



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

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### Abstract

**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.

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**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.

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### INTRODUCTION

Most patients with pathological gastroesophageal reflux (GER) have a hiatus hernia<sup>[1]</sup>. Patients with Barrett's esophagus that covers more than 3 cm are shown to have a hiatus hernia in 96%<sup>[2]</sup> 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<sup>[3,4]</sup>. 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. 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)<sup>[5]</sup>. 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: 17-76 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); a 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. I 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 in order to provide simultaneous recordings from the hypopharynx and the esophagus to the stomach. The catheter was calibrated outside the patient before and immediately after the investigation using the thermal compensation option in the software.

The investigation was performed in the supine position and comprised 10 swallows of a 10-mL water bolus, each swallow time separated by 30 s intervals. The difference (cm) between the hiatus level and the gastroesophageal transition level as imaged during water swallowing

**Table 1 Percentages of symptoms graded 2 or 3 for pharyngeal burn sensation, heartburn, acid regurgitation in all three hernia groups**

Hiatus hernia size	Pbr	Hbr	Ac	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; Ac: Acid regurgitation; GER: Gastroesophageal reflux.

was calculated. A difference of 2 cm or more was regarded as a hiatus hernia.

After the HRM study, 24-h pH monitoring was performed. An antimony pH-electrode 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.

### Statistical analysis

Fisher's exact test was used for comparison between the three groups regarding symptom frequency.  $P < 0.05$  was regarded as significant. The Student *t*-test was used for comparison between the three groups regarding the percentage total reflux time.

## 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

**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 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.

manometric 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*<sup>[6]</sup>. 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*<sup>[7]</sup>, 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*<sup>[8]</sup>, 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 reflux 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.

**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.

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