CASE REPORT

Tension pneumothorax due to perforated colon

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SUMMARY

A very rare case of traumatic diaphragmatic hernia is reported in a 65-year-old woman who presented 46 years after her initial thoracoabdominal injury with tension faecopneumothorax caused by a perforated colon in the chest cavity. She presented in a critical condition with severe respiratory distress, sepsis and acute kidney injury. She had a long-standing history of bronchial asthma with respiratory complications and had experienced progressive shortness of breath for the past year. A recent CT scan had excluded the presence of a diaphragmatic hernia but showed a significantly raised left hemidiaphragm. On admission, chest X-rays showed a significantly raised left hemidiaphragm and mediastinal shift, but the possibility of a diaphragmatic hernia with strangulated bowel in the chest was not suspected until the patient was reviewed by the surgical and intensive care unit consultants the next morning and a repeat CT performed. She had a successful outcome after her emergency operation.

BACKGROUND

Blunt trauma can uncommonly result in diaphragmatic hernia, which can occasionally cause acute life-threatening complications after remaining asymptomatic for many years. Although asymptomatic diaphragmatic hernia is a diagnostic challenge in patients with a history of thoracoabdominal injury who present with non-specific respiratory or gastrointestinal symptoms, this diagnosis should be suspected. CT scan is the investigation of choice. This case presentation is to highlight that strangulated post-traumatic diaphragmatic hernia is a rare cause of tension pneumothorax.

CASE PRESENTATION

A woman aged 65 years was brought to the emergency department of our hospital, with severe shortness of breath for a few days. She had experienced increasing shortness of breath for the past 12 months worsening to the extent that she could only walk 30–35 yards in her house. Her medical history was significant for long-standing bronchial asthma, paralysed left hemidiaphragm following a road traffic accident in 1969 (46 years ago), functional dysphonia and a strong family history of atopy. She had had previous admissions to hospital between 2004 and 2006, with severe acute asthma, pneumonia, pleural effusions and pneumothorax, and was regularly followed up by respiratory physicians. On her most recent visit to the clinic, it was noted that her symptoms of asthma were poorly controlled on regular medications and a CT of the thorax had been arranged for further assessment.

On her emergency admission, she was in severe respiratory distress with signs of severe sepsis and acute kidney injury; noted were heart rate of 124/min, blood pressure 97/54 mm Hg, respiratory rate 22/min and saturations of 89% on air. Abdominal examination was unremarkable.

The patient was resuscitated in line with the 'septic six protocol', and immediately assessed by the surgical and intensive care unit (ICU) on-call teams, which suspected severe chest sepsis. The complete lack of abdominal signs concealed the later discovered underlying colonic perforation. An immediate CT scan was contemplated but, due to acute renal failure, deferred until improvement in renal function with resuscitation. The patient was later transferred to a medical high-dependency unit for further management. However, she remained anuric despite fluid resuscitation, and further deteriorated overnight requiring inotropic infusion. Next morning, the patient was reviewed by the ICU and surgical consultants, who suspected diaphragmatic hernia with bowel perforation as the cause of septic shock, and arranged an urgent CT of the thorax and abdomen.

INVESTIGATIONS

Laboratory results revealed white cell count $29 \times 10^3/\mu\text{L}$, C reactive protein 433 mg/dL, haemoglobin 96 g/dL, urea 27, creatinine 412 and estimated glomerular filtration rate 9. Arterial blood gases showed severe acidosis. Chest radiograph demonstrated a gas filled shadow in the left pleural cavity, causing compression of the lung, and a shift of the trachea and mediastinum to the right ([figure 1](#)). CT of the thorax and abdomen confirmed a large left

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Figure 1 Gas-filled shadow in left pleural cavity, causing compression of lung and shift of trachea and mediastinum.

Figure 2 Large left diaphragmatic hernia and perforated large bowel causing tension pneumothorax.

diaphragmatic hernia and perforated large bowel causing tension pneumothorax (figures 2 and 3).

TREATMENT

The patient was in a precarious condition when she was taken to the operating theatre for emergency laparotomy and possible thoracotomy (p-possum score predicted mortality 96%).

Intraoperative findings revealed a clean peritoneal cavity with a large defect in the left hemidiaphragm, through which most of transverse colon with splenic flexure and omentum had herniated to the thorax. The spleen was quite large and abutted the diaphragmatic opening, making access quite difficult. On enlarging the diaphragmatic opening, the left pleural cavity was found filled with faecal fluid and gas under tension. It proved possible to deliver the herniated part of colon and omentum into the abdomen without recourse to thoracotomy. The procedure involved resection of the gangrenous and perforated part of the transverse colon with colostomy, splenectomy and thorough saline lavage of the pleural cavity, and repair of the diaphragm, with continuous non-absorbable (prolene) sutures, and insertion of apical and basal intercostal chest drains. The distal colonic stump was stapled and stitched adjacent to the end colostomy. The left lung fully expanded postoperatively (figure 4).

OUTCOME AND FOLLOW-UP

The patient had a prolonged stay in ICU and remained intubated for 3 weeks, requiring mechanical intubation, nasogastric

Figure 3 Large left diaphragmatic hernia and perforated large bowel causing tension pneumothorax (lung window).

Figure 4 Postoperative X-rays showing fully expanded left lung.

feeding and extended courses of antibiotics for her severe septic condition. She was shifted to the surgical ward on day 35, and finally discharged home after an extensive period of physiotherapy. During her recent clinic review, she appeared well recovered from her operation, with no respiratory or abdominal symptoms. She is planned for a regular follow-up and restoration of bowel continuity in due course.

DISCUSSION

Blunt or penetrating thoracoabdominal trauma uncommonly results in diaphragmatic injury. The reported incidence of diaphragmatic rupture after blunt trauma is 0.8–1.6%, whereas the incidence rises to 15% among patients with penetrating trauma.¹ The actual incidence rate of post-traumatic diaphragmatic hernia is undefined, as the preoperative diagnosis is normally a challenging process. Since it can remain asymptomatic for years, diaphragmatic hernia is usually identified if the patient is examined for other problems.² The published case reports reveal that 18% of blunt and 32% of penetrating injuries are diagnosed in a delayed fashion, generally more than 3 years after the initial trauma and sometimes as many as 40 years later.³ The blunt diaphragmatic trauma usually causes larger radial rupture compared to smaller injury caused by penetrating injury, and is hence more likely to present as delayed diaphragmatic hernia. The three phases of presentation of diaphragmatic rupture—acute, latent and obstructive—as described by Grimes, are well recognised.⁴ Patients in the latent phase may present with abnormal X-rays while being either asymptomatic or present with gastrointestinal or respiratory symptoms. Patients with obstructive phase often present months to years later with incarceration, obstruction, strangulation or perforation. Delayed presentation may be due to delayed detection or delayed rupture.⁵ A systematic review of the literature by Rashid *et al*⁶ revealed 17 cases of delayed presentation of diaphragmatic rupture ranging of a period of 24 hours to 50 years.

The patient we report had an extremely unusual presentation of post-traumatic diaphragmatic hernia. She remained asymptomatic for almost 46 years following blunt trauma, which is 4 years less than the longest ever reported interval between diaphragmatic rupture and repair.⁷ At the same time, she presented with the most serious complication of post-traumatic diaphragmatic hernia, ‘tension faeco-pneumothorax’, of which only 11 cases have been reported,⁸ with most of the patients presenting between 6 months and 8 years post injury.^{7 9 10} Our case therefore represents by far the latest interval between injury and this

most serious of complications. There was no available record of the primary thoracoabdominal injuries our patient suffered but she was managed conservatively and diagnosed as having paralysed left hemidiaphragm with longstanding raised diaphragm on follow-up imaging. She had worsening shortness of breath in the prior 12 months, which was put down as due to worsening of asthma, and a CT scan performed 4 months previously had revealed a static rise of the left hemidiaphragm but with no features of diaphragmatic hernia. Longstanding persistent intra-abdominal pressure on a weak diaphragm can ultimately lead to rupture of the diaphragm. Abrupt changes to the pressure gradients have been noted to result in asymptomatic hernias becoming acutely symptomatic.¹¹

Conventional CT has been reported to have a sensitivity of 14–82%, with a specificity of 87%.¹² Helical CT has increased sensitivity, 71–100%, with higher sensitivity on the left than on the right.¹³ CT findings indicative of diaphragmatic rupture include direct visualisation of injury, segmental diaphragmatic non-visualisation, intrathoracic herniation of viscera, collar sign and peridiaphragmatic active contrast extravasation.¹² However, most of these findings have been seen in acute traumatic ruptures. Approximately 23–73% of traumatic diaphragmatic ruptures can be detected by initial chest radiography, with an additional 25% found with subsequent films,¹³ however, only 33% of hernias are detected when interpreted by the trauma team leader at initial evaluation.¹⁴ CT confirmation is ideal if conditions permit, because the X-ray findings can mimic hydropneumothorax or consolidation, causing delay in diagnosis or inadvertent perforation of viscus in diaphragmatic hernia if an intercostal chest tube is placed.¹⁵

Left-side rupture is more common than right-side rupture (68.5% vs 24.2%), owing to hepatic protection and increased strength of the right hemidiaphragm. However, the increased prevalence of left-side hernias may also result from congenital weaknesses in points of diaphragmatic embryologic fusion. Fifteen per cent of bilateral acquired diaphragmatic hernias have also been reported.¹ The stomach is the most commonly herniated organ on the left side (80%), followed by the omentum, small intestine, colon and spleen,¹⁶ whereas the liver is most frequently herniated on the right side.² The standard surgical approach for diaphragmatic rupture is laparotomy or, less commonly, thoracotomy. Acute traumatic rupture is approached via laparotomy because concomitant intra-abdominal injuries are more likely to be present than are thoracic injuries (84% vs 53%).¹⁴ A transabdominal approach can be surgically demanding in long-standing hernias because the herniated contents tend to be firmly adherent to intrathoracic structures, and this is made worse if bowel strangulation and perforation is present. A combined thoracoabdominal approach is recommended in these patients. In our patient, we had prepared for thoracoabdominal extension but were able to manage surgically with an abdominal approach only, which underscores that this was probably an acute rupture. The use of non-absorbable sutures is widely recommended for repair of diaphragmatic defects,¹⁴ interrupted and continuous techniques are both equally effective,¹⁷ however, larger defects need a synthetic mesh.¹⁴ Thoracoscopic repair of diaphragmatic hernia in elective settings is an established technique in the hands of surgeons with advanced skills.

Mortality is low after elective repair but the mortality from ischaemic bowel secondary to strangulation may be as high as 80%,¹⁸ and surviving patients have prolonged hospital stay

requiring long periods of rehabilitation. Postoperative complications are formidable, occurring in 43.5% patients, mainly related to pulmonary complications.¹⁹

Learning points

- ▶ Post-traumatic diaphragmatic hernia should be suspected in patients with acute respiratory distress with abnormal chest X-ray who have known or suspected history of diaphragmatic injury.
- ▶ Strangulated diaphragmatic hernia can rarely present as tension pneumothorax.
- ▶ Exclude the possibility of diaphragmatic hernia before placing a chest tube for hydropneumothorax.
- ▶ Perforated colon in these circumstances may present without any abdominal signs.

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REFERENCES

- 1 Saladyga A, Milliken J. *Acquired diaphragmatic hernias*. emedicine.medscape.com/article/428055 (accessed 5 Jan 2016).
- 2 Sadrizadeh A, Maddah G, Nouri Dalouee M, *et al*. Delayed presentation of traumatic diaphragmatic hernia: the evaluation of surgical treatment results. *J Cardiothorac Med* 2015;3:288–92.
- 3 Cameron JL, Cameron AM. Diaphragmatic injury. In: *Current surgical therapy*. 10th edn. St Louis, MO: Mosby-Year Book, 2011:930–7.
- 4 Grimes O F. Traumatic injuries of the diaphragm. Diaphragmatic hernia. *Am J Surg* 1974;128:175–81.
- 5 Johnson CD. Blunt injuries of the diaphragm. *Br J Surg* 1988;75:226–30.
- 6 Rashid F, Chakrabarty MM, Singh R, *et al*. A review on delayed presentation of diaphragmatic rupture. *World J Emerg Surg* 2009;4:32.
- 7 Singh S, Kalan MM, Moreyra CE, *et al*. Diaphragmatic rupture presenting 50 years after the traumatic event. *J Trauma* 2000;49:156–9.
- 8 Ramdass MJ, Kamal S, Paice A, *et al*. Traumatic diaphragmatic herniation presenting as a delayed tension faecopneumothorax. *Emerg Med J* 2006;23:e54.
- 9 Kelly J, Condon E T, Kirwan W O, *et al*. Post-traumatic tension faeco-pneumothorax in a young male: case report. *World J Emerg Surg* 2008;3:20.
- 10 Kafih M, Boufettal R. A late post-traumatic diaphragmatic hernia revealed by a tension fecopneumothorax (a case report). *Rev Pneumol Clin* 2009;65(1):23–6.
- 11 Taheri MR, Stern EJ. "Delayed" right diaphragmatic rupture because of positive pressure mechanical ventilation. *Curr Probl Diagn Radiol* 2012;41:133–5.
- 12 Desir A, Ghaye B. CT of blunt diaphragmatic rupture. *Radiographics* 2012;32:477–98.
- 13 Sliker CW. Imaging of diaphragm injuries. *Radiol Clin North Am* 2006;44:199–211.
- 14 Hanna WC, Ferri LE, Fata P, *et al*. The current status of traumatic diaphragmatic injury: lessons learned from 105 patients over 13 years. *Ann Thorac Surg* 2008;85:1044–8.
- 15 Wadhwa R, Ahmad Z, Kumar M. Delayed traumatic diaphragmatic hernia mimicking hydropneumothorax. *Indian J Anaesth* 2014;58:186–9.
- 16 Ganie FA, Lone H, Lone GN, *et al*. Delayed presentation of traumatic diaphragmatic hernia: a diagnosis of suspicion with increased morbidity and mortality. *Trauma Mon* 2013;18:12–16.
- 17 Matesevych OY. Blunt diaphragmatic rupture: four years' experience. *Hernia* 2008;12:73–8.
- 18 Pross M, Manger T, Mirow L, *et al*. Laparoscopic management of a late-diagnosed major diaphragmatic rupture. *J Laparoendosc Adv Surg Tec A* 2000;10:111–14.
- 19 Alhadi SC, Mohammad IS, Rasool SIG, *et al*. Delayed presentation of traumatic diaphragmatic hernia: a case report. *IOSR J Dental Med Sci* 2013;8:71–3.

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