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Diaphragmatic Hernia Emergency Surgery: A Case Series and Review

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ABSTRACT
A congenital anomaly with a frequency of 0.17–6% in adulthood is congenital diaphragmatic hernia (CDH). Rupture of the diaphragm occurs in only approximately 5% of severe closed thoraco-abdominal injuries, making it a relatively uncommon complication of trauma. Asymptomatic instances to severe respiratory or gastrointestinal symptoms are all possible clinical presentations. Anamnesis, clinical symptoms, and radiological examinations all contribute to the diagnosis. Diaphragmatic hernia cases with respiratory and gastrointestinal symptoms were hospitalised to our Academic Department of General Surgery six times between May 2013 and June 2016 (four females, two males; mean age 58 years). There were chest X-rays, barium studies, and CT scans done. In Case 1, a transverse and descending colon was herniated into a left diaphragmatic hernia. Case 2 exhibited left CDH, allowing the colon, spleen, and stomach to pass. Cases 3 and 6 both had a stomach-in-hemithorax finding. Case 4 had a left diaphragmatic hernia that permitted passage of the transverse colon, spleen, and left lobe of the liver. In Case 5, the spleen and stomach had ruptured into the chest. Surgery was always done in an emergency. The hernia's contents were diminished, and the defect was patched up using mesh or primary repair. The post-operative recovery periods were all uneventful. Patients with or without a history of trauma are diagnosed with a diaphragmatic hernia when their stomach and respiratory symptoms coexist. To determine the size, position, and contents of the diaphragmatic defect, a chest X-ray, CT scan, and barium tests should be performed. The use of emergency surgery is essential for lowering morbidity and death.

Keyword: Diaphragmatic rupture, Mesh, Emergency surgery, Laparotomy, Thoracotomy, Congenital diaphragmatic hernia.

1. INTRODUCTION

With a 67% survival rate, congenital diaphragmatic hernia (CDH) is a birth defect that affects 1 in every 1500 births [1]. The diaphragm's improper formation during embryogenesis is one of the main characteristics of CDH.

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Lung development is hampered by the abdominal contents herniating into the chest as a result of the diaphragm's inadequate construction. Clinical manifestations might range from instances with no symptoms to those with severe respiratory or gastrointestinal problems, as well as occasionally hemodynamic instability. The degree of pulmonary hypoplasia and pulmonary hypertension determine the wide range of severity in CDH patients. The majority of posterolateral hernias (also known as Bochdalek hernias) occur on the left side (85%), with the right side (13%) and bilateral hernias (2% each) occurring less commonly [2].

Diaphragmatic rupture (DR) is a rare consequence of trauma that develops in 5% of cases, including those involving auto accidents [3-5]. Typically, a patient may not receive a diagnosis for years after a trauma before issues arise. Traumatic diaphragm rupture is regarded as requiring surgical repair, particularly in individuals who are symptomatic [6].

On the absolute requirements for operation and the timing, there is disagreement. The beginning of complications has the highest rates of death and morbidity; as a result, emergent surgery is required.

The accepted practises during the past few decades have been primary suture repair or covering the defect with a synthetic mesh. Recent research suggests that biologic meshes can minimise adhesion development, induce a limited inflammatory response, and close the diaphragmatic defect [7]. Patients with DR typically receive laparotomy or thoracotomy as therapies.

Laparoscopic methods for hernia repair have also recently grown in favour [8]. Only one example [9] of a robotic method in elective surgery has been documented in the literature, and it has not yet been described as an effective approach in emergencies. This paper reviews the literature and describes the surgical experience of a surgical unit treating congenital or traumatic diaphragmatic hernias in an emergency scenario.

2. METHODS

At our Academic Department, six cases of abdominal and respiratory symptoms associated with diaphragmatic hernia were seen in the emergency room. Bowel noises were audible but there were no breath sounds in the left chest region. In each case, urgent surgery was done.

The hernia's contents were diminished, and mesh or primary repair was used to fix the defect.

Case 1: A 63-year-old lady who complained of dyspnea and intestinal blockage was admitted. Anamnesis indicated strabismus, mental impairment, and severe abdominal pain. During the physical examination, bowel noises could be heard in the left chest region but no breath sounds were. The transverse colon was seen displaced into the left hemithorax above the splenic flexure on a chest X-ray and barium enema. The collapse of the lung and the mediastinal shift to the right were suggested by computed tomography. The transverse and descending colon was lodged in the left hernia of the diaphragm. A left diaphragm agenesis, mega colon (diameter 10 cm), and left liver agenesis were discovered during an emergency laparotomy. An intraoperative bronchoscopy identified left lung hypoplasia. It involved a subtotal colectomy with an ileo-rectal anastomosis and primary diaphragm repair. The post-operative course went without a hitch, and on the fifteenth postoperative day, the patient was released. All known congenital disorders have no anomalies seen in the karyotype, phenotypic, or genetic pattern.

Case 2: A 50-year-old lady who complained of abdomen, chest, and dyspnea was admitted. There were no audible breath sounds in the left chest region. There was no traumatising past.

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An X-ray of the chest showed a shift of the mediastinum to the right and intestinal gas in the left chest. Large annular diaphragmatic defect detected by CT scan enabled passage of the colon, spleen, and stomach. Using a combined emergency chest-abdominal technique, the defect was repaired by reducing the contents and using Mersilene mesh®. The thoracic thick adhesion between the chest and the abdominal contents was released using a thoracotomy method.

The collapsed left lower lobe of the lung was expanded with increased tidal volume prior to mesh placement, and a chest drain was inserted into the left pleural space. An immediate post-operative chest X-ray revealed minor pleural effusion and enlargement of the left lung. The 13-day postoperative stay was uneventful during the recovery period.

Case 3: A 73-year-old woman who complained of dysphagia and shortness of breath arrived. Anamnesis revealed no evidence of trauma history. She had a history of hypothyroidism and high blood pressure. The existence of the stomach in the left hemithorax was revealed by barium and chest X-ray investigations. A massive diaphragmatic hernia, which caused the stomach to herniate into the chest, was discovered by CT scan. Hernia contents were decreased during an emergency laparoscopic, and the defect was repaired with Proceed mesh. The post-operative course went without a hitch, and 7 days after surgery, the patient was released.

Case 4: A 63-year-old woman was presented with complaints of dyspnea for two days, which progressively worsened and was accompanied by dry coughing and pain in her left side of the chest. There was a previous car accident six years prior. The initial chest radiograph showed a colon gas shadow in the lower part of the hemithorax and a raised left hemi diaphragm. The spleen, left lobe of the liver, and transverse colon were able to pass through the left diaphragmatic hernia, according to a CT scan. In an emergency, surgery was done, lowering contents and using biological mesh to fix the defect; Tutomesh, bovine pericardium mesh®). On the tenth post-operative day, the patient was released from the hospital without incident.

Case 5: A labour accident involving a 50-year-old guy. He was treated using advanced trauma life support guidelines. He had chest and stomach pain, dyspnea, fever, a left hypochondrium hematoma, reduced breath sounds on the left side, and subcutaneous emphysema when he went to the emergency hospital. His past medical history included treated hypertension and obesity. Initial barium and chest radiography studies revealed a stomach in the left hemithorax. As evidence of a traumatic diaphragmatic rupture with full disruption of all muscle layers, a CT scan showed the stomach and spleen in the left hemithorax in addition to multiple rib fractures, a collar sign, and fractures of the left humerus and scapula. A traumatic defect in the left diaphragm and a stomach and spleen in the left thorax were discovered during an exploratory laparotomy. The hernia's contents were diminished, and biologic mesh (Tutomesh bovine pericardium mesh®) was used to close the defect.

The patient was admitted to an intensive care unit after surgery. On the eighth postoperative day, he was moved out of the ICU, and he was released on the twentieth.

Case 6 : A 51-year-old man described having experienced dyspnea, stomach pain, nausea, and vomiting over the previous five months. Over the last two weeks, the severity of these symptoms had gotten worse. Anamnesis revealed a left splenopancreatectomy for non-lymphoma Hodgkin's four years prior. A little peritoneal effusion without peritoneal response was found during the physical examination.

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After a nasogastric tube was placed, symptoms significantly improved. A left hemi diaphragmatic rupture with a gastric herniation was suspected based on the chest X-finding ray's of a significant fluid level beneath an apparent raised left hemi diaphragm; the diagnosis was confirmed by barium studies and a thoracic-abdominal computed tomography. After an urgent left thoracotomy, the stomach's volvulus and some intestinal loops were discovered. Herniating through the ripped diaphragm was a portion of the transverse colon that had been trapped. The hernia, which had a diameter of 12 cm, was restricted to the left hemi diaphragm's posterior side. In addition to a significant reduction in the size of the left lung and an inflammatory mass in the greater omentum adherent to the diaphragm, dense adhesions between the herniated organs and the left pleura-lung were discovered during surgery. As a result, a resection of the mass, an adhesiolysis, and a decrease of the volvulus were carried out. Finally, the left diaphragmatic defect was directly sutured. The patient recovered without incident, and pathology revealed Hodgkin's lymphoma.

Review of the Literature

By searching PubMed/MEDLINE from 1983 to 2017 and using the phrases "emergency surgery," "traumatic diaphragmatic rupture," and "congenital diaphragmatic hernia," a systematic review was carried out. Search results showed 555 papers. Thirty-two papers were excluded because they dealt with hiatal hernia, forty paraesophageal hernias, and 59 elective settings. Three hundred twenty-three publications were excluded because they were not in English (N = 87), presented cases in children (N = 178), or were not interesting human species (N = 58). The full texts of 101 papers were evaluated for eligibility as a result, and 697 patients' ethiopathogenesis was traumatic and 38 patients' was congenital.

Pathogenetic mechanism

Sennertus [11] first reported diaphragmatic rupture with abdominal organ herniation in 1541. Diagnosis of congenital diaphragmatic hernias can occur during pregnancy or in the newborn stage. Contrarily, CDH in adults is incredibly uncommon and can happen through the anterior parasternal Morgagni foramen or the posterolateral, typically left-sided Bochdalek hernia, which was originally identified in 1848 [12]. Although the exact cause of the condition is still unknown, it is thought to be related to the oesophageal canal's failure to completely close during the eighth week of pregnancy.

A uncommon condition known as a Morgagni hernia is brought on by faulty sternal attachments to the diaphragm development. According to one theory, traumatic diaphragmatic hernias are caused by a rapid rise in the pleuroperitoneal pressure gradient at possible weak spots along the embryological points of fusion [13].

The omentum or an abdominal hollow viscus can enter the pleural cavity in the course of DR, which typically results from blunt or penetrating injuries or iatrogenic causes. This can produce imprisonment or even strangling, which can be deadly. Traumatic diaphragmatic hernias can occasionally result from blunt thoracic-abdominal trauma (5%) and are frequently brought on by penetrating injuries (10–19%) [14, 15]. Additionally, some authors described uncommon and particularly cases of DR following surgery or pregnancy; for example, Sano A. et al. reported a case of a pregnant woman who underwent an emergency caesarean section and diaphragm repair in the 28th week of pregnancy [16]; Moussa G. et al. described a right DR in a patient with a history of window fenestration and sarcoidosis [17]; and Naka In addition, Marfan's syndrome and CDH were linked, according to Barakat et al. [19].

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Site of rupture

80% of CDH development is on the left [20]. Additionally, 88–95% of diaphragmatic ruptures happened on the left [21], and forceful trauma, in particular, frequently results in extensive diaphragmatic abnormalities that involve (>80%) the left posterolateral diaphragm [22]. The right haemidiaphragm is stronger than the left one because of the size of the liver which has a protective effect. Because of this, side ruptures are extremely uncommon and have a high mortality and morbidity rate [23]. Only two cases with bilateral DR were recorded, and the literature research mentioned in this study corroborated the high prevalence of left damage at 80%.

Presenting symptom and investigations

According to Nayak et al., severe symptoms were present in 46% of CDH cases, and visceral strangulation was responsible for 32% of fatalities [24]. Additionally, the review of the literature reveals a range in the percentage of delayed symptoms (5–45.5%) [25, 26]. Acute, obstructive, gastrointestinal symptoms, chronic dyspnea, chest discomfort, recurring stomach pain, postprandial fullness, and vomiting are common symptoms of late-presenting left-sided CDH [27]. These symptoms often progress to cardiorespiratory failure. In fact, right-sided CDH is typically only accompanied by respiratory problems due to the possibility that partial liver displacement may prevent further herniation of hollow viscera [1].

Despite the fact that the absence of breath sounds and the presence of bowel noises in the chest are typical CDH symptoms, a 38% misdiagnosis rate has been documented [28]. In circumstances where there are no symptoms at all, diagnosis is obviously challenging. On the other hand, the diagnosis is obvious when acute presentations are brought on by an increase in abdominal pressure and the fast displacement of herniated viscera into the chest that follows [29, 30].

Surgical treatment

The diaphragm is routinely closed either completely or partially during surgical repair using an open abdominal approach. Thoracotomy or a combined thoracic-abdominal approach is preferred when the diagnosis is delayed due to suspicions of adhesions between viscera and the chest, as in the case 2 that was recently reported. The success of the thoracoscopic method, according to some writers, is tainted by a higher frequency of hernia recurrence [34–36].

The implantation and care of a patch leads in much longer operating times, and during thoracoscopy, an intraoperative pulmonary hypertension with subsequent hemodynamic instability may emerge. For these reasons, thoracoscopic correction of CDH is favoured when there are minor pulmonary hypertension or tiny diaphragmatic abnormalities [37]. In cases like case 3, the laparoscopic technique is currently a safe and viable choice for CDH [37].

However, the preferred course of treatment for diaphragmatic rupture is immediate surgery. To lessen viscera-pleural adhesions and prevent catastrophic intra-thoracic visceral perforation in delayed patients, a thoracic approach is advised [38]. When intestinal obstruction is suspected to be present, an abdominal approach may also be necessary to regulate organs. Although the best method of repair for diaphragmatic hernias is still up for debate, it is widely agreed that nonabsorbable sutures can effectively close the majority of defects [39]. When a defect is too large to be completely repaired, mesh repair is frequently

utilised, and the use of tension-free mesh is essential to the process' effectiveness. Because of its stronger resistance to infections, lower risk of displacement, and lower rate of hernia recurrence, biologic mesh has recently been introduced to replace synthetic mesh [7, 40]. However, there is still only limited evidence in the literature to support its superiority. Biologic meshes have been successfully used in polluted surgical fields in our prior experience, in fact [40]. Although this illness is uncommon, practitioners should be urged to share their knowledge of using biologic meshes to treat diaphragmatic hernias [7].

3. CONCLUSIONS

Surgery is the preferred course of treatment for diaphragmatic hernias, especially in an emergency situation. It is advised to use a multidisciplinary strategy in specialised centres.

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