

## Post-Traumatic Left Diaphragmatic Rupture with Intrathoracic Migration of Abdominal Organs: A Case Report

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**ABSTRACT:** Traumatic diaphragmatic rupture (TDR) is a rare but critical injury commonly resulting from high-velocity blunt or penetrating trauma. It often leads to abdominal organ herniation into the chest cavity, making timely diagnosis crucial for optimal management. Despite its potential severity, TDR remains frequently underdiagnosed, often due to the lack of specific early symptoms or delayed detection. This article presents a case of left diaphragmatic rupture in a 39-year-old male following blunt trauma from a motor vehicle accident, with associated abdominal organ herniation. We discuss the pathophysiology, diagnostic challenges, and treatment modalities for TDR, including surgical intervention, postoperative management, and potential complications. Early identification and surgical repair are essential to reducing morbidity and mortality associated with diaphragmatic ruptures, especially in polytrauma patients. The need for high clinical suspicion and prompt radiological investigations, including chest X-ray and CT scans, is emphasized. Despite successful initial repair and management, the patient ultimately succumbed to complications, highlighting the complex nature of multi-trauma cases.

**KEYWORDS:** Traumatic diaphragmatic rupture, abdominal organ herniation, blunt trauma, multi-trauma, emergency care.

### 1. INTRODUCTION

Traumatic diaphragmatic rupture is an uncommon injury resulting from both blunt and penetrating abdominal or thoracic trauma. It carries significant morbidity and a mortality rate ranging from 14% to 21% in cases identified early [1,2]. Diagnosing this condition preoperatively remains a challenge in the assessment of polytrauma patients, with less than 50% of cases recognized before surgery [2,3]. In the acute phase, only 5% of diagnosed cases are not linked to life-threatening visceral injuries, such as the case described here. Early diagnosis requires a high index of suspicion combined with appropriate radiological imaging [4].

### 2. AIM OF THE ARTICLE

The aim of this article is to highlight the diagnostic and therapeutic challenges associated with traumatic diaphragmatic rupture (TDR) following high-velocity thoracoabdominal trauma. Through the detailed presentation of a clinical case and review of existing literature, the article seeks to:

1. Emphasize the importance of maintaining a high index of suspicion for early diagnosis, particularly in multi-trauma patients.
2. Illustrate the pathophysiology, clinical manifestations, and imaging findings of TDR to aid in timely identification.
3. Outline the surgical strategies and postoperative management required to optimize patient outcomes, while addressing potential complications and their impact on prognosis.

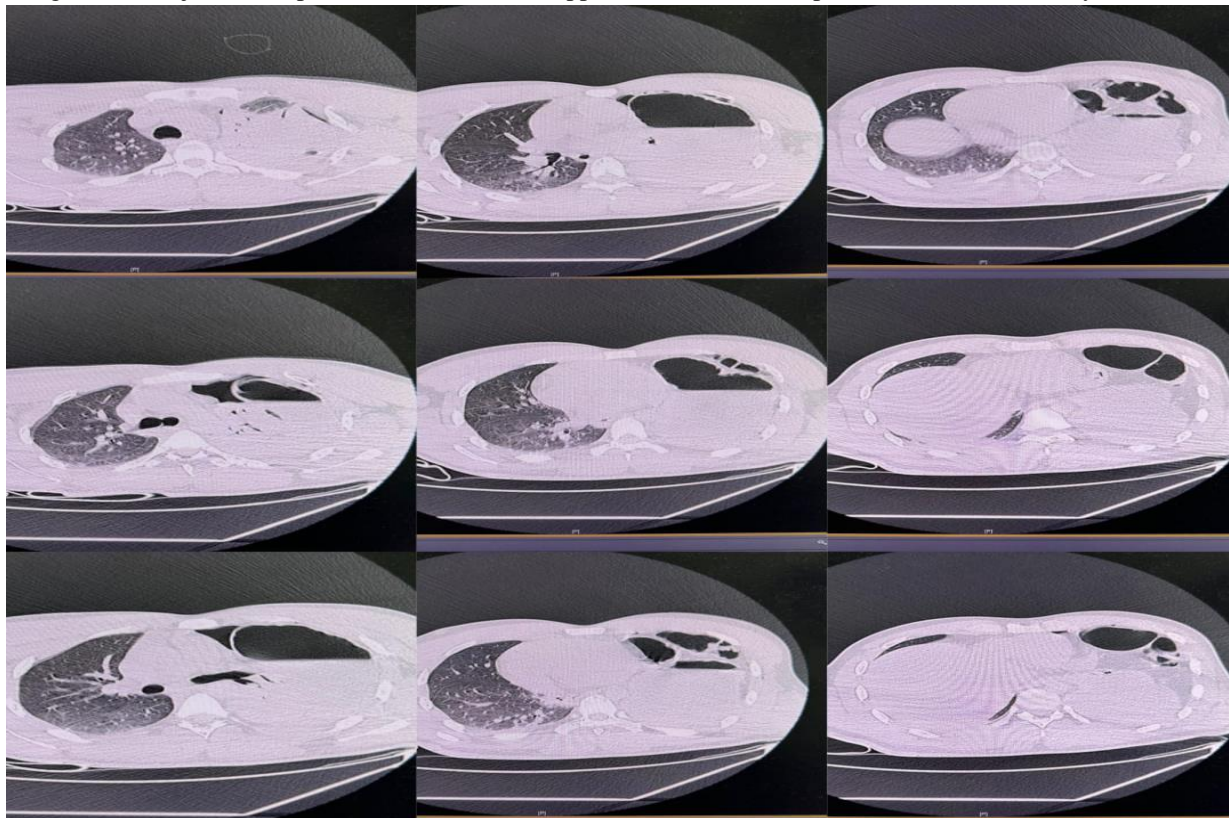
By documenting this case, the article aims to contribute to the existing body of knowledge and improve the clinical management of this rare but life-threatening condition.

### 3. PRESENTATION OF CASE

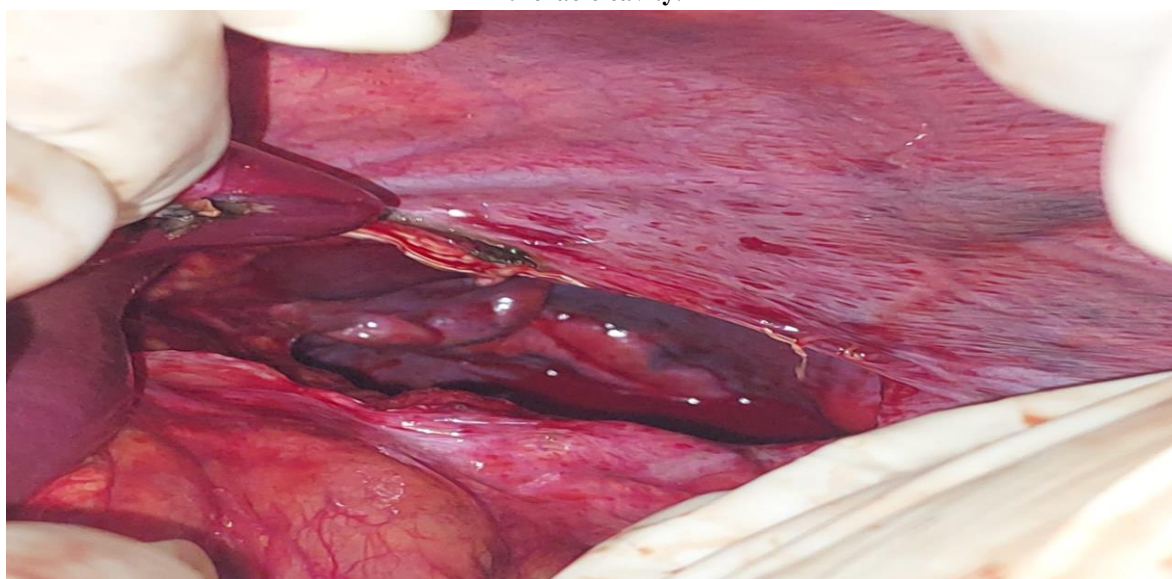
A 26-year-old male, the victim of a road traffic accident (RTA) with cranial and thoracoabdominal points of impact, was brought to our Trauma Center in critical condition. He had initially lost consciousness at the scene and was intubated and ventilated upon arrival. While there were no visible abdominal wounds, signs of blunt abdominal trauma were evident. Due to the patient's unconscious state, a detailed abdominal examination could not be conducted. A whole-body CT scan revealed several injuries, including a right fronto-temporal hematoma and bilateral parietal and temporal contusion-hemorrhagic lesions, with edema more prominent in the left temporal region. Minimal subarachnoid hemorrhage was detected in bilateral parietal sulci, and a minimal intraventricular hemorrhage was observed in the right occipital horn. Additionally, a left diaphragmatic rupture was identified, with herniation of abdominal organs into the left thoracic cavity through a 45.3 mm traumatic defect. (Figure 1) A small left

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pneumothorax was also noted. An exploratory laparotomy was performed by the visceral surgery team. Intraoperative findings revealed no peritoneal effusion or false membranes. However, a post-traumatic diaphragmatic rupture with a 12 cm defect was identified on the left side. (Figure 2) The herniated contents included the stomach, transverse colon, and greater omentum, all of which were viable with no signs of ischemia. (Figure 3) Normal findings were noted for the liver, gallbladder, spleen, colon, duodenum, and abdominal esophagus. The gastrocolic ligament was collapsed, though the posterior gastric surface remained unremarkable. During surgery, the herniated stomach, transverse colon, and omentum were gently reduced into the abdominal cavity. The left diaphragmatic defect was repaired using non-absorbable sutures. (Figure 4) A thoracic drain (Joly Ch 24) was placed through the diaphragmatic defect under apnea, and a subphrenic drain (Salem catheter) was positioned on the left side. Postoperative care included antibiotic prophylaxis, analgesics, and a scheduled follow-up thoracoabdominal CT scan within 24 hours. Initially, the postoperative period was uneventful. However, the patient's neurological condition deteriorated significantly within 72 hours due to worsening cerebral injuries. Despite intensive care and supportive measures, the patient succumbed six days after the trauma.

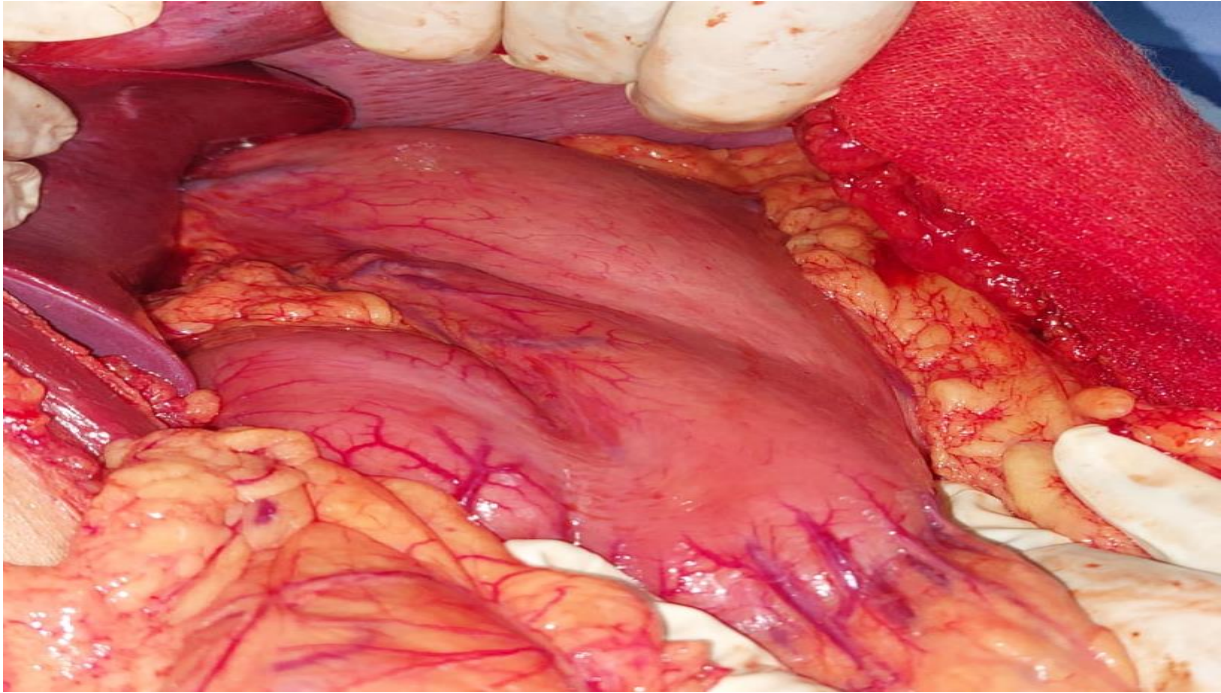


**Figure 1: CT scan slides showing the left diaphragmatic rupture, with herniation of abdominal organs into the left thoracic cavity.**

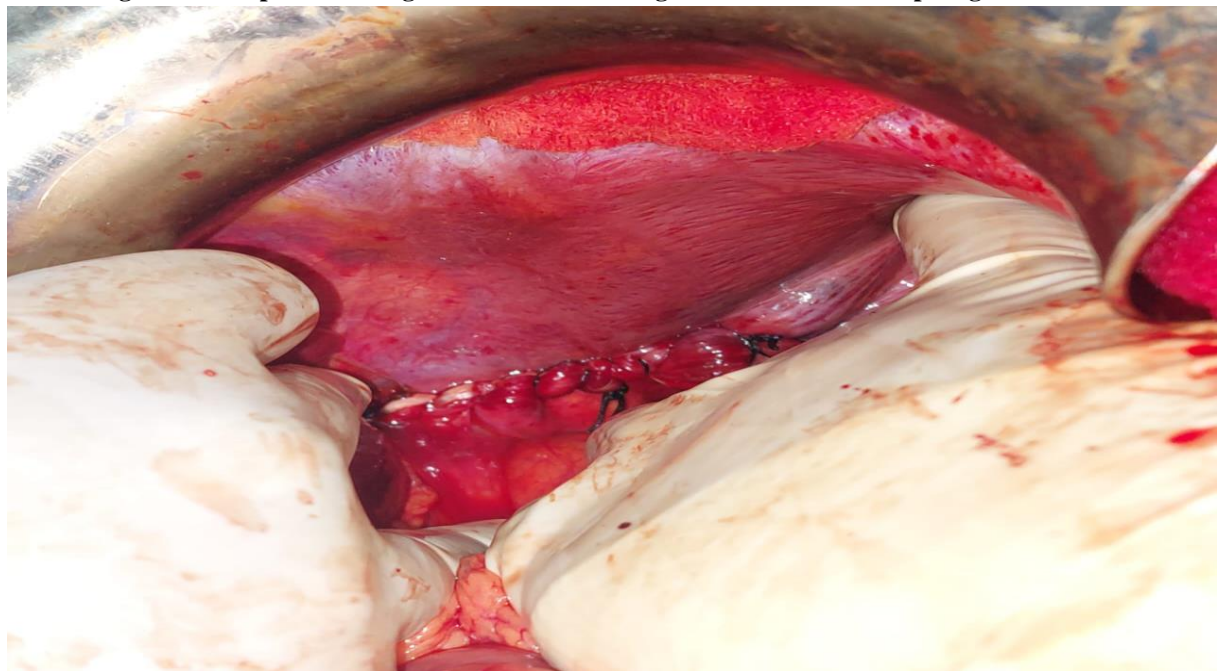


**Figure 2: The diaphragmatic defect measuring 12cm in its long axis.**

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**Figure 3: Peroperative image of the stomach being reduced from the diaphragmatic defect.**



**Figure 4: Peroperative image showing the diaphragmatic defect repaired using non-absorbable sutures.**

### 4. DISCUSSION

Traumatic diaphragmatic rupture (TDR) with abdominal organ herniation is a rare yet serious condition often resulting from high-velocity blunt or penetrating trauma to the thoracoabdominal region, as initially described by Sennertus. Due to the significant force required to rupture the diaphragm, such injuries are frequently accompanied by multi-system trauma, as seen in our patient. Blunt trauma leads to a sudden rise in intra-abdominal pressure, generating a significant trans-diaphragmatic pressure gradient. This shearing force can cause avulsion of the diaphragm from its attachments, as evidenced by the 8 cm defect identified in our case. [5,6,7]

TDR may present acutely or with delayed manifestations, depending on the extent of injury and clinical circumstances. A delay in presentation can be attributed to factors such as the progressive weakening of a devitalized diaphragm or gradual herniation becoming symptomatic over time. Cases have reported delayed rupture due to necrosis of diaphragmatic muscle or unnoticed initial injury, with herniation becoming evident only during subsequent complications. In our patient, herniated abdominal viscera into the thoracic cavity caused symptoms of respiratory distress, highlighting the potential severity of such injuries. [8,9,10]

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The coexistence of a small left pneumothorax and diaphragmatic rupture in our patient raises another diagnostic challenge. Literature suggests that tension pneumothorax can mask a hernia, particularly if the herniated contents reduce spontaneously. Serous fluid drainage in such scenarios could indicate a peritoneal-pleural communication, necessitating high clinical suspicion for accurate diagnosis. [11]

TDR is often a missed diagnosis during initial evaluations of polytrauma patients, with detection rates under 50% during the acute phase. This diagnostic delay can be attributed to non-specific clinical features or overshadowing by other severe injuries, such as rib fractures or intra-abdominal organ damage. Advanced imaging techniques, particularly CT scans, have significantly improved diagnostic accuracy, as in our case, where a thoracoabdominal scan identified the diaphragmatic defect and herniation. [11,12]

The definitive treatment for diaphragmatic hernia involves hernia reduction, pleural drainage, and repair of the diaphragmatic defect. Surgical approaches can range from open laparotomy or thoracotomy to minimally invasive techniques such as laparoscopy or thoracoscopy. In our patient, laparotomy was chosen due to the extent of injury, with successful reduction of the stomach, transverse colon, and greater omentum, followed by primary repair of the defect with non-absorbable sutures. Despite initial improvements in respiratory function, our patient succumbed to complications from polytrauma, emphasizing the critical need for multidisciplinary management in such cases. [13]

Early recognition and surgical intervention are crucial to reducing morbidity and mortality associated with TDR. A high index of suspicion is essential, particularly in patients with a history of high-velocity trauma and accompanying thoracoabdominal injuries. Timely diagnosis and appropriate surgical management can prevent life-threatening complications such as strangulation and ischemic bowel, which have a reported mortality rate of up to 80% when present. [14]

Our case underscores the importance of comprehensive evaluation, prompt surgical intervention, and vigilant postoperative monitoring in managing TDR. Future emphasis on integrating advanced imaging with clinical judgment may further enhance outcomes in such complex trauma scenarios.

### **5. CONCLUSION**

Traumatic diaphragmatic rupture (TDR) with abdominal organ herniation is a critical and often underdiagnosed complication following high-velocity thoracoabdominal trauma. Early recognition of this injury is essential to prevent severe complications such as organ ischemia and respiratory distress, which can significantly affect patient outcomes. This case highlights the importance of a high clinical index of suspicion, particularly in polytrauma patients, and underscores the value of advanced imaging techniques, such as CT scans, in facilitating prompt diagnosis.

Surgical intervention remains the cornerstone of treatment, with hernia reduction, pleural drainage, and diaphragmatic repair being necessary to manage the defect. However, the challenges of managing multi-system trauma patients mean that prompt and coordinated multidisciplinary care is critical to minimizing morbidity and mortality.

In conclusion, traumatic diaphragmatic rupture is a rare yet potentially fatal injury that requires timely diagnosis and effective management. Continued vigilance, early intervention, and ongoing patient monitoring are key factors that can improve survival and reduce complications in affected individuals.

### **PROVENANCE AND PEER REVIEW**

Not commissioned, externally peer reviewed.

### **CONSENT**

As per international standard or university standard, patient(s) written consent has been collected and preserved by the author(s).

### **ETHICAL APPROVAL**

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

### **CONFLICTS INTERESTS**

Authors have declared that no competing interests exist.

### **SOURCE OF FUNDING**

None

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