

Jan Lesinski¹, Tadeusz M. Zielonka^{1,2}, Olga Wajtryt¹, Krystyna Peplinska³, Aleksandra Kaszynska³

¹Clinical Department of Internal Medicine, Czerniakowski Hospital in Warsaw, Poland

²Department of Family Medicine, Warsaw Medical University, Warsaw, Poland

³Department of Internal Medicine and Cardiology, Solec Hospital in Warsaw, Poland

Giant hiatal hernias

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Abstract

Dyspnoea is most often caused by disorders of the respiratory and/or cardiovascular systems. Much less often it is brought about by the displacement of abdominal organs into the thoracic cage. Hiatal hernias may give rise to diagnostic difficulties, as both clinical and radiological symptoms suggest different disorders. Computed tomography is the method of choice when making a diagnosis.

We have presented a series of 7 cases of giant hiatal hernias, each with a varying course of the disease, clinical symptoms, radiological features and prognoses.

In two of the cases, the hernias were of a post-traumatic nature. Four cases of large diaphragmatic hernias were found in elderly patients (over 90 years old). An advanced age and numerous coexisting chronic diseases disqualified most of the patients from surgical treatment despite the hernias' large sizes. In only one case was fundoplication performed with a good end result. Two patients died, and an extensive hernia was the cause of one of the deaths. Upper gastrointestinal symptoms were present only in a few of the patients.

An early diagnosis of giant hiatal hernia is crucial for the patients to undergo prompt corrective surgeries.

Key words: acquired diaphragmatic hernia, dyspnoea, elderly patients, gastroesophageal reflux disease, kyphoscoliosis, hiatal hernia

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Introduction

Diaphragmatic hernias may be congenital or acquired. Congenital Bochdalek and Morgagni-Larrey type hernias occur in areas of the diaphragm with decreased resistance [1]. In the United States, the frequency of occurrence is estimated to be 1/2500 new-borns [2]. Often, they are not diagnosed until adulthood [3]. Acquired hernias may be posttraumatic, iatrogenic or idiopathic [4–6]. Hiatal hernias are the most common type of acquired diaphragmatic hernias. They have been described in 2.9–20% of patients undergoing gastroscopies [7]. In reality, they could occur much more frequently, even in up to 10–50% of the population. They are defined as a displace-

ment of the stomach or other abdominal organs into the thoracic cage through the oesophageal hiatus of the diaphragm [6]. Four types of hiatal hernias have been distinguished: sliding (type I), paraesophageal (type II), combined (type III), and giant paraesophageal (type IV) [8]. Each type is characterised by different symptoms, course of the illness and complications [9]. Sliding hernias are the most common type, as they occur in as many as 90% of cases [10]. A giant paraesophageal hernia is diagnosed when at least 30% of the stomach has translocated into the chest [11]. Hiatal hernias can be asymptomatic, or they may present with various, sometimes atypical, cardiovascular, pulmonary or gastrointestinal symptoms. An undiagnosed diaphragmatic hernia may lead to

Address for correspondence: Tadeusz M. Zielonka, Department of Family Medicine, Warsaw Medical University, Stepinska street 19/25, 00–739 Warsaw, Poland, e-mail: tadeusz.zielonka@wum.edu.pl

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death [12]. The mortality rate of hiatal hernias is estimated to be 0.6/1,000,000 adults [13].

In this article, we have presented a series of 7 cases of large diaphragmatic hernias in elderly patients. The aim of the work was to show the variety of clinical symptoms, different course of the illness, risk factors and prognoses depending on the actions taken.

Case study

Case 1

A 94-year-old female, leading a sedentary lifestyle for the past three years due to a surgically operated intertrochanteric hip fracture, was admitted to hospital because of general condition deterioration and acute renal failure caused by dehydration secondary to decreased food and fluid intake. Her medical history included abdominal pain, nausea, regurgitation aggravated by meals and orthopnoea. On admission, the patient was in a fair medical condition, with slight dyspnoea, but no respiratory distress (SaO_2 98%, BP 150/90 mm Hg, HR 70/min). Normal breath sounds were heard over both lungs, the abdomen was soft, but painful in the epigastrium on palpation. The patient also presented with abnormal laboratory values: GFR 20 mL/min/1.73m²; urea 183 mg/mL, Na⁺ 126 mmol/L. The chest X-ray showed a large shadow with a diameter of 95 mm overlying the heart (Fig. 1). The chest CT revealed a large hiatal hernia with translocation of nearly the entire stomach into the thoracic cage (Fig. 2). The hiatus was estimated to have 55 mm in diameter. Due to the patient's advanced age and a high risk of complications, the woman was disqualified from surgery. The treatment (i.v. proton pump inhibitor, fluids) led to a significant improvement in the patients' clinical state and in laboratory values, a relief of dyspnoea and abdominal pain, and an improvement in kidney function. On discharge, the woman was recommended to eat in a reclined position, and follow a suitable diet (small, frequent meals, avoidance of foods increasing gastroesophageal reflux disease symptoms).

Case 2

A 92-year-old female with severe kyphoscoliosis, chronic heart failure, permanent atrial fibrillation, deep vein thrombosis treated with anticoagulants, posthaemorrhagic stroke, was admitted to the clinic due to an exacerbation of orthopnoea. On admission, the patient was in a fair general condition and presented with tachypnoea, an irregular HR of around 85/min, SaO_2 94%, signs

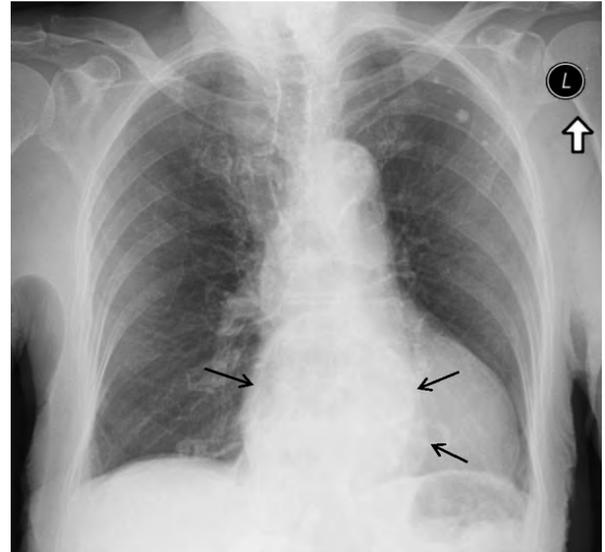


Figure 1. Posterior–anterior chest X-ray. An image of a large sliding hernia, with the gastrointestinal tract visible in the midline (arrows)



Figure 2. Computed tomography of the chest. The shadow observed in the chest X-ray was caused by a large hernia (black arrows) of the esophagus with displacement of the stomach into the chest

of congestion on lung auscultation and increased peripheral oedema. Laboratory studies revealed a raised level of NT-proBNP (1085 pg/mL). Scoliosis and a mass in the middle lobe of the right lung connecting with the right hilum were described in the chest X-ray (Fig. 3). The chest CT showed a large hiatal hernia, lung emphysema and fibrosis, atelectasis in the second segment of the right lung, and also enlargement of multiple hilar and mediastinal lymph nodes up to 14 mm (Fig. 4). Diuretic use led to a decrease in dyspnoea and total regression of oedema. The patient was



Figure 3. Posterior–anterior chest X-ray. Significant distortion of the chest with a large hiatal hernia with displacement of the entire stomach into the chest (black arrows)

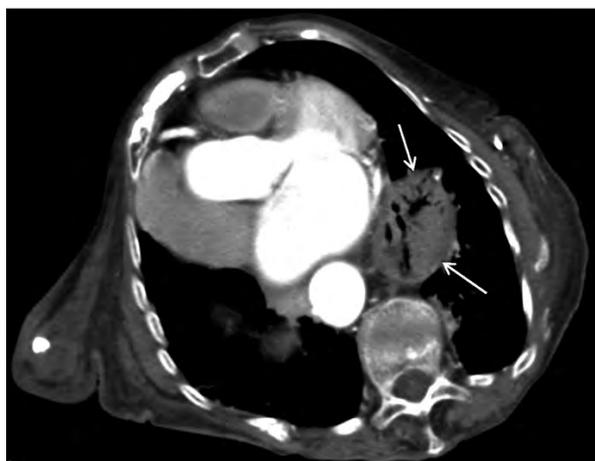


Figure 4. Computed tomography of the chest. Deformation of the chest, a large hiatal hernia (arrows), atelectasis in the right lung, and enlargement of multiple hilar and mediastinal lymph nodes

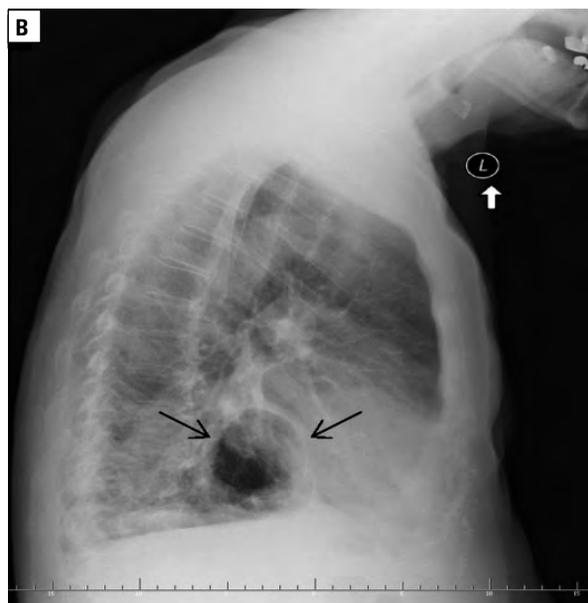
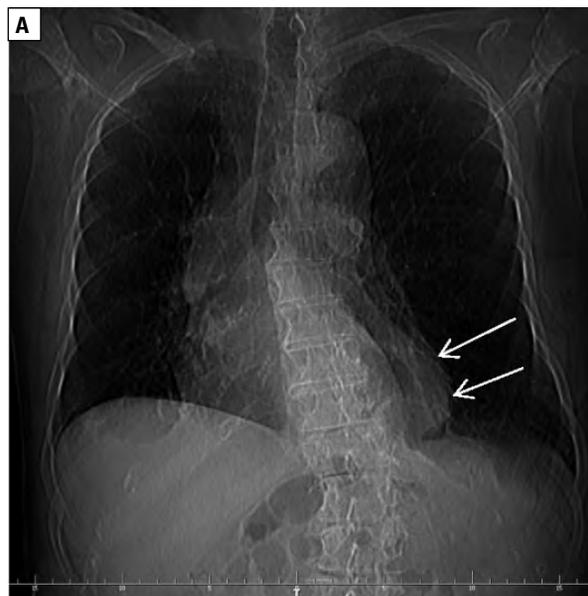


Figure 5. A — posterior–anterior chest X-ray; **B** — lateral chest X-ray. A significant scoliosis and a brighter area partially projecting onto the heart silhouette (black arrows)

released home in a stable condition. After 2 years she was readmitted with a diagnosis of community acquired pneumonia. The woman complained of a cough, expectoration of a large amount of a mucopurulent secretion, dyspnoea and dyspeptic symptoms after meals. These signs intensified when compared to the previous hospitalisation. On patient examination, attention was turned to the severe deformation of the thoracic cage, an irregular HR of around 90/min, BP 140/100 mm Hg, SaO₂ 89%, signs of congestion over the lung fields and intensified peripheral oedema. Labora-

tory studies showed an increase in CRP (6.1 ng/dL), and NT-proBNP (4386 pg/mL). The chest CT revealed a persistent large hiatal hernia with the stomach protruding into the thoracic cage, as well as signs of increasing pulmonary hypertension. The EF was 60% in the ECHO, and also large tricuspid regurgitation with Right Ventricular Systolic Pressure RSVP of 70 mm Hg were described. The woman received oxygen therapy, a loop diuretic, a mucolytic agent and an antibiotic obtaining an improvement in her medical state. The patient observed a decrease in nausea after the implemen-

tation of a proton pump inhibitor and a change in body position while eating. She was discharged to home in a stable condition.

Case 3

A 96-year-old male with chronic heart failure, persistent hip and knee joint pain due to osteoarthritis, treated with hormone therapy for prostate cancer for the past couple of years, as well as citalopram and donepezil due to a mild depressive disorder, was admitted to hospital because of a decline in his general condition, increasing weakness for the past month, dizziness and bradycardia of around 38–50/min. He denied episodes of fainting, loss of consciousness and chest pain. He didn't complain of dyspnoea or decreased exercise tolerance. There were no gastrointestinal problems such as nausea, vomiting, dyspeptic symptoms or heartburn. The patient was fully oriented, mobile, and aware of his conditions. Laboratory studies revealed increased levels of NT-proBNP (1688 pg/mL). The ECG showed sinus bradycardia of 51/min, PQ 0.19 s, elongation of the QT interval (490 ms), QRS 113 ms, without signs of ischemia. The 24-hour ECG Holter monitoring registered a sinus rhythm of 59/min, with episodes of bradycardia down to 45/min, without any relevant pauses, an average elongation of the QT interval to 481 ms, maximally to 568 ms, but without any significant ventricular arrhythmias. The echocardiogram showed an enlarged left atrium, diastolic dysfunction, moderate aortic, mitral and tricuspid valve insufficiency, and an EF of 65%. Drug-induced QT-prolongation was suspected. Citalopram and donepezil were discontinued. The chest X-ray revealed a brighter area of 55 × 70 mm in size in the left side of the thoracic cage, partially projecting onto the heart silhouette, described as a thick-walled cavity with features of atelectasis on the periphery or a hiatal hernia (Fig. 5). The chest CT showed a large hiatal hernia imitating a tumour in the mediastinum (Fig. 6). Because of the asymptomatic course, the only changes in therapy included conservative treatment involving headrest elevation and keeping an upright position for at least 30 minutes after meals.

Case 4

A 95-year-old female was admitted to hospital due to suspected pneumonia. Her general condition was poor. She had substantial dyspnoea at rest because of cardiorespiratory failure (irregular HR around 120/min, BP 90/60 mm Hg, SaO₂ 80%).

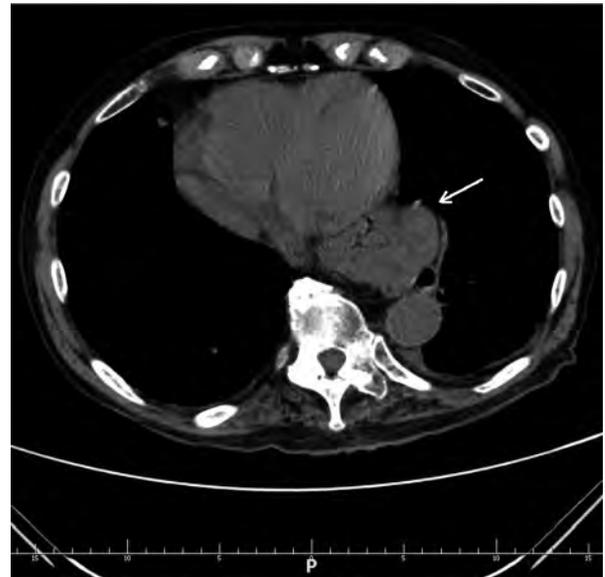


Figure 6. Computed tomography of the chest. A large hiatal hernia imitating a tumour in the mediastinum (arrow)

She had been bedridden with right-sided hemiparalysis for the past four years due to a stroke. She had hypertension, chronic atrial fibrillation with chronic heart failure. On admission to hospital, muscle atrophy and oedema of the lower limbs were noted. On lung auscultation, breath sounds were normal. Laboratory studies revealed an increase in inflammatory markers (CRP 1.85 mg/dL, WBC 17×10^3 /mL) and hyponatraemia (124 mmol/L), with normal concentrations of troponin, D-dimers and haemoglobin. An arterial gasometry was done: pH 7.41, PaCO₂ 47 mm Hg, PaO₂ 55 mm Hg, HCO₃ 29.8 mmol/L. The chest X-ray showed a huge hiatal hernia with translocation of the entire stomach into the chest (Fig. 7). A nasogastric tube was placed, the patient received fluids intravenously, ceftriaxone, metronidazole and oxygen therapy. There was no change in the woman's medical condition and the patient passed away after 72 hours.

Case 5

A 70-year-old male with coronary artery disease, after a bypass (CABG) and subsequent angioplasty (PTCA) with implantation of two stents, with ischaemic cardiomyopathy, hypertension, type 2 diabetes treated with insulin, postischaemic stroke with subsequent left-sided hemiplegia, suffered a spinal injury after hitting a wall when trying to drive out of the garage. The CT revealed fractures of vertebrae Th10 and Th11, as well as the arch of C7, fluid in both pleural cavities, and a substantial hiatal hernia with

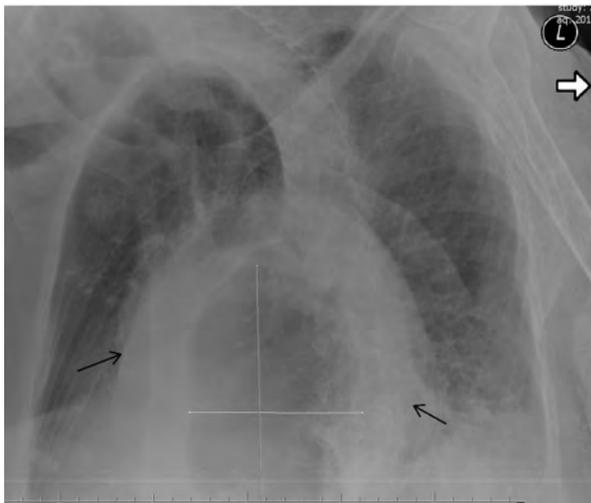


Figure 7. Anterior–posterior chest X-ray. A huge hiatal hernia with translocation of the entire stomach into the chest (black arrows)

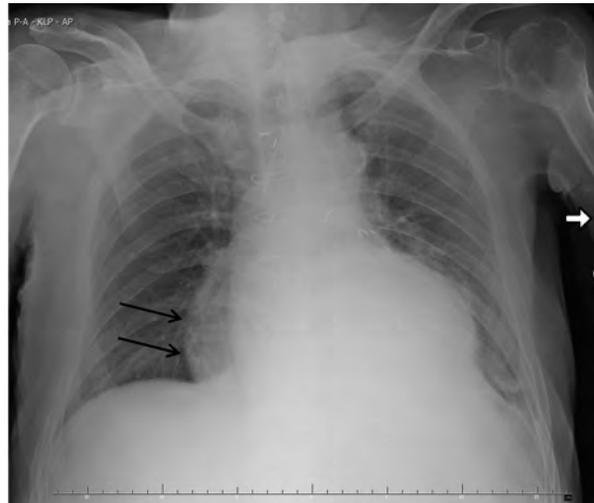


Figure 8. Posterior–anterior chest X-ray. A large diaphragmatic hernia is visible at the base of the lung (black arrows) with a diameter of 21 cm

translocation of the stomach into the thoracic cavity. The patient was not at that time qualified for surgery. After the accident, he remained in a supine position or in a corset. He reported increased nausea, vomiting after food or fluid intake and also presented with increasing retrosternal chest pains of a non-ischaemic character, appearing after meals and lasting around 1 hour. For this reason, he was admitted to the general ward. On admission, vital signs were normal (BP 110/70 mm Hg, HR 98/min, SaO₂ 95%). The chest X-ray showed atelectasis located near the heart in the left lung, a significantly enlarged heart and moderate pulmonary congestion (Fig. 8). Circulatory treatment was intensified with a clinical improvement. The patient was discharged home and was advised to eat frequent small portions with a raised headrest and not eat while in a supine position. After two weeks the man was readmitted to hospital with forceful vomiting after meals. A nasogastric tube was inserted, and 600 mL of retained fluid was obtained in a short period of time with a marked alleviation of symptoms. Gastroscopy was performed revealing the body and fundus of the stomach to be in the thoracic cage as well as inflammatory changes of the mucous membrane. Intravenous fluid supplementation, a proton pump inhibitor, metoclopramide, antibiotics to treat a urinary tract infection and intensive insulin therapy were used. Increasing emaciation and hypoalbuminaemia were observed. After consulting the gastroenterologist, tube feeding was used parenterally, and subsequently, a Ryles nasogastric tube was inserted. However, when the patient remained in a supine po-

sition, the tube curled within the hernia (Fig. 9). The man was disqualified multiple times by surgeons from surgical treatment, mainly due to heart failure. The patient's condition gradually deteriorated. In addition, he presented with diarrhoea caused by *Clostridium difficile*. During the course of vancomycin treatment, the man went into cardiac arrest in the mechanism of asystole, and despite cardiopulmonary resuscitation, there was no return of vital functions.

Case 6

An 87-year-old woman, chronically treated only for arterial hypertension, was admitted to hospital due to fluid in the right pleural cavity. Three weeks earlier she sustained a thoracic cage injury after falling over and hitting a chair. The chest X-ray revealed fractures of ribs VI, VII, VIII and IX on the right side and changes suggesting a large oesophageal hernia (Fig. 10). For the past couple of weeks she had significantly decreased her food intake due to a lack of appetite and nausea. On physical examination, she presented with decreased breath sounds at the base of the right lung as well as reduced fremitus and dullness on percussion (BP 154/81 mm Hg, HR 69/min, SaO₂ 96%). Laboratory tests showed a slight decrease in sodium concentration (131 mmol/L) and haemoglobin (11.9 g/dL), and an increase in D-dimers up to 2895 ng/mL. The chest CT showed a large oesophageal hernia, a 5 cm in diameter polypoid structure with polycyclic features on the anterior stomach wall and a widened oesophagus up to 35mm partially filled with fluid (Fig. 11). During gastroscopy, a large sliding hernia with

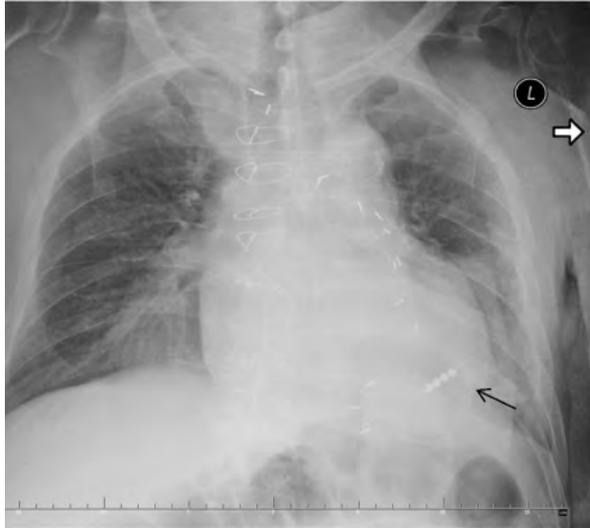


Figure 9. Anterior–posterior chest X-ray. Arrows pointing at the right side of hernia and at the left side the tube curled within the hernia (black arrows)



Figure 11. Computed tomography of the chest showed a large oesophageal hernia (arrows), a 5 cm in diameter polypoid structure with polycyclic features on the anterior stomach wall and a widened oesophagus up to 35 mm partially filled with fluid



Figure 10. Posterior–anterior chest X-ray. Arrows pointing at the heart silhouette suggesting a large oesophageal hernia



Figure 12. Computed tomography of the chest revealed a shadow, 8 cm in diameter, in the lower mediastinum with a visible fluid level — an oesophageal hernia (black arrows)

the translocation of the entire stomach fundus into the thorax was observed. The stomach mucous membrane was inflamed. The patient did not consent to surgery. She was discharged home with recommendations of following an appropriate diet.

Case 7

An 82-year-old female with an oesophageal hernia and esophagitis diagnosed over ten years ago, ulcerative colitis, arterial hypertension, substantial kyphoscoliosis, narrowing of the bile ducts after a cholecystectomy and choledochostomy

performed years ago due to bile stones. In 2012, a chest X-ray showed a round structure located on the diaphragm with a fluid level superimposed on the heart. The CT revealed a shadow, 8 cm in diameter, in the lower mediastinum with a visible fluid level — an oesophageal hernia (Fig. 12). In the following years, the patient presented with abdominal pain in the epigastric region, an expanding sensation retrosternally, reflux of food content or gastric acid, a decreased exercise tolerance and restricted breathing. She also complained of nausea and vomiting, particularly when driving a car. She was hospitalised

Table 1. Demographic and clinical data of the whole group of patients

Sex (M male/F female)	2/5
Age (years \pm SD)	88 \pm 9.36
Symptoms:	(+/-)
Respiratory (cough or dyspnoe)	5/2
Heart (arrhythmias or tachycardia)	4/3
Thoracic pain	3/4
Abdominal (pain or nausea)	4/3
Respiratory failure	3/4
Heart failure	7/0
Post-traumatic hernia	2/5
Kyphoscoliosis/fracture	7/0
Surgical treatment	1/6
Improvement after treatment	4/3
Death	2/5

due to an exacerbation of symptoms (chest pain, dyspnoea and heartburn). Gastroscopy revealed signs of type B oesophagitis according to the LA classification of GERD, as well as a large hiatal hernia. During 24-hour pH monitoring, pH < 4 was recorded for 244 min — 91% of the total recording time. The total DeMeester score was 201.5 times the norm (a normal value is below 14.72 — 95th percentile). At this point in time the patient agreed to surgery. A Nissen fundoplication was performed. Since then the woman hasn't had any of the previously reported symptoms.

Discussion

In the study group of patients with large oesophageal hernias, 4 things stood out: advanced patients' age, thoracic cage deformity (kyphoscoliosis, broken vertebrae or ribs), female sex and a wide range of symptoms and disease progression (Table 1). As many as 4 patients were above the age of 90 (96, 95, 94 and 92 years, respectively). This is consistent with earlier Japanese observations, in which the importance of age, vertebral fractures and female sex were also emphasised in the development of large diaphragmatic hernias [14–16]. A conception was put forward that as osteoporosis in women advances with age during menopause, it favours vertebral fractures, which leads to thoracic cage deformities, which in turn contributes to the formation of large diaphragmatic hernias [14]. The ageing of society can be the cause of the observed, not only in Japan, increase

of large diaphragmatic hernia prevalence [17]. In Japan, an increase in the percentage of diaphragmatic hernias from 10% to 15% was noted in the population under age 70, whereas in people over age 70, it rose from 32% to 48% [18]. It is also believed that progressive diaphragmatic flaccidity is one of the causes of an increased prevalence of large diaphragmatic hernias in the elderly related to the process of ageing [19].

Old age, along with coexisting disorders, was the main risk factor for perioperative death in patients operated due to large diaphragmatic hernias in the Canadian population [20]. For this reason, only in one of the patients in the studied group, a relatively young, 82-year-old, was the fundoplication procedure a success (Table 1). Recently published Japanese data have indicated good results of large diaphragmatic hernias being repaired laparoscopically in the elderly [21]. The authors have highlighted the safety of the procedure. However, the surgeries were carried out in a younger population than in the presented material, since the operated patients were 74–87 years old. This indicates the importance of an early diagnosis of large diaphragmatic hernias, when it is still possible to carry out the procedure — the only effective treatment method. Perioperative mortality was 0.9%, and 5-year mortality was 10% [22]. Unfortunately, in a large group of patients who were operated on, a reoccurrence of symptomatic diaphragmatic hernias was found in up to 35% of patients [22]. Nevertheless, the significant improvement in life quality after surgery and the alleviation of cumbersome symptoms, mainly gastric, is highlighted [23].

Thoracic cage deformity, in the form of vertebral fractures, significant scoliosis or costal fractures, was observed in all 7 of the examined patients. In some of the subjects, as in case 2, serious anatomical deformities occurred with the displacement of the stomach to the right of the heart (Fig. 3). In these cases it is very difficult, using the chest X-ray, to diagnose a diaphragmatic hernia, and a CT scan is necessary. This radiological examination is believed to be the *gold standard* in the diagnosis of hernias, as it allows us to evaluate their presence, localisation, dimensions and content [24, 25]. The sensitivity, specificity and accuracy of this method are 100%, 93% and 95%, respectively [25]. Significant chest wall deformity due to scoliosis is a recognised risk factor affecting diaphragmatic hernia formation [26].

The development of diaphragmatic hernias may be connected with not only external factors such as for example trauma, but also endogenous

factors like obesity and the tissue degeneration associated with age. In the literature, we can find reports suggesting a relationship between the occurrence of GERD symptoms and diaphragmatic hernias and obesity [27, 28]. However, in the discussed group, none of the patients were obese. This agrees with Japanese results, which indicated a higher incidence of diaphragmatic hernia symptoms in middle-aged obese men and elderly women with a low BMI [16].

In the presented cases, attention is drawn to the varied clinical course of diaphragmatic hernias (Table 1). In two patients, who were after thoracic cage trauma with fractured ribs or vertebrae, gastric symptoms (nausea and vomiting after meal consumption) worsened rapidly leading to dehydration. However, in two subsequent patients, serious injuries and bone fractures were also noted, but GERD symptoms progressed gradually and were accompanied by dyspnoea. In the literature, the importance of trauma as a causative agent in the formation of diaphragmatic hernias has been underlined [24, 25, 29, 30]. Violent thoracic or abdominal trauma leads to diaphragmatic injury in 0.8–15% of cases [29]. In some of these cases, patients present with rapidly worsening symptoms leading to a quicker diagnosis. Hernia symptoms are not always so pronounced, which is why the diagnosis may be delayed by months or even years [30]. In certain cases, diaphragmatic rupture occurs sometime after the event [25]. Post-traumatic hernias are associated with a higher mortality rate and are more often an indication for surgical treatment [24, 30]. This was also confirmed by one of the cases presented above.

On the other hand, in one of the cases, a large diaphragmatic hernia was discovered by accident basing on abnormalities in a chest X-ray while the patient was being treated for drug-induced bradycardia. Heart arrhythmias in the form of atrial fibrillation were found in two of the patients, while chronic heart failure was found in all of them. However, this is more likely to be due to the advanced age of the study group. Tachycardia ($> 120/\text{min}$) was observed in only one of the patients. Chest pain was reported by 3 patients, but in 2 of the cases, the pain was retrosternal, described as distending and associated with food intake, and in the third case, it was pleural pain related to chest wall injury. Although most of the literature indicates a prevalence of gastrointestinal symptoms and specifically symptoms of gastroesophageal reflux disease and oesophagitis, some reports describe cases in which cardiologi-

cal symptoms, such as haemodynamic instability caused by a large diaphragmatic hernia [31], changes suggesting an acute myocardial infarction [32], left ventricle compression by a large hernia [33] and fainting after a meal [34], dominate.

What is surprising, only one patient complained of a cough, which was rather connected to a respiratory tract infection and was not chronic. Diaphragmatic hernias contribute to the development of GERD, which is an important cause of non-pulmonary cough [35]. Meanwhile, in cases of large diaphragmatic hernias this symptom was not observed. On the other hand, dyspnoea was reported by 5 patients and respiratory failure was diagnosed in 3 cases. Respiratory symptoms occurred mostly in an acute disease presentation or in cases of overlapping disorders (for example pneumonia with a diaphragmatic hernia or heart failure with a diaphragmatic hernia). It is believed that dyspnoea is not a common symptom of diaphragmatic hernias [36]. It may be the result of ventilation or perfusion abnormalities [37].

Despite the large sizes of hernias, gastrointestinal symptoms did not occur in all of the patients. Five patients reported nausea, 4 complained of GERD symptoms, and 3 of vomiting. Abdominal pain occurred in 3 of the subjects. The literature has underlined the importance of these symptoms in patients with hiatal hernias, which may lead to ulceration of the stomach mucosa or even to its perforation [9].

The overlapping of gastrointestinal, cardiological and pulmonary symptoms is quite common in these patients [24]. In one of the cases, the co-occurrence of pronounced gastrointestinal, cardiological and pulmonary manifestations was noted and should be treated as an alarm group of symptoms requiring a rapid response and emergency surgical treatment. This patient was disqualified from surgery due to multiple coexisting risk factors and died after a few months' time. The remaining cases concerned people over the age of 90. In these patients, hernias had a long documented course and their symptoms were subdued and non-specific. However, analysing these cases, it seems that in older people the prognosis will be less favourable, particularly with coexisting disorders.

The observed population ageing in developed countries will lead to an increase in the detection of large hiatal hernias. Such a diagnosis in 80-year-olds, and all the more in 90-year-olds, will have a significant effect on the further quality of their lives, as well as worse future survival prognosis. A great majority (78%) of deaths is pronounced in type III and IV hiatal hernias and is correlated with coexisting diseases [13]. This

is why a relatively early detection of disturbances is important, while it is still possible to carry out the procedures laparoscopically. The problem particularly concerns older women with thoracic cage deformities.

Conflict of interest

The authors declare no conflict of interest.

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