CASE REPORT

Chronic empyema: importance of preventing complications in the management of pleural effusions

Viktor Molander,¹ Maria Diakopoulou,¹ Lotta Orre,² Giovanni Ferrara^{1,3,4}

¹Lung Allergi Kliniken, Karolinska University Hospital, Stockholm, Sweden

²Department of Cardiothoracic Surgery and Anesthesiology, Karolinska University Hospital, Stockholm, Sweden

³Section of Respiratory Diseases, Department of Internal Medicine, University of Perugia, Perugia, Italy

⁴Respiratory Medicine Unit, Department of Medicine, Karolinska Institutet, Stockholm, Sweden

Correspondence to

Dr Giovanni Ferrara,
giovanni.ferrara@ki.se

SUMMARY

We report a case of chronic empyema in a 63-year-old man with a history of asbestos exposure and alcohol overconsumption. In 2009, he presented with dyspnoea, exudative pleurisy on the right side with no symptoms of infection or malignancy. In 2013, the patient presented with increased dyspnoea and a massive chronic empyema had evolved. Culture of the pleural fluid was positive for *Escherichia coli* and anaerobic bacteria, and he was treated with antibiotics, chest drainage as well as surgical evacuation. After surgery, as the lung failed to expand, growth of opportunistic bacteria and rising C reactive protein obliged long-time treatment with broad-spectrum antibiotics as well as chest drainage with daily saline flushes. The patient still suffers from fatigue, poor nutritional status and anaemia, and further treatment with chest drainage and antibiotics is planned. Advanced chronic empyema is a difficult condition with poor response to treatment, and diagnostic delay is the main cause of complications.

BACKGROUND

Management of pleural infections and prevention of their complications is a rising problem in the Western world, with incidence and mortality reported on the rise in both North America and Europe despite availability of antibiotics; no clear data are available from the rest of the world, but it is possible that the scenario is no different. Difficulties in the early diagnosis and often need of aggressive surgical treatments with limited efficacy make empyema one of the most frustrating conditions in respiratory medicine, with a high incidence of complications and costs for the healthcare system. Our case highlights the difficulties in the diagnosis of the condition (especially in the presence of risk factors and comorbidity) and the high rate of complications to which both patients and doctors are challenged within the difficult management of empyema.

CASE PRESENTATION

A 63-year-old man, previous smoker and with a history of asbestos exposure and alcohol overconsumption, presented in a peripheral hospital with dyspnoea on January 2009. The chest X-ray showed a rapidly progressive right-side pleural effusion (figure 1), and 15 L of pleural exudative fluid were drained in a few days. He was also diagnosed with atrial fibrillation, chronic heart failure and thyrotoxicosis. No signs of malignancy or infections could be found at that time and a diagnosis of

exudative pleurisy, likely secondary to asbestos was made. He was admitted again in late 2009 with recurrent right-side pleural effusion and referred to the main hospital in the city for further investigations. He underwent a thoracoscopy but biopsies and cytology were negative for malignancy or infectious diseases. After drainage of the fluid with a chest tube, the lung could not expand showing a 'trapped lung'. The patient was offered decortication, but no surgery was performed because of mild symptoms and refusal by the patient.

In April 2012, he presented again with dyspnoea and anaemia. CT thorax showed thickened pleura and solid changes in the right pleural cavity, again with suspicion of mesothelioma. Once again the patient declined surgery. A positron emission tomography (PET) CT could not confirm the suspicion of mesothelioma or of a secondary tumour in the pleural space, and no further investigation or interventions were offered.

In January 2013, he presented again with 2 months of progressive dyspnoea, cough, weight-loss and anaemia. A new CT thorax showed advanced thickening of the pleura on the right side as well as left-sided pleural fluid and parenchymal infiltrates. Microbiology including blood cultures and samples from the respiratory tract (bronchoscopy) failed to detect pathogens. The patient received a chest drainage, and from the dark, smelling fluid coming from the pleura positive cultures for *Escherichia coli* and anaerobic bacteria were obtained this time.

INVESTIGATIONS

The patient was treated with antibiotics according to drug susceptibility testing and with regular pleural lavages with saline. Soon after the primary infection was eradicated, growth of opportunists such as *Enterococcus faecium* and *Stenotrophomonas maltophilia* was detected. Again, no evidence of malignancy could be found, either from all the tissue samples obtained from the lung or from an enlarged axillary lymph node that was biopsied. C reactive protein (CRP) fluctuated between 100 and 350 during antibiotic therapy. A new CT thorax in March showed massively thickened pleura and rounded formations in the pleural space (figure 2). Furthermore, the fluid from the drainage was grey/black, giving a strong suspicion of aspergillosis. Once again, repeated samples for microbiology, including selective cultures and antigens, failed to identify a fungal infection.

To cite: Molander V, Diakopoulou M, Orre L, et al. *BMJ Case Rep*. Published online: [please include Day Month Year] doi:10.1136/bcr-2013-200454

Figure 1 Chest X-rays showing rapid pleural fluid progression in 1 month in 2009.

DIFFERENTIAL DIAGNOSIS

A chronic pleural exudative effusion is often a very difficult clinical problem, with several complications and bad prognosis. The history of asbestos exposure, the negative results of different microbiology and cytology analysis on the fluid oriented the clinicians in 2009 towards a diagnosis of asbestos pleurisy, which is a rare benign condition. The find of a thickening of the pleura oriented them towards a diagnosis of mesothelioma, but a thoracoscopic biopsy and a PET CT never confirmed this hypothesis.

Previous tobacco and high alcohol consumption could have strengthened the suspicion of an infectious cause of the effusion and towards an empyema, although the patients presented with only sporadic low-grade fever.

TREATMENT

As described, the patient was treated with chest drainage and daily saline lavages. Antibiotics (piperacillin/tazobactam, meropenem, ciprofloxacin) were used against the *E coli* and anaerobic infection. The patient required several erythrocyte transfusions due to the persistent anaemia, likely due to microscopic bleeding in the pleural space and as a result of a chronic infection.

After the CT scan showed signs of aspergillosis, surgical evacuation of the empyema was made. The pleural cavity was filled with massive amounts of soft grey/pink necrotic tissue

(figure 3), which was impossible to fully evacuate. The post-operative period was complicated with massive bleeding, two re-operations in an attempt to stop the bleeding, a broncho-pleural fistula, need of a tracheostomy and intensive care. CRP was as high as 428 in the postoperative period, despite treatment with broad-spectrum antibiotics and antimycotics. The patient eventually stabilised and could be discharged by the intensive care unit after 3 weeks.

OUTCOME AND FOLLOW-UP

Even after surgery, the right lung failed to re-expand due to very thick and fibrotic changes of the remaining pleura and parenchyma. CRP remained elevated and fluctuated between 150 and 250. It was decided with a multidisciplinary conference among chest physicians and thoracic surgeons to continue for at least two more months with daily saline lavages, antibiotics and antifungal treatment. In early June 2013, the patient was still admitted to the hospital and suffered from fatigue, dyspnoea and weight loss. The patient is still in need of continuous chest drainage as well as long-term rehabilitation.

DISCUSSION

Empyema represents a difficult and challenging condition due to the high rate of complications, the low evidence for treatment options and the relatively bad prognosis.^{1 2}

Figure 2 CT of the chest showing extensive destruction of the lung, massive thickening of the pleura and aspergilloma-like masses in the remaining pleural space.

Figure 3 (A) Thoracoscopic appearance of the pleural cavity and of the lung, with extensive necrotic materials and fibrosis; (B) scrambled-egg-like grey-pink necrotic materials extracted from the pleural space.

Its incidence and mortality have been reported to be alarmingly increasing in the Western world both in children and in adults,^{3–5} with limited effect of the vaccine for the most common pathogen (*Streptococcus pneumoniae*).⁶ We report here the case of a man with a history of smoking, high alcohol consumption,^{7–8} and exposure to asbestos, who developed a severe form of chronic empyema over a period of 4 years. The clinical picture was complicated by the relatively mild symptoms in the first 3 years (low grade fever, progressive weight loss and tiredness) and by the delay of surgical intervention (also due to the reluctance of the patient to an invasive procedure). All these factors contributed to a progressive and extensive damage of the right lung and the need of thoracotomy/decortication⁹ in the attempt to cure the infection; by the time the condition became life-threatening. Microbiology was of limited value, as expected,¹⁰ leading to the isolation of different bacteria during the time of treatment. No isolate could be deemed responsible for causing the empyema, and it is not possible to exclude that healthcare related-infections complicated the clinical picture once invasive procedures became necessary. Therefore, after the first isolates, antibiotic treatment was mainly empiric, and included also antifungal compounds on the basis of a pure clinical suspicion, without a microbiological correlate. Furthermore, the occurrence of a bronchopleural fistula represented a severe complication, adding new uncertainty to the medical management of the case.

Laboratory tests were of limited value in guiding the treatment, due to the necrosis in the pleural space and the absence of correlation with microbiology.

A permanent drainage was then considered necessary; this reduced the quality of life of the patient and still represents a potential focus of new infections after the patient's discharge.

The patient needed to stay in the hospital for more than 5 months, with considerable costs and risk for nosocomial infections.

This case illustrates how diagnostic and interventional delay is extremely detrimental in the management of pleural infections: these conditions are per se difficult to manage and need early diagnosis and treatment (medical and often surgical) to avoid severe complications.^{1–12} Recent studies on the predictive value of procalcitonin and blood culture bottle cultures showed that the accuracy of an early diagnosis can be improved.^{10–13} Potential benefits of intrapleural fibrinolytic therapy have been assessed in randomised control trials and meta-analysis,^{14–16} but the heterogeneity of the cohorts and of the design of the studies do not allow firm recommendations for their use; they would

have not been useful in our case anyway, due to the long and complicated course of the disease.

Our case shows that once the chance to effectively cure an empyema is lost, both the patient and the physician can be exposed to several difficult complications and frustrations.

Learning points

- ▶ Advanced chronic empyema is a difficult condition, associated with poor response to medical and surgical treatment.
- ▶ It is often the result of predisposing medical factors; however, diagnostic delay is the main cause of a complicated empyema.
- ▶ Chronic empyema often results in an irreversible anatomic damage of the pleural space and of the lung, leading to secondary difficult complications like bronchopleural fistulae.
- ▶ Invasive procedures are needed to evacuate the pleural space and to treat the infection, with high risk for perioperative and postoperative complications.
- ▶ Microbiology is generally of limited help, due to the difficulties in identifying the pathogens causing the infection and to the high risk of nosocomial infections.

Acknowledgements The authors would like to thank Dr Micheal Runold, Dr Marianne Kóvamees and Dr Mamdo Al-Ahmeri for their help in the management of this case.

Contributors All authors were directly involved in the management of the case, in the design, data collection and analysis and writing of the manuscript.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Davies HE, Davies RJO, Davies CWH; BTS Pleural Disease Guideline Group. Management of pleural infection in adults: British Thoracic Society Pleural Disease Guideline 2010. *Thorax* 2010;65(Suppl 2):ii41–53.
- 2 Tobin CL, Lee YCG. Pleural infection: what we need to know but don't. *Curr Opin Pulm Med* 2012;18:321–5.
- 3 Grijalva CG, Zhu Y, Nuorti JP, et al. Emergence of parapneumonic empyema in the USA. *Thorax* 2011;66:663–8.
- 4 Bender JM, Ampofo K, Sheng X, et al. Parapneumonic empyema deaths during past century, Utah. *Emerg Infect Dis* 2009;15:44–8.

- 5 Finley C, Clifton J, Fitzgerald JM, *et al.* Empyema: an increasing concern in Canada. *Can Respir J* 2008;15:85–9.
- 6 Burgos J, Falcó V, Pahissa A. The increasing incidence of empyema. *Curr Opin Pulm Med* 2013;19:350–6.
- 7 De Roux A, Cavalcanti M, Marcos MA, *et al.* Impact of alcohol abuse in the etiology and severity of community-acquired pneumonia. *Chest* 2006;129:1219–25.
- 8 Ruiz M, Ewig S, Marcos MA, *et al.* Etiology of community-acquired pneumonia: impact of age, comorbidity, and severity. *Am J Respir Crit Care Med* 1999;160:397–405.
- 9 Rathinam S, Waller DA. Pleurectomy decortication in the treatment of the 'trapped lung' in benign and malignant pleural effusions. *Thorac Surg Clin* 2013;23: 51–61. vi.
- 10 Menzies SM, Rahman NM, Wrightson JM, *et al.* Blood culture bottle culture of pleural fluid in pleural infection. *Thorax* 2011;66:658–62.
- 11 Mahmood K, Wahidi MM. Straightening out chest tubes: what size, what type, and when. *Clin Chest Med* 2013;34:63–71.
- 12 Bhatnagar R, Maskell NA. Treatment of complicated pleural effusions in 2013. *Clin Chest Med* 2013;34:47–62.
- 13 McCann FJ, Chapman SJ, Yu WC, *et al.* Ability of procalcitonin to discriminate infection from non-infective inflammation using two pleural disease settings. *PLoS One* 2012;7:e49894.
- 14 Rahman NM, Maskell NA, West A, *et al.* Intrapleural use of tissue plasminogen activator and DNase in pleural infection. *N Engl J Med* 2011;365:518–26.
- 15 Janda S, Swiston J. Intrapleural fibrinolytic therapy for treatment of adult parapneumonic effusions and empyemas: a systematic review and meta-analysis. *Chest* 2012;142:401–11.
- 16 Rahman NM. Intrapleural agents for pleural infection: fibrinolytics and beyond. *Curr Opin Pulm Med* 2012;18:326–32.

Copyright 2013 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.

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