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The role of rhinomanometry after nasal decongestant test in the assessment of adenoid hypertrophy in children

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ABSTRACT

Introduction: Nasal respiratory obstruction is a very common otolaryngologic problem, often caused by adenoid hypertrophy (AH). Nasal fiberoptic endoscopy (NFE) represents the gold standard method to diagnose AH. Rhinomanometry represents a valid diagnostic support.
Objective: The aim of our study was to analyze the diagnostic value of rhinomanometry after nasal decongestant (ND) test for the evaluation of adenoid hypertrophy in children.
Materials and methods: Seventy-one of 97 collaborative children, aged 6–12 years, affected by upper airways obstructive symptoms and diagnosed as 'chronic oral breathers' by a standardized questionnaire were included in the study. The first evaluation included a complete physical examination, anterior rhinoscopy and anterior active rhinomanometry. Patients with a positive rhinomanometry underwent a second rhinomanometry after the administration of the nasal decongestant (ND) xylometazoline. All children were evaluated using nasal fiberoptic endoscopy (NFE).
Results: At rhinomanometry a normal nasal airflow was found in 19 (26.8%) of children while nasal obstruction was underlined in 52 (73.2%). These patients were tested also with rhinomanometry after ND which confirmed the presence of nasal obstruction in 29 (55.7%) of patients. All patients included in the study underwent a NFE: 34 (47.8%) of them presented severe AH with an occlusion >75% of the choanal opening (grade ≥ 3) and 37 (52.2%) presented no or a mild form of AH (grade < 3). When compared to NFE, rhinomanometry test after ND had 82.7% sensitivity and 82.6% specificity. Positive predictive value and negative predictive value were 85.7% and 79.2%, respectively. Two receiver operating characteristic (ROC) curves were derived using data related to rhinomanometry vs NFE, and to rhinomanometry after ND vs NFE.
Conclusions: Rhinomanometry after ND, compared to rhinomanometry, is more specific and useful to evaluate nasal obstruction due to AH in children, and it may be helpful to avoid unnecessary surgical procedures in children with temporary nasal obstruction.

1. Introduction

Nasal respiratory obstruction is a very common condition in children and it is often associated with adenoid hypertrophy (AH) [1,2].

Nasal fiberoptic endoscopy (NFE) is currently considered the best method to evaluate the nasopharynx since it allows a dynamic and direct evaluation of the postnasal space [3,4]. This is not only a reliable test, but it is also safe and well tolerated [5].

Rhinomanometry (which measures air pressure and the rate of airflow during breathing) represents a very useful test to detect an increase in nasal airway resistance. It is often used by clinicians to diagnose nasal obstruction and to follow up patients treated with medical and surgical procedures aimed to improve nasal patency [6,7].

The administration of a nasal decongestant (ND) greatly reduces turbinate edema associated with transient conditions (such as allergic rhinitis) [8].

The aim of our study was to analyze the diagnostic value of rhinomanometry after ND test for the evaluation of nasal obstruction caused by AH.

2. Materials and methods

A not randomized observational study was performed. At the Department of Pediatric Immunology and Allergology of the

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Policlinico 'Umberto I' in Rome we selected 97 children aged 6–12 years (mean age 7.7 years) with upper airways obstructive symptoms from March 2006 to December 2007. Parents were asked to fill a standardized questionnaire in order to define the condition of "chronic oral breather" as previously reported by the Brouillette's guidelines revised by Carroll et al. [9–11]. Questions were aimed to score the severity of sleep-related symptoms according to a 4-point scale. We considered habitual snorers children with scores ≥3, occasional snorers scores from 2 to 1 and non-snorers scores of 0. In particular the questions were as follows: does your child snore during sleep? Does your child happen to have an apnea during sleep? Is the child restless while asleep? Is the child irritable or sleepy during the day? When your child sleeps, do you ever shake him to make him start breathing again? Do you watch your child while he sleeps being afraid about his breathing?

The study was approved by the local Scientific Ethics Committee and informed consent at enrolment was obtained by all parents. Exclusion criteria were craniofacial malformations, nasal infections during the last 2 weeks, deviated nasal septum and velopharyngeal insufficiency. The study design is summarized in Fig. 1.

From the analysis of the questionnaires administrated 71 patients were classified Habitual Snorers. Forty-three (60.6%) boys were included. These patients were selected to undergo a complete physical examination, an anterior rhinoscopy, a NFE and an anterior active rhinomanometry (Sibelmed Rinospir PRO 164). Occasional and non-snorers children were excluded.

To perform rhinomanometry patients were asked to wear a face mask, close their mouth and breathe only with the nose in accordance with the International Committee on Standardization of rhinomanometry [6]. A retest was performed in all patients.

The results of rhinomanometry were considered related to nasal flows of 150 Pa and compared with pediatric reference values height-dependent reported in literature [12]. In accordance with Zapletal et al. the degree of nasal obstruction, based on rhinomanometry test values, was estimated as fraction of predicted values (p.v.) of rhinomanometric parameters: grade 1 corresponded to no obstruction (71–100% of p.v.); grade 2 to mild obstruction (57–70% of p.v.); grade 3 to moderate obstruction (43–56% of p.v.); grade 4 to severe obstruction (29–42% of p.v.); grade 5 to very severe obstruction (less than 29% of p.v.).

Subjects with an obstruction ≥grade 2 in one nostril or ≥grade 1 in both nostrils were considered affected by nasal obstruction and were administered ND (xylometazoline chloridrate, 0.05%), 2 drops/nostril, with a 5-min interval between them. The test was repeated after half an hour [13].

NFE was performed by an expert otorhinolaryngologist using a 2.7 mm diameter endoscope and the degree of AH was calculated using Cassano et al. criteria [14], as follows: grade 1 corresponded to free choanal opening (<25%); grade 2 to adenoids occluding the upper half of the choanal opening (50%), without tubarian ostium involvement; grade 3 to adenoids occluding 75% of the choanal opening, with partial Eustachian tube involvement; grade 4 to adenoids completely occluding the choanal opening associated with an unevaluable tubarian ostium.

2.1. Statistical analysis

Statistical analyses were performed using SPSS (Statistical Package of Social Sciences, Chicago, IL, USA) software version 9.0. Two by two tables were used to calculate sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV). We plotted receiver–operator characteristics (ROC) curves for rhinomanometry and NFE, in order to quantify the accuracy of the tests.

ROC curve is a graphical plot of the sensitivity, or true positive rate, vs false positive rate; it can also be represented by plotting the fraction of true positives out of the positives (TPR = true positive rate) vs the fraction of false positives out of the negatives (FPR = false positive rate).

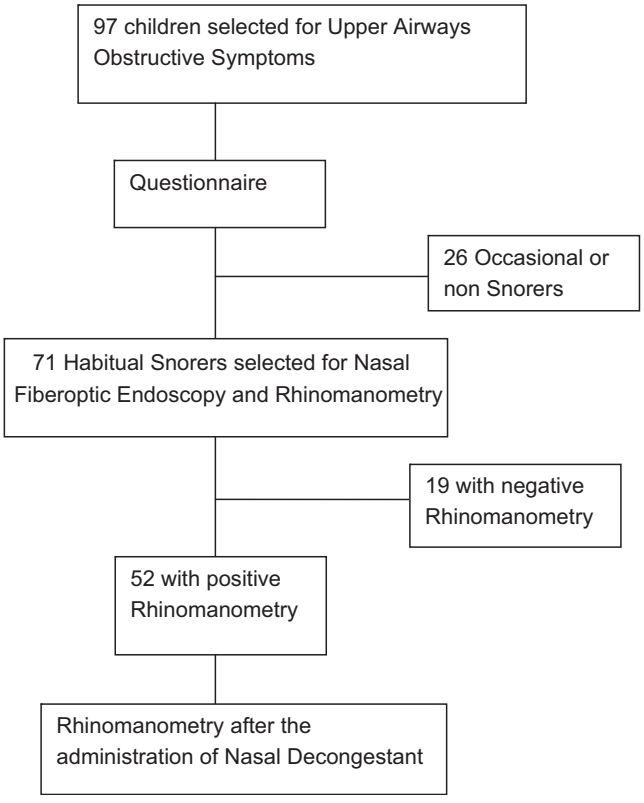

Fig. 1. Study design.

3. Results

According to questionnaires, of 97 patients 71 (73.2%) were classified as habitual snorers and 26 (26.8%) as occasional or non-snorers.

The 71 habitual snoring patients underwent rhinomanometry: 52 (73.2%) showed obstruction in one or both nostrils and 19 (26.8%) a normal nasal airflow.

The 52 patients with nasal obstruction at rhinomanometry underwent rhinomanometry after the administration of ND: 27 (52%) resulted affected by bilateral nasal obstruction (grade ≥ 3), 2

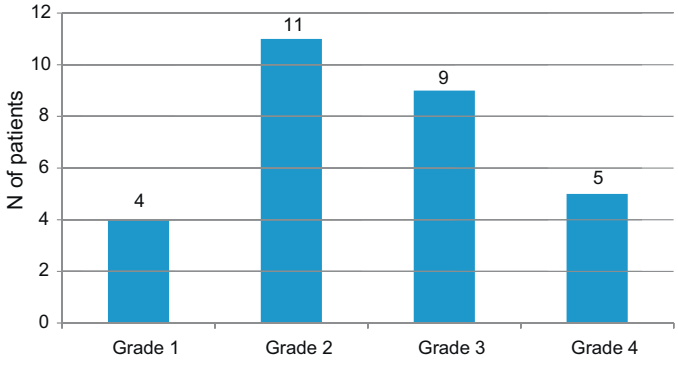

Fig. 2. Grade of nasal obstruction in the 29 patients obstructed at rhinomanometry after nasal decongestant test.