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Case Report

Misery due to missed injuries

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ABSTRACT

Missed injuries and delayed diagnosis are still common problems in the treatment of trauma patients especially, polytrauma. Diaphragmatic injuries are quite common and one of the most important missed injuries. It can result from either blunt or penetrating trauma. Traumatic diaphragmatic injuries (TDI) may go unnoticed initially and later present as life-threatening conditions. Here we present such a case of a fatal diaphragmatic injury, which was diagnosed during the autopsy.

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1. Introduction

Traumatic diaphragmatic injury (TDI) is one of the most important missed injury.¹ Missed injuries are injuries that were not identified by the primary and secondary surveys. A clinically significant missed injury is defined as an injury in which delayed diagnosis resulted in morbidity or mortality that was potentially avoidable with an earlier diagnosis.² TDI is not an uncommon scenario pertinent to blunt or penetrating trauma to the thorax or abdomen. It may present acutely with respiratory or hemodynamic instability or may go unnoticed at the initial trauma and later present as a diaphragmatic hernia or as a catastrophic event. Diagnosis is complicated by the lack of a single reliable radiological diagnostic modality and the frequent presence of concomitant multisystem injuries, which directs the attention away from the diaphragm.

2. Case History

A 22-year old male had an episode of severe abdominal pain followed by a sudden syncopal attack on a railway platform. Immediately he was examined by the railway medical

officer and declared as dead. The Body was kept at the mortuary. After getting requisition from the investigating officer, the autopsy was conducted on the next day. There was a history of trauma (fall from height) before 3 months – exact details not known. Also, he had the complaint of stomach pain for the past 5 days and the USG abdomen was done one day before the death and the report was suspected of cholecystitis.

During the autopsy, the following findings were noted - Moderately nourished male body with bluish discoloration of gums and nailbeds of all the fingernails and toenails (Figures 1 and 2)

Two old healed wound scars on the back of left side of the chest (Figure 3).

Except for the scars mentioned above, there were no external injuries anywhere on the body.

On the opening of the thoraco- abdominal cavity, the peritoneal cavity contained 750 ml of yellowish-brown purulent fluid (Figure 4); the left thoracic cavity contained 1500 ml of yellowish-brown purulent fluid with food particles (Figure 5); the right thoracic cavity contained 750 ml of yellowish-brown purulent fluid.

Heart: Normal in size; cut section: All chambers were empty; Valves: Normal; Coronaries: Patent; Great vessels:

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Fig. 1: Bluish discoloration of nailbed of all the fingernails

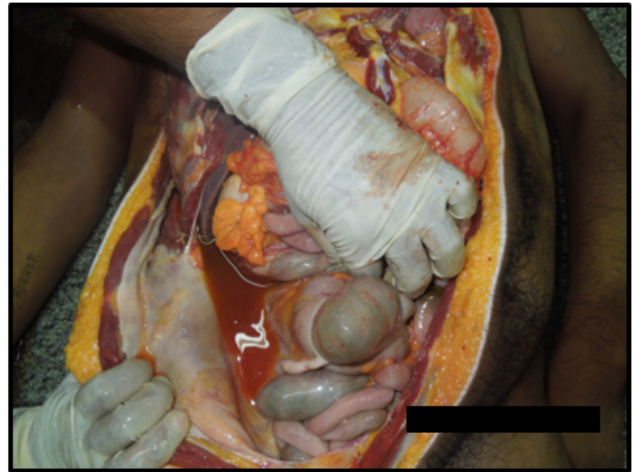


Fig. 4: 750 ml of yellowish-brown purulent fluid in Peritoneal cavity



Fig. 2: Bluish discoloration of gums

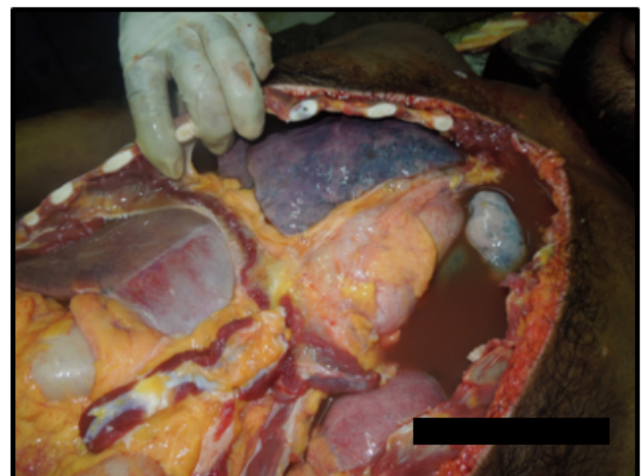


Fig. 5: 1500 ml of yellowish-brown purulent fluid in Leftthoracic cavity



Fig. 3: Two old healed wound scars

Normal. Right Lung: Normal in size; Left lung: Collapsed (Figures 6 and 10); cut section of both the lungs: Congested. Upper Portion of the Stomach found in the left Thoracic cavity (Figure 6); four perforations of variable dimensions on the anterior wall of Stomach (Figures 7 and 9); Stomach: Contained 300 grams of partly digested food particles with no definite smell; mucosa: Pale; Full Thickness defect of size 7 x 6 cm on the left side of Diaphragm (Figure 8); Liver, Spleen, and Kidneys: Normal in size; cut section: Congested; Bladder: Empty.

Larynx and Trachea: Empty; Hyoid bone and other Laryngeal cartilaginous structures: Intact.

On dissection of the head: Scalp, Vault, Dura mater, and Base of Skull: Intact; Brain: Normal in size; cut section: Normal.

Ribs, Pelvis and Spinal column: Intact

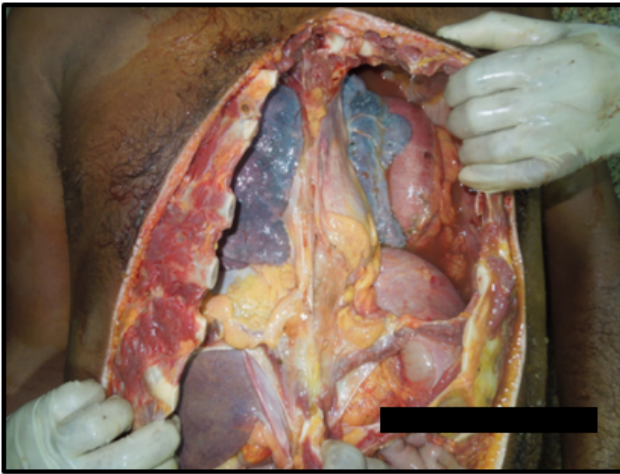


Fig. 6: Left Thoracic cavity containing collapsed left lung with herniated upper portion of stomach (After removal of fluid)

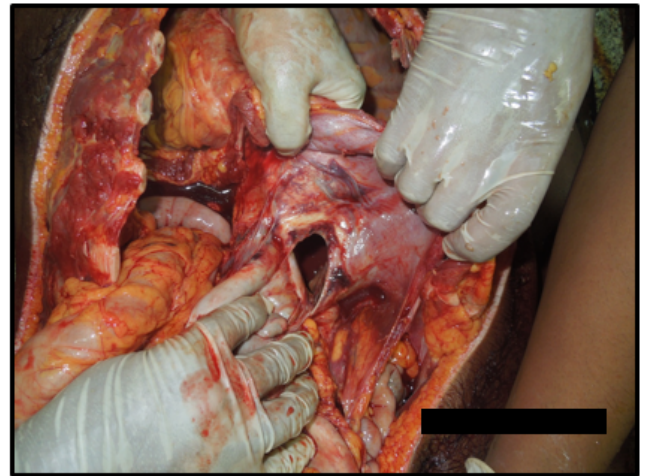


Fig. 8: Full Thickness defect of size 7x 6 cm on the left side of Diaphragm (After reduction of Herniated Stomach)

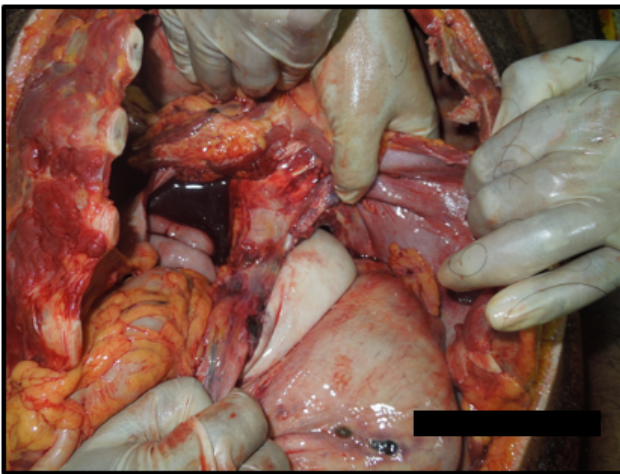


Fig. 7: Stomach herniation through the rent in left side of diaphragm

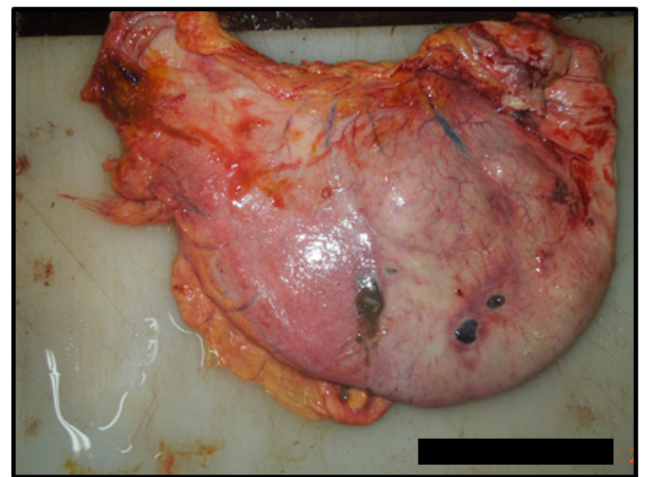


Fig. 9: Four perforations of variable dimensions on the anterior wall of Stomach

1. Viscera was preserved and sent for chemical analysis.
2. Tissue bits were preserved for Histopathological examination.

Opinion as to the cause of death

Reserved pending the reports of chemical analysis of viscera and Histopathological examination of Tissue bits.

1. Viscera report came as negative for Alcohol and/or Poison.
2. HPE report:

Lungs: Haemosiderin-laden macrophages and congested alveoli (Figure 11).

Stomach: Inflammatory infiltrates in the walls (Figures 12 and 13)

Diaphragm: Muscle bands with congested blood vessels and inflammatory infiltrates consist of lymphocytes,

neutrophils, histocytes, and multinucleated giant cells (Figure 14).

Liver: Features of congestion

Kidney: Interstitial haemorrhages

The cause of Death in this case was the effects of stomach herniation into the left thoracic cavity.

3. Discussion

An intact diaphragm is the most important muscle of respiration, performing up to 70% of the work of breathing at rest, by creating a negative intrathoracic pressure during inspiration by contraction of the striated muscle which shortens and flattens the diaphragm, increasing intrathoracic volume and lowering intrathoracic pressure. The converse happens in the expiration and this mechanism contributes

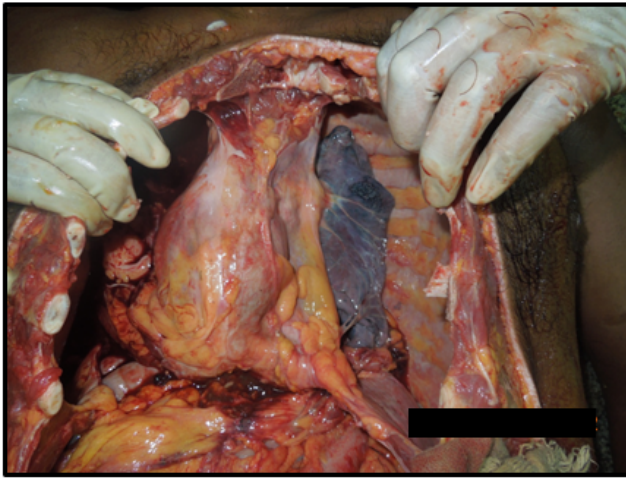


Fig. 10: Left Thoracic cavity containing collapsed left lung (After removal of fluid and reduction of herniated contents)

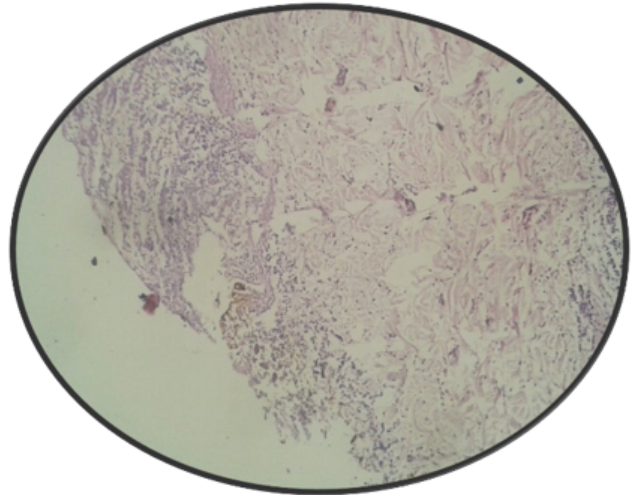


Fig. 13: HPE of Stomach

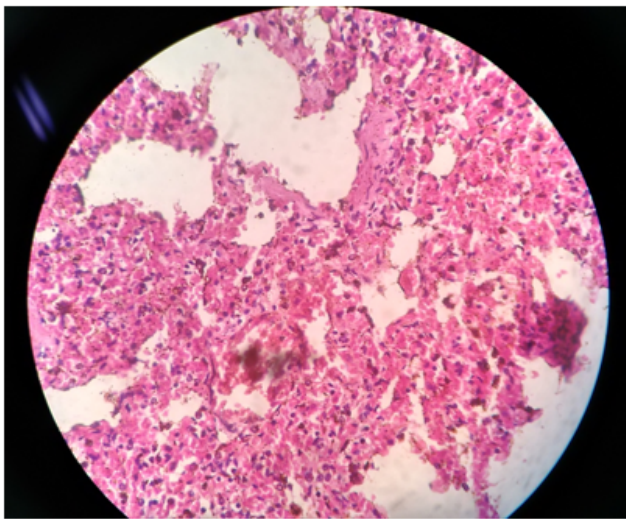


Fig. 11: HPE of Lung

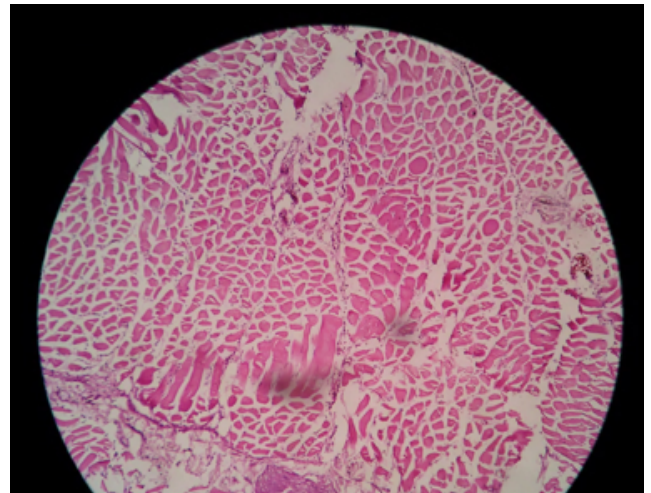


Fig. 14: HPE of Diaphragm

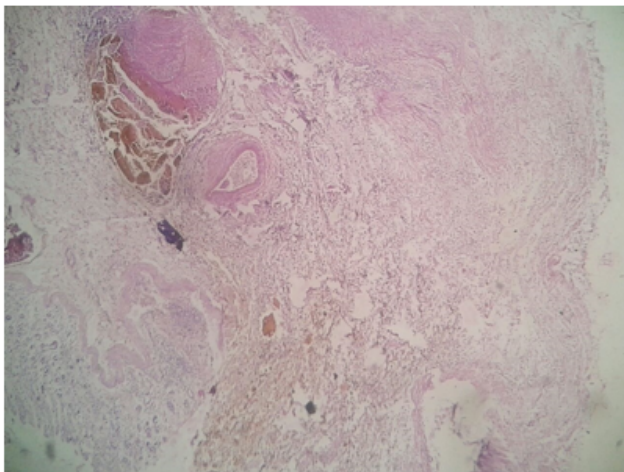


Fig. 12: HPE of Stomach

to ensuring the venous return to the heart. Disruption of the mechanism coupled with compression of the IVC at the diaphragmatic hiatus by herniated intrathoracic abdominal viscera will significantly reduce cardiac venous return and may cause catastrophic cardiovascular collapse.³

Incidence: Though the incidence of missed injuries has a wide variation from 0.4 to 65%, 10 to 12% of missed injuries were clinically significant and among those clinically significant missed injuries 20 to 50% were associated with mortality.⁴ Diaphragmatic injuries occur in 0.8 to 15% of thoracoabdominal traumas. 10 to 15% of Penetrating trauma causes diaphragmatic injuries when compared to 1.6% of blunt injuries.⁵

The mechanism for Rupture: Frontal impact from motor accidents can cause an increase in intra-abdominal pressure and creates a pressure gradient between pleural and peritoneal cavities and result in the transfer of energy

through the diaphragm causing long radial tears in the posterolateral aspect of the diaphragm, the embryologically weak point. The lateral impact from a motor vehicle collision can distort the chest wall and shear the ipsilateral diaphragm which is 3 times more likely than any other type of impact to cause a rupture.⁶

Penetrating injuries are more likely to cause TDI than blunt injury but cause smaller defects compared to blunt injury which causes larger and linear tears. Smaller defects may go unnoticed at initial presentation and gradually enlarge over years due to pressure gradient to present as herniation.^{6,7}

TDI on the left side is three times more common when compared to right side. The reason is that diagnosis is easier on the left as the liver may well plug the diaphragmatic defect on the right side making plain radiography diagnosis difficult and also the pressure required to rupture the left side is significantly low than that on the right, due to the relative weakness on the left from the lumbocostal trigone and the point of embryological fusion.⁸ Since the energy required to rupture the right side of the diaphragm is higher, the associated visceral injury is more likely and thereby mortality rate is high when right side injury occurs. In our case also, the TDI was on the left side as presented by other authors.^{7,8}

There are three phases of diaphragmatic injuries. The acute phase is at the time of the injury to the diaphragm. The delayed phase is associated with transient herniation of the viscera thus accounting for the absence or intermittent nonspecific symptoms. The obstruction phase signifies complication of a long-standing herniation, manifesting as obstruction, strangulation, and rupture as explained by Grimes in 1974.⁹

Because of coexisting injuries, the diagnosis of TDI can sometimes be missed in the acute phase and may present later on with obstructive and life-threatening symptoms. Patients present with nonspecific symptoms and may complain of chest pain, abdominal pain, dyspnoea, tachypnoea, and cough.⁹ There are various literatures suggesting that TDI cases present as asymptomatic diaphragmatic hernias to various life-threatening conditions such as respiratory distress, intestinal obstruction, pneumopericarditis, hematemesis, etc. A High index of suspicion is needed to timely diagnose the TDI.¹⁰

As proposed by other authors,^{2,4,10} in our case, the diagnosis of TDI was missed in the initial phase and presented with fatal abdominal pain. The deceased would have a diaphragmatic injury from the old trauma (fall from height) which was unnoticed and undiagnosed. After three months, he was presented with abdominal pain. The stomach loop is herniated through the diaphragmatic defect into the left thorax which leads to strangulation and perforation of the stomach. The tear in the diaphragm was proved as old in histopathological examination. Due to the absence of suspicion, the treating physician and the

sonologist might have missed the diagnosis of TDI and subsequent catastrophe.

The diagnostic features of TDI in chest X-ray are NG Tube visible in the thorax, Hepatic displacement, Collar sign of herniated abdominal viscus, Bowel loops in the chest which are almost conclusive, and irregularity of diaphragmatic outline, Mediastinal shift, and Atelectasis of lower lobes which are suggestive. Though the plain chest x-ray picks up most of the diaphragmatic injuries, the diagnosis of uncomplicated TDI remains difficult. 20-50% of chest x-rays of patients with TDI are reported as normal initially and confirmed as TDI in serial studies. The diagnostic accuracy of the plain chest x-ray is almost four times greater (62% v 17%) for left-sided injury than for right.^{8,10}

CT imaging has been considered as poor for studying the movement of the diaphragm due to movement artefacts. Magnetic Resonance Imaging is an excellent modality to diagnose the injuries of the diaphragm but the feasibility to use it in unstable and intubated patients is very much restricted.⁸

Surgical intervention is therapeutic and in some cases diagnostic too.

4. Conclusion

The approach to trauma care has improved in recent decades but delayed or missed diagnoses still occur. Deaths in such cases can occur immediately after the incident or after a variable period of time. Deaths due to delayed uncommon complications especially after apparent recovery can raise various medico-legal issues – negligence and compensation. Serial and repeated assessments both clinical and radiological are mandatory not only to diminish disastrous complications in thoracic and abdominal trauma patients but to avoid litigation as well. Focussed Abdominal Sonography for Trauma (FAST) may be extended to visualize the abnormal or absent movements of the diaphragm to aid in the diagnosis of TDI. After initial stabilization of patients with thoracoabdominal trauma or before discharging a patient with thoracoabdominal trauma diagnostic laparoscopy or thoracoscopy should be considered to inspect the diaphragm.

5. Source of Funding

None.

6. Conflict of Interest

None.

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