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Spleen in the thorax: A case report on traumatic diaphragmatic rupture

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ABSTRACT

INTRODUCTION: Most of the cases of diaphragmatic rupture occur following abdominal trauma and herniation of abdominal organs into the thorax can occur.

PRESENTATION OF CASE: Twenty three years old male presented after a blunt abdominal trauma following a road traffic accident. Investigations revealed a left sided diaphragmatic rupture with herniation of spleen and stomach into the left hemithorax. Surgical repair of the defect was done and splenectomy had to be done due to extensive splenic laceration. Two third of the spleen was found in the left hemithorax.

DISCUSSION: Diagnosis of diaphragmatic rupture can be missed in cases of polytrauma. High clinical suspicion with aids from imaging modalities help in the diagnosis. In suspicion of herniation of abdominal contents into the thorax, one should be careful in insertion of chest tube in view of damaging the herniated organs. Treatment is surgical repair and reduction of herniated contents.

CONCLUSION: Although a rare entity, diaphragmatic rupture can occur in cases of abdominal trauma. High clinical suspicion with imaging helps in the diagnosis.

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1. Introduction

Diaphragmatic rupture following trauma is a rare condition occurring in 0.46% of abdominal trauma cases; penetrating trauma contributes to two third cases of such injuries while the rest are caused by blunt trauma [1]. In a metaanalysis, it was found that young males in their thirties were the most vulnerable group of patient for diaphragmatic rupture. Left sided rupture was almost three times more common than right sided rupture which might be due to the protection by the liver on the right side [2].

Left sided diaphragmatic injury is commonly associated with herniation of the spleen and stomach into the thorax. Spleen in the thorax can also be part of a congenital anomaly or can occur after a traumatic event leading to a defect in the diaphragm [3]. The most concerning effects of diaphragmatic rupture are compromise of diaphragmatic function, intra-abdominal bleeding from viscera injury, herniation related strangulation and impairment of venous return to the heart [2]. These injuries need to be addressed quickly by surgical approach either from thoracotomy or laparotomy.

There have been very few reported cases of diaphragmatic rupture followed by herniation of abdominal contents in the thoracic cavity. In an audit of diaphragm injury cases in 2018–2019 in our hospital, there were only three such cases, all being on the left side. Here we report an unusual case of abdominal trauma which was

initially thought as a tension pneumothorax but on evaluation the spleen was found on the thorax due to diaphragmatic rupture. This work is reported according to SCARE guidelines [4].

2. Presentation of case

Twenty three years male, following a high velocity motor vehicle accident presented to the Emergency Department complaining of pain in the left hypochondrium and left upper back. Abrasions were present in left iliac fossa and bony crepitus was palpable over left scapula, mid thoracic spines and left thoracic paravertebral regions. Oxygen saturation was maintained in room air; however, blood pressure was on the lower side. Extended focused assessment with sonography for trauma (eFAST) scan showed lung point on the left hemithorax, no free fluid in the abdomen was noted. POCUS (Point of Care Ultrasonography) revealed cardiac activity in right hemithorax and disrupted splenic architecture. Based on immediate assessment tension pneumothorax was suspected so needle decompression of the left hemithorax was done and air release was noted.

Chest x-ray (Fig. 1) however showed raised left hemidiaphragm with heterogeneous opacities over the left upper zone. After stabilizing the patient, Contrast-Enhanced Computed Tomography (CECT) was done which revealed left diaphragmatic rupture with herniation of stomach, small bowel, large bowel and spleen in the left thoracic cavity with left hemopneumothorax, left lung contusion, grade IV splenic injury, grade I left kidney injury, left posterior 6th to 10th ribs fracture, spinous process of T2 to T6 vertebrae frac-

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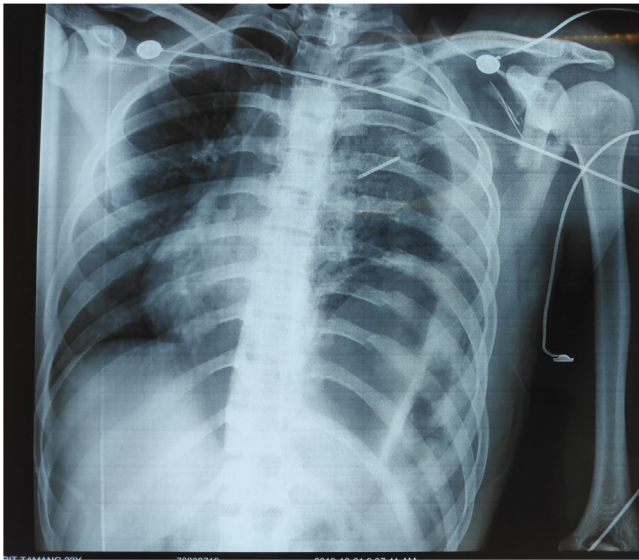


Fig. 1. Chest Xray showing elevation of left hemidiaphragm and opacities in the left thorax with the needle used for decompression.

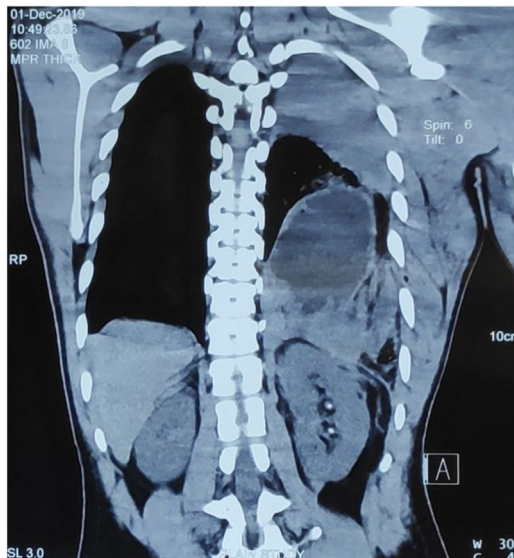


Fig. 2. CT scan showing herniation of abdominal content into the left hemithorax.

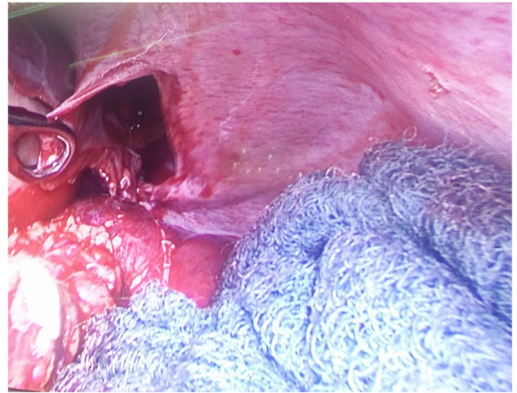
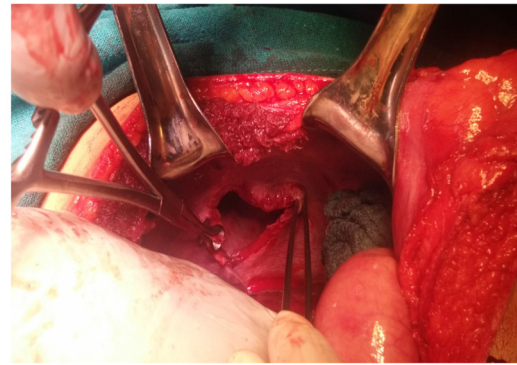


Fig. 3. Defect in the Diaphragm (open and thoroscopic views).

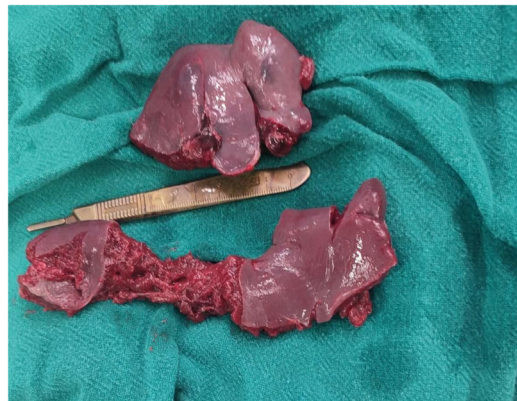


Fig. 4. Lacerated Spleen for which splenectomy had to be done.

ture and comminuted fracture of left scapula (Fig. 2). There was no extravasation of contrast.

Exploratory laparotomy was done with midline incision from above the umbilicus with left subcostal extension. Posterior segment of the left diaphragm had defects of 10 × 8 cm, 2 × 3 cm and 1 × 2 cm (Fig. 3). Stomach, transverse colon, splenic flexure and 2/3rd of spleen were present in the left hemithorax. Grade IV splenic injury was noted. 1 × 1 cm defect was noted in antimesenteric border of jejunum 80 cm from the ileocecal junction along with 5 cm serosal tear at splenic flexure area along taenia coli with mesenteric hematoma extending into the retroperitoneal cavity. However, the splenic pedicle was intact. Two-third of the spleen was already detached and floating in the left hemithorax. Hernial contents were reduced, jejunal perforation was closed and splenectomy was done (Fig. 4). Intrathoracic cavity was also visualized via thoracoscopy (Fig. 3). The diaphragmatic rents were repaired.

ICU monitoring was done and the patient was discharged after 2 weeks. Postoperative X-Ray was done (Fig. 5). The patient is being

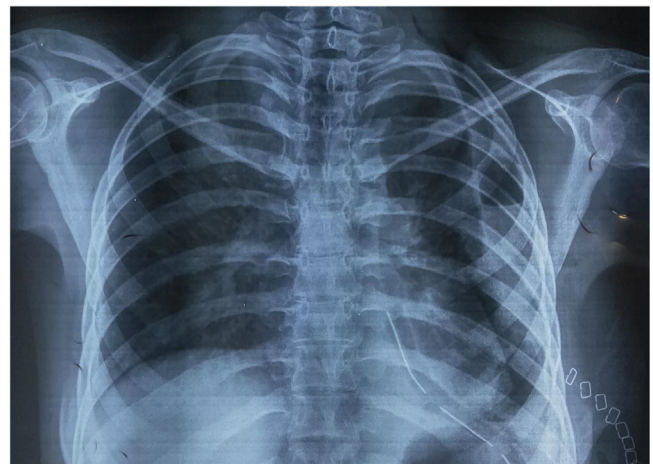


Fig. 5. Post operative Chest Xray with chest tube in situ.

kept on close follow up twice a month and has returned to his normal activities.

3. Discussion

We report a case where the spleen was found in the left upper hemithorax following a blunt abdominal trauma after a motor vehicle accident. Intraoperative findings showed left sided diaphragmatic rupture and splenic laceration along with bowel perforation. This case is unique due to the rarity of such occurrence and is interesting as sometimes the emergency assessment points out to tension pneumothorax in such cases. In such cases of polytrauma, the diagnosis of diaphragmatic rupture can go undetected mainly because of other more apparent findings that become the point of initial focus. Without the signs of herniation, the diaphragmatic defect in the Chest X-ray can be missed [5].

In patients with blunt trauma, the incidence of traumatic diaphragmatic rupture is 1–7% and that of herniation of abdominal organs is 3–4% [5,6]. Spleen and liver injury were the commonly associated injury in blunt diaphragmatic rupture after bone fractures [7]. A study of blunt abdominal trauma in Nepal reported road traffic accidents as its most common cause in Nepal with spleen as the most commonly injured organ which is the same as in our case [8].

The patient in this case presented with pain in the left hypochondrium and left upper back. The common clinical symptoms in diaphragmatic rupture are marked respiratory distress and diffuse abdominal pain [6]. Rapid diagnosis can be done in bedside with ultrasound (eFAST) later supported with adjuvant imaging modalities like Xray and CT scan [9].

Major features in plain radiographs (Chest X-ray) like loss of diaphragmatic contour, elevated left diaphragm than the right (more than 4 cm), small or large bowel in chest, gas bubbles in the chest, presence of nasogastric tube in the chest, and pleural collection with obliteration of the costophrenic angle, mediastinal shift, pneumothorax, hemopneumothorax, loss of gastric bubble under left cupola and/or pneumoperitoneum may suggest diaphragmatic rupture [10]. Our case findings were elevated left hemidiaphragm with opacities in the left hemithorax with mediastinal shift to the right.

CT scan is a valuable tool in detecting diaphragmatic hernia with blunt abdominal trauma, especially in cases with high index of suspicion. The CT signs of diaphragmatic injury include direct visualization of injury with free edge of the disrupted diaphragm, intrathoracic herniation of visceral content, collar sign i.e focal constriction of the bowel or omentum, dependent viscera sign, intramuscular hematoma and peridiaphragmatic active contrast extravasation [11]. Overall, multi-detector CT scan has a sensitivity of 78% for left sided diaphragmatic injuries with specificity of 100% [12]. In addition to the typical findings, our case also had presence of spleen in the left thorax as a visceral content. However, there was no extravasation of the contrast. Moreover, in polytrauma like ours, CT scan is a vital tool in assessing and managing coexisting injuries [13].

Herniated bowel along with fluid inside it can sometimes mimic as hydropneumothorax. In a case report from Bangladesh, chest tube insertion was done in a case of diaphragmatic rupture with herniation of bowel as chest X-ray picture was confused with findings of hydropneumothorax [14].

Similar case as ours was reported in Greece where the left kidney was found herniated in the left chest, separated completely from its vascular pedicle and ureter, along with the entire spleen which was also separated from its vascular tree following a blunt trauma. Chest x-ray had shown massive left hemothorax without any addi-

tional signs to suggest diaphragmatic injury. Further imaging was not done in this case and the patient was rushed to surgery [15].

Another case report from India reports injury of the herniated stomach during chest tube insertion in a case of thoracic trauma with hidden diaphragmatic rupture [16]. A case with traumatic rupture of right hemidiaphragm with herniation of small bowel loops following stab injury has been reported from Nepal which was diagnosed after bowel loops were seen in X-Ray in the right hemithorax [17]. We should be careful in insertion of the chest tube in cases with suspected diaphragmatic rupture as it may cause injury to the herniated abdominal organs.

Spleen in the thorax has been reported in a case with Poland Syndrome involving left hemithorax [18]. A rare benign entity, thoracic splenosis occurs with a prior history of traumatic spleen rupture or with the history of splenectomy, this was not present in our case but can present as such in the future for this patient [19].

Treatment of traumatic diaphragmatic rupture is surgical with abdominal approach (laparotomy) for repair in acute cases. In chronic case, thoracic approach (thoracotomy) can also be used [20].

4. Conclusion

Although a rare entity, diaphragmatic rupture can occur in cases of abdominal trauma. High clinical suspicion with imaging helps in the diagnosis. It can be associated with herniation of abdominal contents into the thorax. Chest tube insertion should be done with caution in such cases.

Declaration of Competing Interest

The authors report no declarations of interest.

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Ethical approval

Ethical approval is not applicable in Case Reports.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

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Surgeons involved in the operation and follow up: Rajan Koju, Bikesh Shrestha, Toshima Karki, Sushil Dahal.

Writing the manuscript and follow up: Sushil Dahal, Sahil Bade.

Literature review, final approval of the manuscript: Sushil Dahal, Rajan Koju, Bikesh Shrestha, Toshima Karki, Sahil Bade.

Registration of research studies

Not applicable.

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