

Traumatic Left Diaphragmatic Rupture with Intrathoracic Gastric Herniation and Concomitant Bladder Injury After Blunt Thoracoabdominal Trauma: A Case Report and Review of the Literature

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ABSTRACT

Unusual and clinically significant, traumatic diaphragmatic injury (TDI) is a common but seldom reported clinical effect of blunt thoracoabdominal trauma, occurring in about 1-5% of cases and often overlooked on initial assessment. Left-sided ruptures of the gastrointestinal system can herniate abdominal viscera into the thorax and cause strangulation if not performed correctly. We note a left TDI with intrathoracic gastric herniation and a 29-year-old man was admitted to the hospital after a lateral motor vehicle collision with entrapment. He was haemodynamically borderline and had a positive Focused Assessment with Sonography for Trauma (FAST) and peritoneal signs. Contrast-enhanced computed tomography (CT) revealed the left diaphragmatic laceration with the stomach herniated into the left hemithorax, left lung atelectasis and a bladder injury in a similar fashion to the one reported in the case of a recent ER. He underwent exploratory laparotomy, reduction of the stomach, primary diaphragmatic repair (phrenorrhaphy) with non-absorbable suture and left chest tube placement. The intraperitoneal survey showed a non-perforating gastric contusion and a bladder-wall haematoma without leak.

TDI diagnosis is based on suspicion and CT, as plain radiography is not sensitive to it. In acute cases, the abdominal approach is preferred as this allows for reduction of herniated viscera and treatment of resultant injuries. Extraperitoneal bladder injuries are generally treated conservatively via catheter drainage, whereas intraperitoneal ruptures are repaired. Prompt CT recognition and an abdominal-first approach allowed for the single-stage repair of a left TDI with intrathoracic gastric herniation and conservative treatment of a low-grade bladder injury, and a non-eventful recovery and discharge. This work is reported in accordance with the SCARE 2020 criteria.

KEYWORDS: Diaphragmatic rupture; Blunt thoracoabdominal trauma; Intrathoracic gastric herniation; Phrenorrhaphy; Bladder injury; Case report.

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INTRODUCTION

TDI is commonly reported in about 1-5% of those hospitalised after blunt trauma at the time of injury and some penetrating thoracoabdominal wounds (1,2). The left

hemidiaphragm is involved in most blunt cases, partly due to the liver protecting the right side and partly as a result of the left posterolateral diaphragm being presumed to be weak (2,3). The sudden rise in the transdiaphragmatic pressure

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gradient during high-energy impact results in a radial tear through which abdominal viscera (most notably the stomach, colon, spleen or omentum) can herniate into the chest (3).

TDI is often a blind spot: up to a third of injuries are missed at first presentation and delayed diagnosis is associated with visceral strangulation and high mortality (1,4). Concomitant injuries are common, and the energy required to disrupt the diaphragm is high (2). We present a young man with left TDI, intrathoracic gastric herniation and an associated bladder injury following a motor-vehicle collision, which was managed by exploratory laparotomy and phrenorrhaphy with a good outcome and a thorough review of the literature on diaphragmatic and bladder trauma. This report is in line with the Surgical CAse REport (SCARE) 2020 guideline (5).

CASE PRESENTATION

A 29-year-old man with no relevant medical history and occasional alcohol use was the restrained driver of a sedan involved in a lateral collision. He was trapped between the steering wheel and dashboard and was extricated by prehospital services after a transient loss of consciousness (Figure 1). On arrival he was conscious (Glasgow Coma Scale 14), with a blood pressure of 100/70 mmHg, mean arterial pressure of 80 mmHg, heart rate of 100 beats/min and oxygen saturation of 95% on room air. Primary survey identified a patent airway with cervical precautions, reduced breath sounds at the left base, and a tender abdomen. FAST was positive for free fluid.



Figure 1. Mechanism of injury—lateral motor-vehicle collision with cabin intrusion and driver entrapment.

Secondary survey revealed pallor, a left flank haematoma and diffuse abdominal tenderness with peritoneal signs (pain score 9/10). Laboratory studies showed leukocytosis ($19.6 \times 10^9/L$), haemoglobin 14.6 g/dL and a mildly elevated creatinine (1.71 mg/dL). Contrast-enhanced CT of the chest

and abdomen demonstrated a left diaphragmatic laceration with herniation of the stomach into the left hemithorax, segmental atelectasis of the left lung and a bladder injury (Figure 2).

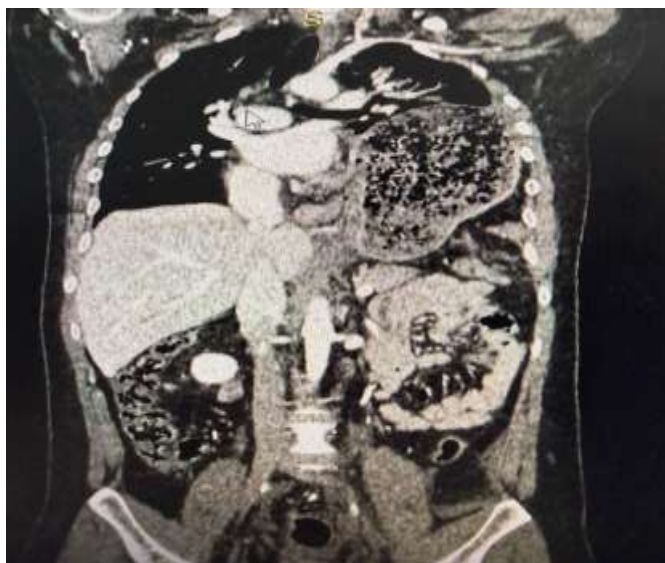


Figure 2. Contrast-enhanced CT showing the stomach herniated into the left hemithorax through the diaphragmatic defect, with associated left lower-lobe atelectasis.

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Given the positive FAST, peritoneal irritation and radiological findings, the patient was taken for emergency exploratory laparotomy through a midline incision. Approximately 50 mL of haemoperitoneum was evacuated. A left diaphragmatic laceration of about 12 cm was identified, through which the stomach had herniated into the thorax (Figure 3); the stomach was reduced into the abdomen.

Systematic exploration revealed a gastric contusion of the lesser curvature without perforation, a bladder-wall haematoma without laceration or urine leak, and a zone II retroperitoneal haematoma that was controlled after Cattell–Braasch and Mattox manoeuvres; both kidneys, the great vessels and iliac arteries were intact.

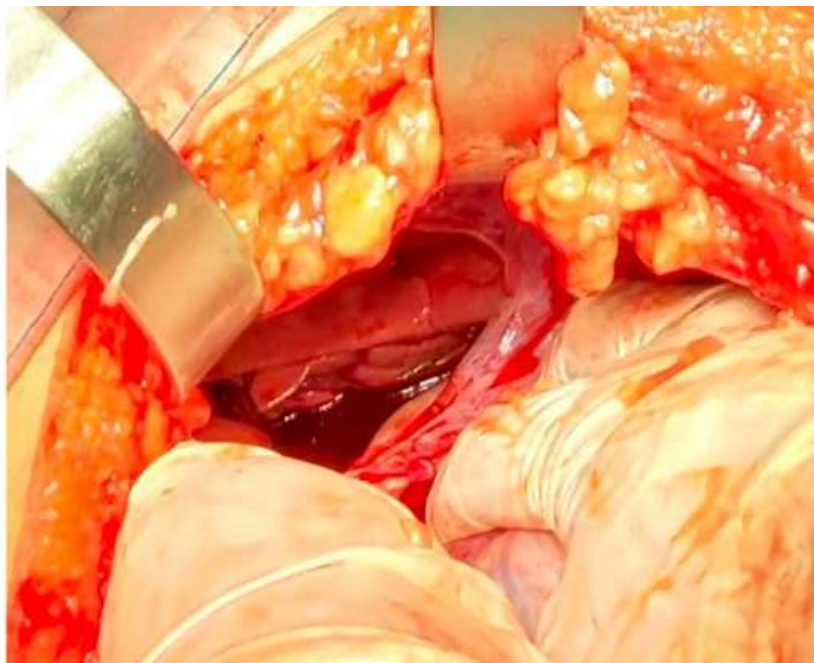


Figure 3. Intraoperative view of the left diaphragmatic defect (~12 cm) after reduction of the herniated stomach.

The diaphragm was repaired primarily with a continuous non-absorbable polypropylene suture (phrenorrhaphy) (Figure 4). Haemostasis was confirmed, a left chest tube was placed, and the abdominal wall was closed in layers. Operative time was

2.5 hours with an estimated blood loss of 800 mL; two units of packed red cells were transfused. The patient was transferred to the ward in a stable condition.



Figure 4. Primary diaphragmatic repair (phrenorrhaphy) with continuous non-absorbable suture.

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Postoperatively he remained haemodynamically stable. Because bedside ultrasound had shown persistent free fluid, a CT urogram was obtained on postoperative day 9, which excluded bladder leak and confirmed an intact diaphragmatic repair; the bladder injury was therefore managed conservatively with catheter drainage. A follow-up chest

radiograph showed re-expansion of the left lung and correct positioning of the repair (Figure 5). The chest tube was removed and oral intake resumed. He recovered without complications and was discharged in good condition, with outpatient follow-up.

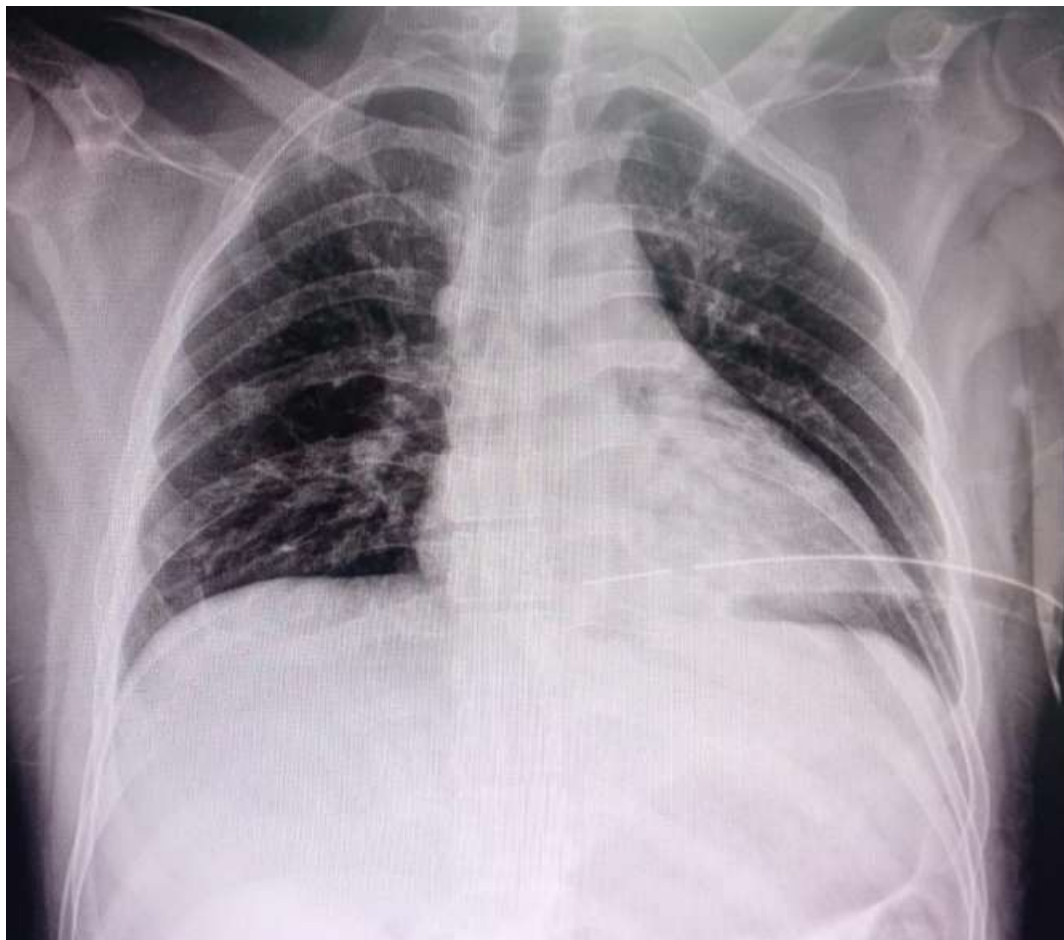


Figure 5. Postoperative chest radiograph showing re-expansion of the left lung and resolution of the intrathoracic herniation.

3. DISCUSSION

This case illustrates the classic features and management priorities of blunt TDI. Diaphragmatic injuries are graded by the American Association for the Surgery of Trauma (AAST) from grade I (contusion) to grade V ($>25\text{ cm}^2$ tissue loss); lacerations of 2–10 cm are grade III and those larger than 10 cm are grade IV [6]. Our patient's ~12 cm laceration with intrathoracic herniation lies at the grade III–IV interface and underlines the value of documenting the defect precisely for both prognosis and registry reporting.

Diagnosis remains the central challenge. Chest radiography is abnormal in fewer than half of cases and findings such as an elevated hemidiaphragm, an intrathoracic gastric bubble or a nasogastric tube curling into the chest are neither sensitive nor specific (4). Multidetector CT with multiplanar reconstruction is the imaging modality of choice, with reported sensitivity of 70–90%; signs include the "collar" and "dependent viscera" signs and direct

discontinuity of the diaphragm (1,4). In our patient CT unequivocally demonstrated the stomach within the left hemithorax, allowing definitive operative planning. A positive FAST in a patient with peritoneal signs reinforced the decision to operate without delay (5).

For acute TDI an abdominal approach through laparotomy is generally preferred because it allows reduction of herniated viscera, full assessment of associated intra-abdominal injuries, and tension-free repair (2,3). Most acute defects can be closed primarily with interrupted or continuous non-absorbable sutures; prosthetic mesh is reserved for large defects with tissue loss that cannot be approximated without tension (3,7). A thoracic approach or a combined strategy is more often required in the chronic, delayed presentation, where dense adhesions form between herniated viscera and thoracic structures (7). In the present case a continuous polypropylene phrenorrhaphy achieved a durable, tension-

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free closure, and postoperative imaging confirmed integrity of the repair.

The associated bladder injury deserves comment because management differs by anatomical pattern. The AAST grades bladder injury from contusion (grade I) to complex ruptures involving the trigone or bladder neck (grade V) (6). The critical distinction is between extraperitoneal ruptures—typically managed conservatively with urethral catheter drainage—and intraperitoneal ruptures, which require operative repair because of the risk of urinary peritonitis and urinoma (8,9). Our patient had a bladder-wall haematoma without leak; the absence of extravasation on CT urography allowed safe conservative management with catheter drainage, avoiding an unnecessary cystorrhaphy.

Beyond the technical points, this case reinforces two broader lessons. First, TDI is a marker of high-energy transfer, so a systematic search for concomitant thoracic, abdominal, pelvic and urological injuries is essential; here the diaphragmatic, gastric and bladder injuries coexisted with a pelvic fracture and retroperitoneal haematoma. Second, structured intraoperative documentation—including photographic capture of the defect and the repair, and explicit AAST grading—improves the quality of the record and of subsequent case reporting. A limitation of single case reports is the lack of generalisability; nevertheless, they remain valuable for uncommon injury patterns and for illustrating decision-making anchored in trauma guidelines.

4. CONCLUSION

Left traumatic diaphragmatic rupture with intrathoracic gastric herniation is an uncommon, easily missed injury that demands a high index of suspicion and prompt CT evaluation. An abdominal-first operative strategy enabled single-stage reduction and tension-free phrenorrhaphy, while the low-grade bladder injury was safely managed conservatively once leak had been excluded. Recognition of the injury pattern, guideline-based decision-making and complete documentation contributed to an uneventful recovery and discharge in good condition.

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