



A Case of an Adult Complicated Left Diaphragmatic Hernia: Case Report and Literature Review

Souad Ghattas, MD¹, Saleem Abdel Backi, MD¹, Jad Al Bitar, MD¹, Kiril Keriakos, MD¹

¹Departement of General Surgery, Mount Lebanon Hospital University Medical Center, University of Balamand, Beirut, Lebanon

Corresponding Author:

Souad Ghattas, Beirut, Lebanon, souadnajibghattas@gmail.com

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Abstract

Introduction: Diaphragmatic hernia by definition is the protrusion of abdominal structures into the thoracic cavity. Classified as either congenital or acquired, adult diaphragmatic hernia without a history of trauma is rare, and iatrogenic diaphragmatic hernia is rarer. The array of symptoms may be acute or latent and will depend on the herniated organ, which certainly makes this pathology a challenge at the level of diagnosis and subsequent management.

Case Report: Here we present the case of a 73-year-old male patient who presented one year post left nephrectomy complicated by splenectomy (post splenic injury), with two weeks history of diffuse abdominal pain, non-bilious vomiting, and shortness of breath. Workup done revealed a left diaphragmatic hernia containing necrotic-perforated small bowel loops. A laparotomy with intestinal resection, loop ileostomy along with a primary repair of the diaphragmatic defect were performed.

Conclusion: Although a great portion of acquired diaphragmatic hernias remain asymptomatic, they may be presenting with severe symptomatology and aggravating complications. At the level of clinical manifestation, suspicion of diaphragmatic hernia ascends the ladder of differential diagnosis in a patient with combined respiratory and gastrointestinal symptoms and hence is essential to avoid delayed treatment and superimposing lethal complications. Definitive treatment of diaphragmatic hernia is surgical repair given the high morbidity and mortality associated with such injury.

Keywords: Case report, Diaphragmatic hernia, Iatrogenic diaphragmatic hernia, Left nephrectomy, Splenectomy

Background

A diaphragmatic hernia is defined as the protrusion of abdominal structures into the chest through a defect in the diaphragm [1]. The overall incidence of diaphragmatic hernia is about 0.8-5/10 000 [2]. In adults' diaphragmatic hernia is rare accounting for less than 5% of the cases [3]. They can be either acquired or due to missed congenital diaphragmatic hernias. From the acquired diaphragmatic hernias, traumatic hernias are the most common, and an iatrogenic diaphragmatic hernia is defined as an acquired defect of the diaphragm following a surgical procedure [2,4]. Diaphragmatic hernias can lead to serious complications with an overall mortality rate of up to 31% [5].

This is the case of a 73-year-old male patient operated on for left diaphragmatic hernia one year post left nephrectomy for left renal cell carcinoma complicated by splenectomy secondary to intraoperative splenic injury.

Case Presentation

Patient Information

A 73-year-old male patient presented to our emergency department in June 2021 with a history of diffuse abdominal pain, nausea, repeated episodes of non-bilious vomiting, obstipation, dyspnea, and shortness of breath of two weeks duration.

Past medical history included hypothyroidism and a history of renal cell carcinoma. Two years prior to presentation in August 2020 the patient was diagnosed with a left renal carcinoma for which he underwent a left nephrectomy. During the operation patient had a splenic injury and a splenectomy was done. There was no history of trauma.

Clinical findings

Upon presentation to our emergency department, blood pressure of 90/70 mmHg was found along with tachycardia heart rate of 110/min, desaturation (oxygen saturation of 87% on 10 liters oxygen nasal cannula), and temperature of 38 degrees Celsius. No

breath sounds were detectable in the left chest area. The abdomen was distended, rigid with diffuse tenderness to palpation, and positive bowel sounds. Laboratory analysis revealed an elevated inflammatory marker (White blood cell count of 11,650/mm³, C-reactive protein of 493 mg/L, Lactate Dehydrogenase 309 IU/L), acute kidney injury as the patient was known to have normal kidney function (creatinine 1.63mg/dL) with hyperkalemia (K 6 mmol/L).

Timeline

On history, the patient presented five days prior to presentation to another hospital where a thoracoabdominal computed tomography (CT) scan without Intravenous (IV) contrast was performed identifying a left diaphragmatic hernia with a small bowel loop occupying the left thorax and pleural effusion. A diagnostic and therapeutic thoracocentesis was the only intervention performed before being transferred to our hospital.

Diagnostic Assessment

Repeat imaging was done due to the rapid deterioration of the patient. Chest radiography showed blunting of the left costophrenic angle reaching the axillary level occupied by bowel loops with a right-sided mediastinal shift. CT scan of the thorax and abdomen without IV contrast revealed a large left-sided effusion with left diaphragmatic hernia containing small bowel loops with sub-pleural air bubbles, complication secondary to pleural tap, or bowel strangulation or perforation. The caecum was seen in the left side of the abdomen with a swirl sign of the mesentery (whirlpool sign) and associated proximal small bowel dilatation in the left hemithorax through the left posterior diaphragmatic defect. Findings were suggestive of cecal volvulus, small bowel obstruction, and possible suffering with left-sided diaphragmatic hernia (Figure 1).

Therapeutic Intervention

Due to these new findings, a decision was taken for urgent laparotomy.

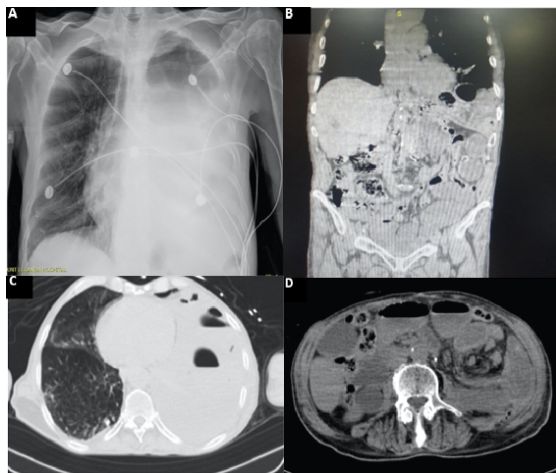


Figure 1: Left diaphragmatic hernia. A: Chest X-ray with visceral herniation in the chest and mediastinal shift. **B:** CT, coronal view with small bowel in left side of chest. **C:** CT, transverse view: Left diaphragmatic hernia containing small bowel loops with sub-pleural air bubbles. **D:** CT, transverse view: swirl sign of the mesentery (whirlpool sign) and associated proximal small bowel dilatation in the left hemi-thorax.

Intra-operative findings showed a 4x2 cm left posterior diaphragmatic hernia (Bochdalek hernia), and a sac containing an ischemic, necrotic, and perforated terminal ileal-loop, manifesting as a complicated closed-loop small bowel obstruction. One liter of fecal material was aspirated from the left pleural cavity. Trans-abdominal blunt dissection was followed until complete liberation and reduction of strangulated bowel loops; 20 cm of necrotic terminal ileal loop was retrieved 10 cm away from the ileocecal valve.

After an extensive lavage of the abdominal and left thoracic cavity through the diaphragmatic defect with 15 liters of warm distilled water, the defect was closed with interrupted Ti-Cron non-resorbable sutures 2-0. In this hemodynamically unstable patient, we decided to perform a discontinuity resection with a double-barrel ileostomy. Because of the bacterial contamination and the possibility of approximating the diaphragmatic edge without tension, the defect was not reinforced with a mesh prosthesis. Drainage to the left upper quadrant and left thoracic chest was placed (Figure 2).

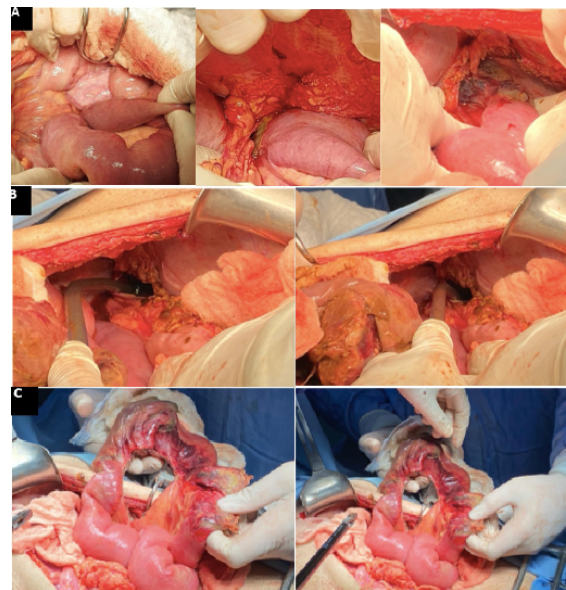


Figure 2: Intraoperative images. A: Terminal ileal-loop herniating through a 4x2 cm defect in the left posterior diaphragm and causing a closed loop small bowel obstruction. **B:** Ischemic necrotic bowel loops with fecal material draining from the left thoracic cavity signifying bowel perforation. **C:** 20 cm strangulated and necrotic terminal ileal loop retrieved 10 cm away from the ileo-cecal valve.

Follow-up and Outcomes

The patient was transferred to the incentive care unit post-Operative. Extubated on day one post-operation, he was hemodynamically stable (Figure 3).

Diet was resumed on day two post-operative. The empiric antibiotherapy was switched to a targeted one after the cultures results. During his stay, the patient presented multiple respiratory complications that required a new chest tube placement, bronchoscopy with lavage, and CT-guided drainage of a left pleural effusion.

On day 35 post admission a purulent fluid was seen in the chest tube. A diagnosis of organized empyema of the left lung was made and managed with left posterolateral thoracotomy, left lung decortication, and empyema drainage. The patient passed away two weeks later from respiratory failure and cardio-respiratory arrest.



Figure 3: Chest X-Ray pre-operation vs day 1 post-operation.

Discussion

Diaphragmatic hernia in adults is rare. It can be due to missed a congenital diaphragmatic hernia or acquired. Acquired diaphragmatic hernias are rare, with an overall incidence of <5% [3]. Trauma is the most common etiology of acquired diaphragmatic hernia. The second most common cause is iatrogenic following surgery, but is very rare, with mostly just case reports in the literature [1]. Two types of congenital diaphragmatic hernias are defined: Morgagni, when the hernia occurs through an anterior parasternal foramen, or Bochdalek Hernia (BH), posterolateral hernia, mainly left-sided, representing persistence of the pleuroperitoneal canal. Of all patients with a congenital BH, only 5% will be diagnosed in childhood or adulthood [6-7]. Left-sided acquired diaphragmatic hernias are more common. This is due to the protection of the right hemidiaphragm by the liver. The abdominal contents that can herniate into the diaphragm vary, but documented cases include herniation of the stomach, small intestine, mesentery, spleen, and pancreas [8]. In our case, the distal ileum with the ileocecal valve was herniating through the diaphragmatic defect.

A careful evaluation of a patient with a herniated viscus is important to avoid the risk of Iatrogenic perforation. Herniated bowel may be massively dilated and mimic tension pneumothorax. A tube thoracostomy in such a situation may result in perforation and/or and/or faecopneumothorax, [9] as is the complication of our case.

The clinical symptoms of patients with a diaphragmatic hernia are usually nonspecific

and vary between chest and/or abdominal and in some cases cardiac symptoms. The abdominal contents on the chest put pressure on the lungs and result in shortness of breath and chest pain [9].

On the other hand, medical imaging is important in the diagnosis of diaphragmatic hernia. The presence of air meniscus signs on the chest x-ray should draw the attention of the clinician to this possible diagnosis. As with our case, this approach may result in some cases being initially misdiagnosed as complex pleural effusions as well as hydropneumothorax, with dangerous consequences as a diagnostic or therapeutic thoracentesis would be done without further investigation. Furthermore, ultrasonography could be a useful tool, especially for traumatic diaphragmatic hernia, having its significance lies in the ability to show diaphragmatic continuity and herniated organs and reveal associated abdominal organ pathologies. As for the golden standard examination, a computed tomography scan is effective the most in many diaphragmatic cases. It has been reported in previous studies that multi-slice CT imaging is the most efficient modality for diagnosing patients with a high clinical suspicion of acquired DH, owing to its accessibility, short duration, and ability to identify concomitant pathologies including rib fractures, hydropneumothorax, abdominal injuries and degree of bowel compromise if any. The usual features of diaphragmatic injury seen on the MDCT scan are diaphragmatic discontinuity, thickened diaphragm, "collar sign," visceral herniation, dependent viscera sign, and so on. As for the MRI modality with a well-known high sensitivity for soft tissue, MR imaging may be performed in the selected patients, or on the late presenting diaphragmatic hernia cases where the diagnosis is still in doubt [9].

In our case, the patient presented with hemodynamic instability and acute onset of obstructive gastrointestinal and respiratory symptoms 1 year post left nephrectomy and splenectomy. Chest x-ray and CT scan findings were suggestive of

a diaphragmatic hernia with strangulated perforated small bowel loops. In a comprehensive literature review, we have found 13 cases of diaphragmatic hernia post-nephrectomy. The delay in presentation was suggested to be the result of the gradual enlargement of a small tear in the diaphragm that had gone unnoticed during surgery. However, referring to our case and intraoperative findings of a bochdalek hernia, delayed presentation of a congenital diaphragmatic hernia couldn't be ruled out (imaging before nephrectomy was not available for comparison).

The treatment of choice of diaphragmatic hernia is surgical repair. Defects in the diaphragm, no matter how small, will not heal alone due to the thoracoabdominal pressure gradient which will favor enlargement of the defect and hence herniation of abdominal contents [10]. In this acute presentation of our case with strangulated and obstructed viscera, the decision for immediate surgery was appropriate.

The approach to repair depends on the presentation (emergency or elective), size and side of the defect, and the presence of complications. For emergent cases, laparotomy is the preferred approach. An open abdominal approach, and primary closure using simple, figure-of-eight, or horizontal mattress sutures using 0 or 1 non-absorbable material is the most common procedure [11]. Repair using a mesh may be required when the size of the defect is too large, and primary closure is not possible. Prosthetic repairs are performed with expanded polytetrafluoroethylene mesh secured by 0 or 1 non-absorbable braided suture, ensuring 2 to 3 cm of overlap beyond the diaphragmatic defect [12]. As well for chronic long-standing diaphragmatic hernias, the edges of the defect become fibrotic, unlike acute diaphragmatic laceration in which the edges can be pulled together without tension. Fixing chronic diaphragmatic hernia frequently requires prosthetic mesh to provide a tension-free repair [12].

Application of a mesh in diaphragmatic injuries associated with solid or hollow viscous injuries was contraindicated given the risk of mesh infection. As biological mesh is incorporated into the surrounding tissues it decreases the risk of infection, adhesion, erosion, extrusion, and rejection compared with the synthetic mesh [13].

In our case, urgent trans-abdominal surgery was the best approach in the context of acute presentation and hemodynamic instability, allowing examination of intra-abdominal organs, lysis of extensive adhesions, and exposure of the ischemic area of the bowel. Primary repair without mesh placement was also preferred due to bacterial fecal contamination of the surgical site and the intermediate size of the defect being 4x2 cm.

Pulmonary complications are the most common postoperatively with atelectasis being the most reported leading to respiratory failure and a 45% mortality rate [13].

In the case of our patient who passed away due to a pulmonary complication which is empyema. Other reported postoperative complications are anastomosis leak, diaphragm paralysis, evisceration, evisceration, nosocomial pneumonia, pulmonary embolism, sepsis, cerebrovascular events, and wound infection [11].

On the bright side and for elective repairs, mortality rates of diaphragmatic hernias are low. However, this rate increases up to 80% in emergency surgery, especially in cases accompanied by necrosis and perforation [11].

Conclusion

Acquired diaphragmatic hernias are very rare. Early and correct diagnosis is essential to avoid delayed management and fatal complications from wrong therapeutic procedure as in the case of our patient who had a thoracentesis and spillage of fecal material on the pleural cavity. Treatment is operative repair and depends on the presence of other intra-abdominal injuries,

patient stability, technical ability of the surgeon, chronicity, location, and the size of the diaphragmatic injury.

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