

### Diagnosis of traumatic rupture of the right hemidiaphragm by thoracoscopy

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Missed or delayed diagnosis of traumatic rupture of the diaphragm associated with blunt trauma remains frequent<sup>1</sup>. The diagnosis may be overlooked because of associated multiple injuries and, even with a high index of clinical suspicion, radiological investigation may be inconclusive. The advent of minimally invasive surgery has expanded diagnostic potential in both the abdomen and chest. A case of traumatic rupture of the right hemidiaphragm is presented in which a conclusive diagnosis was made at thoracoscopy.

#### Case report

A 36-year-old man was admitted from a peripheral hospital following a road traffic accident. His injuries included fractures of the right fifth, sixth and seventh ribs, L4 and sacrum, and an intertrochanteric fracture of the right hip. He also had a right haemothorax, which drained 1050 ml blood via a tube in the 3 days before transfer. Some 8 years previously the man had undergone total proctocolectomy with end ileostomy for ulcerative colitis, which was complicated by recurrent intra-abdominal sepsis. On admission he had a temperature of 38.2°C; the pulse rate was 100/min. Chest examination demonstrated dullness of the right base with bronchial breathing. The right leg was in a Thomas splint. Full blood count and general biochemical results were normal. Arterial blood gases showed hypoxia: the partial pressure of oxygen was 7.85 kPa and of carbon dioxide 5.14 kPa; the pH was 7.42. Chest radiography showed a generalized opacity in the right base that obscured the right hemidiaphragm. Abdominal ultrasonography was normal.

The patient was commenced on 1.2 g Augmentin (1 g amoxycillin plus 200 mg clavulanic acid; Beecham, Brentford, UK) intravenously three times daily and 40 per cent oxygen by face mask as treatment for right lower lung contusions and associated atelectasis. The following day he underwent internal fixation of the right hip fracture. At 3 days after admission repeat chest radiography clearly demonstrated an elevated right hemidiaphragm (Figure 1). Ultrasonographic examination could not confirm a diagnosis of ruptured hemidiaphragm. Intra-abdominal injection of 200 mBq <sup>99m</sup>technetium–tin colloid failed to demonstrate contrast in the chest as a result of previous adhesions.

As a diagnosis of ruptured right hemidiaphragm was still considered likely, the patient underwent right thoracoscopy. Under general anaesthesia using a double-lumen endobronchial tube, 1.5 litres carbon dioxide were introduced into the right pleural space following collapse of the right lung. A 0° laparoscope (Karl Storz, Tuttlingen, Germany) attached to an Olympus camera (OTV-S2; KeyMed, Dublin, Ireland) and imaging system was introduced through a 10-mm Surgiport (US Surgical, Norwalk, Connecticut, USA) cannula in the sixth intercostal space in the anterior axillary line. Using a blunt retractor introduced through a 5-mm cannula, the lung lobes were identified and retracted to demonstrate herniated liver in the chest cavity (Figure 2). A minithoracotomy incision was made through the seventh intercostal space, and repair of the diaphragmatic hernia was carried out using two layers of 0 Prolene (Ethicon, Edinburgh, UK) sutures. A tear in the pericardium extending along the phrenic nerve for 5 cm was also identified, indicating the possibility of concomitant phrenic nerve palsy. The patient was discharged 14 days later. The right hemidiaphragm remained elevated with no movement on screening, suggesting a persistent phrenic nerve palsy.



Figure 1 Chest radiograph 6 days after admission, demonstrating an elevated right hemidiaphragm

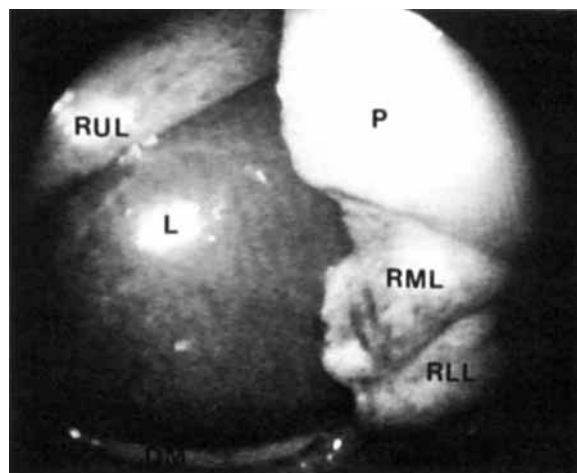


Figure 2 Thoracoscopy showing herniated liver in the right chest cavity. RUL, right upper lobe of lung; RML, right middle lobe of lung; RLL, right lower lobe of lung; L, liver; DM, diaphragmatic margin; P, pericardium

#### Discussion

This case typifies the diagnostic difficulties in confirming a ruptured right hemidiaphragm in the multiple trauma victim despite a high index of clinical suspicion. Conventional diagnosis rests on chest radiography showing a raised hemidiaphragm<sup>2</sup>. Although ultrasonography is frequently helpful<sup>3</sup>, a conclusive diagnosis may be difficult. Computed tomography may also be useful, but difficulty can arise in delineating the diaphragm from the liver with right-sided ruptures<sup>4</sup>. Other diagnostic options include magnetic resonance imaging, which still requires further evaluation, and injection of radionuclide tracers into the abdomen, which was unsuccessful here because of postoperative adhesions.

Diagnostic laparoscopy can be useful and, in the case of suspected injuries to other abdominal organs, may be the preferred endoscopic diagnostic aid. Contraindications to laparoscopy may include previous abdominal operations or associated thoracic and cerebral injuries. Arendrup and Jensen have commented on the theoretical usefulness of thoracoscopy

in the identification of diaphragmatic hernia but have not reported any personal experience<sup>5</sup>. The present case confirms the ease and usefulness of thoracoscopy in the evaluation of the patient with trauma. Experience in this case would suggest that thoracoscopy should be considered when conventional radiological measures are unhelpful in the diagnosis of traumatic rupture of the diaphragm.

## References

1. Grimes OF. Traumatic injuries of the diaphragm. *Am J Surg* 1974; **128**: 175–81.
2. Johnson CD. Blunt injuries of the diaphragm. *Br J Surg* 1988; **75**: 226–30.
3. Somers JM, Gleeson FV, Flower CD. Rupture of the right hemidiaphragm following blunt trauma: the use of ultrasound in diagnosis. *Clin Radiol* 1990; **42**: 97–101.
4. McElwee TB, Myers RT, Pennell TC. Diaphragmatic rupture from blunt trauma. *Am Surg* 1984; **50**: 143–9.
5. Arendrup HC, Jensen BS. Traumatic rupture of the diaphragm. *Surg Gynecol Obstet* 1982; **154**: 525–30.

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### Easy technique for cholangiography during laparoscopic cholecystectomy

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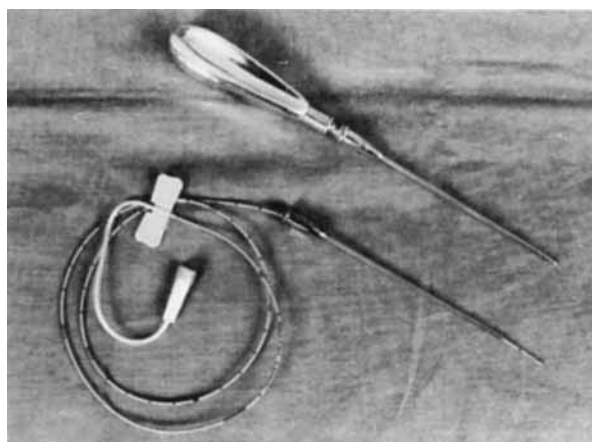
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The authors routinely use operative cholangiography during laparoscopic cholecystectomy to establish the presence of choledocholithiasis, which is then dealt with endoscopically, and to define the bile duct anatomy, preventing bile duct injury. The Tilley–Lichtwitz trocar and cannula (Downs Surgical, Sheffield, UK), commonly used for maxillary antral lavage, facilitate the placing of a ureteric catheter into the cystic duct.

#### Surgical technique

The Tilley–Lichtwitz trocar and cannula are introduced through the abdominal wall under direct vision, in the mid-clavicular line, just under the ribs. A no. 4 ureteric catheter snugly fits a 7-Fr cannula and a no. 5 catheter an 8-Fr cannula (*Figure 1*). The ureteric catheter can then be directed easily using the metal cannula aimed towards the cystic duct; the latter is then cannulated in the normal way.



**Figure 1** a Tilley–Lichtwitz trocar and cannula. b A ureteric catheter with attached 'butterfly' is seen placed through the cannula, the trocar having been removed

#### Discussion

The use of this instrument allows easy placement of the cholangiogram catheter within the abdominal cavity and the rigidity of the metal cannula is useful in facilitating manipulation. Its use in preference to a disposable intravenous cannula is recommended.

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