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Case report

Mycobacterium goodii pneumonia: An unusual presentation of nontuberculous mycobacterial infection requiring a novel multidisciplinary approach to management

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ABSTRACT

Background: Mycobacterium goodii is a rapidly growing nontuberculous mycobacterium which has been associated with several infections including cellulitis, osteomyelitis, lymphadenitis, infected pacemakers and bursitis but it is a rare cause of respiratory infection.

Case presentation: In this case report we describe a 51-year-old woman who presented with a 6-week history of non-productive cough, pleuritic chest pain and weight loss. She had a history of gastric adenocarcinoma managed with a distal oesophagectomy and total gastrectomy and consequentially suffered severe post-operative gastric reflux. Initial cultures were negative but following a VATS lung biopsy *Mycobacterium goodii* was cultured and histology revealed an organising pneumonia. Treatment was with a prolonged course of steroids, amikacin and meropenem followed by oral ciprofloxacin and doxycycline. Ongoing gastric dysmotility and weight loss showed clinical improvement with a novel approach of a combination of prokinetics and somatostatin analogues controlling risk of repeat aspiration and improving symptom control.

Conclusions: This is an unusual case of organising pneumonia related to *Mycobacterium goodii* infection and highlights the importance of mycobacterial culture in unusual and unresolving cases of organising pneumonia. The importance of controlling symptoms related to gastric dysmotility and aspiration is also addressed.

1. Introduction

Mycobacterium goodii is a rapidly growing nontuberculous mycobacteria (NTM). *M. goodii* is part of the *Mycobacterium smegmatis* group which is also composed of *Mycobacterium smegmatis* and *Mycobacterium wolinskyi*. It was reclassified as such in 1999 by Brown et al. [1]. It is a rapidly growing NTM that is emerging as a nosocomial pathogen [2]. This may be related to its resistance to many forms of decontamination and sterilization [3]. Isolates of *M. goodii* have occurred in cases of surgical wound infections, osteomyelitis, cellulitis, nosocomial disease and respiratory disease [1]. Respiratory cases of *M. goodii* are uncommon but may be associated with structural lung disease and impaired mechanisms related to clearance of the organism [4]. In this case report we describe a case of *M. goodii* lung infection in a patient with chronic gastric reflux and probable recurrent aspiration. We describe the clinical presentation, the difficulties related to diagnosis, the importance of obtaining appropriate samples for mycobacterial culture, and a novel approach to control of dysmotility symptoms to improve patient's quality of life (QoL).

2. Case presentation

A 51-year-old female non-smoker presented with a 6-week history of a non-productive dry cough and progressive dyspnoea. The cough was associated with pleuritic chest pain and decreased energy. She denied haemoptysis or night sweats. She reported chronic gastric reflux, ongoing for 3 years following a distal oesophagectomy, total gastrectomy and jejunal-oesophageal anastomosis for gastric

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Abbreviations

M. goodii Mycobacterium goodii
NTM Nontuberculous Mycobacteria
PEG Percutaneous endoscopic gastrostomy
QoL Quality of life
VATS Video Assisted Thoracic Surgery

adenocarcinoma, vomiting and weight loss requiring a percutaneous endoscopic gastrostomy (PEG) tube for nutritional requirements. Physical examination revealed cachexia and chest was clear to auscultation. Oxygen saturations were 100% on room air and she was apyrexial. Laboratory results showed a white cell count of 8.7×10^9/L and C-reactive protein of 64mg/L. Chest radiograph demonstrated poorly defined nodular opacities in the inferior right upper lobe and a pronounced nodular consolidation in the right mid zone.

A high-resolution CT thorax showed extensive nodular changes in the right upper and lower lobes with confluent areas of consolidation with air bronchograms, see Fig. 1. Bronchoscopy was grossly normal. A bronchoalveolar alveolar lavage was carried out. There was no growth on routine, nocardia, actinomyces or fungal culture. Mycobacterial testing did not demonstrate acid-fast bacilli and Mycobacterium species were not isolated on culture. The patient was treated with piperacillin/tazobactam and a tapering dose of oral steroids with an initial clinical response. Oral azithromycin was added antimicrobial activity, pro-kinetic activity and anti-inflammatory action. Over the next 12 weeks she did not improve. Repeat bronchoscopy was again negative for bacterial and mycobacterial culture. A CT guided lung biopsy was carried out with negative culture. Steroid dose was increased to treat features of organising pneumonia. No granulomatous inflammation was observed on histology.

The patient continued to complain of cough, dyspnoea and high-volume vomitus, up to 2 L per day and weight loss to 39kg. Clinical signs deteriorated with bronchial breathing and audible crackles bilaterally. A Video Assisted Thoracic Surgery (VATS) guided right sided lung biopsy was undertaken. Histology demonstrated necrotising granulomatous inflammation, caseous necrosis and auramine-positive tubercle bacilli in association with an organising pneumonia. Mycobacterial culture demonstrated acid-fast bacilli on microscopy. GeneXpert did not detect MTB complex DNA. The patient was started on empiric treatment for non-tuberculous mycobacteria (NTM) with intravenous (IV) amikacin, IV meropenem, IV clarithromycin and oral ciprofloxacin and oral doxycycline. Culture was ultimately positive for *Mycobacterium goodii* (Fig. 2). The reference laboratory reported resistance to clarithromycin and ceftriaxone and susceptibility to ciprofloxacin, amikacin, cotrimoxazole, doxycycline, imipenem, linezolid and co-amoxiclav. Meropenem minimum inhibitory concentration was 1.0 μg/ml. Clarithromycin was stopped on identification of this organism. She was treated with 6 weeks IV therapy and changed to oral ciprofloxacin and doxycycline. She was subsequently changed to sulfamethoxazole/trimethoprim and ciprofloxacin.

Her course was complicated by ongoing gastric dysmotility, vomiting and aspiration pneumonia affecting tolerance of anti-mycobacterial medications. A palliative medical referral, for specific symptom control only, recommended the addition of octreotide, commenced at 1000mcgs and metoclopramide 40 mgs, subcutaneously (s/c) in 24 hours. The octreotide was increased to 2000mcgs and metoclopramide to 60 mgs s/c in 24 hours in the following week. On day 3 of this treatment she began to eat for the first time in months, volume of vomitus reduced to minimal. She was converted to somatostatin long acting depot, somatuline autogel 90 mgs deep s/c per month and domperidone 20 mgs half hour per-prandial. PEG feeding was discontinued. Over years her somatuline dose was monitored, eighteen months later her somatuline was discontinued as her symptoms were well controlled. Following discontinuation, she developed a further aspiration pneumonia. Depot somatuline 90 mgs deep s/c per month recommenced with no further aspiration pneumonia and continued weight gain.

Her dysmotility symptoms were controlled with this regimen and she tolerated her anti mycobacterial therapy. Treatment with continued with dual oral therapy for 2 years and a decision was made to continue lifelong sulfamethoxazole/trimethoprim monotherapy with regular outpatient monitoring. The cavitation and consolidation seen on radiology resolved and patient symptomatically improved.

3. Discussion

M. goodii has been identified in the environment and in aquatic systems, including drinking water supplies [5]. There have been cases of infection in sternal wounds post cardiothoracic surgery, breast abscesses post breast augmentation and prosthetic device infections [2,6]. *M. goodii* is a rare cause of mycobacterial lung disease [7] and more rarely associated with aspiration pneumonia with only one known case reported to date [8]. There are approximately 45 case reports of *M. goodii* infection in the literature [6]. Among the reported pulmonary diseases associated with *M. goodii* are chronic granulomatous disease, necrotising granulomatous pneumonia, achalasia with pulmonary infiltrates and lipoid pneumonia. Cases of chronic lipoid pneumonia typically occur secondary to either chronic aspiration or chronic oil ingestion predominates [1]. The patient described in the case may have been at risk of NTM disease due to her low body weight of 39kg and her chronic gastric reflux. Rapidly growing NTM lung infections have been associated with oesophageal disorders [9] which was a particular risk factor in this case. The stasis of food and regurgitation lead to chronic aspiration and may ultimately lead to infection due to these rapidly growing mycobacteria.

Treatment for *M.* goodii is often complicated by delays in diagnosis [2]. Empiric therapy for rapidly growing NTM is not recommended by the American Thoracic Society but when used it involves clarithromycin and rifampicin. However, *M. goodii* is inherently resistant to these agents due to overexpression of the *Wag31* gene and the presence of the *erm* gene [10]. Treatment of *M. goodii* therefore should be guided by antimicrobial susceptibility testing. *M. goodii* is generally susceptible to amikacin, sulfamethoxazole and ethambutol [1] with the former thought to be the most active and effective drug [4]. *M. goodii* shows intermediate susceptibility to ciprofloxacin, tobramycin and doxycycline; variable susceptibility to cefmetazole, clarithromycin and

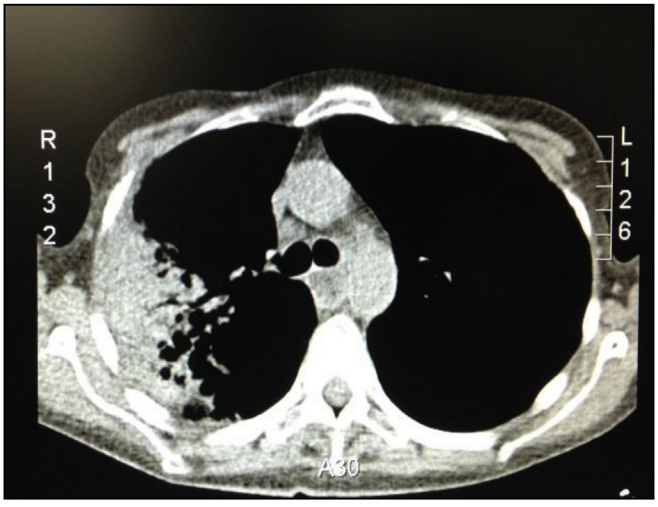

Fig. 1. CT thorax showing extensive nodular changes in the right upper and lower lobes with confluent areas of consolidation with air bronchograms and several foci of consolidation.

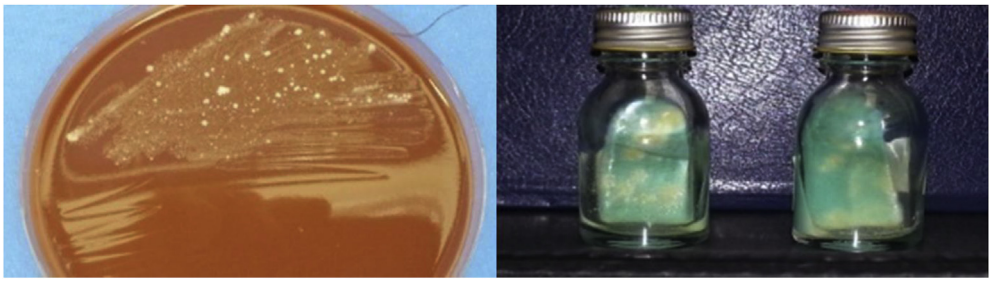

Fig. 2. *M. goodii* on Chocolate blood agar medium (left) and Lowenstein-Jensen agar slopes (right).

cefoxitin. It is resistant to isoniazid and rifampicin. Monotherapy regimes of trimethoprim-sulfamethoxazole (TMP/SMX) or doxycycline have reportedly been associated with treatment failure necessitating a more prolonged course in cases [11]. Treatment of *M. goodii* requires long courses of treatment with the duration depending on the particular clinical syndrome [2]. For respiratory diseases, initial combination therapy followed by oral therapy for 6–12 months of treatment has been effective [8]. Doxycycline and TMP/SMX are the most common agents used with parenteral amikacin or imipenem used in cases of severe infections [7]. In patients with chronic pulmonary disseminated disease repeat susceptibility testing should be performed at 3 and 6 months respectively regardless of clinical and radiological status [4]. In addition, treatment of the oesophageal disease may prevent occurrence of and facilitate recovery from these infections [11].

4. Conclusion

M. goodii can cause a severe cavitating pneumonia associated with cryptogenic organising pneumonia secondary to recurrent aspiration. Treatment requires prolonged courses of medications and should be guided on susceptibility results. We aim to highlight the importance of obtaining appropriate samples and the necessity of appropriate mycobacterial culture. The study presented demonstrates the novel use of somatostatin analogues in the management of underlying gastric dysmotility as an adjunct to the treatment of NTM infection.

Conflicts of interest

There are no potential or completing conflicts of interest.

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