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CASE REPORT

An unusual case of empyema

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Abscess formation and empyema are serious sequelae of pneumonia. Colonisation of the pleural fluid occurs most frequently by aerobic organisms or mixed aerobic and anaerobic species including: *Streptococcus pneumoniae*, *Streptococcus milleri*, *Bacteroides* species and anaerobic fusobacteria. *Actinomyces*, *Eikenella corrodens* and *Nocardia* species are a rarely reported combination of anaerobic organisms resulting in empyema, especially in the Northern hemisphere. A 65-year-old man presented in a severely debilitated state with poor dentition and features of severe pneumonia. His past medical history included diabetes mellitus, peripheral vascular disease and cerebrovascular events. CT scan revealed consolidation, empyema and abscess formation. The patient was initially managed with intravenous dicloxacillin and metronidazole and a diagnostic aspirate was followed by chest drain insertion. Microscopy results showed *Nocardia* and antimicrobial therapy was altered to cotrimoxazole and ticarcillin/clavulanate. After additional nutritional support the patient was fit for video assisted thoracoscopy and decortication. Further culture results confirmed the growth of *Actinomyces* species and *Eikenella corrodens* and the therapy was modified to cotrimoxazole and benzylpenicillin. Pneumonia and empyema due solely to anaerobic organisms is rare but should be suspected if clinical onset is insidious. Anaerobic culture of specimens is indispensable to the rapid choice of appropriate antibiotic.

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Introduction

Abscess formation and empyema are two sequelae of pneumonia which are found with higher frequency in the context of obstructive bronchial carcinoma and aspiration pneumonia. In these instances, colonisation is often by mixed flora and may include *Streptococcus pneumoniae*, *Streptococcus milleri*, *Bacteroides* species and anaerobic

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fusobacteria. Investigation comprises obtaining samples by aspiration or biopsy for careful bacteriological staining and culture, allowing selection of the most effective antibiotic regimen. Surgical drainage of empyema is usually required and occasionally, decortication may also be necessary. We report an unusual case of pneumonia resulting in an abscess and empyema caused by *Actinomyces*, *Eikenella corrodens* and *Nocardia* species.

Case report

A 65-year-old male, originally from Scotland, presented to a regional hospital with 1–2 weeks of increasing shortness of breath, shivers, sweats and left-sided pleuritic chest pain. This was on a background of about 6 months of cough productive of purulent sputum, weight loss and general reduction in functioning. Past medical history included insulin dependent diabetes mellitus, peripheral vascular disease with a femoro-popliteal by-pass, and cerebrovascular disease with 3 previous cerebrovascular accidents (CVA). The most recent CVA had occurred 2 years previously and had left him with reduced mobility due to a residual mild right hemiparesis. He was an ex-smoker with a 100 pack-year history and had a small degree of asbestos exposure during his career as a marine engineer.

On examination, he was afebrile, haemodynamically stable and saturating at 99% on 2 l of oxygen via nasal cannulae. He had a widespread maculopapular rash with pustules and excoriations. Examination of the respiratory system revealed dullness to percussion and coarse crackles at the left lung base and mid-zone. There was otherwise normal air entry throughout.

Investigations revealed a normocytic anaemia (Hb 85 g/L), leucocytosis with predominant neutrophilia (25.9×10^6 and 23.1×10^6 respectively) and significant thrombocytosis (1.18×10^6). The CRP was elevated at 262 as was the ESR at 102 and albumin was low at 15 g/l. Liver enzymes and renal function were normal. The chest X-ray demonstrated almost complete 'white-out' of the left lung field consistent with significant fluid collection. A CT scan of the chest confirmed the presence of a thick-walled fluid collection involving most of the left hemithorax and left lower-lobe consolidation (Fig. 1).

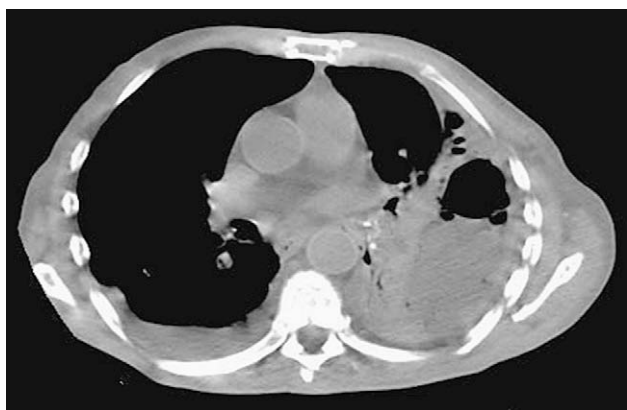


Figure 1 CT scan slice showing thick-walled empyema with left lower-lobe consolidation.

A diagnostic aspirate was performed and foul-smelling purulent material was collected followed by insertion of an intercostal catheter. Approximately 2 l of purulent fluid were drained over the next 48 h. Intravenous dicloxacillin and metronidazole were commenced whilst awaiting bacteriology results. Gram-staining revealed the presence of gram-negative bacilli and weakly ZN-positive branching rods consistent with *Nocardia*. At this stage the antibiotic regimen was altered to co-trimoxazole and ticarcillin/clavulanate. The patient underwent a CT head which revealed cerebrovascular disease only and the patient was transferred to our centre for further investigation and management.

On arrival at our centre we noted extreme cachexia, debilitation, grade III/IV pressure sores involving both heels and gross malnutrition as evidenced by severe hypoalbuminaemia. His dentition was in an extremely poor state – he had not had a dental review for a number of years. Further questioning revealed a minimal oral intake for the preceding 6–12 months, very little mobilization and repeated refusals to attend for a medical review when encouraged by his partner. All these issues were addressed as part of his medical care. Thoracic surgeons were consulted to give advice on the most appropriate timing for surgical intervention and it was felt that improving his nutritional status was the most important immediate step. This was undertaken via enteral feeding with high protein and high caloric feeds.

He was finally stable enough to undergo video assisted thoracoscopy and decortication about 5 weeks after initial presentation. Modified barium swallow demonstrated penetration of food bolus into the upper airway. Further culture results confirmed growth of *Actinomyces* sp. and *E. corrodens*. *Nocardia* was not isolated in culture. Antibiotic therapy was further altered to comprise co-trimoxazole and benzylpenicillin.

The patient recovered well and was discharged home 10 weeks post-presentation on a course of oral penicillin.

Discussion

This case presents an unusual cause of empyema in the context of extreme debilitation. The organisms isolated have only rarely been reported to cause significant lung pathology in such a combination.

Actinomyces species are facultatively anaerobic, gram-positive prokaryotic bacteria and are commensals of the human oropharynx, gastrointestinal tract and female genitalia. There are 14 species that have been characterized. These include six species that have been shown to be pathogenic in humans (*Actinomyces israelii*, *Actinomyces meyeri*, *Actinomyces odontolyticus*, *Actinomyces naeslundii*, *Actinomyces viscosus* and *Actinomyces gerenceseriae*). *A. israelii* is the most commonly reported species with *A. meyeri* infections having a propensity for lung tissue.¹ Pulmonary actinomycosis is a rare infection with an incidence of 1:300,000 per year worldwide with males more often affected than females.^{2,3}

Most *Actinomyces* infections are polymicrobial with reported co-infections of *Actinobacillus actinomycetemcomitans*, *E. corrodens*, *Enterobacteriaceae*, *Bacteroides*,

Capnocytophaga, *Staphylococci*, and *Streptococci* with prevalence depending on site of infection.¹ It has been suggested that these other organisms may enhance the pathogenicity of *Actinomyces* by creating an anaerobic environment in which it may thrive.⁴

E. corrodens is a facultatively anaerobic, gram-negative fastidious bacillus, which was first isolated by Eiken in 1958 from human saliva.⁵ It is a commensal bacterium of human mucosa in the oral cavity, the upper respiratory, gastrointestinal and genitourinary tracts.⁶ Pulmonary infections of *Actinomyces* and *E. corrodens* have similar risk factors including alcoholism, poor oral hygiene and dental disease, emphysema, chronic bronchitis and bronchiectasis,⁷ head and neck neoplasia, diabetes mellitus, cerebrovascular accidents, steroid use, and abuse of amphetamines.^{8,9}

Nocardia species are aerobic branching filamentous gram-positive, weakly acid-fast bacteria normally residing as soil saprophytes. Inhalation of the bacilli leads to pulmonary infection and although uncommon, causes a serious pneumonia especially in the immunocompromised host.^{10,11}

The pathogenesis of the pulmonary infection caused by *Actinomyces* and *E. corrodens* most likely starts with aspiration of oropharyngeal or gastrointestinal secretions into the lungs causing occlusion, atelectasis and pneumonitis. The established acute inflammation is then followed by a chronic, indolent phase with necrosis, fibrosis and cavitation.⁴ The clinical picture of these pulmonary infections is of pneumonia with cough and sputum, chest pain, dyspnoea, haemoptysis and occasionally a localized chest wall swelling. Systemic symptoms include anorexia, weight loss, malaise, night sweats and fever.^{12,13} Complications reported include empyema,¹⁴ necrotic parenchymal disease,¹⁵ pseudotumor¹⁶ and bronchopleural cutaneous fistula.¹⁷ The peak incidence is around 50 years of age for *Actinomyces* and *E. corrodens* infections.^{2,3,14} In immunocompromised patients the incidence of Actinomycosis is similar but there appear to be two peaks of *E. corrodens* infections at 0–14 years and 44+ years old.⁸

Frequent misdiagnosis and delayed diagnosis are due in part to actinomycosis sharing clinical features with more common lung diseases including malignancy, tuberculosis, fungal infections and lung abscesses.¹² One study showed that only 7% of those with the infection were suspected of the diagnosis on admission.¹⁸ *Actinomyces* species are not usually recovered from sputum or bronchial lavage samples as these are not routinely anaerobically cultured. Even anaerobic cultures may not yield positive results due to inadequate technique, previous antibiotic therapy or bacterial overgrowth.² *E. corrodens* may also go unnoticed in routine bacteriological tests as special laboratory techniques and precautions are required to isolate this bacterium.¹⁹ On gram-stain, *Nocardia* can be indistinguishable from *Actinomyces* species, and must be differentiated by the use of a modified acid-fast stain.²⁰ Ultimately, CT or ultrasound guided fine needle aspiration or core biopsy is required to provide microbial and histology specimens to confirm diagnosis.

Clinical experience rather than randomized, controlled trials dictates the current excepted penicillin regimen in the treatment of *Actinomyces* infections²¹ with tetracyclines or erythromycin as alternatives.¹² *E. corrodens* has shown

unusual antimicrobial sensitivity and variability amongst strains. The most effective agents are penicillins,⁸ chloramphenicol and tetracycline,²² 3rd generation cephalosporins,²³ carbapenems and quinolones.⁹ Studies have demonstrated a resistance to macrolides,²⁴ metronidazole, cephalothin and cefuroxime⁹ and clindamycin.²³ One group has reported that growth of *E. corrodens* may be enhanced by clindamycin.²⁵ Current opinion for treatment of *Nocardia* species is sulphonamides or trimethoprim–sulfamethoxazole as first line and amikacin, carbapenems and 3rd generation cephalosporins as second line or in the severely ill as a combination therapy.¹⁰ Surgery is an important adjunct to medical therapy especially in cases of empyema, abscesses or sinus infection.^{26–28}

Our case represents a rare case of *Actinomyces*, *E. corrodens* and *Nocardia* polymicrobial pneumonia, with resulting complications of empyema and pulmonary abscess. The course of events leading to this patient's illness in all probability began with his stroke resulting in dysphagia and inhalation of oral secretions. With respect to his poor dentition, oral pathogens were the most likely candidates for infection and *Actinomyces* species and *E. corrodens* were isolated. Delay in seeking medical care resulted in progression of the infection, leading to severe systemic symptoms and complications of pneumonia. This also resulted in delaying the definitive treatment of empyema which remains drainage and decortication.^{27,28} Nevertheless, good clinical care with appropriate antibiotic use resulted in a successful treatment outcome.

Conflict of interest statement

No conflicts of interest in the preparation and submission of this case report were identified for any of the authors.

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