Case Reports

Spontaneous neutrocytic hepatic hydrothorax without ascites

A. A. ABBA*†, M. A. LAAJAM* AND S. A. ZARGAR†

Department of Medicine, College of Medicine, King Saud University, and ‡Department of Medicine, Riyadh Medical Complex, Riyadh, Kingdom of Saudi Arabia

Introduction

Pleural effusion occurs infrequently in patients with cirrhosis of the liver, almost always in the presence of clinically obvious ascites. Although the mechanism of fluid transfer into the thorax is controversial, the main factor seems to be the presence of defects in the membranous parts of the diaphragm. This is usually on the right side. Subsequent infection of the pleural fluid is believed to be due to either migration of infected ascitic fluid or by haematogenous spread.

The present case report describes a case where a right-sided hepatic hydrothorax without ascites is complicated by bacterial infection. To the authors' knowledge, this is the first report in the literature.

Case Report

A 45-year-old male Egyptian teacher presented with progressive shortness of breath of 4 weeks duration. One week prior to confinement, he had mild but continuous fever. He had no other symptoms referable to the respiratory system. He was treated for bilharrziasis as a child and was diagnosed to have hepatitis C virus infection 1 yr prior to hospitalization. He denied alcohol ingestion or blood transfusion, and had never smoked cigarettes.

On examination, the patient was found to be in respiratory distress with a respiratory rate of 30 breaths min^{-1}, febrile (temperature 38·5°C), and jaundiced with stigmata of chronic liver disease. Examination of the abdomen revealed hepatomegaly with a span of 16 cm and splenomegaly of 5 cm. Examination of the chest revealed signs of massive

right-sided pleural effusion. Cardiovascular and central nervous system examination was unrevealing.

Complete blood count showed white cell count of $30·8 \times 10^9$ 1^{-1} with neutrophil leucocytosis (90%), haemoglobin of 143·g 1^{-1} and platelet count of 65×10^9 1^{-1}. With treatment, leucocytosis was reversed with a white cell count of $6·8 \times 10^9$ 1^{-1}. He remained thrombocytopenic. There was marked hypoxia (PO_2 61·7 mmHg) and hypocapnia (PCO_2 27·5 mmHg). Urea, electrolytes, creatinine and plasma glucose were within normal limits. Initial liver function tests revealed total protein of 56·3 g 1^{-1}, albumin 21·9 g 1^{-1}, alanine aminotransferase 121 IU 1^{-1}, aspartate aminotransferase 91 IU 1^{-1}, total bilirubin 58 μmol 1^{-1} direct bilirubin 23 μmol 1^{-1}, prothrombin time 28·9 s (control 12·3 s) and International normalized ratio (INR) 5·0. Urine analysis revealed no proteinuria. Serology for anti-hepatitis C antibody was positive.

Chest X-ray posteror–anterior view (Plate 1) shows massive right-sided pleural effusion; aspiration of which revealed straw-coloured transudate – total protein 7·5 g 1^{-1} (cf. serum protein 51·3 g 1^{-1}) lacate dehydrogenase 50 U 1^{-1} (cf. plasma 518; and upper limit of normal 683) and glucose of 5·4 mmol 1^{-1}. The cell count was 950 cells mm^{-3} (95% neutrophils and 5% lymphocytes). After 2 days of antibiotic therapy, the fluid remained a transudate with markedly reduced cells (250 mm^{-3}; 80% neutrophils; 20% lymphocytes). Gram's stain was negative and culture of the fluid did not grow any organisms including acid-fast bacilli. Mantoux test was negative. Ultrasound (Plate 2) and computed tomographic (CT) scan of the abdomen showed hepatosplenomegaly with coarse echotexture, portal fibrosis, dilated portal veins and right pleural effusion. There was no ascites. Lateral decubitus film and CT of the chest after initial aspiration did not reveal any underlying
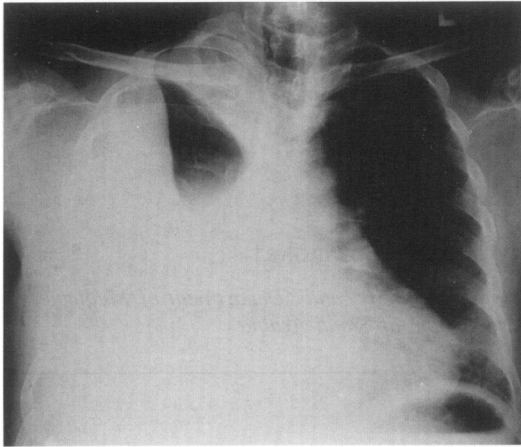
Plate 1 Postero-anterior chest X-ray showing massive right pleural effusion.
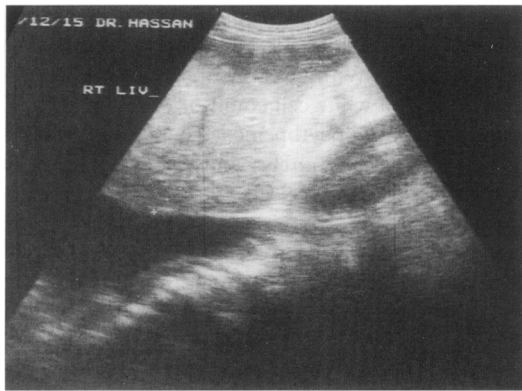

Plate 2 Ultrasound scan of the abdomen demonstrating coarse hepatic echotexture, right pleural effusion and lack of ascites.

pulmonary lesion. Upper gastrointestinal endoscopy revealed Grade III oesophageal varices with gastric and duodenal erosions. Electrocardiogram and echocardiogram were normal. Urinary protein was negative. Intraperitoneal injection of technetium sulphur colloid (Tc_m^{99}) demonstrated rapid transfer of radioactive material to the right hemithorax within 10 min (Plate 3).

PROGNOSIS AND FOLLOW-UP

The patient responded to therapeutic pleural aspiration, salt restriction, diuretics, albumin infusions and antibiotic therapy with cefotaxime. He was afebrile after 2 days, leucocytosis resolved in 1 week and pleural effusion cleared in 2 weeks. He was maintained on spironolactone 100 mg daily without recurrence of effusion over a 5-month follow-up period.

Discussion

The incidence of pleural effusion in cirrhotics is variable but a reasonable estimate is 4–6% (1). It almost always occurs in the presence of clinically demonstrable ascites. Although pathogenesis of pleural effusion may be multifactorial, it is widely believed that defects in the membranous part of the diaphragm play the most important role. The effusion is right-sided in 67% of cases, left-sided in 16% of cases and bilateral in 16% of cases (2). Hepatic hydrothorax defined as pleural effusion in a cirrhotic patient in which a pulmonary or cardiac cause is excluded was first reported in 1963 (3). Twelve cases without ascites have since been reported in the world literature. Since clinical examination could miss minimal ascites, some cases reported before the advent of ultrasonography could well have had clinically undetectable ascites. Patients who develop hepatic hydrothorax without ascites are believed to have defect(s) in the diaphragm, and movement of the fluid is assisted by the cyclical negative pressure during respiration (4). Diagnosis can be established rapidly by radionuclide imaging after intraperitoneal injection of 99_m technetium sulphur colloid, which demonstrates movement of the dye from the abdomen to the chest as in the present case. The movement is unidirectional since intrapleural injection of dye is not recovered in the peritoneum. It is also believed to be specific to hepatic hydrothorax as it does not occur in pulmonary or cardiac causes of pleural effusions (5). Other methods of demonstrating such movement of fluid include intraperitoneal injection of radiolabelled albumin and recovery of the same in the thorax, induction of pneumoperitoneum and demonstration of pneumothorax (2) and, more recently, real-time ultrasonography has been shown to demonstrate such diaphragmatic defects (6).

The fluid in the pleural space could be infected, as could the ascitic fluid if present. Xiol *et al.* (7) studied 11 episodes of spontaneous bacterial empyema (SBEM) in eight patients using the following as inclusion criteria: (1) a compatible clinical course, presence of fever or shock; (2) positive pleural fluid culture or, if negative, pleural fluid polymorphs count >500 cells mm^{-3}; (3) no evidence of pneumonia on a chest radiograph; and (4) presence of pleural effusion before the infective episode. If any of this evidence was not applicable, a transudative pleural fluid at the time of infection was included. The present case satisfies all but one (4) of the above criteria. All 25 episodes of SBEM in 20 cases reported to date occurred in patients with concomitant ascites (7–17).
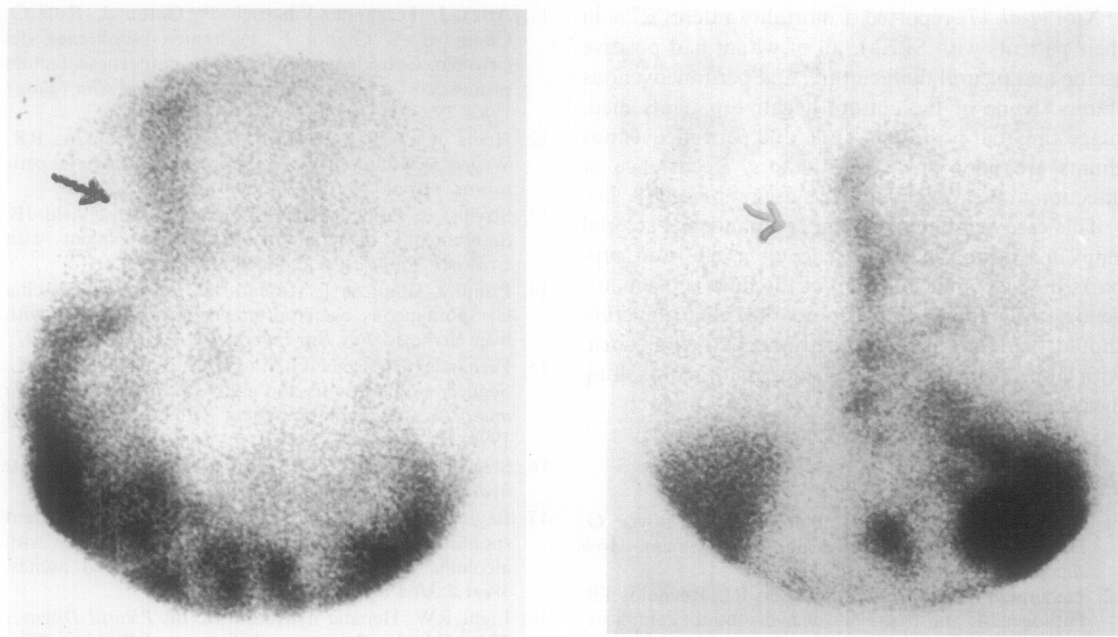
Plate 3 Radionuclide scan of the chest and abdomen after intraperitoneal injection of 99_m technetium sulphur colloid showing passage of the dye into the right hemithorax. (a) anterior view and (b) posterior view.

The present patient is the first to present with infected pleural fluid in the absence of ascites. Although migration of already infected ascitic fluid (as a part of spontaneous bacterial peritonitis) is considered as a likely cause of pleural infection, haematogenous spread probably plays a greater role. The latter, in fact, is believed to be the most likely pathogenesis of SBP rather than direct migration of organisms into the peritoneal cavity from the bowel wall. The present case supports this theory. Enterococci are the most common organisms isolated, *Escherichia coli* accounting for 61% (11 of 18 cases); *Clostridium perfiringens* in 11% (two of 18) and one each of *Klebsiella pneumoniae, Streptococcus agalactiae, Staphylococcus aureus, Pasturella multicoda* and *Aeromonas hydrophila.* As many as seven of 25 (28%) pleural aspirates were culture negative (classified as culture negative SBEM as in the present case). It must be emphasized that pleural aspirates should be inoculated into the blood culture bottles directly for both aerobic and anaerobic cultures. The yield from blood and ascitic fluid cultures is four of 14 (28·5%) and 13 of 20 (65%), respectively (7 17). Management is initially medical, aiming at controlling infection and reducing or stopping formation of ascites. Antibiotic therapy with any of the β-lactams has been used successfully (7) in addition to fluid and salt restriction, diuretic therapy and therapeutic thoracentesis. The combination of furosemide 40 mg and spironolactone 100 mg orally seems to be ideal (18). Repeated thoracocentesis is probably not beneficial as there is rapid re-accumulation. Tube thoracostomy may lead to rapid life-threatening volume depletion and is considered by some as a relative contraindication (19). This is probably true where ascites is prominent, as tube thoracostomy can lead to drainage of ascitic fluid within minutes (18).

Since parenteral tetracycline is no longer available, thoracoscopic pleurodesis with talc with or without biological glue has been used successfully by Monroux *et al.* (20) and Vargas *et al.* (21). Surgical repair of the diaphragmatic defects has been used as a means of controlling refractory hydrothorax (5). Not unexpectedly, patients without pre-operative ascites may develop ascites post-operatively, which may lead to failure of the repair. Pleuro-venous shunt has also been shown to control hepatic hydrothorax (22). Pleurodesis is usually required as an adjunct to therapy. Transjugular intrahepatic portosystemic stent shunt (TIPS) is used to control variceal haemorrhage. Recently, this procedure has been reported to successfully control refractory hepatic hydrothorax in six patients without any serious complications (23, 24).

Xiol *et al.* (7) reported a mortality rate of 27% in their patients with SBEM, all of whom had positive ascitic and pleural fluid culture, and peritoneovenous shunts. None of the culture negative patients died, suggesting that positive cultures and peritoneovenous shunts are poor prognostic factors. Recurrence of infection in the pleural fluid has been reported (8, 17).

This case demonstrates that spontaneous bacterial empyema occurs in the absence of ascites and supports the view that infection of the fluid is haematogenous. All patients with a compatible clinical picture should therefore be considered and treated as such, with appropriate antibiotics and ascites-controlling measures.

References

1. Alberts WM, Salem, AJ, Solomon DA, Boyce G. Hepatic hydrothorax: cause and management. *Arch Intern Med* 1991; **151:** 2383–2388.
2. Lieberman FL, Hidemura, R, Peters RL, Reynolds TB. Pathogenesis and treatment of hydrothorax complicating cirrhosis and ascites. *Ann Intern Med* 1966; **64:** 341–351.
3. Case Records of Massachusetts General Hospital Case 10 – 1963 *N Eng J Med* 1963; **368:** 320–325.
4. Chen A, Yat-Sen H, Yen-Chang T, Hung-Shang T, Tung-Chao C. Diaphragmatic defect as a cause of massive hydrothorax in cirrhosis of the liver. *J Clin Gastroenterol* 1988; **10:** 663–666.
5. Rubinstein D, McInnes IE, Dudley FJ. Hepatic hydrothorax in the absence of clinical ascites: diagnosis and management. *Gasteroenterology* 1985; **88:** 188–191.
6. Raju EP, Rao PN, Venkateswarlu J, Subhashini S. Ultrasound documentation of diaphragmatic rent in hepatic hydrothorax. *Indian J Gasteroenterol* 1989; **8:** 111–112.
7. Xiol X, Castellote J, Baliellas C, Ariza J, Roca AG, Guardiola J, Casias L. Spontaneous bacterial empyema in cirrhotic patients. Analysis of eleven cases. *Hepatology* 1990; **11:** 365–370.
8. Flaum MA. Spontaneous bacterial empyema in cirrhosis. *Gasteroenterology* 1976; **70:** 416–417.
9. Murray M, Marks SJ. Spontaneous bacterial empyema, pericarditis and peritonitis in cirrhosis. *Gasteroenterology* 1977; **72:** 772–773.
10. Mirouze D, Juttner HU, Reynolds TN. Left pleural effusion in patients with chronic liver disease and ascites. *Dig Dis Sci* 1981; **26:** 294–298.
11. Ariza J, Fernandez-Viladrich P, Garau J, Rufi G, Casanova A, Gudiol F. Peritonitis espontanea del cirrotico. Consideraciones sobre su patogenesis factors pronosticos: a proposito de 59 cases. *Med Clin (Basc)* 1982; **79:** 305–310.
12. Hoefs JC, Canawati HN, Sapico FL, Hopkins RR, Weiner J, Montgomerie JZ. Spontaneous bacterial peritonitis. *Hepatology* 1982; **2:** 399–407.
13. Streifler J, Pitlik S, Dux S, Garty M, Rosenfield JB. Spontaneous bacterial pleuritis in a patient with cirrhosis. *Respiration* 1984; **4b:** 382–385.
14. Primo J, Hinojosa J, Moreno MJ, Ferreras I, Sanchia C. Spontaneous bacterial empyema in a patient with liver cirrhosis. *Rev Esp Enferm Dig* 1991; **79:** 296–297.
15. Fernandez-Esparrach G, Mascaro J, Rota R, Valerio L. Septicemia, peritonitis and empyema due to *Pasturella multocida* in a cirrhotic patient (letter). *Clin Infect Dis* 1994; **18:** 486.
16. Steciw A, Colodny SM. Empyema due to *Aeromonas hydrophilia. Clin Infect Dis* 1994; **18:** 474–475.
17. Baylor PA, Bobba VV, Gian PD, Gittin N. Recurrent spontaneous infected pleural effusion in a patient with alcoholic cirrhosis, hepatic hydrothorax and ascites. *West J Med* 1988;; **149:** 216–217.
18. Light RW. Hepatic hydrothorax. In: *Pleural Diseases* Third Edition. Baltimore: Williams and Wilkins, 1995, p. 87.
19. Runyon BA, Greenblad M, Ming RHC. Hepatic hydrothorax is a relative contraindication to chest tube insertion. *Am J Gastroenterol* 1986; **81:** 566–567.
20. Mouroux J, Hebuterne X, Perrin C *et al.* Treatment of pleural effusion of cirrhotic origin by videothoracoscopy. *Br J Surg* 1994; **81:** 546–547.
21. Vargas FS, Milanez JRC, Filomeno LTB, Feranndex A, Jatene A, Light RW. Intrapleural talc for the prevention of benign or undiagnosed pleural effusion. *Chest* 1994; **106:** 1771–1775.
22. Narita K, Iwanami H, Ikeda N *et al.* A case of hepatic hydrothorax treated by pleuro-venous shunt. *Kyobu-Geka* 1992; **45:** 1205–1208.
23. Haskal ZJ, Zuckerman J. Resolution of hepatic hydrothorax after transjugular intrahepatic portosystemic shunt (TIPS) placement. *Chest* 1994; **106:** 1293–1295.
24. Strauss RM, Martin LG, Kaufman SL, Boyer TD. Transjugular intrahepatic portosystemic shunt for the management of symptomatic cirrhotic hydrothorax. *Am J Gastroenterol* 1994; **89:** 1520–1522.