

Delayed right-Sided Diaphragmatic Rupture after Blunt Chest Trauma: A Rarity

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Case report

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Abstract

Traumatic injuries of the diaphragm are relatively uncommon, as such are frequently missed, especially when it occurs following blunt trauma and on the right side. These injuries often occurred in the setting of polytrauma, as such other obvious injuries tend to mask the diaphragmatic injuries thus resulting in delayed or missed diagnosis. We report the case of a 45 year old man with delayed right-sided diaphragmatic rupture following blunt trauma, who had trans-thoracic open repair with complete relief of symptoms. Although right diaphragmatic rupture is uncommon because of the cushioning effect of the liver, it should be included in the differential diagnosis of persistent right sided chest pain in a patient that has sustained previous chest trauma, no matter how remote the history might be.

Introduction

Traumatic injuries of the diaphragm following blunt trauma are uncommon, as such are frequently missed during the initial treatment and are subject to delayed surgery^{1,10}. Right-sided hemi-diaphragmatic injuries are particularly uncommon, prone to delayed diagnosis and may go undetected for years until patient develops symptoms. This uncommon occurrence of right diaphragmatic rupture is attributed to the cushioning and protective effect of the liver, this account for the predominance of diaphragmatic rupture on the left hemi-diaphragm which lacks such protection⁵. Injuries of the left hemi-diaphragm have predominated with a ratio of 25:1². Early diagnosis may facilitate repair before long-term effects such as respiratory symptoms and reduced pulmonary capacity occur^{2,7}. These injuries often occurred in polytraumatized patients; as such other obvious injuries may initially dominate the clinical severity, consequently, deviating attention away from diaphragmatic injuries. A high index of suspicion is require to reduce the risk of missed right-sided hemi-diaphragmatic injuries ,as delayed diagnosis or missed injury may have major implications for both treatment and outcomes^{1,4,5}.

Case Report

A 45 year old man presented to us with recurrent right sided chest pain for ten years, no cough or any other cardiorespiratory symptom. No history suggestive of tuberculosis, exposure to industrial or chemical pollution or cigarette smoking. He is a survivor of a motor vehicular crash 10 years prior to presentation in which he lost his spouse and was unconscious for three days while on admission and was discharged from the attending hospital after receiving treatment and returned to his normal work. Patient subsequently, started having recurrent right-sided chest pain for which he was given analgesics and antibiotics at various health facilities without resolution of his symptom. He was then referred to Jos university teaching hospital on account of a mass in the right chest that was seen on CT scan performed for the persistent chest pain. Examination revealed a middle aged man that was essentially, healthy-looking. His chest was dull to percussion on the right middle and lower zones, with decreased air entry in the same area. The cardiovascular system and other systemic examinations were essentially normal.

Contrast-enhanced chest CT scan showed ruptured right hemi-diaphragm with herniation of the liver into the chest (Figs. 1).

Blood and other investigations were essentially normal. Patient was prepared and had right posterior lateral thoracotomy, which revealed a posteromedial diaphragmatic rupture approximately 16 × 8 cm, with irregular edges and herniation of the entire left lobe of the liver with adhesions (Figs. 2&3) After sequential adhesiolysis and reduction of the liver into the abdomen, the diaphragmatic defect was repaired primarily in two layers with prolene 1 suture without tension (Fig. 4). The right lower and part of the middle lung lobes were noted to be collapsed but re-expanded gradually. A chest drain was placed and the chest was closed in layers. The post operative course was uneventful and the patient was discharged on the eighth post operative day. He has remained in good health with normal lung function after a follow-up period of three years.

Discussion

Traumatic injuries of the diaphragm are relatively uncommon after blunt trauma, as such are frequently missed after initial assessment and treatment¹⁻⁴. The different mechanisms that result in diaphragmatic rupture after blunt trauma included avulsion of the attachments of the diaphragm or shearing of the stretched membrane after right or left lateral impact to the chest wall, rib fracture fragments directly penetrating the diaphragm, and a sudden increase in intra-abdominal pressure throughout the abdomen, with the relatively weak, unprotected diaphragmatic tear from the force⁵. Right-sided hemidiaphragmatic ruptures are particularly prone to delayed diagnosis or even go undetected for years and are thus, subject to delayed surgery^{1,3}. The left hemi-diaphragm has been shown to be injured in 50–88% of patients who had blunt diaphragmatic rupture whereas right sided injuries were less frequent, occurring in 12–40% of cases^{5,10}. The right diaphragm appears to be protected from traumatic impact by the energy absorbing liver, thus accounting for the lower incidence of right sided ruptures^{5,6}. Right sided ruptures are also, frequently missed and thus may present with late symptoms¹. The high frequency of left sided injuries has been attributed to an area of congenital posterolateral weakness^{5,7-10}.

An early and accurate diagnosis of diaphragmatic injury in the setting of blunt and penetrating trauma can be difficult even with the help of sophisticated diagnostic modality^{5,6}. Computed tomography is the main stay in the diagnosis of such injuries, which may be subtle at presentation. Key features in blunt trauma include diaphragma fragment distraction and organ herniation because of increase intra-abdominal pressure^{1,5,6}. The index patient had an initial delay due probably to the head injury with loss of consciousness he had at the initial presentation. The subsequent ten year diagnostic delay could be due to the atypical presentation and those who attended to him during that period could not link his symptoms to the trauma which appeared remote from his symptoms. An early CT scan could have saved him this period of delay.

Operative intervention remains the main stay management approach for traumatic diaphragmatic ruptures regardless of the presentation, whether early or late to avoid complications that might arise from the presence of abdominal viscera in the chest. Surgical repair is also required in all diaphragmatic ruptures because the diaphragm does not heal spontaneously. The thoracic approach is usually recommended for chronic diaphragmatic hernias due to dense intra-thoracic adhesions that could be encountered in such cases as well as in right sided rupture due to the ease of access to the operating field as the liver would prevent adequate access from the abdomen^{1,3,6}. With experience however, both approaches are viable especially in the initial presentation. The thoracic approach could be achieved either by Video assisted thorachoscopic surgery (VATS) or through a thoracotomy. Combined chest and abdominal approaches have been employed in some cases^{4-7,9}. Laparoscopic surgery is another approach in the treatment of traumatic diaphragmatic ruptures in institutions where the facilities and expertise are available.

Conclusion

This case draws our attention to the fact that the diagnosis of right-sided traumatic diaphragmatic rupture could be missed at the initial trauma evaluation, most especially where other obvious injuries might be given high premium over diaphragmatic injuries, as is the case with this patient. A high index of suspicion is recommended in the initial assessment of patients with chest and/or abdominal blunt trauma; it is even more so when a patient presents with non-specific features many years after chest and/or abdominal trauma.

Declarations

Ethics Approval and Consent to Participate: Institutional clearance was obtained from the ethical committee of the hospital, as well as informed consent from the patient.

Consent for Publication: Written informed consent was obtained from the patient for the publication of this article and any accompanying Images.

Availability of data and Materials: not applicable

Competing interest: None

Funding: None

AUTHORS' CONTRIBUTIONS

NJM - Was the lead surgeon, designed and wrote the manuscript as well as approval of the final copy of the manuscript.

NJD - Participated in the surgery, design and writing of the manuscript, as well as approval of the final copy of the manuscript.

NAM – Participated in the surgery, design and writing of the manuscript, as well as approval of the final copy of the manuscript.

UB – Participated in the surgery, design and writing of the manuscript, as well as approval of the final copy of the manuscript.

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Figures



Figure 1

Contrast chest CT scan showing liver in the chest (white arrow)

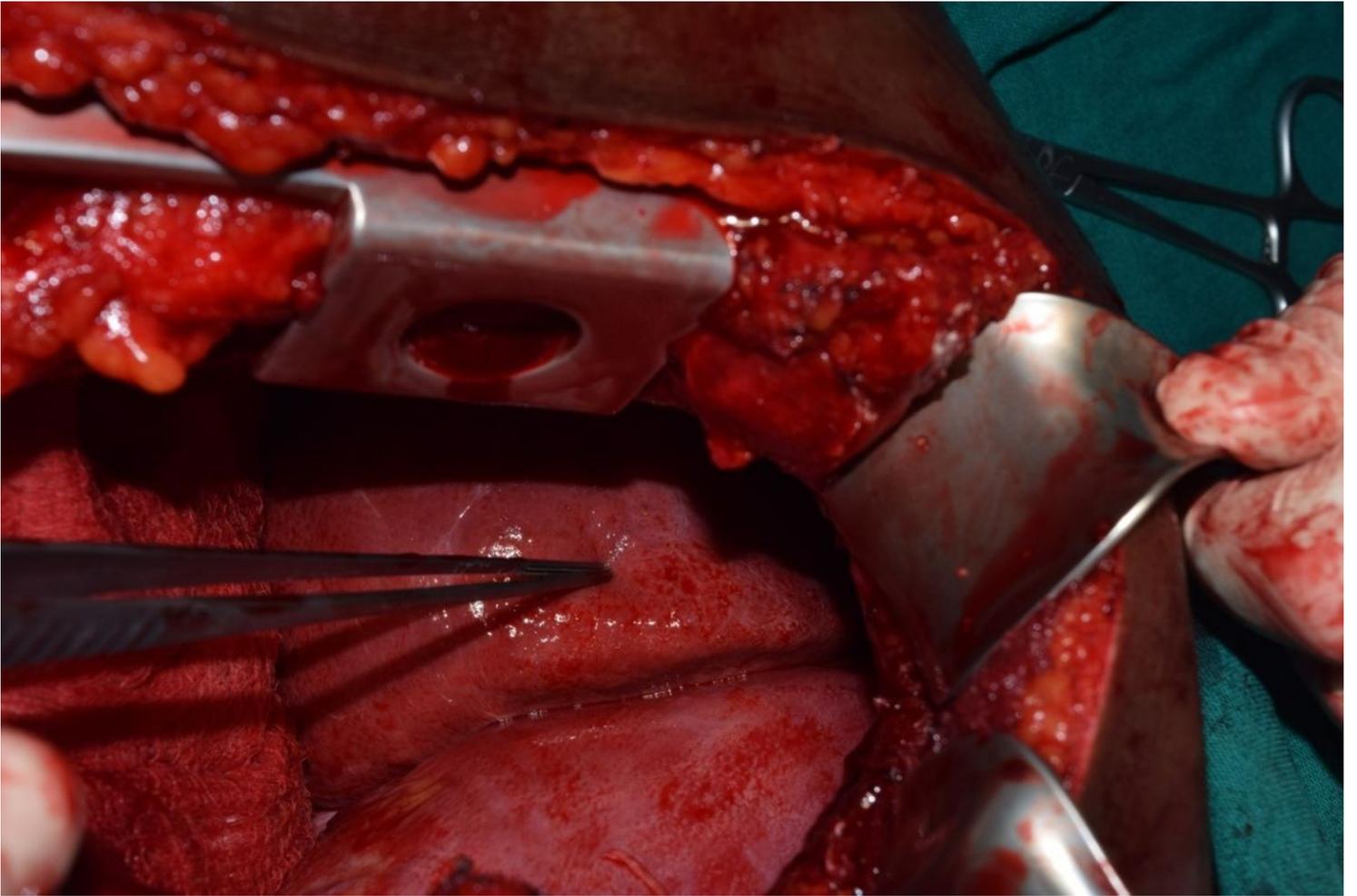


Figure 2

intraoperative picture showing liver in the chest (white arrow)

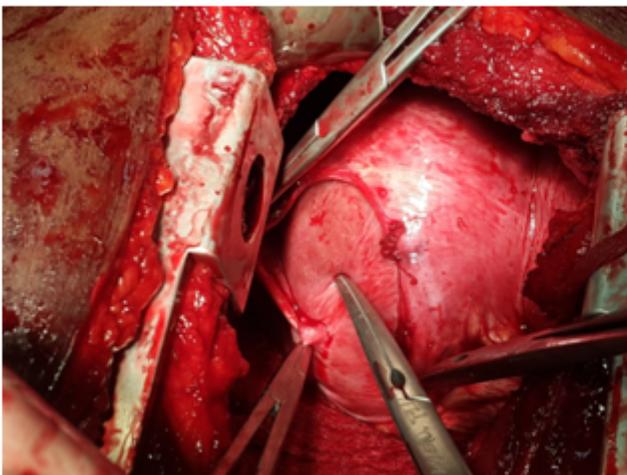


Figure 3

Diaphragmatic defect after reducing the liver back into abdominal cavity (white arrow)

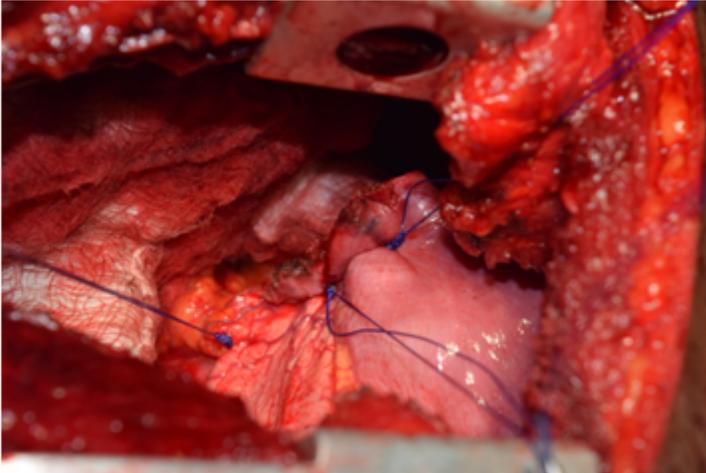


Figure 4

Primary diaphragmatic repair (white arrow)