

Original Research Article

Non-Invasive Ultrasound Diagnosis of Gastroesophageal Reflux Disease

Saatov ZZ, Karimov MM, Sobirova GN, Akhmathodjaev AM, Yakubov MM

Republican Specialized Scientific Practical Medical Center of Therapy and Medical Rehabilitation, Tashkent, Uzbekistan

*Corresponding Author:

Saatov ZZ

Email: fht-tma@mail.ru

Abstract: The clinical efficacy of transabdominal ultrasonography of gastroesophageal reflux disease was presented in the article. 250 patients with clinical and endoscopic signs of gastroesophageal reflux disease were examined. It was determined the length of the abdominal esophagus, the esophageal diameter, lumen width, the thickness and structure of walls. It was also revealed that the most common signs of gastroesophageal reflux disease were the expansion of the diameter of the distal part of the esophagus after intake of liquids, regurgitation of gastric contents into the esophagus in the form of a symmetrical thickening of the walls of the esophagus.

Keywords: gastroesophageal reflux disease, reflux-esophagitis, lower esophageal sphincter, ultrasound.

INTRODUCTION

In the XXI century the interest of scientists to gastroesophageal reflux disease (GERD) is not random: over the last decade this problem has become one of the most common gastroenterological diseases with significant impact on patients' quality of life, reducing their daily activity. In addition, the progression of GERD often leads to severe complications such as ulceration and stricture of the esophagus, bleeding, metaplasia and dysplasia of the epithelium, which, in turn, are significant risk factors for the development of adenocarcinoma [2, 4, 7]. Modern methods of diagnosis of GERD – esophagogastroduodenoscopy (EGDS), pH-impedance measurements are highly informative and sensitive, but not applicable for routine testing of all patients suffering from heartburn. High prevalence of GERD symptoms dictates the need to develop non-invasive methods of screening diagnostics among persons suffering from indigestion [3].

According to the international classification of diseases, GERD divided into endoscopically positive and negative forms. In the first case we detect signs of esophagitis, the second changes the lining of the esophagus is absent. Non-erosive reflux disease (NERD) is a significant problem of medicine, because of influence on the patients' quality of life, and high prevalence of this form of the disease.

In accordance with the results of large studies, non-erosive form of GERD (defined as the presence of symptoms of heartburn and/or regurgitation of a sour at least 1 time per week in the absence of damage to the mucous membrane of the esophagus) occurs much more

frequently than erosive esophagitis (EE): among all patients who have the criteria of GERD [12, 14]. At the same time, it has been shown that the severity and intensity of symptoms, and, consequently, reducing the patients quality of life with NERD and EE are comparable [6, 13].

According to the observations of some researchers, 17% of patients with erosive esophagitis have extra esophageal manifestations of GERD. Besides than the GERD through the initiation of viscerovisceral interaction could be the trigger of bronchial asthma, chronic bronchitis, ischemic heart disease, arterial hypertension.

Currently, transabdominal ultrasonography is one of the most widely used methods of diagnosis in various diseases. One of the main advantages of the ultrasonic method is highly informative, non-invasive, harmless and not burdensome for the patient [1, 5]. In addition, the study can be repeatedly used to study the dynamics of the pathological process. In the last years, it has been proven that ultrasound is an effective method for diagnosing hiatal hernia (HH), gastroesophageal reflux (GER) and esophagitis with accuracy to 95, 5% [10, 11, 15]. The use of transabdominal ultrasound allows reducing radiation load on the patients with comprehensive examination, which is especially important in regions with high radioactive environment, as well as the examination of children, pregnant women and patients who are contraindicated for traditional methods of research [8, 9].

The information about of transabdominal ultrasound examination of the esophagus in the literature is very few, therefore, of great interest is the definition of its role and place in the complex diagnosis of GERD.

The purpose of this investigation was study of possibilities of using of transabdominal ultrasonography for the diagnosis of GERD.

MATERIAL AND METHODS

250 outpatients with GERD aged 18 to 60 years were participated in investigations. Assessment of complaints and anamnesis of patients was held with special Likert questionnaire. Endoscopy was carried out according to standard methods with OLYMPUS GIF XPE endoscope. Transabdominal ultrasound examination was carried out on MINDRAY DC-6 equipment.

Ultrasonic investigations were carried out on prandial, with first performed a scan of the epigastric region in the sagittal plane from the midline to the left. Then the sensor was moved in a transverse plane, producing serial sections from the level of the xiphoid cut to the navel and back. It was revealed topographical features of the distal part of the esophagus and its anatomical landmarks (liver, aorta, inferior Vena cava, and diaphragm). Then directly studied the distal part of the esophagus, where they measured the length of the

abdominal esophagus, its diameter, wall thickness, lumen width, and the diameter of the esophageal-gastric junction. Then was studied ultrasonography of the distal part of the esophagus on a background of contrasting of the stomach. For filling the stomach used 200-400 ml of liquid (water, juice, tea). Average dimensions were: length – 37.5 mm, width 9.9 mm, wall thickness – 2.6 mm, width of 4,4 mm. The gastroesophageal junction was defined as a small diameter extension of the esophagus to an average of 10.8 mm at the confluence of the stomach.

Statistical processing of the obtained data was carried out using the software package SPSS v.15.0 (2007) and MS Excel for Windows XP. Using standard methods of variation statistics were calculated for the following parameters and criteria: arithmetic mean (M), error arithmetic average (m). To assess the statistical significance of the mean differences in the cases of the two samples used t-student test. Differences were considered significant at error probability of p<0.05.

RESULTS

The study of the dynamics of clinical manifestations of GERD in patients according to scale Likert (table. 1) showed that the main characteristic symptom of the disease in the first place was heartburn 100%. Then such symptoms such as belching – 82,8%, regurgitation – 53.2% and retrosternal pain and 43.6%.

Table 1: Dynamics of clinical manifestations of GERD in patients

Symptoms	Scores on the Likert scale	Frequency of symptoms
Heartburn	4,5±0,3	100%
Burp	3,2±0,2	82,8%
Regurgitation	2,4±0,5	53,2%
Chest pain	2,2±0,7	43,6%

Endoscopic studies have shown (table. 2) that 54.8% of patients with GERD were spent in the form of catarrhal esophagitis. The remaining 38.4% of patients in the mucosa noted the presence of erosions - erosive esophagitis. 61.5% of them, were patients with GERD, which had single (2 to 3) erosions in the mucosa of the esophagus. In 38.5% of patients were noted, the

presence of multiple erosions of the mucous membrane of the esophagus. Of the other organic changes at endoscopic examination was the presence of marked cardiac insufficiency have 76, 0% of patients and the presence of a hernia subphrenic hole in 18.8% of patients.

Table 2: Endoscopic characteristics of GERD in patients

	Catarrhal esophagitis	Erosive esophagitis	Lower esophageal sphincter insufficiency	Hiatal hernia
GERD	54,8%	Single erosion – 61,5% Multiple erosions – 38,5%	76,0%	18,8%

For diagnostic ultrasound of the GER was conducted contrasting with fluid in the amount of 200-400 ml. During the study was revealed retrograde fluid flow from the proximal stomach into the distal esophagus, pendulum movement of fluid in the stomach and the esophagus, extension of the abdominal

esophagus. The frequency of the ultrasonic symptoms of GER were identified in the result of the study is presented in table 3. We identified presence of cardiac insufficiency, GER and its severity according to the duration of reflux and degree of dilation of the abdominal esophagus.

Table 3: The frequency of ultrasonic symptoms of gastroesophageal reflux

Ultrasound symptoms, %	Frequency ultrasound symptoms, %
Regurgitation	93,6
The expansion of the diameter of the esophagus after liquid intake	94,8
Thickening of the walls of the esophagus	100

Studies have shown that the most significant criterion for the diagnosis of GER is the increase of the diameter of the esophagus by 0.35 cm and more in the 3rd minute of the study. Thus, the main ultrasonographic criteria for diagnosis of GER are the extension of abdominal esophagus and increasing of esophageal diameter by 0.35 cm and more.

Presence of ultrasound signs of the lower esophageal sphincter insufficiency combined with a thickening of the walls of the esophagus by 7-9 mm indicates the development of esophagitis and confirms diagnosis (table.4).

Table 4: Changing the size of distal part of esophagus in patients with GERD

Measured parameters	Values	
	Min-max	M±m
Length	30,2-43,6	37,9±6,8
Length (after liquid intake)	33,4-51,4	43,7±8,5
Diameter	13,2-23,1	18,3±4,9
Diameter (after liquid intake)	14-27,6	21,4±6,8
The wall thickness	5,3-9,8	7,6±2,3
The thickness of the walls (after liquid intake)	5,7-9,4	7,8±2,1

Thus, the specific ultrasonic symptoms of GER were expansion of the diameter of the distal part of the esophagus after liquid intake, regurgitation of gastric contents into the esophagus, signs of esophagitis in the form of a symmetrical thickening of the walls of the esophagus.

Ultrasound examination of the esophagus due to its noninvasiveness unhindered accessibility, high informativity, simplicity and accessibility may be the method of choice in patients with contraindications to endoscopy. The combination of ultrasound signs of GER and thickening of the esophageal wall can suggest the presence of reflux esophagitis in the patient. Analysis of the data showed that in our study the diagnostic efficiency of ultrasound screening in detecting of GER was high and was equal: accuracy 93%, sensitivity 90%, specificity – 94%. In addition, ultrasound can be used for dynamic monitoring and evaluation of the effectiveness anti reflux therapy (method is not associated with radiation exposure that allows for it's recur).

CONCLUSIONS

1. The developed technique of transabdominal ultrasound study of GERD allows diagnosing the presence of this pathology in patients.
2. Transabdominal ultrasonic method allows us to verify GERD according to the presence or absence of lower esophageal sphincter insufficiency by changing the thickness of the walls of the esophagus.

3. The method of transcutaneous transabdominal ultrasound examination of the GERD is non-invasive, reasonable and practically no contraindications diagnostic method which can be carried out in outpatient and inpatient institutions to verify the diagnosis of GERD.

REFERENCES

1. Бурков, С. Г., & Арутюнов, А. Г. (2002). Ультразвуковая диагностика заболеваний дистального отдела пищевода. *Ультразвуковая и функциональная диагностика*, 2, С. 193.
2. Ивашкин, В. Т., Шептулин, А. А., & Трухманов, А. С. (2005). Рекомендации по обследованию и лечению больных гастроэзофагеальной рефлюксной болезнью. // *Пособие для врачей*. М.
3. Кайбышева, В. О., Кучерявый, Ю. А., & Трухманов, А. С. (2013). Результаты многоцентрового наблюдательного исследования по применению международного опросника GERD Q для диагностики гастроэзофагеальной рефлюксной болезни. // *Рос. журн. гастроэнтерол. гепатол. Колoproктol*, 21(5), 15-23.
4. Кайбышева, В. О., Кучерявый, Ю. А., & Ивашкин, В. Т. (2014). Обсуждение проблемы гастроэзофагеальной рефлюксной болезни в материалах Всемирного гастроэнтерологического конгресса (Шанхай, 2013). // *Рос. журн. гастроэнтерол. гепатол. Колoproктol*, 3, 22-27.
5. Клишина, И. Н., Белова, И. Б., & Китаев, В. М.

- (2006). Трансабдоминальное ультразвуковое исследование в диагностике патологии дистального отдела пищевода. // *Медицинская визуализация*, 2, 37-43.
6. AskMayoExpert. (2015). Gastroesophageal reflux disease. // Rochester, Minn.: *Mayo Foundation for Medical Education and Research*.
 7. Chandrasoma, P. T., & DeMeester, T. R. (2006). GERD. Reflux to Esophageal Adenocarcinoma. Academic. Press
 8. Di Mario M., Bergami G., Fariello G., & Vecchioli Scaldazza A. (2007). Diagnosis of gastroesophageal reflux in childhood: Comparison of ultrasonography and barium swallow. *Radiol. Med*, 89, 76–81.
 9. Farina, R., Pennisi, F., La Rosa, M., Puglisi, C., Mazzone, G., & Riva, G. (2008). Contrast-enhanced colour-Doppler sonography versus pH-metry in the diagnosis of gastro-oesophageal reflux in children. *Radiol Med*, 113, 591–8.
 10. Holloway, R. H. (2007). Esophageal ultrasonography: A new view on esophageal motility. *Am. J. Gastroenterol*, 102, 146–8.
 11. Madi-Szabo, L., & Kocsis, G. (2010). Examination of gastroesophageal reflux by transabdominal ultrasound: can a slow, trickling form of reflux be responsible for reflux esophagitis? *Can. J. Gastroenterol*, 14(7), 588-92.
 12. Ronkainen, J., Aro, P., & Storskrubb, T. (2005). High prevalence of gastroesophageal reflux symptoms and esophagitis with or without symptoms in the general adult Swedish population: a Kalixanda study report. *Scand. J. Gastroenterol*, 40, 275–285.
 13. Yi, C. H., Hu, C. T., & Chen, C. L. (2007). Sleep dysfunction in patients with GERD: erosive versus nonerosive reflux disease. *Am. J. Med. Sci*, 334, 168–170.
 14. Zagari, R. M., Fuccio, L., & Wallander, M. A. (2008). Gastro-oesophageal reflux symptoms, oesophagitis and Barrett's oesophagus in the general population: the Loiano-Monghidoro study. *Gut*, 57, 1354–1359.
 15. Zhu, S. Y., Liu, R. C., Chen, L. H., Yang, H., Feng, X., & Liao, X. H. (2004). Sonographic anatomy of the cervical esophagus. *J. Clin. Ultrasound*, 32, 163–71.