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Gastroesophageal reflux in infants with persistent/recurrent wheezing – an ultrasonographic study

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Abstract

Literature data suggests an association between gastroesophageal reflux disease and respiratory symptoms as recurrent/persistent wheezing or chronic cough.

Objective. The aim of this study was to appreciate the number of the postprandial GER episodes in healthy infants, in infants with persistent/recurrent wheezing and in infants with vomiting

Methodology. The study group comprised 132 infants with intermittent vomiting or persistent/recurrent wheezing evaluated through ultrasound exam for assessing numbers of gastroesophageal reflux (GER) episodes during a 10 minutes postprandial examination. A control group of healthy infants was examined for assessing the number of postprandial GER episodes detected at ultrasound exam.

Results. Ultrasound exam revealed significant differences between the number of postprandial GER episodes in patients with vomiting compared to patients with recurrent/persistent wheezing or normal infants. There were no differences between the number of postprandial GER episodes in patients with recurrent/persistent wheezing and healthy infants. In conclusion, postprandial GER episodes are more frequent in infants with vomiting compared with healthy infants or those with recurrent/persistent wheezing.

Key words: gastroesophageal reflux, wheezing, ultrasonography, infant.

Introduction

Ultrasonography has been used in the last decades in the assessement of upper digestive tract motility disorders, including gastroesophageal reflux disease (GERD). Ultrasonography could provide data about distal esophagus and gastroesphageal junction morphology, especially in the pediatric population. Real time ultrasonographic exam permits also a good evaluation of the number of gastroesophageal reflux episodes (GER) in the postprandial period. Literature data suggests an association between GERD and respiratory symptoms as recurrent/persistent wheezing or chronic cough.

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Objectives

The purpose of this study was to study the number of the postprandial GER episodes in healthy infants, in

infants with vomiting and in infants with persistent/recurrent wheezing.

Methodology

The study was retrospective and included 132 patients with symptoms suggestive for GERD: recurrent/persistent wheezing with poor response at bronchodilatatory treatment or intermittent vomiting/regurgitation in the absence of a detectable organic cause.

In each of the patients of the study group a postprandial ultrasound examination was performed in order to detect the GER episodes. To appreciate the GER episodes, a liquid meal was administrated (milk formula). All patients were examined in a supine position after ingestion of a liquid meal. The abdominal esophagus was detected in a longitudinal section below the sternum, with the transducer angled 20-30 degree to the right side (fig.1).

The intraabdominal esophagus is detectable between the aorta and left liver lobe from the diaphragm hiatus to gastroesophageal junction (fig.2). If the transducer is angulated more cranial after detection of intraabdominal esophagus, it is possible to see the distal part of thoracic esophageal segment.

The GER episode has the following sequences: opening of the lower esophageal sphincter, the movement of the gastric content into esophagus in a certain amount of time, the return of the refluxed material into the stomach and the closing of the lower esophageal sphincter (fig.3).

The number of GER episodes were counted during a period of 10 minutes of postprandial ultrasonographic examination.

An ultrasonographic examination was also applied to a number of 15 healthy infants (control group) for counting the postprandial GER episodes during a 10 minutes period.

In the patients from the study group, the cough episodes related to GER episodes were counted.

The statistic analysis. Arithmetic mean and standard deviation were calculated for the ultrasonographic parameters. The independent sample t-test was used to appreciate the differences between the number of GER episodes for the study group and the control group and to appreciate the difference between the number of GER episodes in boys and girls. The regression was applied to appreciate the influence of age on the number of GER. Odds ratio was used to evaluate the association of cough episodes in patients from the study group.

Results

The study group included 132 patients (70 boys and 62 girls) aged between 1 and 12 months. This group comprised 38 infants with recurrent/persistent wheezing and 94 infants with intermittent vomiting, in absence of an organic cause and without respiratory symptoms. The



Fig.1. Transducer position in ultrasonographic examination of distal esophagus.

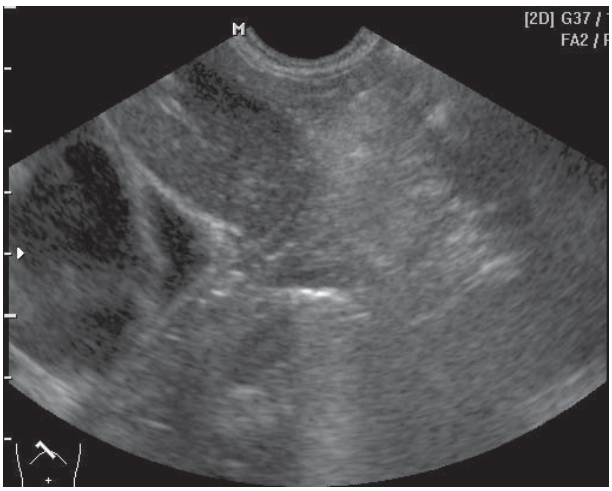


Fig.2. Ultrasonographic aspect of distal esophagus in a longitudinal view.

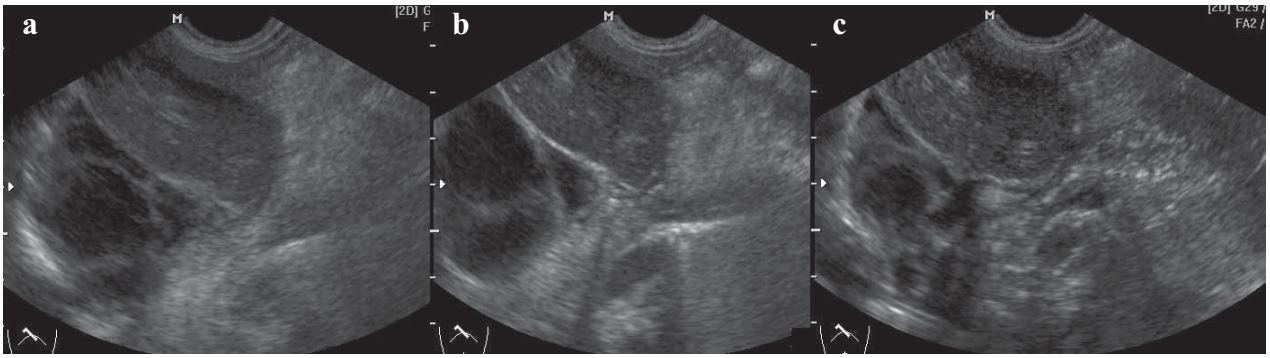


Fig.3. Ultrasonographic exam in GER episode: A. Movement of the gastric content into the distal esophagus. B. Presence of gastric content in the distal esophagus. C. Return of content from esophagus into the stomach.

postprandial ultrasonographic examination was performed in 38 patients with recurrent/persistent wheezing (20 boys, 18 girls; mean age and standard deviation 6.9±3.3 months) and 94 patients with vomiting (50 boys, 44 girls; mean age and standard deviation 3.9±2.5 months).

The control group comprised 15 healthy infants (8 boys, 7 girls) with ages between 1 to 10 months, mean age and standard deviation were 4.6±2.7 months. To these infants the number of GER episodes in an 10 minutes postprandial examination was counted.

Demographic data are presented in table 1.

Table 1. Demographic data and number of GER episodes detected by ultrasound in the study and control groups.

	Wheezing	**Vomiting**	**Control group**
Patients number	38	94	15
Mean age ± SD (months)	6,9 ± 3,3	3,9 ± 2,5	4,6 ± 2,7
Mean ± SD (GER episodes no)	1,57 ± 1,44	2,35 ± 2,14	1,13 ± 1,24

The age had no influence on number of postprandial GER in infants with wheezing ($R^2 = 0.01$; p=0.18) or in infants with vomiting ($R^2 = 0.07$; p=0.09).

There were no significant differences between number of GER episodes in boys and girls (table 2).

The mean number of GER episodes found in a postprandial period of 10 minutes and the standard deviation were 1.13±1.24 episodes in the control group; 1.57±1.44 postprandial GER episodes was detected in infants with recurrent/persistent wheezing and 2.35±2.14 postprandial GER episodes in patients with vomiting (table 1).

The statistical analysis did not reveal significant differences among the control group and the infants with recurrent/persistent wheezing (p=0.29), but revealed significant statistical differences regarding the number of GER episodes between the infants with vomiting compared with the ones with recurrent/persistent wheezing (p=0.04), and the infants with vomiting compared with the healthy ones (p=0.03).

Table 2. Influence of gender on the number of GER episodes.

	Wheezing		**Vomiting**	
Gender	Female	Male	Female	Male
Mean ± SD (GER episodes no)	1,80 ± 1,50	1,33 ± 1,77	2,31 ± 1,77	2,38 ± 2,44
p	0,89		0,32	

For the patients from the study group, an association between the cough episodes and the GER episodes was observed for the infants with vomiting and for those with recurrent/persistent wheezing. The cough episodes surely associated with an episode of GER, detected through ultrasonography, were found in 7/38 of the wheezing patients (18.4%) and in 8/94 of the vomiting patients (8.5%). There were no significant statistical differences regarding the association of cough with the GER episodes in vomiting and wheezing infants (p=0.25). Odds ratio (2.4274) was in the confidence interval (95% CI – 0.8126 to 7.2513).

Discussions

There are different methods used to diagnose GERD: 24 hours distal esophageal pH-monitoring, esophageal manometry, electrical impedance, ultrasonography, including the intraluminal one [1]. These methods have different specificity and sensitivity. The 24 hours distal esophageal pH-monitoring is the most used method to diagnose the pathologic GER.

The studies found in the literature about the utility of ultrasonography in diagnosing GERD for small aged patients use mainly 24 hours distal esophageal pH-moni-

toring as a reference method. The literature data about the sensitivity and the specificity of real-time ultrasonography compared with pH-monitoring in diagnosing GERD are different, generally between 38-100%, to 45-87% [2-7]. In a previous study performed by the authors of this article, a sensitivity of 88.2% and a specificity of 25% of ultrasound compared with pH-monitoring in GERD diagnosis was demonstrated [8].

Literature data reported an association between GERD and wheezing, asthma or chronic cough [9-14]. A recent study revealed that esophageal reflux is more severe in subjects with recurrent bronchitis than in those with a chronic cough [15]. In the present study, for postprandial GER identified through ultrasound exam, healthy infants, infants with vomiting without respiratory symptoms and infants with recurrent/persistent wheezing were evaluated. This study did not find significant statistical differences between the number of reflux episodes identified postprandial to the healthy infants compared to those with reccurent/persistent wheezing (p=0.29). In return, this study revealed more numerous GER episodes in patients with vomiting without respiratory symptoms compared to those with recurrent/persistent wheezing (p=0.04). Anyway, the association of respiratory symptoms (cough episodes) with reflux episodes detected at the ultrasonographical examination in real time was more frequent in patients with wheezing compared to those with vomiting (18.4% vs. 8.5%), but without significant statistical differences (p=0.18). This fact suggests that it is important to evaluate infants with chronic cough for GERD in a subsequent study.

In **conclusion**, this study demonstrated no differences between healthy infants and recurrent/persistent wheezing patients regarding postprandial GER episodes. There were more frequent cough episodes related to GER episodes in children with respiratory symptoms compared with children having intermittent vomiting without respiratory diseases.

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