal obstruction in children.

Adenoidectomy is one of the commonest surgical treatments in children. It appears indicated for a specific category of children with chronic nasal obstruction. This operation, however, will have good results only if obstruction was due to large adenoids. On the other hand, a post-operative training of nasal breathing by the child's parents is very important as the hypertrophy of the adenoids induced habitual mouth-breathing.

CONCLUSIONS

Assessment of the nasal and nasopharyngeal anatomy and aetiologies of nasal obstruction can be easily obtained by fiberscopic examination. It is both a valuable and safe diagnostic method even in infants as young as 26 days. Adenoid hypertrophy is a common cause of continuous nasal obstruction, especially affecting children aged between 2 to 7 years. When accurately diagnosed, nasal obstruction due to adenoid hypertrophy is, in general, successfully treated by adenoidectomy.

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