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Impact of laryngopharyngeal and gastroesophageal reflux on asthma control in children

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ABSTRACT

Objective: A prospective study was carried out to determine the sensitivity and specificity of reflux symptoms and laryngeal findings to diagnose laryngopharyngeal reflux (LPR) and gastro-esophageal reflux (GER) in children with asthma by comparing the results of double probe pH monitorization and to determine the difference between controlled and uncontrolled asthma in terms of GER and LPR coexistence.
Methods: A total of 50 patients (23 girls, mean age 10.8 ± 0.4 years) with mild to moderate persistent asthma were included in this study. The patients were divided in two groups according to the asthma control status as controlled (n = 27) vs. uncontrolled asthma (n = 23). All patients completed the reflux symptom questionnaire and then they underwent flexible fiberoptic laryngoscopy and 24 h double probe (pharyngeal and esophageal) pH monitorization. Laryngopharyngeal and gastroesophageal reflux were defined according to the double probe pH meter results.
Results: The prevalences of LPR and GER were 70% and 46% in asthmatic patients, respectively. The reflux symptom score and LPR disease index were not useful to predict LPR or GER. There was no association between asthma control status and LPR and GER. Vocal nodule seems to be a valuable sign to evaluate LPR in asthmatic children.
Conclusions: The reflux symptom score and LPR disease index do not seem reliable to diagnose LPR and GER in children with asthma. The frequency of LPR and GER are independent of asthma control, atopy and long acting beta agonist usage.

1. Introduction

Pediatric laryngopharyngeal reflux (LPR) has gained better recognition over the past few years. Even though the relationship between gastro-esophageal reflux disease (GERD) and asthma has been investigated, there was a little data about the association between asthma and laryngopharyngeal reflux (LPR) in children [1].

The relationship between reflux and respiratory distress resembles chicken or egg dilemma. There is no doubt that reflux of gastric contents is an important cause of chronic cough [2]. It was speculated that refluxate may enter the airway and stimulate tracheo-bronchial cough receptors and it is possible that microaspirations occur directly stimulating cough and/or resulting in airway inflammation and cough reflex sensitization [3]. Lung hyperinflation in asthma lowers the diaphragm and can interfere with the flap valve mechanism produced by the angulated entry of the esophagus into the stomach. These fluctuations in intrathoracic and intraabdominal pressures increase the risk of reflux [4].

Laryngopharyngeal reflux is different from classic gastroesophageal reflux. It is believed that the primary defect in LPR might be upper esophageal sphincter dysfunction, whereas GER is lower esophageal dysfunction [5]. Patients with LPR usually deny symptoms of heartburn and regurgitation. Instead of gastrointestinal symptoms, most LPR patients have throat symptoms like dysphonia, chronic cough, globus pharyngeus, and chronic throat clearing [6].

A diagnosis of LPR may be established by questioning of the symptoms, videolaryngoscopic evaluation of larynx or double probe pH monitoring [7–9]. Ambulatory 24 h double probe (pharyngeal and esophageal) pH monitoring is both highly sensitive and specific for diagnosis of LPR [10,11].

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The aim of this study was to determine the predictive value of reflux symptom score and LPR disease index to diagnose LPR and GER in children with asthma by comparing the results of double probe pH monitoring study. Secondly we aimed to determine the difference between controlled and uncontrolled asthma in terms of GER and LPR coexistence.

2. Subjects and methods

A total of 50 patients aged 7–17 years (23 girls, 27 boys) with mild to moderate persistent asthma, between December 2009 and December 2010 were randomly included in this study according to controlled and uncontrolled status at asthma outpatient clinic. Randomization was performed using a computer generated randomization list and 50 patients were selected out of 150 patients with asthma. However, 4 patients did not enter the study because the procedure was invasive. Three of these 4 patients had controlled asthma. Four other patients were selected by the randomization programme to replace the missing ones. The age, sex, height, weight, active and passive smoking, skin prick tests, pulmonary function test, treatments and asthma control status of the subjects were recorded. Asthma severity was used only as a criterion for patient selection and the patients with intermittent asthma were not included the study. However, the patients were divided into two groups: those with controlled asthma or those with uncontrolled asthma. The diagnosis, severity and control status of asthma were assessed according to the Global Initiative for Asthma (GINA) guidelines. The assessment of asthma control included the control of the clinical manifestations (symptoms, night waking, reliever use, activity limitation and lung function) over 4 weeks [12].

All patients completed the reflux symptom questionnaire [7] and were examined by the same allergist (MK). Pulmonary function tests were performed. After these procedures were completed, flexible fiberoptic laryngoscopy was performed by same ENT specialist (SA) and according to the images LPR disease index was calculated [9]. Finally, 24 h double probe (pharyngeal and distal esophageal) pH monitoring study (MMS, Ohmega, software 8.11 version, Holland) was performed. The ENT specialist and the gastroenterologists were blinded to the asthma control status of the patients. Dual channel probe had two sensors for measuring pH, separated on the two different probes (MMS, Holland). The probes are connected with common entry (Fig. 1). Calibration was performed before and after each examination at pH 7 and pH 1. The electrodes were introduced transnasally. The pharyngeal probe was located above UES (within 1 cm of glottis) and the esophageal probe was located above LES (3rd vertebral body above diaphragm). After initial placement of the probe, a lateral chest X-ray was obtained to document accurate positioning (Fig. 2).

During the 24 h examination the children were encouraged to live a normal everyday life and eat normally. Parents were instructed to press a button on the monitor to indicate the after-feeding and sleeping periods. Abnormal symptoms and signs such as coughing episodes, respiratory distress, and emesis were also recorded by the parents.

Subjects were studied for approximately 24 h. The Gastrosoft Programme was used to review the events recorded on the esophageal and pharyngeal probes.

The number of reflux episodes (pH $<$ 4), the percentage of time that pH is less than 4 (reflux index), the number of reflux of at least 5 min in duration, the longest reflux episode, and the total time of recorded pH less than 4 were recorded. The reflux index was obtained by dividing the total registered time during which esophageal pH persisted below 4 by the total registered period (in minutes). The result was expressed as the percentage of time elapsed with pH below 4.

Gastroesophageal reflux was defined as abnormal reflux index ($>$4%) and/or total number of reflux episodes (pH $<$ 4) $>$ 50 within 24 h [13]. There is no data about abnormal reflux index for pharyngeal probe in children. Six reflux episodes and higher on pharyngeal probe was defined as LPR with reference to the adult studies [14,15].

Atopy was defined as reaction to allergens on skin prick test [16]. Skin prick testing was performed for common inhaler allergens *Dermatophagoides farinae*, *Dermatophagoides pteronyssinus*, *Aspergillus fumigatus*, *Alternaria alternata*, ragweed, trees (*Ulmus*, *Quercus*, *Populus*, *Platanus*, *Salix*), certain grasses (*poa mix*, *C. dactylon*, *P. pratensis*, *D. glomerata*, *A. sativa*, *Festuca*), cat, dog and cockroach and food allergens (egg, milk, hazelnut, peanut, wheat, cacao) (Laboratorie des Stallergenes, Fresnes Cedex, France) with a response considered positive if the wheal was at least 3 mm greater than the negative control.

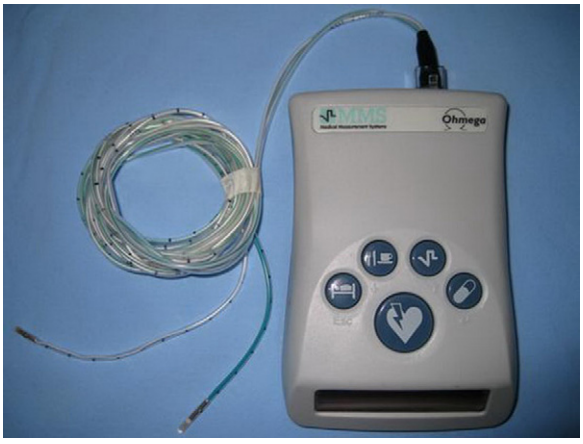

Fig. 1. The view of the dual channel probe with two sensors, separated on the two different probes.

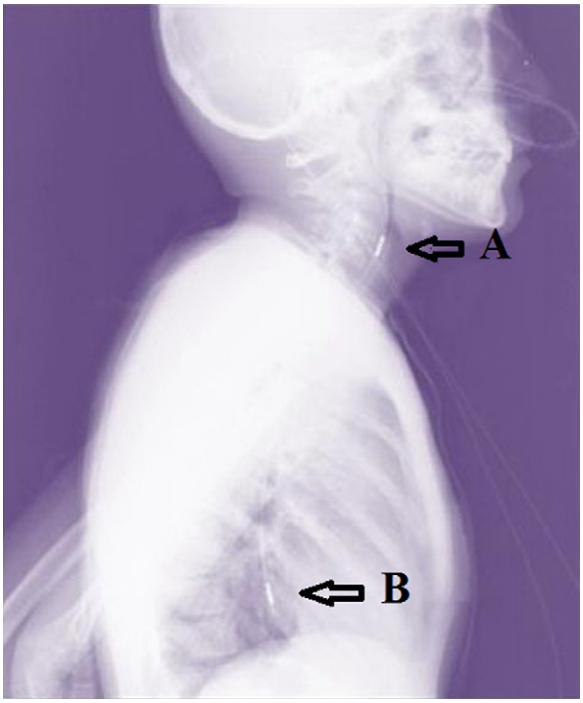

Fig. 2. X-ray imaging of the pharyngeal probe (A) and esophageal probe (B).