CASE REPORT

Pleural infection: a case where clinical improvement was misleading

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SUMMARY

A 28-year-old Gurkha soldier presented with signs of severe chest sepsis and respiratory distress. High-flow oxygen, broad-spectrum intravenous antibiotics and intravenous fluids were started immediately. Bedside thoracic ultrasound demonstrated a moderate right pleural effusion suggestive of an empyema. A pleural aspirate was borderline for pleural infection, therefore, a chest drain was inserted and the patient was transferred to high dependency. Within 48 h the patient clinically improved. Three weeks later, a persistently raised C reactive protein and indeterminate right lower lobe radiographic changes was observed. Video-assisted thorascopic surgery was subsequently performed. Although technically difficult, a large amount of pus was drained from the pleural cavity. The patient was discharged, returning to normal army duties 8 weeks later. Follow-up chest radiographs showed complete resolution of the empyema and no evidence of scarring. The CRP normalised to <1.

BACKGROUND

Pleural infection is frequently encountered with an approximate incidence of up to 80 000 cases in the UK and the USA per year combined.¹ Morbidity and mortality associated with pleural infection is high.¹ In the UK, approximately 20% require surgery to recover within 12 months of their pleural infection and overall 20% of patients die from pleural empyema.¹

Given the high mortality and morbidity associated with pleural infection, this case provides an important reminder to clinicians to aim for as much resolution of a pleural infection as possible, where appropriate.

If a patient has improved clinically, the underlying pleural infection may persist. Monitoring inflammatory marker trends (eg, CRP) may be beneficial in assessing a patient's response to treatment. Furthermore, observing resolution of pleural fluid on chest radiograph, thoracic CT or ultrasound may also help monitor a patient's progress. Patients who have failed to improve after 5–7 days of intravenous antibiotics and chest tube drainage should be considered for early thoracic surgical intervention and surgical drainage of the infected pleural collection where appropriate.¹

CASE PRESENTATION

A 28-year-old Gurkha soldier from Nepal presented with a 2-week history of progressively worsening shortness of breath, cough, haemoptysis, pleuritic chest pain and a high fever. He had previously presented to another hospital 2 weeks earlier

with a cough and hot sweating episodes and discharged following a normal chest radiograph on a 7-day course of co-amoxiclav 500/125 mg for a lower respiratory tract infection (LRTI).

The patient had no medical history and was normally fit and well and was not taking any regular medications. He was a non-smoker and did not drink alcohol.

On readmission, the patient was haemodynamically compromised and in respiratory distress with the following bedside observations: Temperature 38.9°C, blood pressure 108/64 mm Hg, pulse 120, respiratory rate 40, peripheral oxygen saturations of 92% on 15 l of oxygen delivered via a non-rebreather mask. An arterial blood gas with the same oxygen delivery showed the following: pH 7.26, PCO₂ 3.8 kPa, PO₂ 10.1 kPa and lactate 4.0.

Crystalloid intravenous fluids and piperacillin with tazobactam 4.5 g every 8 h were started promptly in the emergency department.

A chest radiograph demonstrated a right-sided dense opacity suggestive of a pleural effusion. Bedside thoracic ultrasound confirmed a moderate unilateral pleural effusion suggestive of an empyema. Pleural aspiration revealed a turbid orange fluid with a pH of 7.22 which was sent for biochemical and microbiological analysis. In case of empyema, the decision was made in the emergency department to insert a straight, 28 French, polyvinyl chloride intercostal chest tube via blunt dissection and the patient was transferred to a high dependency unit.

Pleural fluid indices later confirmed an exudative pleural effusion. Pleural fluid microscopy, bacterial culture, acid-fast bacilli (AFB) and cytology were all negative. Three separate sputum samples were also negative for bacterial culture and AFB. Serum respiratory screen for influenza A/B, adenovirus, *Mycoplasma pneumoniae*, psittacosis, legionella and *Coxiella burnetii* were all negative. Urinary legionella and pneumococcal antigen were also negative.

The patient clinically improved within 48 h of the above treatment and tracheal intubation was avoided. The chest drain was left in situ for 7 days while it continued to drain turbid fluid and was removed once it was no longer draining, having confirmed it was not blocked. A chest radiograph showed a persistent opacity in the right lower lobe which was thought to be an area of inflammation from the initial consolidation and pleural infection.

Bronchoscopy was normal and bronchioalveolar washings were negative for microscopy, bacterial culture, AFB and cytology.

To cite: Gould J. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-008700

Mycobacterial culture results also returned with no growth after 42 days incubation.

INVESTIGATIONS

- ▶ Chest radiograph
- ▶ Thoracic ultrasound
- ▶ Ultrasound-guided pleural aspiration and chest drain insertion
- ▶ Thoracic CT
- ▶ Bronchoscopy

DIFFERENTIAL DIAGNOSIS

The differential diagnosis of a fever and raised inflammatory markers after an LRTI includes

1. Partially treated/non-resolving pneumonia
2. Pleural infection
3. Liver abscess, secondary to direct migration from the pleura
4. Tuberculosis
5. Other occult infection
6. Auto-immune pathology
7. Malignancy (more common in older individuals, especially with a smoking history)

TREATMENT

- ▶ Prompt broad-spectrum antibiotics and intercostal chest drainage
- ▶ Early nutritional support
- ▶ Video-assisted thorascopic surgery (VATS) debridement and decortication

OUTCOME AND FOLLOW-UP

The patient remained afebrile 48 h after admission. Two weeks postadmission and after completing 10 days of intravenous piperacillin with tazobactam and oral clarithromycin, the patient was well, however, the CRP remained elevated at 80 (initially 320). Repeat chest radiograph and thoracic CT were unable to confirm resolution of the pleural infection due to significant postinfective inflammatory changes.

In view of the persistently raised CRP and right lower lobe radiographic changes, the patient was referred to a tertiary centre for a thoracic surgical opinion, who opted for VATS debridement with a view to decortication. The patient consented to undergo VATS on explaining he might not return to peak fitness to maintain his army duties. The procedure was technically difficult and resulted in a large amount of pus being incised and drained from a localised cavity.

The culture results were again negative and the patient made a full recovery after a further 2 weeks of antibiotics. The patient was discharged and returned to normal duties in the army 8 weeks after discharge. A follow-up chest radiograph showed complete resolution of the empyema with no evidence of pulmonary or pleural scarring and the CRP normalised to <1.

DISCUSSION

The definition of empyema is pus within the pleural space; however, many trials and studies use the term pleural infection to encompass both complicated parapneumonic effusions and empyema.² In this case, the pleural fluid initially drained was turbid orange and not frank pus. The pus accumulation developed later during an organising stage of the pleural infection also creating a localised loculated collection of pus and was treated effectively on performing a VATS with careful

decortication and subsequent drainage. The multiple negative bacterial culture results in this case were likely due to oral antibiotic treatment started by another hospital for a LRTI prior to the development of a pleural infection.

There are numerous case reports noting empyema as a complication of LRTI and pneumonia. The incidence of empyema is also on the increase in both developed and developing countries,² although the reasons for this are not yet clear. This case report therefore serves as an important reminder to ensure biochemical markers and imaging are reviewed together to form an overall clinical picture. The patient in this case felt very well after completing a 10-day course of antibiotics and was medically fit for discharge based purely on the patient's bedside observations and clinical response to treatment. However, persistently raised inflammatory markers suggested that the infection had not fully resolved. A chest radiograph demonstrated indistinct patchy opacification at the right lower lobe which suggested resolving pleural infection or persistent loculated infection. This prompted further investigation with thoracic CT and subsequently, VATS.

Learning points

- ▶ Pleural fluid pH < 7.20 is consistent with a pleural infection. If the pH is > 7.2, history, examination and clinical context are essential to reach the diagnosis.
- ▶ Negative bacterial cultures were likely due to prior antibiotic use and therefore led to diagnostic challenges. When bacterial cultures are negative, antibiotics should cover both common community-acquired bacterial pathogens as well as anaerobic organisms.¹
- ▶ If the C reactive protein (CRP) remains elevated post lower respiratory tract infection (LRTI) treatment, one should consider the complication of pleural infection.
- ▶ Following appropriate antimicrobial treatment and intercostal chest tube drainage of a known pleural infection, a persistently raised CRP together with unresolved radiographic changes of a pleural effusion, strongly suggest an unresolved pleural infection. Typically, this might be a loculated empyema requiring a thoracic surgical opinion, where appropriate.
- ▶ Patients with continued signs of sepsis and residual pleural fluid should undergo further radiological imaging.¹ Patients with persistent sepsis and a residual pleural collection should be discussed early with a thoracic surgeon to consider surgical options available where appropriate.¹

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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