CASE REPORT

Unusual case of a giant lung abscess initially misdiagnosed and treated as an empyema

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SUMMARY

We report the case of a 66-year-old man with dental infection who presented to our emergency department complaining of a 3-month medical history of chest pain and productive cough, in association with malaise, fever, weight loss and anaemia. His chest radiograph showed a nearly total opacification of the right hemithorax and chest ultrasound findings were suggestive of empyema, subsequently confirmed by a chest CT. The patient started appropriate treatment. A follow-up chest CT performed to rule out bronchopleural fistula revealed a large lung abscess. The patient had the final diagnosis of a giant lung abscess, which was initially thought to be an empyema because of the clinical and radiologic similarities with this entity. The initial misdiagnosis led to prompt percutaneous drainage of the lung abscess in addition to antibiotherapy and respiratory physiotherapy with a good final outcome, which suggests the efficacy of this approach in similar cases.

BACKGROUND

Despite of the advent of antibiotics, lung abscess still harbours significant morbidity and mortality, which reaches up to 38.2%.[1–4]

This case depicts an unusually large lung abscess in a patient with dental infection, initially thought to be an empyema because of clinical and radiologic similarities with this entity. The initial misdiagnosis led to prompt percutaneous drainage of the lung abscess in addition to antibiotherapy with a good outcome, which suggests the efficacy of this approach in similar cases.

CASE PRESENTATION

A 66-year-old Caucasian man presented to our emergency department complaining of acute small volume haemoptysis. He reported a 3-month medical history of progressively worsening productive cough with purulent sputum, right pleuritic chest pain, orthopnea, low-grade fever, asthenia, malaise and unintentional weight loss of ~15 kg (>10% body weight).

He was a former smoker of 50 pack-years and his medical history was unremarkable, except for a previous allergy to iodinated contrast agents. He had no regular medication and denied chronic alcohol or drug misuse.

On examination, the patient was pale and emaciated, with low-grade fever (38.2°C) and a heart rate of 112 beats/min; the remaining vital signs were stable. Oral cavity inspection showed dental caries and signs of periodontal infection. Lung auscultation revealed crackles in the right anterior lung fields and absent breath sounds in the right lower posterior lung fields with dullness at percussion.

INVESTIGATIONS

Laboratory evaluation displayed increased inflammatory markers (white blood cell count 19.7 × 10^9/L with a differential of 77% neutrophils, C reactive protein 33 mg/dL), thrombocytosis (1 072 000 platelets/mL), anaemia (haemoglobin level 73 g/L) and hypoalbuminemia (2.9 g/dL), without other relevant findings. Arterial blood gas analysis on room air was normal.

Sputum acid-fast bacilli smear was negative, ruling out active baciliferous tuberculosis. Screening test for HIV was also negative.

The chest radiograph showed a nearly total opacification of the right hemithorax (figure 1). Bedside chest ultrasound, performed to clarify this finding, revealed a large, dense homogeneous echogenic pleural effusion with thickened parietal pleura, suggestive of empyema. Visceral pleura and adjacent lung were not visualised due to the large-volume effusion.

A non-contrast chest-CT was requested in order to make a complete assessment of the lesion and rule out other alternative causes, showing a giant pleural fluid collection with pleural thickening, suggestive of empyema, associated with total collapse of the right lower lobe and partial collapse of the upper and middle lobes (figure 2).

Diagnostic thoracentesis revealed a thick, purulent and putrid-smelling pleural fluid, confirming the diagnosis of empyema. Biochemical analysis was not possible due to the fluid characteristics.

A chest tube drainage was inserted and the patient started empirical antibiotherapy, being admitted to the Pulmonology department.

Streptococcus constellatus was isolated from the purulent aspirate. Nevertheless, the putrid-smelling purulent material was suggestive of anaerobic infection and a mixed aerobe–anaerobe infection was admitted. Sputum collected for tuberculosis culture was negative, as well as routine sputum and blood cultures.

Eight days after admission, the patient developed persistent air leak through the chest tube and a second chest CT was performed to rule out bronchopleural fistula. The CT scan showed a massive irregular thick-walled cavity with dependent air-fluid level, suggestive of a lung abscess involving almost the entire upper and lower lobes

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Figure 1 Posterior–anterior chest radiograph at admission, showing a nearly total opacification of the right hemithorax.

of the right lung and compressing the surrounding lung parenchyma. No bronchopleural fistula was found. The chest tube was placed inside the abscess cavity and no empyema was observed (figure 3). The patient had the final diagnosis of a giant lung abscess. Initial findings in chest CT led to the misdiagnosis of empyema.

TREATMENT

The patient was treated with a 5-week course of piperacillin–tazobactam, achieving clinical and radiological improvement. The chest tube was removed after 21 days, given the progressive and significant reduction of abscess size on serial radiographs and cessation of purulent drainage for more than 3 days. During hospital stay, he was enrolled in respiratory physiotherapy and rehabilitation. Supplemental nutritional support was also provided given the patient's catabolic state due to prolonged infection.

OUTCOME AND FOLLOW-UP

There was a steady improvement in patient's clinical status. Weight gain and normalisation of albumin and haemoglobin levels were observed. A control chest-CT performed before discharge showed reduction in the size of the abscess cavity (figure 4).

The patient was referred to respiratory rehabilitation, as well as Pulmonology, Thoracic Surgery and Dental outpatient clinics.

He refused thoracic surgery. Respiratory physiotherapy and rehabilitation were maintained for months, with progressive clinical improvement. No recurrent pulmonary infections were observed. Pulmonary function tests revealed small airway obstruction and a decreased diffusing capacity for carbon monoxide (DLCO, 67%) with normal diffusing capacity corrected for alveolar volume (DLCO/VA, 99%); blood gases were normal. Imaging reevaluation with chest-CT 1 year after hospital admission showed a complete resolution of the residual cavity, with residual fibrosis with traction bronchiectasis–bronchiolectasis located in the posterior segments of the upper and lower lobes, thus confirming a favourable evolution (figure 5).

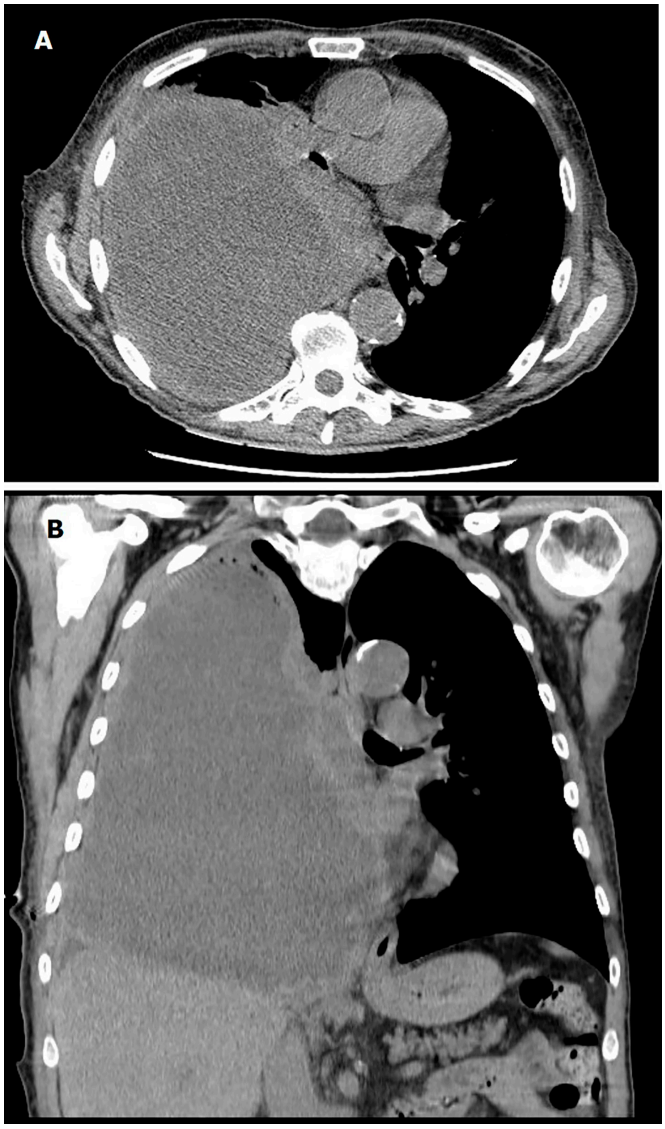

Figure 2 Non-contrast chest-CT at admission revealing a giant pleural fluid collection with pleural thickening, suggestive of empyema, associated with total collapse of the right lower lobe and partial collapse of the upper and middle lobes. (A) Axial and (B) coronal views.

DISCUSSION

A lung abscess is a circumscribed inflammatory mass within lung parenchyma whose central part has undergone purulent liquefaction necrosis as a result of a microbial infection. It may communicate with the bronchial tree, draining its content and resulting in a thick-walled cavity with a radiographic finding of an air-fluid level.[1 5 6]

Lung abscesses are more frequently observed in male patients over the age of 50 with altered state of consciousness, such as alcoholics or epileptics, since the majority arise from aspiration of oral cavity secretions, being typically localised in posterior segments of the lungs.[1 3 7–9] Dental and periodontal infection, as displayed by our patient, also increases the risk for aspirating oropharyngeal bacteria, as well as dysphagia or gastro-oesophageal reflux disease. Other predisposing factors include bronchial obstruction, coexisting lung diseases, pneumonia, diabetes mellitus, immunosuppression and extra-pulmonary infections with haematogenous spread or direct extension from contiguous structures.[3 6–8]

Figure 3 Follow-up non-contrast chest-CT performed 8 days after admission, showing a massive irregular thick-walled cavity with dependent air-fluid level, suggestive of a lung abscess. This cavity involves almost the entire upper and lower lobes of the right lung and compresses the surrounding lung parenchyma. The chest tube is placed inside the abscess cavity (arrow). No empyema or bronchopleural fistula are observed. (A) Axial and (B) coronal views.

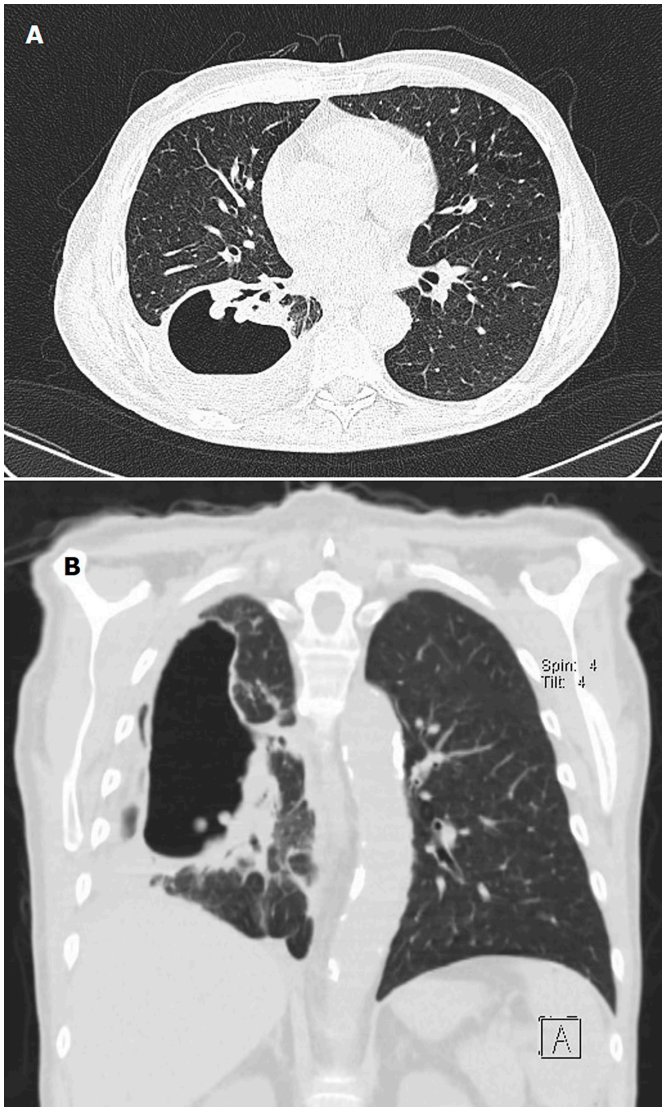

Figure 4 Follow-up non-contrast chest-CT performed before discharge (28 days after initial CT scan), demonstrating a reduction in the size of the abscess cavity. (A) Axial and (B) coronal views.

The major aetiologic agents of lung abscesses are anaerobes and microaerophilic streptococci, which are part of the normal flora colonising the oral cavity and gingival crevices.[3 8–11] Anaerobic bacteria are difficult to isolate from respiratory specimens, but various studies showed that anaerobic infections can be diagnosed based on the presence of a characteristic foul-smelling putrid discharge in patients with a lung abscess,[9] as it was the case in our patient.

Streptococcus constellatus, isolated from our patient's purulent aspirate, belongs to the *S. anginosus* group, the second most commonly isolated organisms in lung abscesses. These gram-positive, facultative anaerobic, microaerophilic bacteria have a striking tendency to form abscesses.[10 12 13] *S. constellatus* is particularly associated with polymicrobial abscesses, with the co-isolate bacteria reflecting the site from which the specimen was obtained.[12] Likewise, in the depicted case a mixed infection with *S. constellatus* and anaerobes was identified, with both organisms originated from dental infection.

Clinical presentation is highly variable. It ranges from acute infections mimicking pneumonia to chronic indolent infections, where patients present with respiratory symptoms of several weeks' duration accompanied by malaise, fever, night sweats, weight loss and anaemia, making a differential diagnosis with tuberculosis and bronchogenic neoplasms. Distinguishing between lung abscess and empyema is also important, since they are managed differently.[14 15] However, it may pose a diagnostic challenge, especially in those cases of localised empyema or when the wall of an abscess abuts the pleural surface and mimics pleural thickening, as in the depicted case. Also, the clinical presentation of empyema is similar to that of lung abscess, ranging from acute to chronic indolent infections, depending on the causative agent. When clinical findings and conventional radiology exams are ambiguous, contrast-enhanced chest CT can accurately differentiate lung abscess from empyema, guiding therapeutical approaches.[14–16] In the presented case though, in addition to a clinical presentation indistinguishable

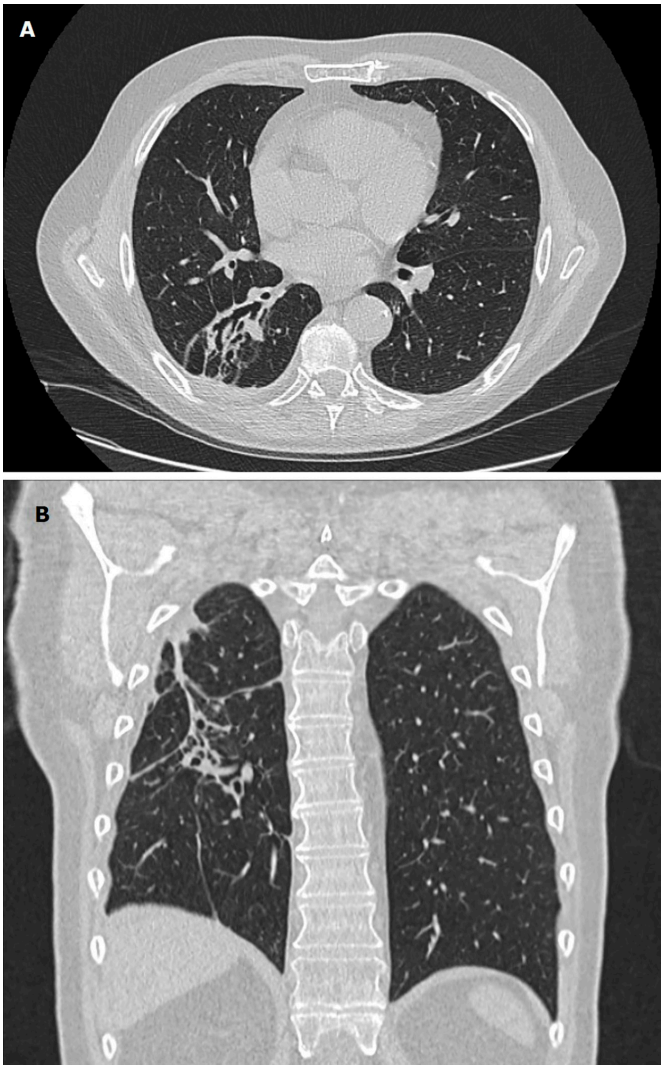

Figure 5 Follow-up non-contrast chest-CT performed 1 year after initial CT scan, showing a complete resolution of the residual cavity, with residual fibrosis with traction bronchiectasis–bronchiolectasis located in the posterior segments of the upper and lower lobes. (A) Axial and (B) coronal views.

from empyema, chest CT findings were not diagnostic and misled both the radiologists and pulmonologists, leading to the misdiagnosis of empyema. This was possibly due to the large volume of the abscess, which abutted the pleura and compressed the surrounding lung mimicking empyema. Also, chest CT was performed without contrast enhancement, and so some helpful features to the differential diagnosis may have been missed, such as an accurate assessment of the lesion's wall thickness and surface regularity, identifying internal septations (suggestive of empyema) or the 'split pleural sign' (separation of uniformly thickened visceral pleura from parietal pleura, also suggestive of empyema).

Medical treatment with antibiotics and respiratory physiotherapy to aid drainage is the mainstay of therapy for lung abscesses, being successful in the majority of cases (80%–90%).[3 6–8 17 18] A 4–6 weeks antibiotic course is consensual in the literature,[2 3 8] but it may be prolonged depending on patient's clinical and radiological evolution, as well as isolated pathogens. Empirical treatment should cover aerobic and anaerobic bacteria. β-lactam–β-lactamase inhibitor combinations or clindamycin are the usually recommended drugs.[3 11 19]

Surgical resection is the recommended approach in the 10%–15% of patients who fail to respond to conservative treatment.[1–3 19] However, not all patients are suitable for surgery, which still carries considerable morbidity and mortality, ranging from 11% to 16%.[8 19–21] Percutaneous catheter drainage may be an alternative to surgery in these patients. Several case reports and series support its efficacy and safety, with lower morbidity and mortality than surgical resection, even in those with high surgical risk,[1 6 8 17 19–21] presenting an overall success rate up to 84%, a complication rate of 16% and associated mortality up to 4.8%.[17 19–21]

This procedure can be performed effectively and safely under image guidance,[6 19–21] or as a bedside non–image-guided procedure in suitable patients[17 20–22]: those with abscesses larger than 4 cm in diameter, pleural based and at least within 2 weeks of onset. In these cases, there is always symphysis of pleura overlying the abscess and the chest wall, minimising the risk of complications.[17] Our patient gathered all this features, which definitely contributed to the success of percutaneous drainage.

In most case series, percutaneous tube drainage was used in the management of lung abscesses refractory to medical therapy.[3 6 17 19–21] Nevertheless, some authors showed both efficacy and safety of this procedure as the primary treatment of lung abscesses in combination with antibiotics in cases of sepsis, deteriorating patient condition, conditions associated with a high mortality rate[19] and in the management of giant lung abscesses.[22]

In the depicted case, we have inadvertently treated a giant lung abscess with primary, non-image-guided, chest tube drainage achieving a good outcome. This result is similar to the study of Mengoli,[22] where two patients with giant abscesses had successful drainage within 24 hours of presentation with no complications, death, or recurrence. To our knowledge, these are the only similar cases reported in the literature in adult patients, despite earlier studies suggest efficacy of primary chest tube drainage in

Learning points

- A lung abscess is a circumscribed area of purulent liquefactive necrosis within lung parenchyma, resulting from a microbial infection. Contrast-enhanced chest CT is the most accurate exam for diagnosing a lung abscess and differentiating it from other entities.
- Most lung abscesses arise from aspiration of oral cavity secretions, being typically localised in posterior segments of the lungs. Thus, the major aetiologic agents are anaerobes and microaerophilic streptococci.
- The mainstay of treatment is a combination of antibiotics and respiratory physiotherapy, being successful in 80%–90% of cases.
- Surgical resection is recommended in the 10%–15% of patients where conservative treatment fails, but yields considerable morbidity and mortality (11%–16%) and not all patients are suitable for surgery.
- Percutaneous tube drainage, with or without image guidance, has proven to be an efficient and safe alternative to surgery. Some authors also suggest this procedure can be successfully used in the primary treatment of lung abscesses in combination with antibiotics in cases of sepsis, deteriorating patient condition, conditions associated with a high mortality rate and in the management of giant lung abscesses.

lung abscesses[23] and that this is an usual approach to children with lung abscesses.[24]

Lung abscesses still cause significant morbidity and mortality, which ranges from 1.0% to 38.2% in different case series.[1–4] Hirshberg *et al*[1] identified the following factors predictive of a poor outcome in patients with a lung abscess: presence of several predisposing factors (such as advanced age, malnutrition or malignancy), haemoglobin levels on admission <10 g/dL, low albumin levels, large abscess size, right lower lobe location and infections with *S. aureus*, *K. pneumoniae* and particularly *P.* aeruginosa.[1 7 25] Many of these factors reflect the underlying poor health status of patients, which is well correlated with poor prognosis.

Our patient presented multiple risk factors for poor outcome. Accordingly, despite of appropriate medical therapy and early chest tube drainage, he had a slow radiological response, requiring a long hospital stay. Nevertheless, there was a steady clinical improvement, weight gain and normalisation of albumin and haemoglobin levels. Although having refused surgical resection of the residual cavity, a complete resolution was observed after several months, with a good final outcome despite the presence of multiple risk factors.

Contributors JSC, the corresponding author, was directly involved in the care of this patient and was responsible for drafting this article and obtaining patient's consent. DPM was responsible for acquisition of data and providing critical revisions of the article. IO and ACV were responsible for reviewing medical literature and providing critical revisions of the article.

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