



## Case report

## Antibiotic instillation for a chronic lung abscess

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## A B S T R A C T

**Introduction:** Antibiotic treatment of lung abscesses fails in 10–20% of cases and require surgery, however, some are unsuitable for resection. Alternative options carry significant morbidity.

**Case report:** A 47 year old man with inoperable non-small cell lung cancer developed a lung abscess following definitive radiotherapy. Initial antibiotic therapy was successful, however four years later his symptoms recurred. Despite multiple courses his symptoms recurred despite long-term antibiotics. Immediately following a diagnostic aspiration, ceftriaxone and metronidazole were instilled into the abscess with subsequent clinical and radiological resolution.

**Discussion:** Lung abscesses are an uncommon complication of radiotherapy. Antibiotic therapy can fail for a number of reasons. Although instillation of antibiotics has not been described in the management of lung abscesses, the direct application of antifungals for aspergillomas is well documented and case series report success in other abscess sites.

**Conclusion:** Direct antibiotic instillation following lung abscess aspiration adds minimal risk and is potentially curative.

## 1. Introduction

Medical treatment of a lung abscess with intravenous antibiotics fails in approximately 10–20% of cases and surgical resection is usually advised, but some patients are unsuitable for surgery. Less commonly, percutaneous thoracostomy can be attempted, however this too carries a significant morbidity [1]. While the instillation of antimicrobials into pulmonary abscesses is not a new concept [2–5], to our knowledge the direct instillation of antibiotics has not previously been reported.

## 2. Case report

A 47 year old man presented with altered voice secondary to a recurrent laryngeal nerve palsy and was found to have a left upper lobe (LUL) non-small cell primary lung cancer (NSCLC) large cell subtype. He was a heavy smoker with a history of Stage 2 gastric adenocarcinoma 8 years previously, definitively managed with a partial gastrectomy and adjuvant chemotherapy. His lung cancer was initially classified as Stage IIIA (T2aN2M0); and was planned for surgical resection following a good response to neoadjuvant chemotherapy. Intra-operatively, the tumour was found to be infiltrating the aortic arch thus he was treated with chemoradiotherapy instead. His disease recurred locally and he developed a second primary lesion in the contralateral upper lobe in the

two years that followed, however both appeared to resolve following further radiotherapy. Following a total 150 Gy to his LUL he was left with significant radiation fibrosis and almost total collapse of the lobe.

One year following the final dose of radiotherapy he presented to hospital reporting two months of intermittent fevers. CT imaging demonstrated a cavitating multi-loculated lesion in the superior aspect of the LUL surrounded by an area of fibrosis (Fig. 1). He was commenced on intravenous (IV) piperacillin/tazobactam after the abscess was aspirated under CT guidance. He rapidly defervesced on antibiotics and following growth of amoxicillin sensitive *Streptococcus milleri* he was changed to IV ampicillin for six weeks, followed by two weeks of oral amoxicillin. Following cessation of antibiotics his fevers recurred and he developed left apical chest pain and a non productive cough. Bronchoscopy demonstrated that the LUL bronchus had been obliterated by fibrosis, without a patent lumen to allow drainage. After a further 6 weeks of oral amoxicillin and clavulanic acid his symptoms abated.

He re-presented again four years later with recurrence of fever and the same abscess. Multiple antibiotics were utilised without success. He was initially commenced on amoxicillin/clavulanic acid then intravenous ceftriaxone 1g daily without symptomatic benefit despite one month of ceftriaxone with short courses of clindamycin and metronidazole. With a dose increase to 2g ceftriaxone daily his fevers settled. Unfortunately he was unable to tolerate the side effects of high dose

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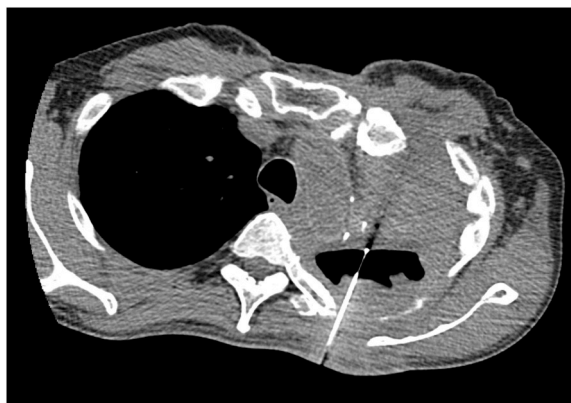


Fig. 1. CT view of the abscess during aspiration.

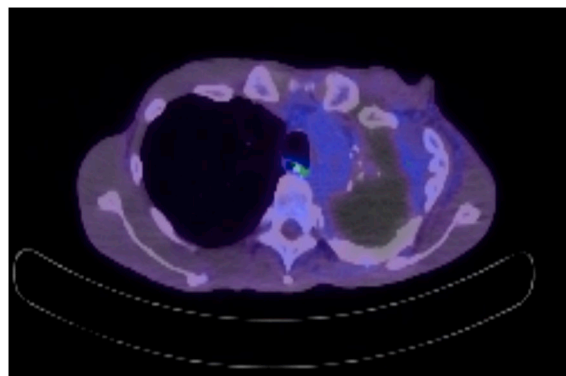


Fig. 2. PET/CT view of the fibrotic, necrotic residual change with no evidence of FDG uptake several years following treatment.

ceftriaxone and stopped after one month, following which his fevers recurred. The abscess was aspirated on three occasions off antibiotics and from one of these *Streptococcus pneumoniae* resistant to macrolides and with intermediate resistance to ceftriaxone was isolated on prolonged broth culture. On no occasion were acid – fast bacilli or malignant cells identified by cytology.

He remained symptomatic and on the fourth aspiration the decision was made to aspirate, lavage with saline and instill antibiotics directly into the abscess cavity. On this occasion 30ml of blood stained fluid was aspirated, 500mg metronidazole was then infused into the cavity and re-aspirated after which ceftriaxone (1g) was administered and left in situ. His fevers resolved and there were no complications from the procedure.

He continued to work for two further years without further fevers or need for antibiotics. He re-presented in 2018 with acute intractable vomiting due to carcinomatosis of the peritoneum, likely secondary to a gastric stump carcinoma due in part to continued heavy smoking. A PET/CT at the time demonstrated no metabolic activity at the site of the abscess (Fig. 2).

### 3. Discussion

Pulmonary abscesses occur when microbial infection results in necrosis and lung cavitation. Patients receiving radiation for NSCLC are at risk of secondary abscesses both from the pneumonitis and fibrosis from the radiation as well as the necrotic tumour itself. Despite this most large studies do not report it as a complication of stereotactic radiotherapy [6]; though a small case series (n = 27) found it occurred in 7% of cases [7].

Anaerobic bacteria and micro-aerophilic streptococci are thought to be the major causative agents for lung abscesses [8] although aerobic gram negative bacteria, particularly *Klebsiella pneumoniae* can be also represent a common cause [9]. Clindamycin is the recommended therapy for lung abscesses since it was found to be markedly superior to metronidazole in a small head to head trial (n = 17) in 1981 [10]. There have been no direct comparisons since, however, with the increasing incidence of macrolide resistance the addition of a third-generation cephalosporin or  $\beta$ -lactamase inhibitor containing penicillin is recommended in combination with clindamycin or metronidazole.

Conservative antibiotic therapy can fail for a number of reasons. There may be virulent or resistant pathogens; abscess drainage may be impaired by severe lung disease; and the antibiotics may be unable to penetrate the abscess wall adequately [11]. Pulmonary resection is the treatment of choice however, some patients are unsuitable for surgery. The alternative options, percutaneous tube drainage and endoscopic drainage, have mainly been confined to those too unwell for surgery. Success rates and complications vary greatly between the case series [1].

We were unable to find any studies reporting the instillation of antibiotics into pulmonary abscess cavities but case series of antibiotic

irrigation have been described for both breast [12] and liver [13] abscesses, often in combination with systemic therapy. The direct application of antifungals into aspergillomas is however a well-recognised, if not widely used, treatment option. First described in 1959<sup>2</sup>; the success of the initial attempts with nystatin and amphotericin B were mixed; but improved once the antifungals were prepared in a paste that solidified at body temperature, increasing the duration of antifungal exposure. No randomised trials have been performed but multiple case series utilising the technique have been published since, primarily for the management of severe haemoptysis, with resolution of symptoms in 30–100% of cases, again often with concurrent systemic treatment [2–5].

### 4. Conclusion

Our patient had numerous reasons for antibiotic failure. He had developed a resistant organism, the degree of damage to the surrounding lung tissue left no drainage available for the abscess, and the extensive surrounding fibrosis greatly reduced antibiotic penetration. All of these factors were overcome by lavage and instillation of antibiotics. We would suggest that this technique adds minimal risk and is potentially curative should an aspiration already be planned for diagnostic purposes.

### Declaration of competing interest

Nil.

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