

## Hiatal hernia recurrence after laparoscopic fundoplication

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**Key words:** laparoscopic fundoplication; hiatal hernia recurrence; gastroesophageal reflux.

**Summary.** *Objectives.* To determine the influence of hiatal hernia size and the laparoscopic fundoplication technique on the rate of hernia recurrence.

*Patients and methods.* The preoperative, operative, and postoperative observational data of 381 patients operated on at the Department of Surgery of Kaunas University of Medicine during the period of 1998–2004 for hiatal hernia complicated with gastroesophageal reflux were analyzed. The surgery technique (Nissen or Toupet operation) was chosen independently of the hernia size. The radiological investigation of the esophagus–stomach using barium contrast as well as esophagogastroduodenoscopy and biopsy was performed for all patients before the surgery. The subjective and objective assessment of the patients' health status was investigated before and no less than 12 months after surgery. If the disease symptoms remained or new ones (i.e. pain behind the sternum, dysphagia, etc.) occurred after surgery, the hernia recurrence was suspected. The radiological investigation of the esophagus–stomach using barium contrast, as well as esophagogastroduodenoscopy and biopsy were performed at the consultative outpatient clinic. The hernia recurrence was confirmed after performing these two investigations. When analyzing the results, the patients were divided into two groups: Group 1 – patients with small hiatal hernia (grade 1 and 2 hernia according to radiological classification), Group 2 – patients with large hiatal hernia (grade 3 and 4 hernia according to radiological classification).

*Results.* A total of 272 (71.4%) patients had small hiatal hernia, and 109 (28.6%) patients had large ones. Hernia recurrence was diagnosed in 7 (2.58%) patients in Group 1, while in Group 2, 11 (10.1%) patients had hernia recurrence ( $P < 0.05$ ). Laparoscopic Nissen fundoplication was performed in 287 (75.4%) patients, after which 14 (4.98%) patients had hernia recurrence, while Toupet fundoplication was performed in 94 (24.6%) patients, after which 4 (4.3%) patients had hernia recurrence ( $P > 0.05$ ).

*Conclusions.* The recurrence rate of hiatal hernia after laparoscopic fundoplications is significantly higher in patients with large hernias (grade 3 and 4 according to radiological classification). The surgery technique (Nissen or Toupet fundoplication) was not a significant factor affecting the recurrence rate of hiatal hernia.

### Introduction

Hiatal hernia as an anatomic diaphragm defect in medical literature was mentioned long time ago. According to the findings obtained during the radiological and endoscopic examinations, N. R. Barrett and P. R. Allison (1) suggested the term *reflux esophagitis*, indicating that acid stomach contents can back up (reflux) into esophagus because of hiatal hernia and altered anatomy, thus being the reason of esophageal inflammation. The achievements of minimally invasive surgery changed the treatment strategy for hiatal hernia and the gastroesophageal reflux disease (GERD). Over the past 10 years, laparoscopic antireflux surgery has been established as an effective, safe

GERD-treatment procedure, which improves patients' quality of life (2).

The main purpose of antireflux surgery is the restoration of esophagus and stomach anatomy in order to prevent the reflux of stomach acid content into the esophagus. The main surgery stages are the following: replacement of the proximal part of the stomach into the peritoneal cavity; removal of the hernia sac; narrowing or elimination the space between the diaphragmatic crura; performance the chosen type of fundoplication. The most common reasons of recurrence are the disruption of the muscle fibers of approached diaphragmatic crura and the wrap migration into the mediastinum. Hernia recurrence determines the appearan-

ce of clinical symptoms (dysphagia, heartburn, *etc.*) and most often requires repeated surgery. Medical literature analysis reveals that the recurrence rate of hiatal hernia is higher when the hernia is of a large size (3–5). The hernia recurrence may be avoided by using various techniques for hiatal closure during laparoscopic fundoplication (4, 6–8).

The purpose of this study was to determine the influence of hiatal hernia size and laparoscopic fundoplication technique on the rate of hernia recurrence.

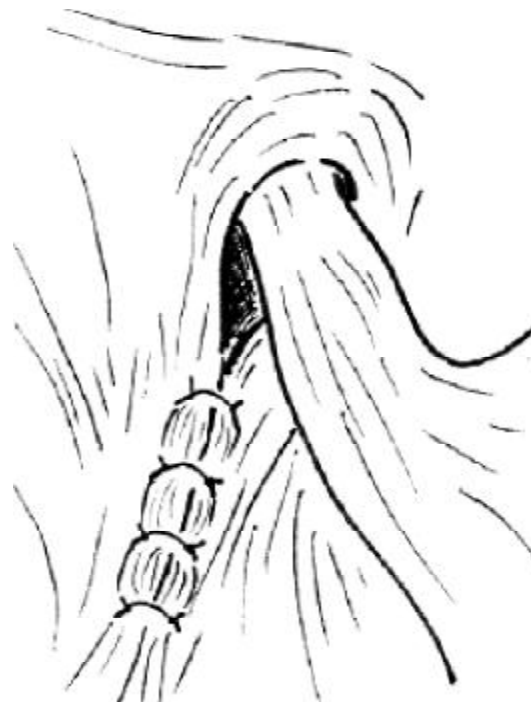
### Patients and methods

During the period of 1998–2004, 381 patients were operated on for hiatal hernia complicated with gastroesophageal reflux at the Department of Surgery of Kaunas University of Medicine. One hundred eighty-three (48%) females and 198 (52%) males underwent 287 Nissen and 94 Toupet fundoplications. The surgery technique (Nissen or Toupet fundoplication) was chosen independently of the hernia size. The esophagus–stomach radiological investigation using barium contrast as well as esophagogastroduodenoscopy with biopsy was performed in all patients before surgery. After radiological examination, all hernias were classified: grade 1 – the abdominal segment of the esophagus moves into the mediastinum and the cardioesophageal link is allocated at the diaphragm level; grade 2 – the cardioesophageal segment is lifted above the diaphragm into the mediastinum; grade 3 – the cardioesophageal segment and the fundal part of the stomach are allocated in the mediastinum; grade 4 – the stomach up to the body zone or even its larger portion is inside the mediastinum. When analyzing the results, the patients were divided into two groups: Group 1 consisted of patients with small hiatal hernia (grade 1 and 2 hernia according to radiological classification); patients with large hiatal hernia comprised Group 2 (grade 3 and 4 hernia according to radiological classification).

### The surgical technique

Three experienced surgeons performed all operations. Pneumoperitoneum was created by inserting a Veress needle above the umbilicus and connecting it to the CO<sub>2</sub> insufflator, and an intraabdominal pressure of 12–14 mmHg was achieved and maintained. The patients were placed in the reverse Trendelenburg position (45°) before intra-abdominal manipulation.

Five trocars were inserted into the peritoneal cavity at the typical sites: at the epigastrium, in the right subcostal area, in the left subcostal area, and on the middle abdominal line above the umbilicus. The short



**Fig. The diaphragmatic crura are sutured using 3–4 nonabsorbable Ethibond sutures (Ethicon, Johnson & Johnson Company, USA) behind the esophagus**

gastric arteries were divided; the same procedure was performed on the gastric diaphragm ligament, releasing the gastric fundus. On the side of the small gastric curve, the liver–stomach ligament was cut, and the right diaphragmatic crus was prepared, followed by the left one. The mobilization of the esophagus was completed through bypassing it in the circular manner, freeing a 3–4-cm intra-abdominal segment and removing the hernial sack. The diaphragmatic crura were then sutured using 3–4 nonabsorbable Ethibond sutures (Ethicon, Johnson & Johnson Company, USA) behind the esophagus (Fig.). The next step of surgery was the formation of 360° (Nissen) or 270° (Toupet) antireflux wrap.

The subjective and objective assessment of the patients' health status was investigated before and no less than 12 months after surgery. We assessed the heartburn left after surgery, regurgitation, dysphagia, also the intensity of these symptoms as well as the patient's satisfaction. If the symptoms remained or new ones (*i.e.* pain behind the sternum, dysphagia, *etc.*) appeared after surgery, the hernia recurrence was suspected. Esophagus–stomach radiological investigation using barium contrast as well as esophagogastroduodenoscopy was performed at the consultative outpatient clinic. The hernia recurrence was confirmed only after performing these two investigations.

*Statistical analysis.* Statistical evaluation was con-

ducted using descriptive analysis: normality test (Shapiro–Wilk W test), the unpaired Mann–Whitney U test to compare data from two study groups.  $P < 0.05$  was considered statistically significant.

### Results

Table shows the general characteristics of the patients, which were divided into two groups according to the hernia size. The patients in these two groups were similar in terms of gender and duration of surgery. The patients in Group 2 were significantly older than patients in Group 1 (Table).

Hernia recurrence was diagnosed in 18 (4.7%) patients after laparoscopic fundoplication. Altogether, 272 (71.4%) patients had small hiatal hernia, and 109 (28.6%) patients had large ones ( $P < 0.05$ ). In Group 1, 7 (2.6%) patients had hernia recurrence, while in Group 2, 11 (10.1%) patients had hernia recurrence ( $p < 0.05$ ). The recurrence rate of hiatal hernia was significantly higher in Group 2.

A total of 287 (75.4%) patients underwent laparoscopic Nissen fundoplication, after which 14 patients (4.98%) had hernia recurrence. The remaining 94 (24.6%) patients underwent laparoscopic Toupet fundoplication, after which 4 (4.3%) patients had hernia recurrence. There was no significant difference in the rate of hernia recurrence depending on the surgical technique.

The patients with hernia recurrence were repeatedly operated on 7–20 months (average 13.5 months) after the first surgery. All the reoperations were successfully performed laparoscopically. The disruption of the muscle fibers of approached diaphragmatic crura was the reason of hernia recurrence in all our cases.

### Discussion

Approximately 5% of all population has hiatal hernia, which in 50–60% of cases is complicated with

gastroesophageal reflux disease. Every year the increasing number of patients choose a laparoscopic surgery as an alternative to a long-term usage of considerably expensive proton pump inhibitors. The prospective randomized clinical trial by L. Lundel *et al.* (9) proved that the method of surgical treatment was more effective than the pharmaceutical one. Several major studies, as well as our clinical research data (3, 10–12) indicate that 87–94% of the patients were satisfied with the results of the surgical treatment.

The concept of large hiatal hernia is not clearly defined. Some authors indicate that large hiatal hernia is when the distance between the diaphragmatic crura, measured during the operation, is more than 6 cm (5, 6). As we did not measure the distance between the diaphragmatic crura during the operation, we defined the large hiatal hernia based on the preoperative radiological esophagus and stomach investigations. One of the most common reasons of postoperative dysphasia and heartburn is hernia recurrence, complicated by the move of the formed wrap downwards or into the mediastinum (13, 14). According to various studies, hiatal hernia recurrence occurs in 0–40% of patients after the operation (12, 14, 15).

Traditionally, in the case of small hiatal hernia, the space between the diaphragmatic crura is closed by interrupted nonabsorbable sutures (2). In the case of large hernia, the conventional hiatal closure may be ineffective, causing a higher recurrence rate. Initial closure of large tissue defects (e.g. groin or postoperative incision hernias) is always followed by tissue extension; therefore, in such cases the suture often breaks, and the tissue defect reappears (16, 17). The recurrence of hiatal hernia is also predisposed by a chronic cough, physical strain, laugh, *etc.*, situations when the intra-abdominal pressure increases. It is not clear yet, whether the surgery technique has any influence on the rate of hernia recurrence or not. According

**Table. General characteristics**

Characteristic	Group 1	Group 2	P
Gender			
male, n (%)	145 (53.3)	51 (46.8)	$>0.05$
female, n (%)	127 (46.7)	58 (53.2)	$>0.05$
Age, mean, years	51	60	$<0.05$
Duration of surgery, min, mean (range)	123.8 (50–300)	125.6 (50–390)	$>0.05$
Technique of surgery			
Nissen, n (%)	213 (78.3)	74 (67.9)	$<0.05$
Toupet, n (%)	59 (21.7)	35 (32.1)	$<0.05$

to the results of our study, the laparoscopic fundoplication technique had no influence on the rate of hernia recurrence.

Independently of the hiatal hernia size, we closed the space between the diaphragmatic crura by interrupted nonabsorbable sutures in all the cases. The results of our study indicate that the recurrence rate was significantly higher in the group of patients with large hernias compared to the group of patients with small hernias. It is still not clear which techniques for hiatal closure we have to choose when operating large hiatal hernias. Today some scientists speculate that the prosthetic mesh should be used for the repair of large hiatal hernias, instead of choosing the ordinary suture of the

diaphragmatic crura (4, 5, 7, 13, 18); others suggest to repair the hiatal defect with the organism's own tissues (5, 6, 8).

Further randomized clinical studies will help us to answer this question.

### Conclusions

1. The recurrence rate of hiatal hernia after laparoscopic fundoplications is significantly higher in the patients with large hernias (grade 3 and 4 according to radiological classification);

2. The surgery technique (Nissen or Toupet fundoplication) was not a significant factor for affecting the recurrence rate of hiatal hernia.

## Stemplinės angos išvaržos atkrytis po laparoskopinės gastrofundoplikacijos

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**Raktažodžiai:** laparoskopinė fundoplikacija, stemplinės angos išvarža, gastroezofaginis refluksas.

**Santrauka.** Darbo tikslas. Nustatyti stemplinės angos išvaržos atkryčio dažnio priklausomumą nuo jos dydžio bei atliktos laparoskopinės fundoplikacijos operacijos metodikos.

*Tirtųjų kontingentas ir tyrimo metodai.* Išnagrinėti 381 paciento, 1998–2004 m. operuoto Kauno medicinos universiteto Chirurgijos klinikoje dėl stemplinės angos išvaržos, kuri komplikavosi gastroezofaginiu refluksu, ikioperaciniai, operaciniai bei pooperacinio stebėjimo duomenys. Operacijos metodika (Nissen ar Toupet operacijos) buvo parenkama atsitiktinai, nepriklausomai nuo išvaržos dydžio. Prieš operaciją visiems ligoniams įvertinta ligos klinika, atliktas stemplės–skrandžio rentgenologinis tyrimas, naudojant bario kontrastą, taip pat ezofagogastroduodenoskopija ir biopsija. Subjektyvus bei objektyvus ligonių savijautos įvertinimas tirtas praėjus ne mažiau kaip 12 mėn. po operacijos. Jeigu po operacijos išliko ligos simptomų arba atsiradavo naujų (skausmas už krūtinkaulio, dusulys), arba įtarus stemplinės angos išvaržos atkrytį, konsultacinėje poliklinikoje buvo atliekamas stemplės–skrandžio rentgenologinis tyrimas, naudojant bario kontrastą, taip pat ezofagogastroduodenoskopija ir biopsija. Išvaržos atkrytis patvirtintas tik atlikus šiuos du tyrimus. Analizuodami rezultatus, ligonius suskirstėme į dvi grupes, remdamiesi rentgenologine stemplinės angos išvaržos klasifikacija: I gr. – mažos stemplinės angos išvaržos (rentgenologiškai – 1 ir 2 laipsnio išvaržos); II gr. – didelės stemplinės angos išvaržos (rentgenologiškai – 3 ir 4 laipsnio išvaržos).

*Rezultatai.* Mažos stemplinės angos nustatytos 272 (71,4 proc.) pacientams, didelės – 109 (28,6 proc.). I grupėje išvaržos atkrytis diagnozuotas 7 pacientams (2,58 proc.); II grupėje – 11 pacientų (10,1 proc.) ( $p < 0,05$ ). 381 operuotam ligoniui atliktos 287 (75,4 proc.) laparoskopinės Nissen fundoplikacijos, po kurių 14 konstatuotas išvaržos atkrytis (4,98 proc.). Likusiems ligoniams atliktos 94 (24,6 proc.) laparoskopinės Toupet fundoplikacijos, po kurių keturiems konstatuotas išvaržos atkrytis (4,3 proc.) ( $p > 0,05$ ).

*Išvados.* Stemplinės angos išvaržos atkrytis po laparoskopinių fundoplikacijų statistiškai reikšmingai dažnesnis pacientams, operuotiems dėl didelių (rentgenologiškai – 3 ir 4 laipsnio) šio tipo išvaržų. Operacijos metodika (Nissen ar Toupet operacija) neturėjo įtakos stemplinės angos išvaržos atkryčio dažniui.

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