

Transdiaphragmatic Intercostal Hernia Following Blunt Trauma and Coughing: A Case Report and Literature Review

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Abbreviations:

TDIH: Transdiaphragmatic intercostal
hernias;
CT: Computed tomography.

Rezumat

Hernie intercostală transdiafragmatică în urma unui traumatism contondent și a tusei: prezentare de caz și revizuire a literaturii

Introducere: Herniile intercostale transdiafragmatice (TDIH) sunt afecțiuni rare, frecvent subdiagnosticate, caracterizate prin hernierea conținutului abdominal prin defecte concomitente ale diafragmei și musculaturii intercostale. De obicei, acestea apar în urma unui traumatism contondent sau penetrant, dar pot surveni și spontan, în urma unor episoade de creștere marcată a presiunii intraabdominale, cum ar fi tusea intensă.

Case report: Prezentăm cazul unui bărbat în vârstă de 68 de ani cu o TDIH de mari dimensiuni, manifestată printr-o masă toracoabdominală stângă progresiv crescândă, apărută după un traumatism contondent și un episod sever de tuse. Inițial, a fost diagnosticat cu o hernie mare a peretelui abdominal lateral. Investigațiile imagistice au evidențiat un defect diafragmatic semnificativ, cu hernierea epiploonului și a flexurii splenice prin peretele toracic. Reparația chirurgicală a fost realizată de o echipă multidisciplinară, prin toracotomie posterolaterală, cu închiderea primară a defectului diafragmatic și reconstrucția peretelui toracic. Evoluția postoperatorie a fost favorabilă, fără recidivă la șase luni.

Concluzie: Acest caz subliniază importanța unui înalt grad de suspiciune clinică, a imagisticii avansate și a managementului chirurgical colaborativ în tratamentul acestei entități rare. De asemenea, este prezentată o revizuire a literaturii de specialitate.

Cuvinte cheie: transdiafragmatic, hernie intercostală, traumatism

Abstract

Background: Transdiaphragmatic intercostal hernias (TDIHs) are rare, frequently underdiagnosed conditions characterized by herniation of abdominal contents through concurrent defects in the diaphragm and intercostal musculature. They usually result from blunt or penetrating trauma but

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may also occur spontaneously following episodes of markedly increased intra-abdominal pressure, such as forceful coughing.

Case presentation: We present the case of a 68-year-old male with a large TDIH manifesting as a progressively enlarging left thoracoabdominal mass after blunt trauma and a severe coughing episode. The initial diagnosis was of a large hernia of the lateral abdominal wall. Diagnostic imaging revealed a significant diaphragmatic defect with herniation of the omentum and splenic flexure through the thoracic wall. Surgical repair was performed by a multidisciplinary team via a posterolateral thoracotomy with primary diaphragmatic closure and thoracic wall reconstruction. The postoperative course was uneventful, with no recurrence at six months.

Conclusion: This case highlights the importance of high clinical suspicion, advanced imaging, and collaborative surgical management in treating this rare entity. Also, a literature review is presented.

Keywords: transdiaphragmatic, intercostal hernia, trauma

Introduction and Clinical Significance

Transdiaphragmatic intercostal hernia (TDIH) is a rare condition characterized by the herniation of abdominal organs through defects in both the diaphragm and intercostal space, resulting in protrusion through the chest wall. This condition was first described by Sharma (1) and was previously referred to as intercostal pleuroperitoneal hernia by Croce (2). Isolated transdiaphragmatic hernias represent approximately 0.8% to 5% of blunt trauma admissions (1). Notably, rib fractures are associated with diaphragmatic injuries in up to 50% of cases (3).

TDIHs may result from blunt or penetrating trauma, falls, crush injuries, or intense coughing or sneezing. Iatrogenic causes, such as postoperative injury, are less common (4). The most frequent presentation is a palpable chest wall mass (3).

We report a case of a large TDIH in a patient with prior blunt thoracic trauma and a violent coughing episode, managed surgically by a multidisciplinary team. A literature review is included to contextualize this rare condition, only 50 cases being reported.

Case Presentation

We report the case of a 68-year-old male patient who presented to our department with a prominent, progressively enlarging intercostal bulge on the left side of the thoracoabdominal wall, measuring approximately 30 × 20 cm. His past medical history was notable for two distinct episodes of blunt thoracic trauma. The first incident occurred several years before, resulting in rib fractures on the left side, for which he received conservative management. The second traumatic event happened

approximately five months before presentation, when he fell and struck the left side of his thorax against the edge of a bathtub.

A few days following this second trauma, the patient experienced a violent episode of coughing, which was accompanied by sudden-onset, sharp, and persistent pain in the left hemithorax. The pain lasted for several days, prompting a visit to the emergency department, where he was treated symptomatically and discharged. Approximately three weeks later, he noted the appearance of a soft, reducible bulge on the left lateral side of his thoracoabdominal wall (*Fig. 1*). The mass gradually increased in size over the following weeks, eventually prompting further medical evaluation.

Upon first clinical examination, the swelling was initially misinterpreted as a large abdominal wall hernia, particularly due to its inferior border extending below the costal margin. The mass was more prominent in the upright position and reduced partially when the patient lay in the right lateral decubitus position.



Figure 1. Frontal and postero-lateral aspect of the Herniating Bulge

A contrast-enhanced computed tomography (CT) scan of the chest and abdomen was performed, which revealed multiple old rib fractures involving the 6th, 7th, and 8th ribs on the lateral side of the left hemithorax. More notably, there was a diaphragmatic defect measuring approximately 85 mm in length through which the omentum and the splenic flexure of the colon had herniated into the thoracic cavity. The herniated contents had further protruded through the 7th enlarged intercostal space into the subcutaneous tissue, forming the visible and palpable intercostal mass (*Fig. 2*).

Based on these findings, the diagnosis of a large TDIH was established, and the patient was referred to our surgical unit for further management. At the time of admission, the patient was hemodynamically stable and in good general condition, at 7 months after the onset of the disease. The physical examination confirmed the presence of a large, soft, and partially reducible mass located at the base of the left thorax and extending into the lateral abdominal wall.

Preoperative evaluation included bronchoscopy to assess the airways and to facilitate selective intubation if needed during surgery. Pulmonary function tests demonstrated a moderate restrictive pattern. A cardiological assessment was also performed and revealed no contraindications for surgery.

Surgical repair was carried out by a multidisciplinary team consisting of a general surgeon and a thoracic surgeon. The procedure was performed through a left posterolateral thoracotomy (*Fig. 3*). Intraoperatively, a large hernia sac measuring 40 × 30 cm was identified, extending through a 9 cm longitudinal rupture in the left hemidiaphragm. After meticulous dissection, the herniated omentum and splenic flexure of the colon were reduced back into the abdominal cavity. The hernia sac was completely excised, and the diaphragmatic defect was closed primarily using interrupted non-absorbable sutures, without the use of prosthetic mesh (*Fig. 4*). The thoracic wall was reconstructed by approximating the ribs using steel wires. A chest tube was placed for pleural drainage, draining approximately 100 mL and was suppressed on the 5th day. Another abdominal drainage tube was placed, draining 200 mL and was suppressed on the 2nd postoperative day. Total surgical time was 120 minutes with an estimated blood loss of 50 mL, without intra-operative incidences.

The postoperative course was uneventful. The patient recovered well and was mobilized early on

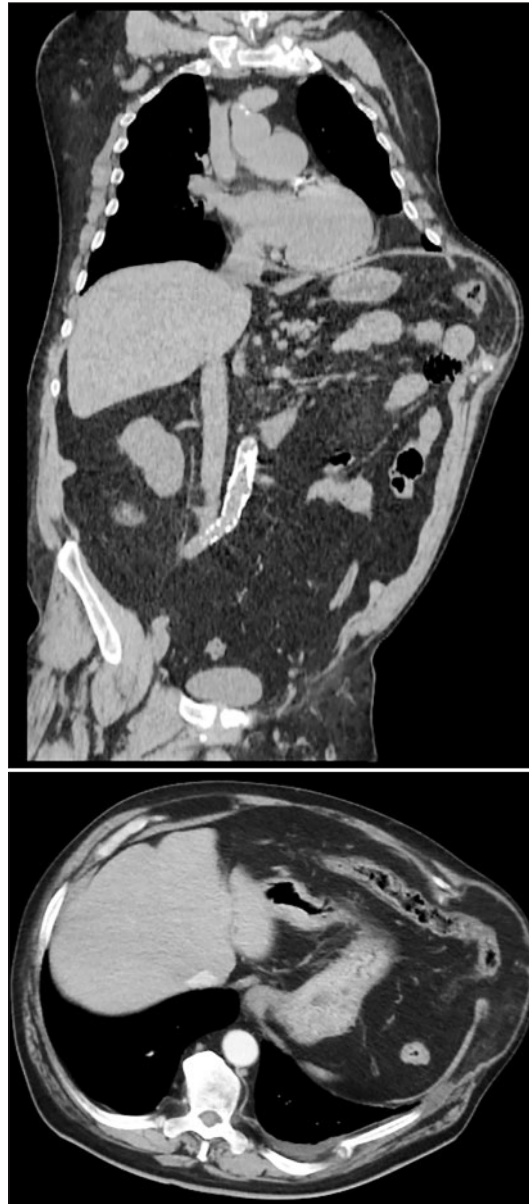


Figure 2. Coronal and axial sections of the Computer Tomography

the first post-operative day. A follow-up CT (*Fig. 5*) scan prior to discharge confirmed the anatomical integrity of the repaired diaphragm and the restoration of the normal costal contour. The patient was discharged in stable condition on the eighth postoperative day. At six months follow-up, he remained asymptomatic, with no clinical or radiological evidence of recurrence.

Discussion

TDIH is a very rare condition. Until 2001 only 11

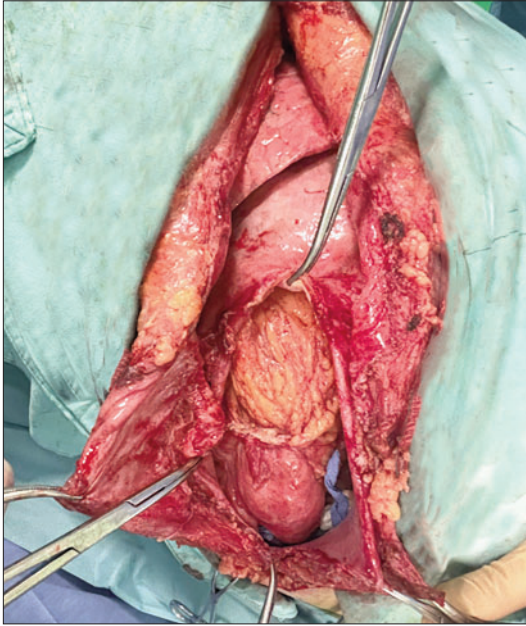


Figure 3. Dissected hernia with the lungs in the superior part of the photo and the contents of the dissected herniated sac in the caudal part of the photo

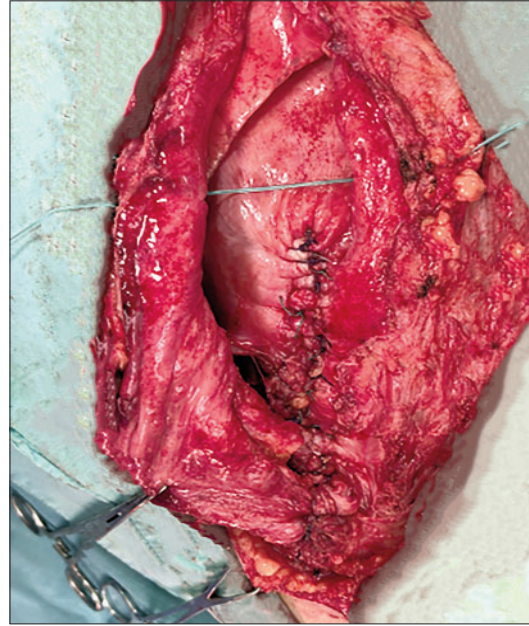


Figure 4. Final appearance of the sutured diaphragm

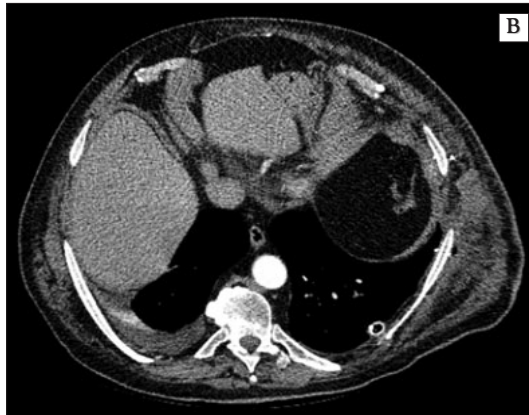
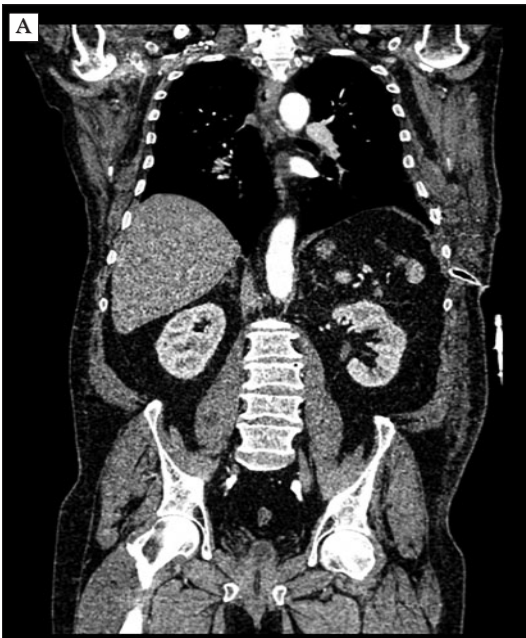


Figure 5. Coronal and axial follow-up CT scan with the chest tube in place

cases were published, with a total of 42 mentions in the literature in 2021 (5). Since then, we identified 8 new cases (4,6–11) and the one presented here, in total 51 cases. In the series discussed by Ioannidis, consisting of 42 patients, the reported mechanism was as follows: penetrating trauma in 9 cases, motor vehicle crash in 9 cases, violent

coughing episode alone in 8 cases and in patients with comorbidities such as chronic obstructive pulmonary disease or pulmonary sarcoidosis in 4 cases, spontaneous in 3 cases, blunt trauma in 4 cases, and falling in 7 cases (5). In the additional cases studied by us, from 2021 to date, the causes for TDIH were: blunt trauma in 2 cases, coughing

or sneezing in 4 cases, previous thoracic surgery 1 case, and heavy load lifting 1 case. Our patient developed TDIH after a violent episode of coughing, but he had also sustained a blunt trauma with rib fractures on the left side, one year before.

Traumatic TDIH occurs more on the left side, perhaps in relation to the fact that the left diaphragm has weakness points such as the esophageal and aortic hiatus and foramen of Morgagni. Also, the liver represents a support for the right diaphragm making it less prone to rupture (6). In TDIH on the right side, the herniated organs can be the liver, colon, and small bowel (12,13).

The commonest site of diaphragmatic rupture is the posterolateral area, the weakest part, along the embryonic fusion line (14).

Intercostal disruption and rib fractures occur usually at the 9th costal cartilage in case of coughing or sneezing and the level of 7th cartilage, after trauma. The 9th and 10th ribs were the most frequently fractured (1).

In our case, the patient had previously sustained a blunt trauma of the left thorax with rib fractures (7,8), one year before and the TDIH occurred after a violent coughing episode, with the hernia sac localized at the level of the 7th intercostal space.

The usual clinical presentation is that of a mass (bulge) in the chest and possible ecchymosis. The symptoms of the acute episode can be: severe pain, acute dyspnea and nausea, vomiting, and abdominal pain if intestines in the hernia sac are strangulated (15). In our patient, the hernia was so large that at the first presentation it mimicked an abdominal wall hernia. The time between the initial trauma or spontaneous onset and the presentation for diagnosis varied from immediate to several years. The average time was 5 months (1). In our case it was 7 months. In case of penetrating trauma or incarceration with strangulation of the content of the hernia sac, the surgery was performed in emergency (16).

Diagnosis requires CT scans that show the lesions of the costal margin, the diaphragm, and intercostal muscles. In the past, chest X-ray films and barium studies were used to confirm the presence of the abdominal organs, usually intestines, in the subcutaneous tissue of the thorax (17).

For a better management of these cases, the Sheffield classification for TDIH and other costal margin injuries, based on CT examination was proposed (18). The identified groups in this

classification were: transdiaphragmatic intercostal hernia (4 patients), costal margin rupture with diaphragmatic rupture (5 patients), costal margin rupture with intercostal hernia (4 patients), costal margin rupture alone (5 patients), diaphragmatic rupture (19 patients), and intercostal hernia one patient. This classification suggests that surgery should address all the elements involved: the costal margin, and the diaphragm and intercostal rupture, so as to prevent recurrence (18).

Once diagnosed, treatment should address all components involved. A multidisciplinary team consisting of a thoracic surgeon and a general surgeon may be needed. Large thoracoabdominal incisions, causing great postoperative pain, tend to be replaced today with minimally procedures like laparoscopic and thoracoscopic surgery (5). The diaphragmatic tears are repaired with interrupted or continuous non-absorbable sutures and are reinforced with mesh if necessary. The intercostal ruptures can be reapproximated and meshes or titanium plates can also be used. A correct surgical technique is essential to minimize recurrence.

Conclusions

Transdiaphragmatic intercostal hernia cases are very rare and represent a heterogeneous group because they are a result of trauma, blunt or penetrating, that can involve healthy patients but they can also be induced by sternutation such as sneezing and coughing in patients with existent comorbidities – obesity, chronic obstructive pulmonary disease, oral steroid use, diabetes mellitus. The presentation and diagnosis can be immediate, in emergency or it may be delayed even for years. Sometimes TDIH can mimic a lipoma or hernia of the abdominal wall. Suspicion of TDIH has to be in cases with previous trauma or surgery, especially thoracic operations or patients with chronic obstructive pulmonary disease and violent coughing episodes. Keeping this mind, along with a thorough CT scan examination, will help in early diagnosing of the TDIH cases. Surgery must address the diaphragmatic rupture, intercostal rupture and costal margin rupture in order to prevent recurrence.

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Conflicts of Interest

The authors declare no conflicts of interest.

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Informed Consent Statement

Informed consent was obtained from the patient.

Data Availability Statement

All data relevant to the study were presented in the paper.

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