Delayed Asymptomatic Left Traumatic Diaphragmatic Hernia after Abdominal Stab Wounds

J Balaguera, M García-Almenta, J Segovia, L Aquiriano, S Delgado de Tórres, L Gamarra, C Cerquella Hernández

Citation

J Balaguera, M García-Almenta, J Segovia, L Aquiriano, S Delgado de Tórres, L Gamarra, C Cerquella Hernández. *Delayed Asymptomatic Left Traumatic Diaphragmatic Hernia after Abdominal Stab Wounds*. The Internet Journal of Surgery. 2007 Volume 17 Number 2.

Abstract

Traumatic diaphragmatic hernia (TDH) is sometimes diagnosed many years after the traumatic event. Due to the silent nature of diaphragmatic lesions, the diagnosis is easily missed or difficult.

We describe a case of left diaphragmatic hernia, in which the diagnosis was made two years after exploratory laparotomy for an abdominal penetrating stab wounds. The patient had remained asymptomatic until he consulted us to present an abdominal wall hernia. A diaphragmatic hernia was detected incidentally when carrying out the preoperative chest x-ray for the incisional hernia. Abdominal CT scan confirmed the diagnosis. Incarceration of the stomach through the diaphramatic defect was observed after laparotomy. Surgical repair of the diaphragmatic defect and of the incisional hernia with expanded polytetrafluorethylene (ePTFE) and polypropylene mesh, respectively, was performed. The patient was discharged 5 days after the surgical procedures and no complications ocurred.

The problems associated with the diagnosis and management of abdominal penetrating stab wounds, as well as the diagnosis and treatment of the delayed left TDH are discussed in the light of this case report.

INTRODUCTION

Diaphragmatic hernia is the generic name for a hernia in the diaphragm. Pathologically, there are two main types of diaphragmatic hernia namely, congenital and acquired. Acquired diaphragmatic hernias can be traumatic or iatrogenic. Traumatic diaphragmatic hernias (TDH) are observed in 10% of diaphragmatic injuries, which include blunt trauma, penetrating trauma (firearm injuries and stab wounds) and iatrogenic lesions (1,2).

Diaphragmatic ruptures are fairly frequent after thoracoabdominal traumas (0.8-5%).

The incidence of these injuries is ascending due to the increase of traffic accidents and of criminal aggressions and they occur in 1-5% after road traffic accidents and in 10-15% after penetrating lesions ($_3$). The mean age of presentation is located around the third decade of life, with a female to male ratio of 4:1; 74.3% on the left side; 24.2% on the right side and 1.5% bilateral. Associated lesions are seen in 91% of all patients; therefore, diaphragmatic rupture must

be suspected in any patient with thoracoabdominal injury ($_{\scriptscriptstyle 4,556}$).

The initial diagnosis of a traumatic injury of the diaphragm is generally difficult and a high index of suspicion is necessary. In a review of 1000 cases, the diagnosis was made pre-operatively in 44.1%, intra-operatively in 41.3% and late in 14.6% of the cases ($_7$).

TDH may appear acutely after a blunt or penetrating lesion or it can also remain missed for many years ($_{8,9,10}$) as our case.

The rate of initially undiagnosed TDH oscillates between 12 and 60%. They remain asymptomatic in nearly half of the patients. Hence, delayed presentation, days or even years after the onset of the initial trauma, are not uncommon. Indeed, they are often revealed by a complication $(_{1121213})$.

We report an inusual case of delayed asymptomatic diphragmatic hernia, after twenty-four months following an exploratory laparotomy secondary to stab wounds.

CASE REPORT

A 28-year-old man consulted us to present an asymptomatic incisional hernia of 6 months of evolution. The patient had had an exploratory laparotomy due to penetrating stab wounds two years before. After revision of the abdominal cavity, the small intestine and omentum wounds were sutured. The operation was concluded uneventfully and the postoperative evolution was normal.

Pre-operative plain chest radiography of the incisional hernia incidentally showed that stomach and omentum were herniated into the left thoracic cavity (Fig. 1), which was confirmed by a computed tomography (CT) of the chest (Fig. 2,3). Despite this gastric incarceration, the esophagogastric junction was in the right position. An asymptomatic diaphragmatic hernia was diagnosed and the patient underwent programmed surgery.

Figure 1

Figure 1: Chest x-ray of the patient with left diaphragmatic hernia. The margen the left diaphragma is not visulized. The mediastinum shfted to the right by herniated abdominal viscera into the left pleural cavity.



Figure 2

Figure 2: Thorax CT (transverse section) scan showing a herniated stomach within the left side of the chest, with mediastinal shifting to the oposite side.



Figure 3

Figure 3: Three-dimensional coronal reconstruction of a chest CT scan ilustrating intrathoracic herniation of the stomach and omentum through a left diaphragmatic rupture (hourglass sign).



Laparotomy revealed that the stomach had herniated into the thoracic cavity through a defect of 12 cm in diameter in the left hemi-diaphragm. After reducing the stomach into the abdominal cavity, the defect was repaired with an expanded polytetrafluorethylene (ePTFE, Gore-tex®) mesh, and with interrumpted sutures. The incisional hernia was repaired using a polypropylene (Prolene®, ETHICON, Johnson&Johnson company), preperitoneal patch through a midline laparotomy. The postoperative course was uneventful. The patient was discharged 5 days after the surgical procedure. After a 10-month follow-up, the patient is asymptomatic and healthy.

DISCUSSION

Penetrating wounds (firearm and stab wounds) in the thoracoabdominal region are the major cause of diaphragmatic injury (63%). These lesions are of smaller size than blunt injuiries and therefore are associated with a major strangulation risk if the diagnosis is not made appropriately ($_5$).

In asymptomatic patients, usually victims of stab wounds treated only with clinical observation, this injury may not be diagnosed. Most authors (14,15) believe that even small diaphragmatic lesions, which are usually resultant from stab wounds, may develop into larger injuries if left untreated and lead to a diaphragmatic hernia with a potential risk of complications and mortality.

The majority of complications occur between one and four years after the injury ($_{16}$). However, they can appear many years later. Singh et al. ($_{17}$) report a case of a delayed TDH presenting 50 years after the traumatic event.

Usually the delayed TDH remains asymptomatic (as in our case), unless there is some form of increased intraabdominal pressure as from obesity, cough or pregnancy. When it is symptomatic, it often presents with chest pain, chronic gastrointestinal or respiratory problems and rarely with acute dyspnea ($_{16}$).

The natural evolution of the diaphragmatic lesion can be divided in three stages: a) acute phase that can show respiratory insuficiency due to mediastinum compression. b) Latent phase with abdominal or respiratory non-specific chronic symptoms. c) Late phase with abdominal viscera herniation and secondary obstruction, with or without ischemic commitment ($_{18,19}$).

Fortunately, gastric or intestinal perforation associated with this type of hernia is uncommon. Mortality rate undergoing emergency repair of this condition is very high (32%). It can be hypothesized that when there is an increment of the abdominal pressure (bout of couging, etc.), respiratory movements and intrapleural negative pressure, the herniation of abdominal viscera may be precipitated. This leads up to incarceration, strangulation, gangrene and perforation ($_{20,21,22}$).

The most commonly herniated organs on the left side are the stomach (80%), omentum, small intestine, colon, and spleen ($_{20}$).

Some studies have shown that diaphragmatic lesions diagnosed and treated on the occasion of trauma have a low mortality rate, specifically for diaphragmatic injuries (0% to 5%), and when diagnosed during complications, the mortality rate increases to between 36% and 48% ($_{23}$). Although some wounds of the diaphragm can heal by themselves, they should be sutured when they are discovered ($_{19}$).

A high index of suspicion of a diaphragmatic lesion after of a penetrating wound in the thoracoabdominal region, physical examination, and proper choice of the diagnostic methods contribute to early and correct diagnosis.

Standard chest x-ray is considered the first-line diagnostic imaging tool. The literature indicates that plain chest X-ray is diagnostic in 73% of patients with diaphragmatic hernia. The signs of diaphragmatic injury on plain radiographs are intrathoracic herniation of abdominal viscera, marked elevation of the hemi-diaphragma, distortion of the diaphragmatic margin and contralateral mediastinal shift ($_{24,25}$).

CT is a very appropriate test for assessment of delayed TDH. Besides suspected diaphragmatic injury, CT can identify other concomitant abdominal and thoracic injuries. Conventional CT has a sensitivity of 82% and specificity of 87% ($_{26}$). Helical CT shows improved sensitivity of 100% and specificity of 100%. Multidetector CT allows thinner slicing and more detailled imaging in a shorter time and greater flexibility in image reconstruction. CT signs of TDH include direct visualization of injury to the diaphragm, segmental diaphragm mobilization, intrathoracic herniation of the abdominal viscera, diaphragm thickening and associated complications ($_{27}$). In our patient the radiological findings were sufficient to make the diagnosis.

Magnetic resonance imaging (MRI) allows excellent imaging of the entire diaphragm and shows a clear discrimination between the diaphragm and adjacent structures. MRI showed the exact site and size of the diaphragmatic hernia in all cases (₂₈).

Ultrasonography can also be diagnostic in patients with TDH because it allows to define absent diaphragmatic movements, herniation of viscera or flaps of ruptured diaphragm ($_{29}$).

Contrast studies and nasogastric tube introduction may be helpful when CT and MRI are not availables ($_6$).

The use of thoracoscopy and laparoscopy in the assessment of these patients has shown that the real number of diaphragmatic injuries is much higher than supposed, including situations where there are other associated abdominal injuries (sensitivity and specificity close to 100%). Ideally, video-assisted thoracoscopy is best used in patients withthout any evidence of abdominal injury ($_{30}$).

Peritoneal lavage may have false-negative results for diaphragmatic injuries in up to 30% of the cases, especially in isolated diaphragm injuries ($_6$).

Right diaphragmatic rupture is considered more difficult to diagnose because the diaphragmatic defect is protected by the liver, unless it is fully herniated into the pleural cavity.

In some cases diaphragmatic injuries secondary to penetrating stab wounds are easy to overlook not only on plain chest x-ray but even during laparotomy, as in our case. The published data correlate with our experience of the possibility of missing these diaphragmatic lesions, especially in patients with bilateral rupture $(_{31})$.

Among the differential diagnoses there are: Bochdalek or Morgani hernia, diapragmatic eventration, paraesophageal hernia, pulmonary kidnapping, epiphrenic esophageal diverticle and severe emphysema (18).

The surgical repair is the treatment of choice of the TDH. According to the literature, the surgical approach depends on the departament that manages the patient. General surgeons use laparotomy in 92% ($_{1,4,5,6}$) and thoracic surgeons carry out thoracotomy in 78% of the cases ($_{11,32}$). Usually, laparotomy seems to be more appropriate, especially when associated intra-abdominal lesions are suspected. The thoracotomy approach can be utilized when safe reduction of the herniated viscera is not possible, when technical difficulties are encountered or when associated intrathoracic lesions are discovered. However, the experience has demonstrated that the surgical approach should be based on the clinical and radiographic findings in each patient.

In a situation when surgeons possess advanced laparoscopic skills to perform dissection and intracorporeal knot tying, the laparoscopic and thoracoscopic approaches are feasible. Left diaphragmatic hernia less than 10cm is amenable to endoscopic repair, depending on the surgeon's experience. The presence of other lesions is not necessarily a contraindication for the endocopic pathway ($_{\rm 30,33,34,35,36}$).

A combined laparoscopic and endoscopic approach to gastric volvulus associated with TDH can be an appropriate pathway as it allows reduction and detortion of the gastric volvulus; diaphragmatic defect repair and percutaneus endoscopic gastropexy with minimal morbidity and good outcome ($_{37}$).

The repair of the hernial defect can be made with nonabsorbable or absorbable suturing material; however, the use of non-absorbable suturing is widely recommended ($_{4,38}$). We think that absorbable suturing material is less reliable, therefore this material should not be used in this pathology. Slowly absorbable stitches seem to be reliable but require further study. Both interrumpted and continuous techniques are equally effective ($_6$). Mesh repair is rarely needed in small defects. It should be used in big defects (as in our case), with the aim to achieve tension-free conditions in the suture line ($_{36}$).

Among the associated complications after the surgical intervention are: Diaphragmatic suture dehiscence, respiratory insufficiency due to diphragmatic paralysis, surgical wound infection, prosthesis infection, empyema or subphrenic abscess ($_{4,556}$).

CONCLUSION

We believe that this case illustrates the necessity of a careful review of the entire abdominal cavity during exploratory laparotomy after penetrating injuries, with the aim of avoiding secondary complications due to unnoticed lesions. Also, this case teaches the necessity to repair all diaphragmatic injuries during exploratory laparotomy to prevent diaphragmatic hernias, and the incarceration, strangulation and secondary perforation of the associated viscera.

CORRESPONDENCE TO

Josué Carvajal Balguera Calle Téllez, 30, escalera 12, 2ª planta, puerta 3 28007 Madrid Spain E-mail: josuecarvajal@yahoo.es Phone: +34915518018 - +34649078173 Hospital fax: +34915345330

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Author Information

Josué Carvajal Balaguera

Surgeon Assistant Surgery Service, Service of Genral and Digestive Surgery and Service of sadiology, Hospital Central de la Cruz Roja San José y Santa Adela

Mercedes Martín García-Almenta

Surgeon Assistant Surgery Service, Service of Genral and Digestive Surgery and Service of sadiology, Hospital Central de la Cruz Roja San José y Santa Adela

Juan Camuñas Segovia

Surgeon Assistant Surgery Service, Service of Genral and Digestive Surgery and Service of sadiology, Hospital Central de la Cruz Roja San José y Santa Adela

Luis Albeniz Aquiriano

Physician Assistana Radiology Service, Service of Genral and Digestive Surgery and Service of sadiology, Hospital Central de la Cruz Roja San José y Santa Adela

Soledad Oliart Delgado de Tórres

Surgeon Assistant Surgery Service, Service of Genral and Digestive Surgery and Service of sadiology, Hospital Central de la Cruz Roja San José y Santa Adela

Luis Peña Gamarra

Surgeon Assistant Surgery Service, Service of Genral and Digestive Surgery and Service of sadiology, Hospital Central de la Cruz Roja San José y Santa Adela

Carlos Ma Cerquella Hernández

Chief Surgery Service, Service of Genral and Digestive Surgery and Service of sadiology, Hospital Central de la Cruz Roja San José y Santa Adela