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Clinical features and diagnostic reliability in paediatric laryngopharyngeal reflux

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ABSTRACT

Objective: The aim of this study was to assess the validity of current diagnostic approaches in pediatric laryngopharyngeal reflux (PLPR). Clinical status findings and 24 h double probe oesophageal pH monitoring results in children with suspected PLPR and/or GERD were analyzed and a clinically useful probability score was developed.
Methods: This is a retrospective longitudinal cohort study including 89 pediatric patients who underwent preliminary oropharyngoscopy, and then nasal fibre optic laryngoscopy and ambulatory 24 h oesophageal pH monitoring in a tertiary pediatric and otorhinolaryngology hospital center. The patients' parents gave written informed consent for diagnostic testing. Statistical analysis was performed using standard descriptive statistics. Associations between variables were assessed using Fisher's exact test, Mann–Whitney test and Kruskal–Wallis test for non-parametric paired samples.
Results: Patients' age spanned 1–18 years with a median of 11.2. Out of the 89 patients, 56 were girls, and 33 were boys. All of the patients underwent nasal fibre optic laryngoscopy and 24 h double probe pH monitoring. Out of 89 examined children, 50 had PLPR. Out of the 50 positive for PLPR, 46 had a positive clinical finding, with a sensitivity of 92% (95% CI: 80.75–97.73%) and specificity of 10.26% (95% CI: 2.93–24.24%). Boys have GERD significantly more often than girls ($p < 0.0001$), and have a worse result of pH monitoring ($p < 0.0001$). The most common finding was an injected and granulated oropharynx accompanied by posterior laryngitis (54/89). Patients with leading symptoms of asthma had significantly worse GERD scores ($p = 0.0493$). The patients were then reassigned to newly developed risk categories and a significant correlation with a positive PLPR diagnosis was found ($p = 0.0262$).
Conclusions: The significance of a thorough otorhinolaryngologic and paediatric examination and patient history taking is still paramount, with additional benefit in diagnosing the disease arising from 24 h oesophageal pH monitoring in select patients. This study brings to light new relationships between clinical symptoms and objective findings and presents a novel attempt to classify the likelihood of diagnosis. Patient stratification could help clinicians in defining groups at high risk and support a timely, cost-effective and precise diagnostic evaluation and proper therapy.

1. Introduction

Pediatric laryngopharyngeal reflux (PLPR) is a common pediatric disorder that remains insufficiently illuminated. The importance of this disease is enhanced when considering that it is frequently linked with comorbidities and overlooked by otorhinolaryngologists and paediatricians. Laryngopharyngeal reflux (LPR) refers to the backflow of stomach contents into the throat, that is, into the laryngopharynx. The symptom complex is associated with acid-induced and pepsin-mediated injury to the mucosa of the larynx and pharynx. There is evidence that LPR is associated with rhinosinusitis, laryngitis, pneumonia, and asthma in children [1]. Another issue is overlapping with similar diagnoses such as GERD and GER which makes a reliable diagnosis uncertain in everyday practice among pediatric otorhinolaryngologists and paediatricians. Gastroesophageal reflux disease refers to gastro-oesophageal reflux that is excessive and that causes tissue damage and/or clinical symptoms. Children with PLPR often do not experience classic GERD symptoms and symptoms may occur

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intermittently, which makes the diagnosis even more challenging [2]. Currently published studies have shed little light on correlation of respiratory symptoms, endoscopic findings and results of frequently used diagnostic tests [3]. One of the most commonly used techniques to document LPR is ambulatory 24 h pH monitoring. When paired with nasal fibre optic laryngoscopy, it represents a minimally invasive and least time-consuming method for detecting PLPR [3,4].

2. Objective

The aim of this study was to assess the validity of current diagnostic approaches in PLPR. We examined clinical status findings and 24 h double probe oesophageal pH monitoring results in children with suspected PLPR and/or GERD and developed a clinically useful probability score combining clinical findings and 24 h pH monitoring results.

3. Methods

This is a retrospective longitudinal cohort study including 89 pediatric patients who underwent oropharyngoscopy, fibre optic larygoscopy and 24 h oesophageal pH monitoring due to symptoms suspected in their medical history suggesting PLPR; chronic coughing, hoarseness of voice, chronic laryngitis, postnasal discharge and frequent throat clearing and asthma. There were three patients with a combination of asthma and allergic rhinitis that were included in the study but the patients were evaluated out of their respective allergen season to avoid misinterpretation of the clinical findings and all three were symptom free regarding the nasal and ocular manifestations of allergic rhinitis. A correlation between local findings of PLPR and (hetero) anamnestic data as subjective factors, and objective data obtained by 24 h dual-probe monitoring were analyzed. The study was carried out in a period from January 1st, 2007 to December 31st, 2012 in a tertiary pediatric and otorhinolaryngology hospital center (Clinical Hospital Centre Sestre milosrdnice, Zagreb, Croatia). This study and its protocol were approved by the University Hospital Centre Sestre milosrdnice Bioethical Board adhering to the Helsinki Declaration of 1983, and an informed consent was obtained from all of the patients' parents and legal guardians. After overnight fasting, a 24 h double-probe pH monitoring was performed (Flexilog 2000, Dual Channel Recorder, Oakfield Instruments Ltd, Witney, UK) using a trans-nasally placed catheter (ComfortTecPlus, Sandhill Scientific, Highland Ranch, Co,USA), and pH recorder (Flexisoft III, Oakfield Instruments Ltd, Witney, UK). Standard protocol 24 h pH monitoring was conducted [5]. Following calibration at 37 °C in pH 7.01 and pH 1.07 buffer solution (Standard instruments GmbH, Karlsruhe, Germany) before each study, the double-sensor arm was introduced trans-nasally and advanced until gastric pH was reached by the distal sensor. The probe was then withdrawn slowly until the distal sensor showed an abrupt increase in pH value, and then the probe of another 5 cm was withdrawn and fixed to the nose, adjusting to the age and heights of patients. When probe misalignment due to inadequate test results was suspected, a chest X-ray was performed and the probe was realigned. All of the patients were fed with their normal formulas or usual diet during pH monitoring. Oesophageal pH was recorded in supine, upright, and postprandial positions. A positive test criterion for diagnosis of GERD was considered as $\geq$5% of total time with pH $<$ 4. At least three episodes of pH below 4 in the proximal probe with a simultaneous drop or a preceding decrease of pH $<$ 4 in the distal probe or $\geq$1% for the percentage of total time pH $<$ 4 in the proximal probe were accepted as PLPR. The reflux, Boix-Ochoa and DeMeester-Johnson indexes, number of acid reflux events lasting >5 min and duration of the longest reflux were also noted.

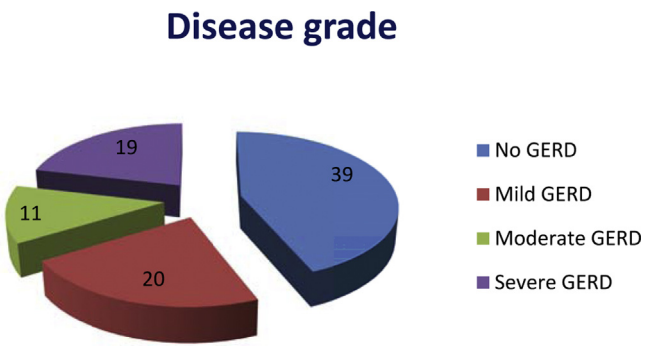

Fig. 1. Distribution of GERD according to severity (n = 89).

Ambulatory 24 h double-probe pH monitoring was applied by the same paediatric gastroenterologist. The otorhinolaryngologic examination was performed by the same otorhinolaryngologist, including nasal fibre optic laryngoscopy (4 mm flexible optic fibre, Storz Videolaryngoscope 11001R01 Karl Storz, Tuttlingen, Germany) that assessed the upper airway from the nasal vestibule to the infraglottic area and the oral cavity/oropharynx. The patients' parents gave written informed consent for diagnostic testing. Statistical analysis was performed using MedCalc software (Version 11.2.1© 1993–2010. MedCalc Software bvba Software, Broekstraat 52, 9030 Mariakerke, Belgium), using standard descriptive statistics and frequency tabulation as indicated. The data for the n = 89 cohort were expressed as ratios due to $n < 100$. Associations between variables were assessed using Fisher's exact test, Mann–Whitney test and Kruskal–Wallis test for non-parametric paired samples. All the tests of statistical significance were performed using a two-sided 5% type I error rate.

4. Results

The study included 89 pediatric patients aged 1–18 years (median age was 11.2). All of them underwent fibre optic laryngoscopy. Out of the 89 patients, 56 were girls, and 33 were boys. All of the patients underwent 24 h double probe pH monitoring. Out of 89 examined children, 50 had PLPR. Out of the 50 positive for PLPR, 46 had a positive clinical finding after medical history taking, oropharyngoscopy and nasal fibre optic laryngoscopy, with a sensitivity of 92% (95% CI: 80.75–97.73%) and specificity of 10.26% (95% CI: 2.93–24.24%). Positive predictive value was 56.79%, and negative predictive value was 50% (Figs. 1 and 2). Further data analysis showed that boys tend to have GERD

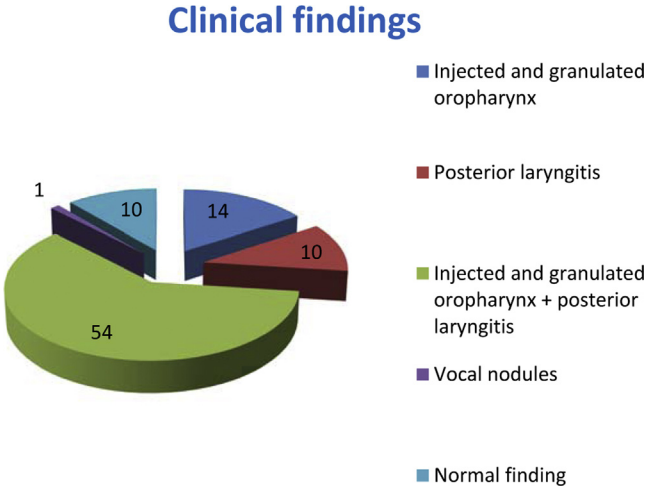

Fig. 2. Distribution of clinical findings (n = 89).