Is the severity of gastroesophageal reflux dependent on hiatus hernia size?

Thomas Franzén, Lita Tibbling

AIM: To determine if the severity of gastroesophageal reflux disease is dependent on the size of a hiatus hernia.

METHODS: Seventy-five patients with either a small (n = 25), medium (n = 25) or large (n = 25) hiatus hernia (assessed by high resolution esophageal manometry) were investigated using 24-h esophageal monitoring and a self-assessed symptom questionnaire. The questionnaire comprised the following items, each graded from 0 to 3 according to severity: heartburn; pharyngeal burning sensation; acid regurgitation; and chest pain.

RESULTS: The percentage total reflux time was significantly longer in the group with hernia of 5 cm or more compared with the group with a hernia of < 3 cm (P < 0.002), and the group with a hernia of 3 to < 5 cm (P < 0.04). Pharyngeal burning sensation, heartburn and acid regurgitation were more common with large hernias than small hernias, but the frequency of chest pain was similar in all three hernia groups.

CONCLUSION: Patients with a large hiatus hernia are more prone to have pathological gastroesophageal reflux and to have more acid symptoms than patients with a small hiatus hernia. However, it is unlikely that patients with an absence of acid symptoms will have pathological reflux regardless of hernia size.

© 2014 Baishideng Publishing Group Co., Limited. All rights reserved.

Key words: Heartburn, Hiatus hernia; Acid reflux

Core tip: Patients with a large hiatus hernia assessed by high resolution esophageal manometry are more prone to have pathological gastroesophageal reflux and to have more acid symptoms than patients with a small hiatus hernia. However, it is unlikely that patients with an absence of acid symptoms will have pathological reflux regardless of hernia size.

INTRODUCTION

Most patients with pathological gastroesophageal reflux (GER) have a hiatus hernia[1]. Patients with Barrett's esophagus that covers more than 3 cm are shown to have a hiatus hernia in 96%[2] and prolonged periods with esophageal pH < 4 in the supine position in 33%. After fundoplication for hiatus hernia, pathological GER disappears in the majority of cases[3,4]. The hernia sac is under the influence of the intrathoracic pressure in association with the intravesophageal pressure during inspiration and expiration. This leads to a significant reduction in the normal gastroesophageal pressure barrier, facilitating GER. From a mechanical point of view, the size of the hiatus and the size of the hernia sac with its rather high compliance, should reason-
ably be expected to have an inhibitory effect on GER and on GER symptoms. The aim of this study was therefore to determine if there is any relationship between the size of a hiatus hernia, the degree of GER, and the frequency of acid symptoms and chest pain.

Seventy-five patients were stratified into three groups with either a small (<3 cm), a medium-sized (3 to <5 cm), or a large (5 cm or more) hiatus hernia, assessed using high resolution manometry (HRM)[1]. They underwent 24-h esophageal pH monitoring and answered a questionnaire on the severity of heartburn, pharyngeal burning sensation, acid regurgitation, and chest pain.

**MATERIALS AND METHODS**

**Study design**

This was a prospective clinical study over a 6-mo period on patients with a small, medium-sized or large hiatus hernia at HRM. They underwent 24-h esophageal pH monitoring and answered a questionnaire on the severity of acid symptoms and chest pain.

**Patients**

The study comprised 75 patients, of whom 25 had a small hiatus hernia <3 cm (13 men, 12 women; median age: 58 years, range: 17-70 years), 25 had a medium-sized hiatus hernia 3 to <5 cm (13 men, 12 women; median age: 51 years, range: 18-74 years), and 25 had a large hiatus hernia 5 cm or more (10 men, 15 women; median age: 48 years, range: 16-84 years) as assessed with HRM. Before examination, the patients had to refrain from eating and drinking for 12 h and had not taken proton-pump inhibitors for 10 d.

**Questionnaire**

The patients were asked to answer a questionnaire about the presence of the following items, each graded from 0-3 (0 = none; 1 = mild; 2 = moderate; 3 = severe): heartburn (a retrosternal burning sensation); pharyngeal burning sensation; acid regurgitation; and chest pain. A maximum symptom score of 12 was thus possible.

**HRM**

The HRM system (ManoScan 360 A-100, Mano View analysis software ver. 1.2.0.1 from Sierra Scientific Instruments Inc., Los Angeles, CA, United States) uses a solid state catheter (4.2 mm diameter) with closely spaced circumferential pressure sensors at 1 cm intervals over 36 cm. The HRM catheter was passed via the nose and positioned 5 cm above the upper end of the lower esophageal sphincter. The Medtronic Synectics equipment for ambulatory pH monitoring was used and the recordings were analyzed digitally. A total reflux time of less than 4% was regarded as normal.

| Hiatus hernia size | Pbr | Hbr | Acr | Chest pain | GER (%) (ranges) |
|--------------------|-----|-----|-----|------------|-----------------|
| <3 cm (n=25)       | 36% | 40% | 40% | 40%        | 2.2% (0%-9.0%)  |
| 3 to <5 cm (n=25)  | 48% | 44% | 44% | 40%        | 1.9% (0%-25.3%)|
| 5 cm more (n=25)   | 56% | 48% | 56% | 44%        | 5.4% (0%-55.7%)|

Median values and ranges of 24-h pH test (GER %) are given. Pbr: Pharyngeal burn sensation; Hbr: Heartburn; Acr: Acid regurgitation; GER: Gastroesophageal reflux.

**RESULTS**

The percentage total reflux time (Table 1) was significantly longer in the group with a hernia of 5 cm or more compared with the group with a hernia of <3 cm (P < 0.002), and with the group with a hernia of 3 to <5 cm (P < 0.04). There was no significant difference between the small- and the medium-sized groups. Pathological GER defined as >4% total reflux time during 24-h pH monitoring was significantly more common with large hernias (64%) than with medium-sized and small hernias (24%) (Table 2). The symptom score in patients with a hernia larger than 2 cm and with pathological GER was twice that of patients with normal GER (Table 2).

Pharyngeal burning sensation, heartburn, and acid regurgitation were more common in the group with large hernias than in the group with small hernias, but the frequency of chest pain was about the same in all three hernia groups (Table 1).

Five of the patients in the group with a hernia <3 cm had no acid or chest symptoms. Their median GER was 1.7% (range: 0.4%-3.6%). Two patients in the group with a hernia 3 to <5 cm and no symptoms had a mean GER of 1.7% (range: 1.4%-2.0%), and two symptom-free patients in the group with a hernia 5 cm or more had a mean GER of 0.6% (range: 0.3%-0.9%).

**DISCUSSION**

In this study, it was found that the group with a large
Hiatus hernia had significantly more gastroesophageal reflux and more acid symptoms than the group with small hernias. This is in agreement with the study by Ott et al\(^1\). They found that patients with large hiatus hernias, assessed with barium esophagogram, were more likely to have abnormal findings on pH monitoring, and that a minimal sized hiatus hernia was a poor predictor of the presence of abnormal gastroesophageal reflux. Patti et al\(^1\), in an upper gastrointestinal series, showed that patients with a large hiatus hernia are more exposed to acid than patients with a small hiatus hernia. In the present study, acid symptomatology was not correlated with the hiatus hernia size as long as the patient did not have pathological values during the 24-h pH test. Pathological total reflux time, i.e., more than 4% during 24 h, was not seen in any of the patients without acid or chest symptoms regardless of hernia size. This implies that certain patients with a large hernia can go without symptoms and that there is no pathognomonic relationship between hernia size, symptoms and gastroesophageal reflux.

In a study by Koch et al\(^8\), the size of the esophageal hiatus assessed during fundoplication surgery was not found to have any relationship with symptoms, number of reflux episodes, or reflux in the upright position, but to have a significant influence on GER in the supine position. In another study, the size of the esophageal hiatus measured during surgery was found to be significantly related to the amount of acid reflux. However, it is not obvious that the degree of gastroesophageal reflex is equally dependent on the size of the esophageal hiatus and the size of the hiatus hernia itself, since a narrow hiatus canal can be found in large non-reducible hiatus hernias.

In conclusion, patients with a large hiatus hernia are more prone to have pathological gastroesophageal reflux and to have more acid symptoms than patients with a small hiatus hernia. However, it is unlikely that patients with an absence of acid symptoms will have pathological reflux regardless of hernia size.

## REFERENCES

1. Savas N, Dagli U, Sahin B. The effect of hiatal hernia on gastroesophageal reflux disease and influence on proximal and distal esophageal reflux. Dig Dis Sci 2008; 53: 2380-2386 [PMID: 18205046 DOI: 10.1007/s10620-007-0158-x]
2. Helman L, Biccas BN, Lemme EM, Novais F, Fittipaldi V. Esophageal manometry findings and degree of acid exposure in short and long Barrett’s esophagus. Anq Gastroenterol 2012; 49: 64-68 [PMID: 22481688]
3. DeMeester TR, Bonavina L, Albertucci M. Nissen fundoplication for gastroesophageal reflux disease. Evaluation of primary repair in 100 consecutive patients. Ann Surg 1986; 204: 9-20 [PMID: 3729589]
4. Lord RV, DeMeester SR, Peters JH, Hagen JA, Elyssnia D, Sheth CT, DeMeester TR. Hiatal hernia, lower esophageal sphincter incompetence, and effectiveness of Nissen fundoplication in the spectrum of gastroesophageal reflux disease. J Gastrointest Surg 2009; 13: 602-610 [PMID: 19050984 DOI: 10.1007/s11605-008-0754-x]
5. Salvador R, Dubecz A, Polomsky M, Gellerson O, Jones CE, Raymond DP, Watson TJ, Peters JH. A new era in esophageal diagnostics: the image-based paradigm of high-resolution manometry. J Am Coll Surg 2009; 208: 1035-1044 [PMID: 19476889 DOI: 10.1016/j.jamcollsurg.2009.02.049]
6. Ott DJ, Glauser SJ, Ledbetter MS, Chan NY, Koufman JA, Gelfand DW. Association of hiatal hernia and gastroesophageal reflux: correlation between presence and size of hiatal hernia and 24-hour pH monitoring of the esophagus. AJR Am J Roentgenol 1995; 165: 557-559 [PMID: 7645469 DOI: 10.1111/j.1442-2050.2011]
7. Patti MG, Goldberg HI, Arcerito M, Bortolasi L, Tong J, Way LW. Hiatal hernia size affects lower esophageal sphincter function, esophageal acid exposure, and the degree of mucosal injury. Am J Surg 1996; 171: 182-186 [PMID: 8554137]
8. Koch OO, Kaindlstorfer A, Antoniou SA, Asche KU, Grandenth FA, Pöntner R. Influence of the esophageal hiatus size on the lower esophageal sphincter, on reflux activity and on symptomatology. Dis Esophagus 2012; 25: 201-208 [PMID: 21895850 DOI: 10.1111/j.1442-2050.2011.01238.x]

## COMMENTS

### Background

Most patients with pathological gastroesophageal reflux (GER) have a hiatus hernia. The hernia sac is under the influence of the intrathoracic pressure in association with the intraesophageal pressure during inspiration and expiration. This leads to a significant reduction in the normal gastroesophageal pressure barrier, facilitating GER.

### Research frontiers

From a mechanical point of view, the size of the hiatus and the size of the hernia sac with its rather high compliance, should reasonably be expected to have an inhibitory effect on GER and on GER symptoms.

### Innovations and breakthroughs

In this study, it was found that the group with a large manometric hiatus hernia had significantly more gastroesophageal reflux and more acid symptoms than the group with small hernias.

### Applications

Patients with a large hiatus hernia are more prone to have pathological gastroesophageal reflux and to have more acid symptoms than patients with a small hiatus hernia. However, it is unlikely that patients with an absence of acid symptoms will have pathological reflux regardless of hernia size.

### Peer review

This study investigates the relationship between the size of a hiatus hernia, the degree of GER, and frequency of acid symptoms and chest pain. It’s a well-carried out study.

## Table 2  Mean scores for pathological and normal gastroesophageal reflux in patients with small, medium or large hiatus hernias

| Hiatus hernia size | Pathological GER Score sum (MV) | Normal GER Score sum (MV) |
|--------------------|--------------------------------|---------------------------|
| < 3 cm (n = 25)    | 3.5 (n = 6)                    | 2.8 (n = 19)              |
| 3 cm to < 5 cm (n = 25) | 6.7 (n = 6)                    | 3.3 (n = 19)              |
| 5 cm or more (n = 25) | 5.8 (n = 16)                    | 2.7 (n = 9)               |

GER: Gastroesophageal reflux.
