Traumatic Diaphragmatic Hernia

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Blunt traumatic diaphragmatic ruptures are uncommon yet associated with high mortality. They occur due to blunt or penetrating thoraco-abdominal injury. Diagnosis is often missed, and a high index of suspicion is vital. They may present acutely or delayed as respiratory distress or obstruction. They can be managed through a laparotomy or a thoracotomy and in the present day with minimal access surgery. We report an interesting case of blunt traumatic diaphragmatic hernia in a 48-year-old man presenting after abdomino-thoracic injury due to fall from height. He had herniation of the colon and stomach. Through a left subcostal incision, the herniated organs were reduced, and the diaphragmatic defect closed with prolene suture.

Keywords: Diaphragm, Hernia, Thorax, Traumatic

INTRODUCTION

Blunt traumatic rupture of the diaphragm is a serious injury that is often difficult to diagnose. It is an uncommon injury whose incidence is rising because of the increasing number of road traffic accidents in the last few years, together with better pre-hospital and hospital resuscitation of severely injured patients and improved diagnostic facilities. Patients with delayed diaphragmatic herniation frequently present months to years after the initial injury with manifestations of visceral herniation, incarceration, obstruction, ischemia from strangulation, or perforation. Diaphragmatic, lumbar and extra-thoracic hernias are well-described complications of blunt trauma. Symbas et al., observed a delay in diagnosis in 8% of cases of diaphragmatic injury from 18 hours to 15 years after injury. Surgery is the mainstay in the treatment of diaphragmatic rupture. Operative repair is technically more difficult if the surgery is delayed. The difference is based on the degree of adhesion present in the thoracic cavity and the state of the herniated organs. Given the number of variables a review of this condition is interesting and thought provoking.

CASE REPORT

A 48-year-old male presented to the emergency room with a history of fall from the terrace (10 feet height) a day back with complaints of left sided chest pain, breathlessness, backache with difficulty in walking. He was referred to our center as a case of polytrauma.

Examination of the left chest showed decreased breath sounds on the left hemithorax, tenderness over the left clavicle and upper lumbar vertebra. Abdomen was slightly distended but soft with no signs of injury. Apart from mild anemia (10 g/dl) and leukocytosis all blood tests were within normal limits.

X-ray chest showed - large air-fluid level in the left thoracic cavity, collapse of left lung field, obliteration of cardio-phrenic angle and shifting of the mediastinum towards the right side suggesting hemo-pneumothorax, 2-6 posterior rib and clavicular fracture (medial and lateral 1/3rd) (Figure 1). X-ray lumbosacral spine showed compression fracture L1. The intercostal drainage tube was inserted immediately.

The patient was managed conservatively and on day 9 gurgling bowel sounds were heard in the left chest on auscultation (Figure 2).

Computerized Tomography (CT) scan thorax was done, which showed herniation of stomach and bowel loops in left thoracic cavity (Figures 3 and 4).
Patient was counselled and prepared for surgery after informed high risk consent.

Laparotomy by left subcostal incision was done and a defect of about 15 cm × 5 cm was found in left hemidiaphragm (Figure 5). Herniating loops of the transverse colon, omentum and stomach were present, with adhesions between them. Contents were normal and were reduced. Intercostal drainage tube was repositioned. The defect was repaired with continuous interlocking prolene suture (Figures 6).

A left subdiaphragmatic abdominal drain was kept and wound closed in layers. Post-operative period was uneventful. Patient was discharged on post-operative day 12 (Figure 7).

Follow-up after 1-year shows no recurrence.

**DISCUSSION**

Approximately 4-6% of patients who undergo surgery for trauma have a diaphragmatic injury. Approximately 0.8-1.6% of patients with blunt trauma shows a rupture in the diaphragm. Ambroise Paré, in 1579, described the first case of diaphragmatic rupture diagnosed at autopsy. The first successful diaphragmatic repair was reported by Riolli in 1886 in a patient with omental prolapse and Naumann in 1888 repaired the defect with herniated stomach. Not until 1951, when Carter et al., published the first case series, was this injury well understood and delineated.

Blunt trauma accounts for 75% of ruptures and penetrating trauma accounts for the rest. A blow to the side is three times more likely to cause diaphragmatic rupture than a blow to the front.

**Etiology**

The mechanism in blunt injury is explained by shearing of a stretched membrane, avulsion at the point of diaphragmatic attachment, and the sudden force transmission through viscera acting as a viscous fluid. Left sided injuries are more often seen. Left-sided rupture occurred in 68.5% of the patients, 24.2% had right-sided rupture, 1.5% had bilateral rupture, 0.9% had pericardial...
rupture, and 4.9% were unclassified in the present collective review. Increased strength of the right hemi-diaphragm, hepatic protection of the right side, under diagnosis of right-sided ruptures, and weakness of the left hemi-diaphragm at points of embryonic fusion all have been proposed to explain the predominance of left-sided diaphragmatic injuries.5

A positive pressure gradient of 7-20 cm of H2O between the intraperitoneal and the intrapleural cavities forces the contents into the thorax. With severe blunt trauma the pressures may rise to as high as 100 cm of water.

**Pathophysiology**

The pathophysiologic effects are due to the impaired function of the diaphragm, compression of the lungs, and displacement of the mediastinum with impairment of the venous return to the heart. In cases of pericardial tear, the heart is compressed by the herniating viscera and a clinical picture of cardiac tamponade may follow. Diaphragmatic action accounts for two thirds of the tidal volume when supine. Functional loss of one hemi-diaphragm results in 25-50% decrease in pulmonary function.

**Clinical features and grading**

The grading of severity has been proposed by Grimes11 who discussed diaphragmatic rupture in phases-acute, latent and the obstructive phase. Acute presentation is in a patient with polytrauma associated with multiple intra-abdominal and chest injuries. The latent phase is when herniation occurs through undetected diaphragmatic ruptures and rents. The obstructive phase is when the loop herniating obstructs and the patient develops distension and strangulation.

**Investigations**

An X-ray is diagnostic when the nasogastric tube is seen in the chest. The collar sign is seen when abdominal contents are seen in the thorax with/without focal constriction. Elevation and distortion of the hemi diaphragm are corroborative signs.12,13 Barium meal usually confirms presence of cardia and fundus of stomach above the diaphragm.

A CT thorax has a sensitivity of 14-82% and a specificity of 87% and permits direct visualization of the contents and the rupture. Focused abdominal sonography for trauma is now a good aid in diagnosing diaphragmatic hernia.14

**Management**

Traumatic diaphragmatic hernia is a frequently missed diagnosis and there is commonly a delay between trauma and diagnosis. Possible explanation is a delayed detection assuming that the diaphragmatic defect occurring with injury manifests only when herniation occurs.

When a diagnosis of diaphragmatic rupture is suspected in a patient with poly trauma the patient is stabilized and taken up for emergent surgery. Minimally invasive procedures...
(abdominal and thoracic) are now a days preferred in small defects detected early. Laparotomy remains the gold standard in large defects. While simple suture is sufficient in the former, larger defects need a synthetic mesh.\textsuperscript{15}

**CONCLUSION**

A knowledge of diaphragmatic hernia is essential for both the physician and the surgeon in atypical abdominal and respiratory discomfort, especially when there is history of trauma. This hernia is amenable to correction by minimal access surgery and requires a prompt diagnosis aided by a high index of suspicion.

**ACKNOWLEDGEMENT**

The authors wish to acknowledge Dr. R.M. Mulmule (Associate Professor) for his assistance.

**REFERENCES**