Reminder of important clinical lesson

A simple chest drain gone wrong: a near miss!

Ricky Frazer, Crawford Deane, Ramsey Sabit

University Hospital Llandough, Penlan Road, Llandough, UK

Correspondence to Crawford Deane, crdeane@gmail.com

Summary

This is a case of a 45-year-old woman, with known alcoholic liver disease who presented with a large right-sided pleural effusion. A pleural tap was performed followed by insertion of an intercostal drain. 7 litres were drained over 4 h and only 300 ml of 20% albumin were administered with the patient becoming acutely short of breath and requiring admission to the intensive treatment unit due to the development of the known and recognised complication of re-expansion pulmonary oedema. The patient required continuous positive airway pressure in an intensive care setting but made a good recovery. It is important to consider re-expansion pulmonary oedema in patients who become acutely short of breath during drainage of pleural fluid or air. Steps should be made to ensure that drainage of large volumes of fluid are performed in a controlled manner to avoid this preventable complication.

BACKGROUND

This patient had a relatively simple procedure performed and developed a known but rare consequence which necessitated admission to intensive treatment unit (ITU). Clearly, in this case the resulting complication was preventable. It is important to remind medical staffs that patients who have intercostal drains in situ need to be managed with close observation. Furthermore, junior doctors who may be relatively unfamiliar with managing such patients should be aware of this potentially life-threatening complication and should know how to recognise it and treat it.

CASE PRESENTATION

We present a case of a 45-year-old female patient who was referred by her general practitioner with worsening shortness of breath (SOB) and the clinical finding of a large right pleural effusion. The patient had a 2-day history of progressive SOB which worsened on lying flat and on exertion. She described a mild unproductive cough and had no previous similar symptoms previously. The patient was known to have decompensated alcoholic liver disease with ascites and oesophageal varices and had several previous admissions under the gastroenterologist for drainage of the ascitic fluid. She no longer consumed alcohol and was on the waiting list for a liver transplant. She was a non-smoker who currently lived with her husband. On clinical examination, the patient was mildly icteric, had palmar erythema and was clubbed. Respiratory examination revealed a dull percussion note with decreased breath sounds throughout the right side of the chest. The abdomen was distended with shifting dullness and gross ascites. Cardiovascular examination revealed, a normal jugular venous pressure with mild pitting pedal oedema.

INVESTIGATIONS

Routine bloods on admission: haemoglobin 12.1 g/dl, white cell count $5.3 \times 10^9/l$, mean corpuscular volume 95

fl, platelets $223 \times 10^9/l$, Na 127 mmol/l, K 4.6 mmol/l, urea 3.1 mmol/l, creatinine 81 $\mu\text{mol/l}$, C reactive protein 8 mg/l, bilirubin 22 $\mu\text{mol/l}$, alanine aminotransferase 29 U/l, alkaline phosphatase 88 IU/l, albumin 29 g/l.

Pleural tap: lactate dehydrogenase 161 U/l, protein 15 g/l, no malignant cells.

Admission chest x-ray (CXR) report: total opacification of the right hemithorax without significant mediastinal shift, consistent with a large effusion (figure 1).

Figure 1 Chest x-ray on presentation of the patient to the medical assessment unit.

Figure 2 Chest x-ray on ward prior to transfer to intensive treatment unit.

DIFFERENTIAL DIAGNOSIS

- ▶ Decompensated liver disease
- ▶ Parapneumonic effusion
- ▶ Lung cancer.

TREATMENT

An intercostal chest drain was inserted without complication, under consultant supervision at 17:00 and a plan made for the administration of 100 ml of 20% albumin for every 1 litre drained. The patient was reviewed at 19:45 by the on-call FP1 doctor as the patient complained of feeling more wheezy and short of breath after having received 200 ml of albumin and having 2 litres drained. The plan made at this time was to repeat the CXR later and continue drainage (figure 2). A further request was made from the nursing staff to have patient reviewed at 21:30 as the patient was now much more short of breath. The patient was reviewed at 22:55 by the FP2 doctor, as the patient complained of feeling very sweaty and 'drowning in fluid'. The doctor at this point documented that the patient was in 'acute respiratory distress'. The examination findings included fine crackles at the left and right lung bases, more prominent on the right. Oxygen saturations were 81% on 10 litres of oxygen, respiratory rate of 40 breaths/min, blood pressure was recorded at 80/42 mm Hg and the heart rate was 90/min. At that point, seven litres of pleural fluid had been drained over 4 h with only 3×100 ml of 20% albumin having been administered. The patient was subsequently reviewed by the medical registrar at 23:20. The case was discussed with the on-call consultant who asked for the ITU to review the patient in the ward. The drain was clamped and the patient was transferred to the ITU where an arterial line was inserted and the patient received continuous positive airway pressure (CPAP) overnight.

OUTCOME AND FOLLOW-UP

The following morning, the patient's SOB had improved considerably and she was transferred out of ITU to ward based care. A CT scan was performed and showed re-expansion pulmonary oedema but no gross underlying pathology to explain the pleural effusion. The patient's

Figure 3 Chest x-ray prior to discharge.

SOB improved further over the next 3 days and the drain was removed. A CXR was then performed and showed no residual pleural effusion or pulmonary oedema (figure 3). The patient was discharged with follow-up in 6 weeks. Since the discharge, the patient has had no further respiratory symptoms.

DISCUSSION

Here we present a case of re-expansion pulmonary oedema secondary to large volume drainage of pleural fluid over a relatively short time period. On surveying the literature, we see that while rare, there are other similar case reports outlining the development of this complication in large pleural drainage. A large study in 2008, looking at the question: does re-expansion pulmonary oedema exist?, found 233 reported cases and concluded that re-expansion pulmonary oedema following pneumothorax and effusion occurred in less than 1% in most studies.¹ The underlying mechanism remains poorly understood but is thought to be due to a combination of rapid pulmonary re-expansion with concurrent mechanical alveolar injury, decrease in surfactant and regional lung tissue hypoxaemia, inflammatory cell migration and release of inflammatory mediators.² The current British Thoracic Society (BTS) guidelines suggest <1.5 litres of pleural fluid should be drained at a time. The majority of cases of re-expansion pulmonary oedema occur in patients with a prolonged duration of lung collapse (between 3 and 7 days) and these patients require particularly close observation during drainage. If clinical signs of re-expansion pulmonary oedema become apparent, prompt recognition and institution of supportive measures are important, such as initiation of CPAP or even mechanical ventilation in some cases.³ The best clinical approach to re-expansion pulmonary oedema is an

Learning points

- ▶ Junior doctors and nursing staff need to be aware of the consequence of large volume drainage over a short time period.
- ▶ While rare, re-expansion pulmonary oedema is a recognised complication which can be life threatening.
- ▶ In patients where chest drains are inserted at the end of normal working hours, it is vital that a comprehensive plan is put in place for management of the chest drain.
- ▶ Adherence to BTS guidelines will help ensure the patient's safety.

awareness of the potential complication and close adherence to the BTS guidelines to ensure its prevention.

Competing interests None.

Patient consent Obtained.

REFERENCES

1. **Echevarria C**, Twomey D, Dunning J, *et al*. Does re-expansion pulmonary oedema exist? *Interact Cardiovasc Thorac Surg* 2008;**7**:485–9.
2. **Stawicki PS**, Sarani B, Benjamin M, *et al*. Reexpansion pulmonary edema. *OPUS 12 Scientist* 2008;**2**:29–31.
3. **Conen A**, Joos L, Bingisser R. Ipsilateral reexpansion pulmonary edema after drainage of a spontaneous pneumothorax: a case report. *J Med Case Reports* 2007;**1**:107.

This pdf has been created automatically from the final edited text and images.

Copyright 2011 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit

<http://group.bmj.com/group/rights-licensing/permissions>.

BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Please cite this article as follows (you will need to access the article online to obtain the date of publication).

Frazer R, Deane C, Sabit R. A simple chest drain gone wrong: a near miss!. *BMJ Case Reports* 2011;10.1136/bcr.12.2010.3563, date of publication

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow