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TRAUMATIC DIAPHRAGMATIC RUPTURE_MANAGED AT A TERTIARY LEVEL HOSPITAL IN EASTERN INDIA

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INTRODUCTION

Diaphragmatic rupture occurs due to blunt or penetrating injury. This can have either an acute presentation or delayed as respiratory distress or obstruction[1] and can be managed through a laparotomy or a thoracotomy.[2] Traumatic diaphragmatic herniation was first described in 1541 by Sennertus.[3] In 1579 Ambrose Pare described 2 cases of traumatic diaphragmatic hernia. One of his patients, an artillery captain, lived for 8 months after a gunshot wound through the chest. At autopsy he was found to have a transverse colon herniated through a thumb-sized rent in the diaIhragm.[4] The diagnosis of traumatic diaphragmatic hernia in a living person was first made by an American, H. I. Bowditch, in 1853. The first successful repair of a lacerated diaphragm produced by a penetrating injury was done in 1886 by Riolfi. In 1899 Walker successfully reduced a diaphragmatic hernia and repaired the diaphragm in a patient who had been crushed beneath a falling tree.[5]

MATERIAL AND METHODS

All patients in this study were treated at SSKM hospital, IPGMER, Kolkata, from May 2011 to May 2012. The parameters included age, mechanism of injury, hemodynamic status at admission, Glasgow coma scale (GCS) score, imaging studies, location of diaphragmatic injuries, associated injuries and outcome. Most of them were due to blunt trauma to chest or abdomen and only one case was due to penetrating injury. All the cases were diagnosed with clinical suspicion and radiological investigations as x-rays and CT scan chest. Patients were usually operated through thoracotomy, but laparotomy added when necessary.

RESULTS

6 patients formed the study group. Out of these 6 cases the 5 cases were due to blunt trauma and one penetrating injury. The age range was 20-60 years. 5 cases were male and only one patient was female. 4 cases were Vehicular-related and 1 female had fall of wall on her related blunt traumatic rupture of diaphragm. The median GCS score on admission was normal; one patient was in severe shock at the time of admission otherwise all were having stable vitals. All had chest radiographs (Fig 1) performed in the emergency department, 3 computed tomography (Fig 2) performed before surgery, while the remaining were operated directly. All the patients were operated as emergency. 4 patients were having left sided diaphragmatic rupture (Fig 3), 1 patient left and central rupture and 1 patient was with both right and left diaphragmatic rupture. Diaphragmatic rupture was associated with other injuries as rib fractures(6), pelvic fracture(2), radius(2) and ulna fractures(1), abdominal organs injuries as stomach perforation(1), splenic injury(2) and liver lacerations(1), pericardial rupture (1) (Fig 4). Patients were operated through thoracotomy and laparotomy. We operated 2 patients through thoracotomy only and in other 3 thoracoabdominal incision or separate thoracotomy and laparotomy incisions in 1, were required. In most of the patients diaphragmatic defect was closed primarily with prolene sutures (Fig 5) but in one patient prolene mesh (Fig 6) was used to close and enforce the defect. This prolene mesh (7×10 cm) was put from the thoracic side after closing the defect with prolene sutures. 2 patients required tracheostomy. 2 patients were in severe shock and resuscitated before operation but one patient died after operation due to hemodynamic disturbance. 3 patients needed re- thoracotomy due to empyema and hemothorax. 5 patients survived and are in follow up while only one patient died in hospital.

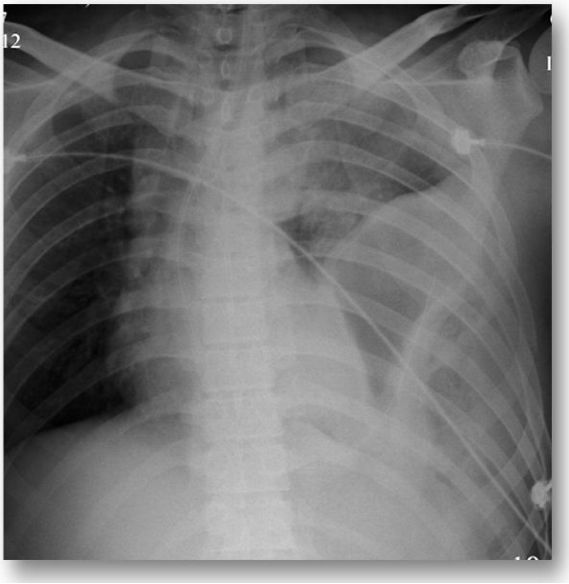


Fig. 1

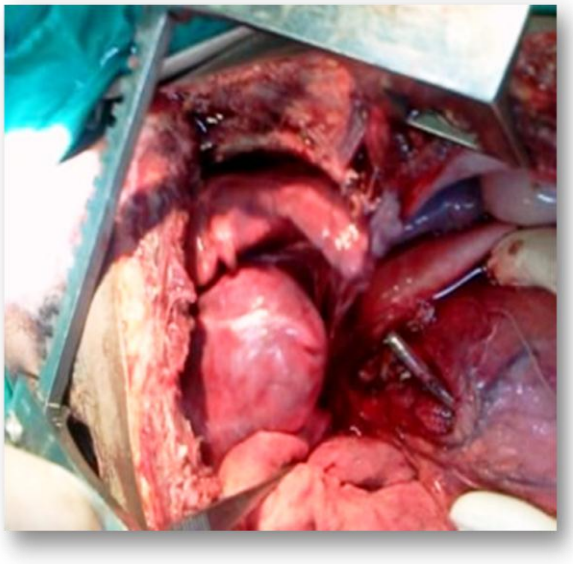
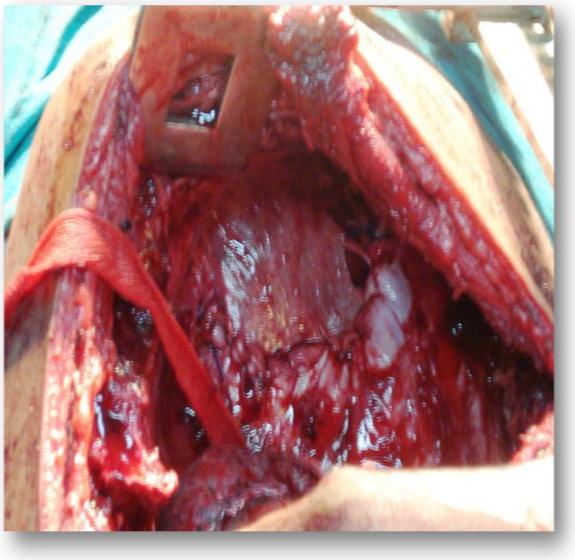


Fig.4.

Fig. 2.



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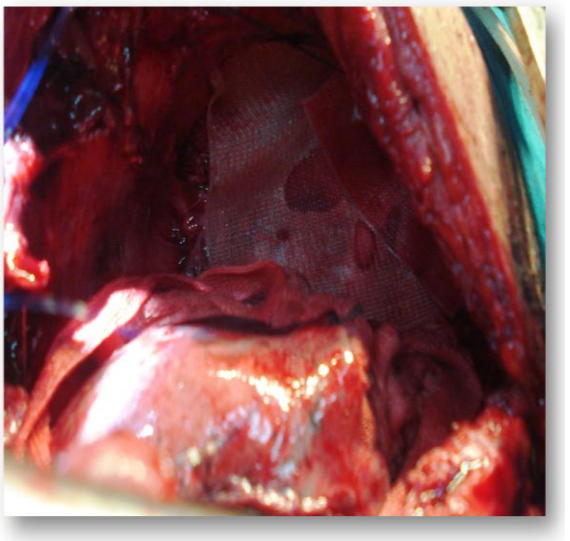

Fig: 6.

DISCUSSION

A number of mechanisms have been suggested as being responsible for diaphragmatic rupture after blunt trauma-

1) Blunt trauma to the flanks or abdomen produces a raised intra-abdominal pressure.[6] The force applied to the abdomen or flanks is, according to Pascal's law, distributed equally in all directions through the fluid abdominal contents. The portion of the left diaphragm which is not buffered by solid viscera or chest wall, tears, being the weakest area to which the force is transmitted.

2) Contracted diaphragm is distorted by opposing forces, leading to a tear in the membrane.[7] Lucido and Wall[8] attempted to explain the site of rupture as being most likely to occur in the posterior lateral left leaflet, as this is the embryological point of weakness-the anterior leaflet being derived from the rather strong septum transversum.

The underlying mechanism for diaphragmatic rupture in blunt injuries is due to a high energy acceleration-deceleration impact. The left diaphragm is more commonly involved, as the weakest point of the diaphragm is at the left posterolateral aspect as it originates from the pleuroperitoneal membrane.[9] The right diaphragm is congenitally stronger, and any impact is further cushioned by the liver. The typical organs that herniate into the thoracic cavity include the stomach, spleen, colon, small bowel and liver, similar to those seen in our patients. Furthermore, even if the herniation does not take place initially, the significant discrepancy between the higher intra-abdominal and the lower intrathoracic pressures will result in the herniation eventually.[10] The herniated contents can result in significant complications, such as respiratory or circulatory embarrassment from the compression, collapse of the lung and the possible shift of the mediastinum.[11] Signs and symptoms of the herniated organs, such as intestinal obstruction or even haematemesis, could also be present. However, in the acute trauma setting, these symptoms are often missed unless they are chronic. The chest radiograph is indispensable in the management of all trauma patients as it is readily performed in the emergency department and is regarded as the first-line diagnostic imaging tool in identifying a diaphragmatic rupture.[12] The specific signs of diaphragmatic rupture include intrathoracic herniation of the abdominal viscera, demonstration of a nasogastric tube tip in the thorax, marked elevation of the hemidiaphragm, and even mediastinal shift.[13] The sensitivity of the chest radiograph has been reported to be as high as 70%[12] almost similar in our series (64.3%). The CT has become indispensable in the current management of haemodynamically-stable patients after blunt trauma. Surgical approach to managing diaphragmatic rupture includes laparotomy, thoracotomy or both. This decision is dependent on the associated injuries and surgeons' preference. Laparotomy is more appropriate in unstable patients when associated intra-abdominal injuries are present or suspected. A thorough examination of both hemidiaphragms is mandatory. Furthermore, this incision can be extended to a thoracolaparotomy if there are significant intrathoracic injuries or when safe reduction of the herniated viscera is not possible.[14] Thoracotomy is more suitable for stable patients without intra-abdominal injuries or contralateral diaphragmatic injuries. The diaphragm is better visualised and repaired through the chest. This decision must be handled with caution as the patient must be able to withstand one-lung ventilation and any intra-abdominal injury would be missed.[15] Routine surgical repair of any diaphragmatic defect is accomplished by interrupted or continuous nonabsorbable sutures and placement of chest tube (s) in the affected thoracic cavity. Very large diaphragmatic defects may require closure with a non-absorbable patch.

CONCLUSION

Most of the diaphragmatic rupture cases are due to blunt trauma to chest or abdomen. Early diagnosis and surgical management give good results and reduce the intra and post operative complications.

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