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Cardiopulmonary Impairments Caused by a Large Hiatal Hernia with Organoaxial Gastric Volvulus Showing Upside-Down Stomach: A Case Report

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Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Patient: Female, 74
Final Diagnosis: Hiatal hernia with gastric volvulus
Symptoms: Dyspena
Medication: —
Clinical Procedure: —
Specialty: Surgery

Objective: Rare co-existance of disease or pathology

Background: Upside-down stomach (UDS) is the rarest type of hiatal hernia (HH), with organoaxial gastric volvulus. A large HH sometimes causes cardiopulmonary impairments owing to multiple factors.

Case Report: We herein report a case of a large HH with UDS that had induced weight loss and severe cardiopulmonary dysfunction in a 74-year-old female patient who presented with shortness of breath, chest pain, severe anorexia, and weight loss of 5 kg over the 3 previous months. Chest X-ray and CT examination revealed that her heart was retracted on the right side, and the hernia contents had induced physical compression of the left lung on the cranial side. Spirometry revealed that the patient's vital capacity (VC), percentage VC, and percentage forced expiratory volume (% FEV) at 1 s were 1.32 L, 60.2%, and 67.5%, respectively. A barium swallow test confirmed a diagnosis of HH with UDS. On the basis of these findings, we performed a laparoscopic Nissen procedure, which resulted in the patient's dramatic recovery. Postoperative examinations showed that the stomach and heart were once again normally located, and the left lung had re-inflated. Postoperative spirometry dramatically improved.

Conclusions: A large HH causes cardiac and pulmonary compression due to mass effects and leads to cardiopulmonary dysfunction. For cases that have both a complicated HH and cardiopulmonary dysfunction owing to the mass effects of hernia contents, laparoscopic HH repair can be a good alternative procedure.

MeSH Keywords: Fundoplication • Heart Failure • Hernia, Hiatal

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/918191

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Background

HHs are a common condition whose incidence increases with age [1]. Although they are asymptomatic in many patients, they can often cause reflux esophagitis by damaging the body's ability to inhibit gastroesophageal reflux [2]. Moreover, when hernia contents become overly abundant due to complicated or excessively large HHs, they can cause cardiac compression with hemodynamic collapse and severe respiratory dysfunction [3,4].

Organoaxial volvulus is a consequence of intrathoracic migration of the stomach into the thoracic cavity through an enlarged hiatus [5]. Then, the body and the antrum of the stomach rotate along the long axis between the cardia and the pylorus. Moreover, mesoaxial volvulus is characterized by rotation of the stomach at the transverse axis; it extends from the middle of the greater curvature to the porta hepatitis.

UDS is the rarest type of HH and is characterized by herniation of all or most of the stomach, including the gastric portions of the posterior mediastinum [5]. UDS is usually caused by organoaxial gastric volvulus, induces severe weight loss by incarcerating the stomach and other intra-abdominal organs, and is associated with a risk of volvulus development [6].

We report here a very rare case of a large HH with UDS that had induced weight loss and severe cardiopulmonary dysfunction in an elderly patient. We performed a laparoscopic Nissen procedure, which resulted in the patient's dramatic recovery.

Case Report

A 74-year-old woman was observed to be showing symptoms of an HH. She complained of shortness of breath, chest pain, severe anorexia, and weight loss of 5 kg over the 3 previous months. She was referred to our clinic for further investigation and treatment. A chest X-ray revealed that her heart was retracted on the right side, and the hernia contents had physically compressed her left lung on the cranial side (Figure 1). Transthoracic echocardiography could not reveal the accurate ejection fraction due to the unusual location of her heart, but her brain natriuretic peptide (BNP) was noticeably elevated (455.0 pg/mL). Spirometry showed that her VC, percentage VC, and% FEV at 1 s were 1.32 L, 60.2%, and 67.5%, respectively; she was therefore diagnosed with severe combined ventilatory impairment. Moreover, an enhanced CT examination revealed that all of her stomach and parts of her jejunum and pancreas were drawn into the hernia sac (Figure 2A, 2B). A barium swallow test confirmed a diagnosis of HH with intrathoracic organoaxial gastric volvulus, which is commonly called UDS (Figure 3). Lastly, an esophagogastroduodenoscopy (EGD) showed reflux esophagitis (Figure 4). Considering these findings, we performed a laparoscopic Nissen procedure to treat the patient's large HH with UDS.

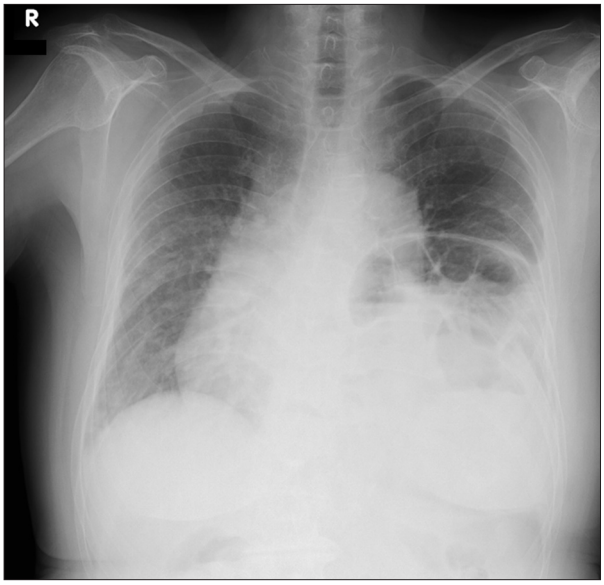

Figure 1. Chest X-ray examination. The heart was retracted on the right side and hernia contents had physically compressed her left lung on the cranial side.

The patient was placed in lithotomy position under general anesthesia. The operation was performed through a laparoscopic approach and included 2 needlescopic devices (Figure 5). First, the hernia was reduced after the herniated jejunum was pulled out from the mediastinum (Figure 6A). The lateral section of the liver was retracted using internal organ retractors. The phrenoesophageal ligament was divided, and the hernia sac was dissected from the mediastinum. Then, the stomach was completely dissected and removed from the mediastinum. The esophagus was taped after complete circumferential dissection of the sac. We had to transect both vagus nerves to pull out the original abdominal esophagus in this case. Second, we performed Nissen fundoplication. We wrapped the stomach with 3-0 monofilament non-absorbable sutures through intraoperative EGD as a bougie (Figure 6B). The hiatus was then closed from the dorsal side using intracorporeal knots with 2-0 monofilament non-absorbable threads; 6 stitches were needed to approximate the crus (Figure 6C). An anchor stitch and a shoulder stitch were made between the wrapped stomach and the bilateral crus. Finally, a drain tube was inserted into the mediastinum. Operating time and blood loss were 240 min and 15 mL, respectively.

A postoperative upper-gastrointestinal series showed that the patient's stomach was normally located, and good passage and peristalsis were confirmed (Figure 6). CT examination verified that her stomach was located in the abdominal cavity and

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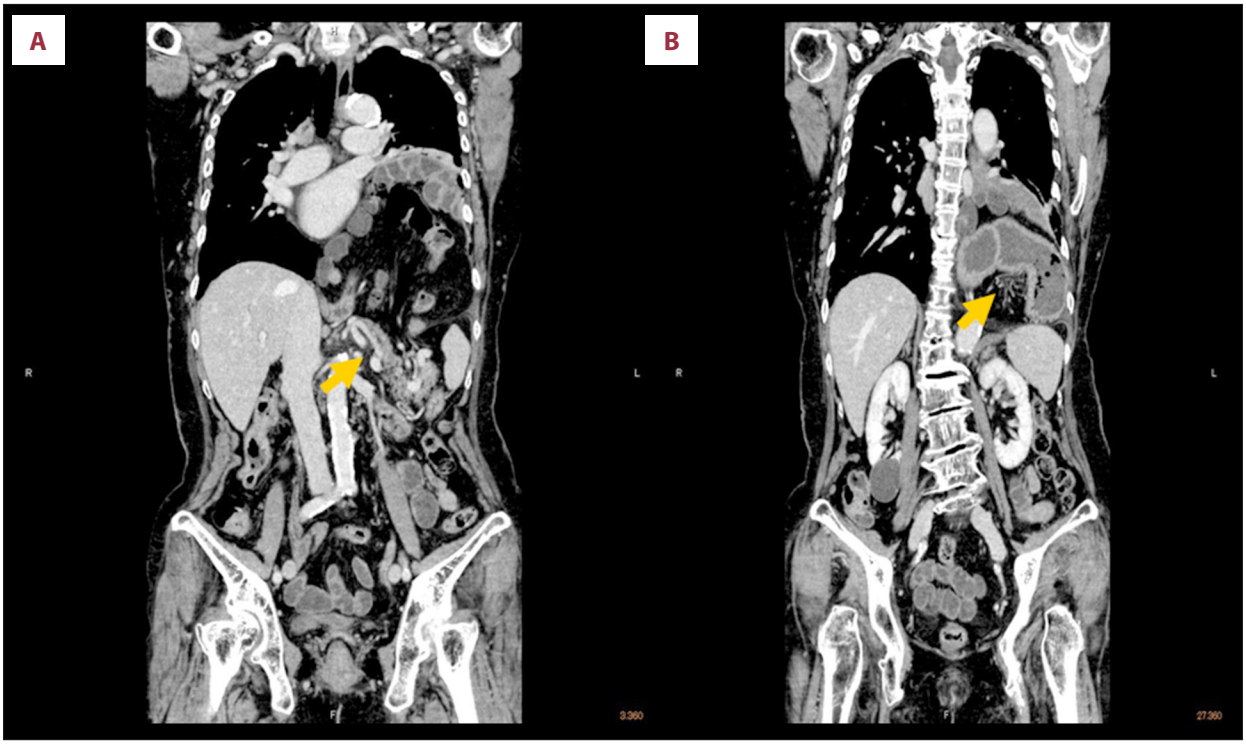

Figure 2. Enhanced CT examination. (**A**) A coronal slice revealed that not only a part of jejunum but also the pancreas body herniated into the mediastinum (arrow). (**B**) The stomach was completely drawn into the hernia sac as the stomach formed an upside-down stomach. Vessels of the lesser curvature were also flipped upside down (arrow).

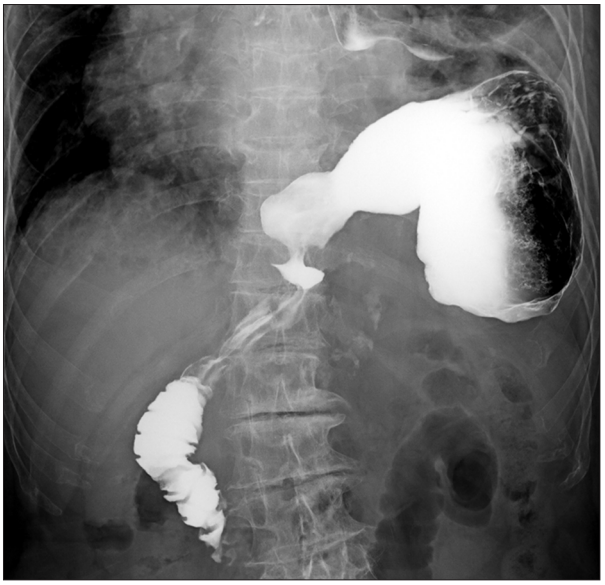

Figure 3. Barium swallow study. This study showed the typical image of the upside-down stomach.

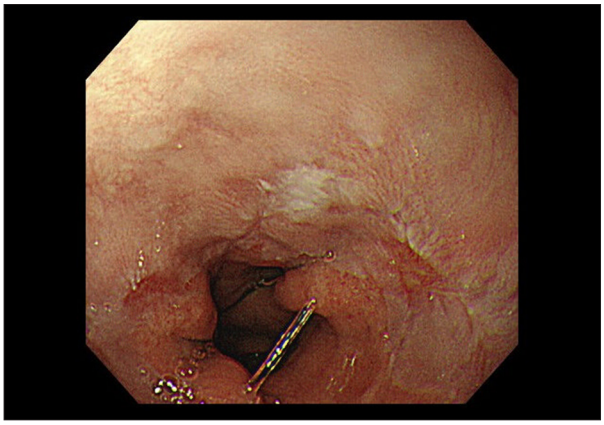

Figure 4. Preoperative EGD finding. Preoperative EGD revealed Grade C reflux esophagitis.

did not have volvulus; furthermore, her heart was in its original position, and her left lung had re-inflated (Figures 7, 8). Her symptoms had disappeared, and postoperative spirometry examination showed a dramatic recovery of her respiratory function; her VC, % VC, and % FEV (1.0) were 1.63 L, 75.4%, and 91.1%, respectively. She was discharged on postoperative day 5 without any complications, and she reported no recurrence of the HH in the 6 subsequent months. Outpatient transthoracic echocardiography revealed that her ejection fraction was 68%, and her BNP level also decreased to normal range after discharge.

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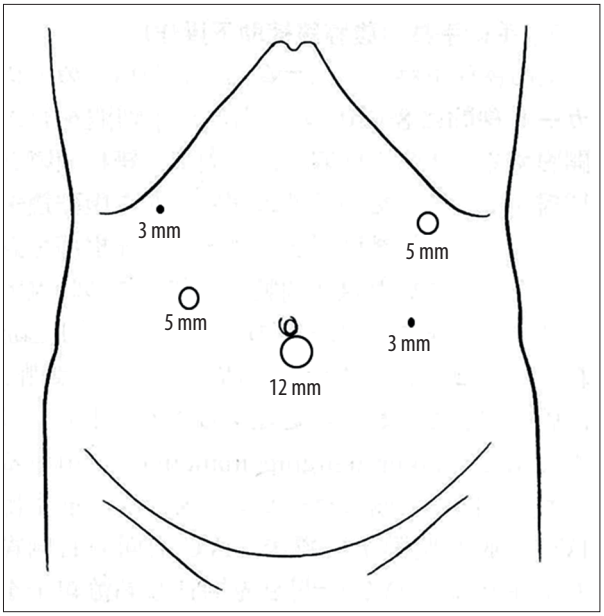

Figure 5. Trocars placements.

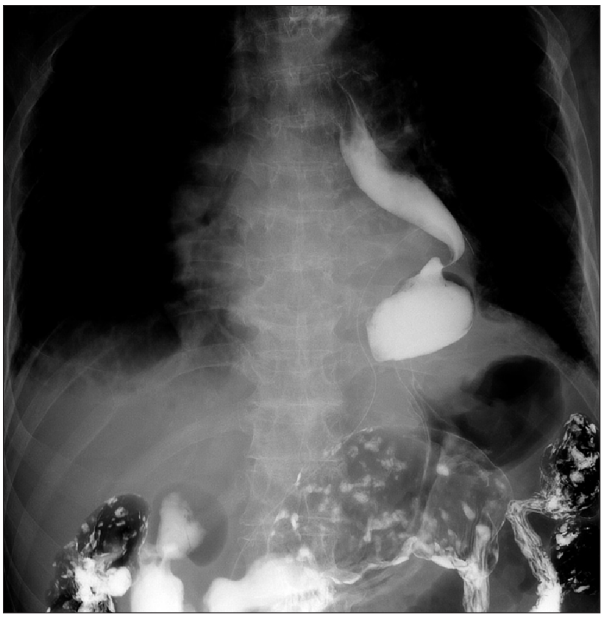

Figure 7. Postoperative upper gastrointestinal series. The stomach was normally located and the passage was satisfactory.

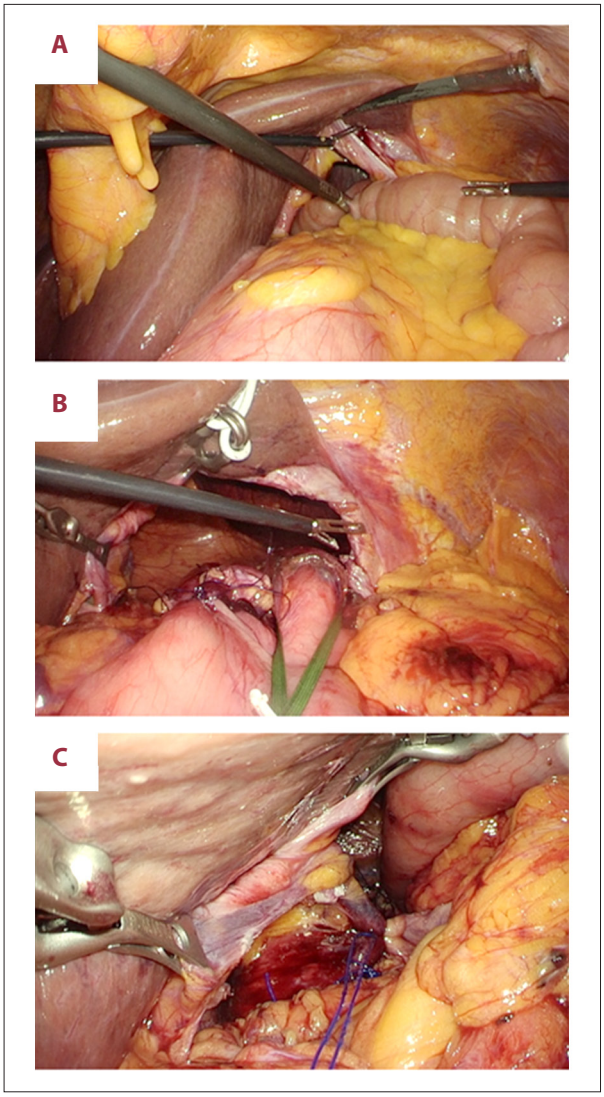

Figure 6. Operative procedures. (**A**) The herniated jejunum was pulled out from the hernia sac. (**B**) The esophagus was circumferentially taped and the hiatus was totally visualized, then gastric fundoplication was performed. (**C**) The hiatus was closed from the dorsal side using intracorporeal knots with 2-0 monofilament non-absorbable threads.

Discussion

In general, HHs are classified into 4 types. In type I (sliding hernia), the gastroesophageal junction migrates cephalad through the hiatus into the mediastinum. In type II (paraesophageal hernia), the gastric fundus herniates through the hiatus into the mediastinum, but the gastroesophageal junction remains in the abdominal cavity. In type III, which is a combination of types I and II, the gastroesophageal junction and the stomach herniate into the mediastinum. Type IV is a type III HH but with additional herniation of other organs into the mediastinum. Type I hernias account for over 90% of all cases of HHs. Type III HHs are the second most frequent, and type IV HHs are the rarest group. In the present case, all of the patient's stomach, a moderate portion of the jejunum, and part of the pancreas had been pulled into a large type IV HH [1-4].

Although HHs are common, HHs with gastric volvulus are observed in less than 5% of all HH patients [7]. Two types of gastric volvulus have been identified – organoaxial and mesoaxial.

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Figure 8. Postoperative CT examination. The stomach was located in the abdominal cavity without volvulus, the heart was located in its original position, and the left lung was sufficiently re-inflated.

The former, in which the stomach rotates around a vertical axis, is the more common of the 2 and is often called UDS [8]. Mesoaxial volvulus is relatively uncommon and represents only about 29% of all torsions that occur in the stomach; its idiopathic pattern is 37% [9]. Gastric volvulus also comes in 2 phases – acute and chronic phases. The acute phase is characterized by gastrointestinal obstruction. Severe stomach pain, dehydration, prerenal failure, and similar symptoms occur, and gastric necrosis or perforation is the worst complication [5]. The chronic phase is characterized by incomplete obstruction and mass effect. Anorexia, vomiting, body weight loss, reflux esophagitis, and cardiopulmonary impairment are experienced.

The migration of most or all of the stomach into an HH can cause mass effects on the surrounding organs, such as the lungs and the heart [3]. The severity of symptoms from these mass effects may also vary depending on whether the patient is lying or standing and inhaling or exhaling and whether the herniated stomach is empty or full [10,11]. Some problems related to cardiac arrhythmia have also been reported, such as atrial fibrillation and flutter [12,13], heart failure due to decreased left ventricular ejection fractions [4], and acute coronary syndrome-like symptoms, and most have been successfully treated by surgical repair of the HH. Milito et al. reported the efficacy of using cardiovascular magnetic resonance imaging for assessing symptomatic patients due to large HHs, and stated that laparoscopic repair can restore the cardiac physiological status [14]. A relationship between large HHs and dyspnea has been noted, and the incidence of preoperative dyspnea is 7–32% [15]. Carrott et al. reported significant postoperative improvements in spirometric and diffusion capacities after HH repair [15]. However, the percentage of the intrathoracic stomach is the only predictor of improvements in%FEV (1.0) [15]. In accordance with these previous reports, the present patient understandably complained of severe dyspnea, and laparoscopic fundoplication restored her cardiopulmonary impairment [16].

In this case, we performed laparoscopic Nissen fundoplication and crural repair. We had 2 rationales. First, preoperative EGD revealed moderate reflux esophagitis due to the HH. Second, avoiding the massive recurrence of the HH was essential for this patient. Recent meta-analyses showed advantages of mesh repair for HHs compared with suture repair in terms of recurrence rate and short-term quality of life [17,18]. However, these advantages of mesh repair for HHs are offset by increased dysphagia due to mesh augmentation [19]. For these reasons, we chose complete fundoplication with crural repair over partial fundoplication, such as the Toupet procedure.

Surgeries in patients with type IV HHs are typically considered high-risk because such patients are usually aged and have comorbid medical problems [20]. Cardiopulmonary dysfunction due to HHs also increases the risk of perioperative complications in such patients. However, laparoscopic HH repair performed by a well-trained laparoscopic surgeon enables the surgical repair of HH in these patients to result in improved cardiopulmonary function without increased perioperative morbidity and mortality [5,13,21].

Conclusions

We treated a very rare case of a large HH with UDS that had induced weight loss and severe cardiopulmonary dysfunction in an elderly patient. The dyspnea in this patient might been due to cardiac inflow obstruction rather than acute mass effects due to UDS. Multiple factors induced by a large HH are involved in cardiopulmonary impairments. Such cardiopulmonary impairment may be reversible by laparoscopic crural repair and fundoplication [22]. Therefore, elective HH repair should be considered in elderly patients with large HHs, with a reasonable expectation of improvement in cardiopulmonary function.

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