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Case Report

Traumatic diaphragmatic injury: case report

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ABSTRACT

Traumatic diaphragmatic injury (DI) is a unique clinical entity that is usually occult and can easily be missed. An emergency laparotomy and thorough exploration followed by the repair of the defect is the gold standard for the management of these cases. Here we are presenting a rare case with Diaphragmatic Injury on the right side which was successfully managed at our center.

Keywords: DI, Hernia, Trauma

INTRODUCTION

Traumatic injuries of the diaphragm are often clinically occult and can be masked and disguised by other violent injuries associated with poly-trauma. Although blunt injury of diaphragm is relatively common and is considered as a marker of severe trauma, it can clinically be occult as other violent injuries may mask and disguise its initial clinical presentation.[2,3] An accurate diagnosis requires a high index of suspicion as missed diaphragmatic injury (DI) may result in herniation and strangulation of intra-abdominal viscera into the thoracic cavity.[1] Therefore, the detection, an accurate diagnosis and prompt management of DI,s, particularly in severely injured or poly-traumatized patients, becomes a real challenge for the trauma surgeon.[1-5] Here we are presenting a rare cases with Diaphragmatic injury on the right side which was successfully managed at our centre.

CASE REPORT

25 year old male patient while traveling in a vehicle accidentally fell in a 100 feet deep ravine, resulting in death of the driver and co-driver of the jeep and the patient sustained poly-trauma which included closed head injury, open fracture of both bones forearm (Rt), Heamopneumothorax (Rt) with multiple fracture ribs (Rt). The patient was in hemorrhagic shock. He was resuscitated as per the ATLS protocol. A focused assessment with sonography for trauma (FAST) was carried out and was found to be normal. The patient underwent intensive conservative neuro-surgical management for closed head injury. Right Heamopneumothorax was managed with intercostal chest drainage (ICD), both bones fracture forearm (Rt) was managed with Open Reduction Internal Fixation (ORIF). The patient made slow, yet progressive recovered and was sent on leave for convalescence.

While on leave the patient developed frequent breathlessness, aggravated with minimal physical exertion. Chest radiograph showed a raised right hemi diaphragm (Figure 1). He was further investigated where a contrast enhanced computer tomography (CECT) chest and abdomen revealed right diaphragmatic Injury with herniation of liver into the right hemithorax (Figure 2 and 3). He was taken up for surgery through a Right postero-lateral thoracotomy approach.

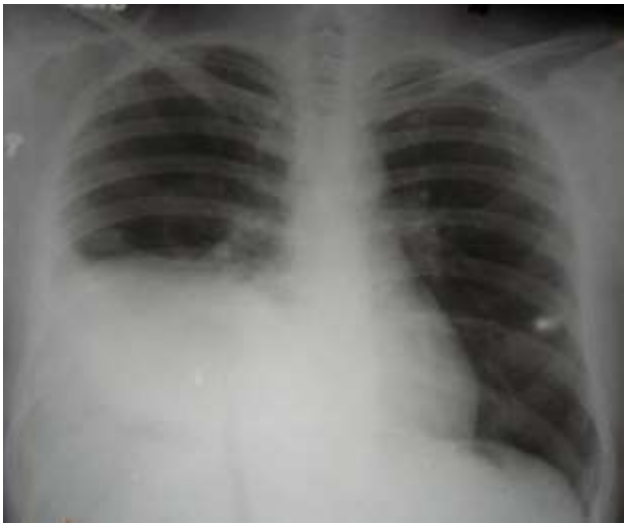

Figure 1: CXR elevated (Rt) dome of diaphragm.

Figure 2: CT scan chest revealed diaphragmatic hernia (R) with herniation of liver (axial view).

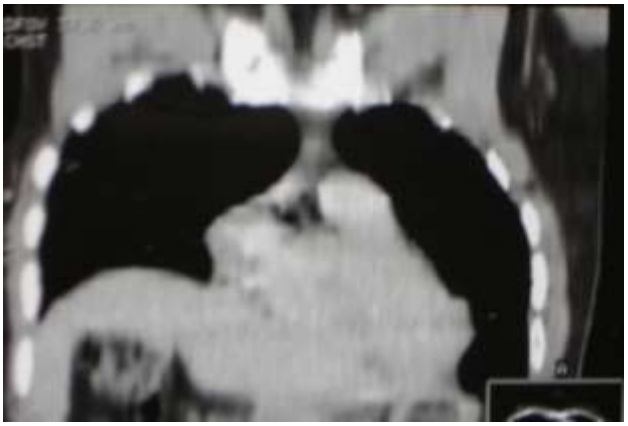

Figure 3: CT scan chest revealed diaphragmatic hernia (R) with herniation of liver (coronal view).

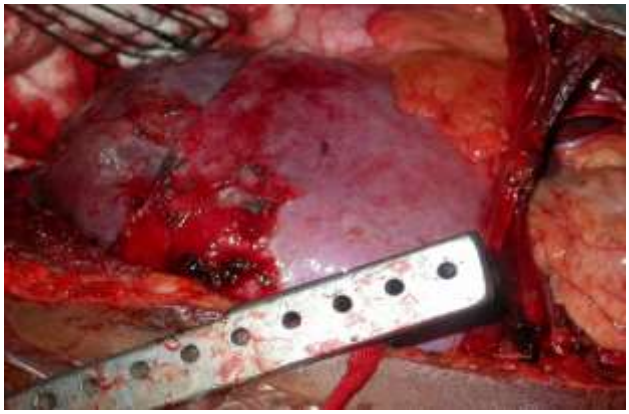

Figure 4: Intra-operative view of the DI with liver bulging into the Rt hemi thorax.

Operative findings

Large retracted tear involving complete right dome of diaphragm (from IVC to right chest wall) (Figure 4). The right lobe of liver had herniated into the right hemithorax with dome adhesions with rim of diaphragmatic defect and a collapsed right lower lobe (Figure 5). There was no herniation of bowel and other abdominal contents.

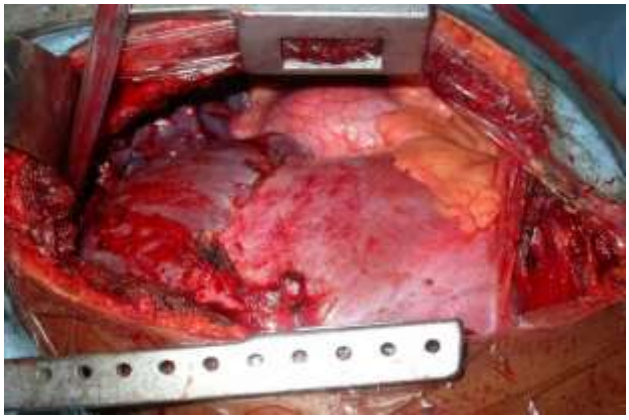

Figure 5: Intra-operative view of the di with uneven margin of the DI.

Figure 6: Intra-operative view of the repair with PTFE mesh.

The repair involved an extensive adhesiolysis, defining the rim of the defect in the right cupola of diaphragm, manual reduction of right lobe of liver into the abdominal cavity. Gortex Polytetraflouroethylene (PTFE) dual mesh plasty was carried out, covering the large diaphragmatic defect and anchoring of the mesh with 1‘0’ interrupted Prolene to chest wall and dome of right diaphragm (Figure 6) followed by bilateral ICD placement. Post op recovery was delayed due to air leak, atelectasis and pleural effusion which resolved with conservative management. Patient showed good recovery though slow, with complete re-expansion of right lung.

DISCUSSION

The incidence of diaphragmatic laceration from blunt or penetrating trauma is about 4.5 %, with the left side is more commonly involved than the right. It is thought that the solid liver partially protects the diaphragm on the right side against sudden changes in pressure, whereas the left leaf of the diaphragm is unprotected. 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.[6] In this case report we have presented DI involving the right and left hemi diaphragm.

Approximately 75% of the diaphragmatic injuries are caused by blunt trauma and 25% by penetrating trauma. Blunt trauma abdomen occurs mostly due to either road traffic accident or falls from a height. In the mechanics of blunt trauma abdomen a direct blow to the abdomen leads to a sudden transmission of force through the abdominal viscera that acts as a hydrodynamic fluid wave leading to significantly increase intra-abdominal pressure resulting in disruption of cupola of diaphragm (usually unprotected left side) and herniation of abdominal contents into the thorax.[9] In our cases the mode of injury was the blunt thoracoabdominal trauma due to Road Traffic Accident (RTA) leading to a direct anterior blow to his thorax and abdomen. DI may be associated with herniation of the stomach, small bowel, colon, spleen, liver or omentum.[7]

According to the duration of injury, diaphragmatic rupture can be categorized into one of three groups (early or acute, i.e. immediately or within 14 days post-injury; latent, diagnosed after acute injury but before intestinal obstruction or strangulation; late, where correct diagnosis is established with intestinal obstruction or strangulation). The missed injuries of the diaphragm may occur either due to delayed rupture or delayed detection. In delayed rupture, the diaphragmatic muscle is devitalized at the time of the initial injury and starts acting as a barrier against herniation but eventually gives in as diaphragmatic tear or defect. Delayed detection becomes evident only when the intrathoracic pressure becomes negative and herniation occurs some time later. Therefore, during exploratory laparotomy, a meticulous inspection and palpation of the entire diaphragm becomes mandatory in every case of trauma.[4]

A high index of clinical suspicion clubbed with imaging studies probably makes an accurate diagnosis of DI. The usual symptoms of DI may include shoulder or epigastric pain, respiratory distress and intrathoracic bowel sounds. In cases of delayed presentation with chronic herniation, symptoms of partial or complete intestinal obstruction may be present.

Initial chest X-ray is the best diagnostic aid in the evaluation of diaphragmatic rupture. A diaphragmatic hernia should be suspected if X-ray chest shows absence of fundic gas shadow in its normal position, elevation of the hemi diaphragm and absence of a sharp hemi diaphragm or presence of a hemopneumothorax.[4,5]

CT scan is the second choice of imaging technique after X-ray chest that may demonstrate the herniation of the abdominal viscera in the thorax but may not be able to directly image the diaphragmatic lacerations.[5]

Laparoscopy and thoracoscopy are now the diagnostic and therapeutic choices of trauma surgeons. Laparoscopy allows assessment and repair of the diaphragm.[1,8] Laparoscopy proved itself a vital tool for detecting these injuries among patients who had no other indications for laparotomy. Thoracoscopy is a very sensitive and specific diagnostic tool in DI, with a very high accuracy of between 98 and 100%.

Repair of the diaphragmatic ruptures can be performed by the classical open method or with minimally invasive methods. An extensive review of the literature revealed that 74% of the total DI was repaired via laparotomy, while 18% were via thoracotomy and 8% had thoracoabdominal approaches.[5]

At laparotomy, careful inspection of the diaphragm may require transaction of the falciform ligament and gentle downward traction of the liver for the right hemi diaphragm and gentle downward retraction of the spleen and greater curvature of the stomach for the left hemi diaphragm. Finally, diaphragmatic lacerations can be repaired with non-absorbable sutures. In cases of diaphragmatic disruption due to massive trauma, prosthetic non-absorbable mesh material is used to reconstruct the diaphragm. In the majority of cases, chest tube drainage is required.

The morbidity includes complications like suture-line dehiscence and recurrence of diaphragmatic hernia, hemi diaphragmatic paralysis secondary to iatrogenic phrenic nerve injuries, eventration of diaphragm, respiratory insufficiency, empyemas and subphrenic abscess.

The overall mortality rate reported in the literature ranges from 4.3 to 37% in a series of penetrating and blunt injuries, respectively. Irreversible shock and head injury are most likely causes of intra-operative or early post-operative deaths, whereas sepsis and multisystem organ failure predominate as late causes of death.[1,4]

CONCLUSION

Diaphragmatic Injury need a great degree of suspicion as it can present acutely or can have a delayed presentation. Meticulous assessment and prompt management would decrease the morbidity and mortality.

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