

Intrathoracic Gastric Herniation Following a Penetrating Thoracic Stab Wound: The Hourglass Sign

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Abstract

Traumatic diaphragmatic rupture following a penetrating thoracic injury may be overlooked because the diaphragmatic defect can be small and the initial clinical findings nonspecific. We report the case of a 20-year-old man admitted following a stab wound to the left lower posterior thorax. The patient was tachypneic, with a normal heart rate and a Glasgow Coma Scale score of 15/15. The CT scout image showed diffuse opacification of the left hemithorax and an enteric tube coiling above the expected level of the left hemidiaphragm. Contrast-enhanced thoracoabdominal CT demonstrated a left diaphragmatic defect with intrathoracic gastric herniation. Coronal reformatted images revealed focal waist-like constriction of the stomach at the diaphragmatic defect, producing the characteristic collar or hourglass sign. Associated findings included a left pneumothorax, hemothorax, pulmonary contusions, and compression of the residual left lung. The diagnosis of acute traumatic left diaphragmatic rupture with intrathoracic gastric herniation was established. Surgical treatment consisted of reduction of the stomach into the abdominal cavity and primary suture repair of the diaphragmatic defect. This case emphasizes the importance of multidetector CT and multiplanar reformations for the early diagnosis of diaphragmatic injury after penetrating thoracic trauma.

Keywords: Traumatic Diaphragmatic Rupture; Penetrating Thoracic Trauma; Gastric Herniation; Collar Sign; Hourglass Sign; Computed Tomography

Introduction

Traumatic diaphragmatic injury is an uncommon but potentially life-threatening complication of thoracoabdominal trauma [1]. Penetrating injuries may produce small diaphragmatic defects and nonspecific clinical findings, making the diagnosis particularly challenging during the initial assessment [1-3]. When overlooked, these defects may allow delayed herniation of abdominal viscera into the thoracic cavity, with a risk of incarceration, strangulation, intestinal obstruction, and respiratory compromise [1,5].

Multidetector computed tomography, particularly when combined with thin-section acquisition and multiplanar reformations, plays a central role in identifying diaphragmatic discontinuity, visceral herniation, and associated thoracoabdominal injuries [1,2]. Among the characteristic imaging findings, the collar sign, also referred to as the hourglass sign, results from focal constriction of a herniated abdominal organ at the level of the diaphragmatic defect [1,4]. We report a case of acute left diaphragmatic rupture with intrathoracic gastric herniation following a penetrating thoracic stab wound, highlighting the characteristic CT findings that enabled prompt diagnosis and surgical management.

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Case Report

A 20-year-old man was admitted to the emergency department following a penetrating stab wound to the left lower posterior thorax. On initial clinical assessment, he was conscious and cooperative, with a Glasgow Coma Scale score of 15/15. He was tachypneic, while his heart rate remained within the normal range. Given the location of the wound and the possibility of an associated thoracoabdominal injury, an urgent radiological evaluation was performed.

The CT scout image demonstrated diffuse increased opacity of the left hemithorax. An enteric tube was noted to coil above the expected level of the left hemidiaphragm, suggesting abnormal intrathoracic migration of the stomach and raising suspicion of a traumatic diaphragmatic injury (Figure 1).



Figure 1: CT scout image showing diffuse opacification of the left hemithorax, with an enteric tube coiling above the expected level of the left hemidiaphragm within the intrathoracic stomach.

Subsequent contrast-enhanced thoracoabdominal computed tomography confirmed a focal defect of the left hemidiaphragm associated with herniation of the stomach into the left thoracic cavity. On coronal reformatted images, the stomach showed a focal waist-like constriction as it passed through the diaphragmatic defect. This appearance corresponded to the characteristic collar sign, also known as the hourglass sign.

Axial images obtained in the lung window demonstrated an anterior left pneumothorax and an associated hemothorax. Pulmonary contusions were also observed, together with compression of the residual aerated left lung by the intrathoracic stomach and the associated pleural collections (Figure 2).

The combination of direct diaphragmatic discontinuity, intrathoracic gastric herniation, and focal constriction of the stomach at the site of the defect established the diagnosis of an acute traumatic rupture of the left hemidiaphragm secondary to the penetrating thoracic stab wound.

The patient underwent surgical treatment. Intraoperative management consisted of reduction of the herniated stomach into the abdominal cavity, followed by primary suture repair of the diaphragmatic defect. No additional information concerning the postoperative course or subsequent follow-up was available in the initial clinical record.

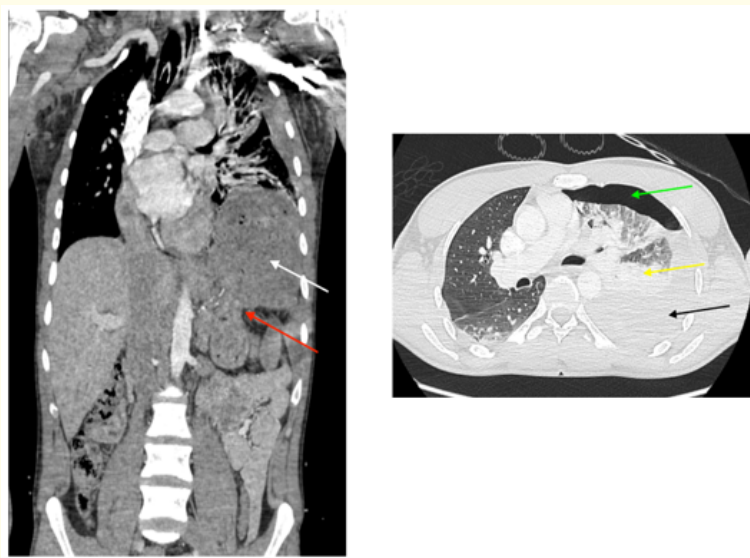


Figure 2: Contrast-enhanced thoracoabdominal CT findings of traumatic left diaphragmatic rupture with intrathoracic gastric herniation.

(A) Coronal reformatted image in the mediastinal window demonstrating migration of the stomach into the left hemithorax (White arrow). Focal constriction of the stomach at the level of the diaphragmatic defect (Red arrow) produces the characteristic collar sign, also known as the hourglass sign. (B) Axial image in the lung window showing an anterior left pneumothorax (Green arrow), traumatic contusion and compression of the left lung (Yellow arrow), and an associated left hemothorax (Black arrow).

Discussion

Traumatic diaphragmatic injuries are uncommon and remain diagnostically challenging, particularly after penetrating wounds involving the lower thoracic or thoracoabdominal regions. Penetrating trauma generally produces smaller diaphragmatic defects than blunt trauma, which may explain why the initial clinical and radiological findings can be subtle or nonspecific [1-3]. When unrecognized, these defects may subsequently enlarge and allow abdominal organs to migrate into the thoracic cavity.

Multidetector computed tomography plays an important role in the evaluation of suspected diaphragmatic injury. Its diagnostic value is improved by thin-section acquisition and multiplanar reformations, which allow direct assessment of diaphragmatic continuity, the wound trajectory, and associated thoracoabdominal injuries [1,2]. Nevertheless, CT does not completely exclude a penetrating diaphragmatic injury. Bodanapally, *et al.* reported a sensitivity of 87.2% and a specificity of 72.4%, while Yucel, *et al.* reported a sensitivity of 82% and a specificity of 88% for multislice CT in penetrating left thoracoabdominal stab wounds [2,3].

The collar sign results from focal constriction of a herniated abdominal organ at the level of the diaphragmatic defect, creating a waist-like or hourglass appearance. In the present case, coronal reformatted CT images clearly demonstrated constriction of the stomach as it passed through the left diaphragmatic defect. The intrathoracic course of the enteric tube on the scout image provided an additional clue

to gastric herniation. Associated pneumothorax, hemothorax, pulmonary contusions, and compression of the residual lung reflected the severity of the accompanying thoracic injuries.

Once diaphragmatic rupture with visceral herniation is established, surgical repair is required to reduce the herniated organ and close the defect. In stable patients with an equivocal CT examination, diagnostic laparoscopy may be considered because small penetrating injuries can remain occult on imaging. Current guidelines favor laparoscopy over CT alone for the diagnosis of suspected left-sided penetrating diaphragmatic injuries, although the supporting evidence is of very low quality [5].

Early diagnosis and treatment are essential to prevent delayed complications such as visceral incarceration, strangulation, obstruction, and respiratory compromise. In our patient, CT enabled prompt recognition of the diaphragmatic rupture and intrathoracic gastric herniation, allowing immediate surgical reduction and primary repair.

Conclusion

Penetrating diaphragmatic injuries may be difficult to diagnose because the defect can be small and clinical findings nonspecific. Multidetector CT with multiplanar reformations is essential for identifying diaphragmatic discontinuity, visceral herniation, and characteristic imaging features such as the collar or hourglass sign. Early recognition of intrathoracic gastric herniation allows prompt surgical repair and helps prevent serious complications, including strangulation, incarceration, and respiratory compromise.

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