

## Review Article

# Traumatic Diaphragmatic Hernia and Iatrogenic Perforation of Gastrothorax - A Review

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## Abstract

Traumatic diaphragmatic hernia is an under recognized sequence of blunt or penetrating thoracoabdominal trauma and represents a diagnostic challenge. Incidence varies from 3% to 8% for blunt injury to 10% for penetrating trauma. Non-specific clinical features might suggest hemopneumothorax and tube thoracostomy performed for it might result in iatrogenic perforation of a gastrothorax. This review aims to focus on the management of such iatrogenically perforated gastrothorax and the traumatic diaphragmatic hernia.

**Keywords:** Traumatic diaphragmatic hernia; Iatrogenic; Perforation; Gastrothorax; Trauma

## Introduction

Traumatic Diaphragmatic Injury (TDI) is an under recognized sequel of blunt or penetrating thoracoabdominal trauma and represents a diagnostic challenge to the surgeon confronted with polytrauma patients [1]. The incidence of TDI varies between 3% to 8% for patients after major blunt trauma to the abdomen and 10% for victims of penetrating chest trauma [2,3].

It is interesting to note that diagnosis of TDI is often missed at the first instance because of non-specific presenting clinical features. Initial Chest Radiograph may show non-specific features or features suggestive of haemopneumothorax. The diagnosis may remain elusive despite a variety of imaging options including Computerized Tomography (CT) and sonography [4,5]. Delay in accurate diagnosis can be months or even years [2,6,7].

Attempts to decompress such a supposed haemo-pneumothorax by intercostal (chest tube) drain may result in iatrogenic injury to a herniated abdominal organ like spleen or stomach [8,9]. Unrecognized and therefore untreated TDI have a high risk of strangulation/other complications involving the herniated organs; which may eventually result in severe morbidity and mortality [10-12]. Thereby warranting an aggressive approach to identify and treat. A high index of suspicion is essential. Repeated clinical evaluations combined with appropriate imaging techniques will improve the accuracy of diagnosis. CT scan is the imaging modality of choice [5]. Invasive diagnostic modalities such as diagnostic peritoneal lavage are of little value [13]. For an isolated diaphragmatic injury, repair can be done laparoscopically, but

in the presence of additional intraperitoneal injury open exploration is being advocated [13].

## Discussion

Blunt trauma and sudden increase in intra-abdominal pressure results in a burst type of injury to the diaphragm. Victims of lateral impact collisions being more likely to sustain a diaphragmatic rupture than those subjected to frontal collision [13]. The left hemidiaphragm is reported to be more involved than the right [1-3,13]. Of the 124 patient records reviewed by Lopez et al. [14], 64.5% showed Left-Sided Injuries (LDIs) and 35.5% had right-sided injuries (RDIs) [14]. This is because the left postero-lateral area, along the embryonic fusion lines of the pleuroperitoneal membrane is the weakest area of the diaphragm. Also postulated is the protective effect of the liver on the right side of the diaphragm.

As compared to penetrating trauma, blunt trauma results in a larger tear [13]. With a sufficiently large defect, intra abdominal organs can be displaced into the pleural space thereby compressing ipsilateral lung, resulting in respiratory distress. The intra abdominal organs which usually herniate into thoracic space include the stomach [2,3,10,15], spleen [3], loops of small bowel [2,16], liver [3,17], colon [3], distal pancreas [3], kidney [16]. In our patient the stomach with greater omentum had herniated.

The clinical presentation of TDI varies. History of trauma is usually given, however, signs and symptoms can be non-specific depending on whether it is acute or delayed presentation; with or without associated injuries; or complicated. In a clinical experience of ours, a patient fell from a tree 10 feet to 12 feet high, presented elsewhere with chest and abdominal pain, breathlessness and vomiting. Initial Chest Radiograph may likely have showed features suggestive of haemo-pneumothorax necessitating chest tube insertion. This is not an isolated experience as similar experiences are reported in the literature. Dalton et al. [8] reported an incidence of a Bochdalek hernia masquerading as a tension pneumothorax and on chest tube insertion the stomach was perforated causing soiling of the chest cavity [8]. Describes placement of chest tube in a tension gastrothorax masquerading as tension pneumothorax, with immediate relief of symptoms [9]. They suggested that diagnosis of

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diaphragmatic hernia should be entertained in certain cases and that emergency management for tension gastrothorax should be decompression with a nasogastric tube [8,18]. In an acute tension gastrothorax, if this maneuver fails, decompression must be achieved either by needle puncture or by chest tube insertion into the stomach, iatrogenic perforation being better than cardiovascular collapse [19-21]. The chest tube in stomach gave our patient symptomatic relief and must have contributed in keeping him haemodynamically stable throughout the period of delay in diagnosis and intervention.

Several reports of missed and delayed diagnosis of TDI abound in literature. Delays of hours to days occur usually. Exceptional cases with delay of months or years, even up to 50 years occur [7].

The delay in diagnosis has been attributed to non specific varied and confusing clinical signs and radiographic findings especially in the presence of additional intra abdominal injuries; absence of symptoms at time of injury, due to absence of associated herniation ab initio when the diaphragmatic rupture occurred; some of the patients become symptomatic only when there is complication associated with herniation-such as obstruction, strangulation or perforation [2,10-12].

Only 25% to 30% of initial chest radiographs are diagnostic of diaphragmatic rupture according to some studies [1,22-24]. The addition of serial examinations, oral contrast, radio-opaque nasogastric tubes and fluoroscopy all add to the ability of chest radiograph to detect diaphragmatic injuries thus pointing to the need for high index of suspicion [3]. The difficulty in obtaining an early diagnosis using chest radiograph had led Beal et al. [25] to advocate that even a "fuzzy" diaphragm in a patient with multiple injuries should be an indication for surgery [25]. CT scan is the imaging modality of choice in the assessment of patients with clinical or radiographic findings suggestive of diaphragmatic rupture [26-28]. Overall sensitivity of helical CT for diaphragmatic rupture is 70% (78% for left sided and 50% for right sided injuries) [13]. Nchimi et al. [5], has shown sensitivity ranging from 56.2% to 100% for independent reviewers [5]. Magnetic resonance imaging is rarely used in acute setting due to logistic limitations, but may be beneficial for patients with uncertain CT findings and delayed presentation of diaphragmatic tear [13].

Once diagnosis of traumatic diaphragmatic hernia is established it is expedient to intervene surgically to avert the potential risk of strangulation of herniated organs with its attendant high morbidity and mortality. Optimal treatment consists of early repair through an abdominal approach with careful attention given to associated injuries [3]. Minimally invasive methods of laparoscopy, laparoscopy assisted repair and thoracoscopy are also used in repair of traumatic diaphragmatic hernia [29-34]. Besides better exposure and visualisation of the diaphragmatic region, the feasibility of restoring the herniated viscera to the abdominal cavity determines the preference for laparoscopic vs. thoracoscopic access. Stapled sutures [35,36], prosthetic meshes [37,38] and direct suturing [31,33] have been variedly advocated for closure of defect. Our patient was successfully treated laparoscopically by direct suturing.

## Conclusion

Traumatic diaphragmatic injury remains a challenge to diagnose and treat in patients of thoracoabdominal injury presenting with dyspnoea. Initial chest radiograph showing opacity in lower lung zones may be deceptive and might warrant CT scan for diagnosis.

A high index of suspicion is imperative for early and accurate diagnosis of TDI in order to avert the dangers of iatrogenic injuries to the herniating viscera, which can prove life threatening.

Laparoscopic surgical repair of TDI is both feasible and effective and should always be a treatment option. It combines the advantage of exploring to rule out concomitant abdominal visceral injuries with lesser postoperative morbidity, better cosmesis and early return to work.

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