CASE REPORT

Misidentification of *Mycobacterium fortuitum* in an immunocompetent patient presenting with a unilateral neck mass

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SUMMARY

A 31-year-old African man with a blameless medical history presented with an enlarging neck swelling of 6 months duration. He was systemically well with normal haematobiochemistry. MRI of the neck demonstrated abnormal signalling in the subcutaneous fat overlying the posterior spinal muscles in the midline and the left sternocleidomastoid muscle. Scanty growth of *Rhodococcus equi* was reported from a turbid fine needle aspirate of the neck on two separate occasions. The swelling progressed despite numerous antibiotic combinations which necessitated surgical debridement. Analysis of debrided tissue using 16S rDNA surprisingly identified *Mycobacterium fortuitum*, not *R equi*, thereby resolving our diagnostic conundrum.

BACKGROUND

This case highlights the superiority of molecular methods of bacterial identification, in this instance 16S rDNA, over traditional methods which focus on bacterial phenotypes. This is especially pertinent when investigating patients presenting with unusual or less-encountered genera. Molecular testing, although expensive and unavailable routinely allows immediate and accurate bacterial identification which in turn leads to the patient receiving prompt treatment with the correct antibiotics. Furthermore, surgical debridement is a very useful adjunct when treating non-healing soft tissue infections because it yields tissue and pus for culture.

CASE PRESENTATION

An immunocompetent 31-year-old African-American man presented with a 6-month history of progressive left neck swelling originating from the occiput and tracking along the anterior border of the sternocleidomastoid muscle terminating next to the thyroid cartilage. He had attended a hospital in Nigeria at the onset of his symptoms and following a fine-needle aspiration and culture 'a virus' had been implicated.

INVESTIGATIONS

Initial haematobiochemical parameters and a chest radiograph were normal. MRI showed abnormal signalling in the subcutaneous fat overlying the posterior spinal muscles in the midline and the left sternocleidomastoid muscle with no muscular infiltration (figure 1). Initial analysis of a fine-needle aspirate showed acute and chronic inflammatory cells with no organism seen on Gram stain and culture. No microorganisms were identified using periodic

acid Schiff with and without diastase, Gram stain, Giemsa stain and Ziehl-Neelsen stain. Despite the negative Ziehl-Neelsen without demonstration of acid-fast bacilli a *Mycobacterium* infection was suggested.

Subsequent analyses of further samples of neck fluid showed scanty pus cells and moderate growth of *Rhodococcus equi* on Analytic Profile Index. This necessitated investigating the patient's immune status. Results for HIV, toxoplasmosis, cytomegalovirus, bartonella serology, antistaphylococcal and antistreptococcal antibodies were negative.

Histopathological analysis of tissue obtained at surgery demonstrated granulomatous necrotising inflammation with abscess formation (figure 2).

Tissue and fluid obtained at surgery were sent to our reference laboratory for culture and susceptibility testing. *Mycobacterium fortuitum* was identified using molecular identification with 16S rDNA. Crucially, an antibiogram was also performed which led to the patient receiving appropriate treatment.

Figure 1 MRI neck—abnormal signalling in the subcutaneous tissue (posteriorly).

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Figure 2 Necrotising granulomatous inflammation with an epithelioid histiocytic granulomatous reaction.

TREATMENT

The patient was initially managed on an outpatient basis but the rapid progression of the swelling necessitated hospital admission. Treatment with oral co-amoxiclav 625 mg thrice daily was stopped and changed to oral rifampicin 600 mg once daily and doxycycline 100 mg twice daily based on sensitivities. The bacteria were sensitive to rifampicin, amoxicillin and ciprofloxacin and gentamicin on susceptibility testing.

The response to varying antibiotic combinations from the sensitivities was minimal. A senior ear nose and throat consultant took over the patient's care and promptly performed surgical exploration.

At surgery an indurated area was noted from the left occiput through to the sternum with involvement of the sternocleidomastoid muscle. Inflammatory tissue was debrided and pus evacuated. Larger samples of inflammatory tissue were obtained and samples sent to our reference laboratory for identification and susceptibility testing.

OUTCOME AND FOLLOW-UP

The reference laboratory analysed the samples using 16S rDNA sequencing. *M fortuitum* was isolated. It was shown to be sensitive to teicoplanin, linezolid, tetracycline, clarithromycin and moxifloxacin using the Kirby Bauer disc diffusion method. The patient was treated with oral clarithromycin 500 mg twice daily and moxifloxacin 400 mg once daily for 4 months based on the minimal inhibitory concentrations of 0.25 and 0.065 mg/L, respectively. He is disease-free after a year of treatment.

DISCUSSION

M fortuitum, is a Gram-positive, non-spore forming bacillus belonging to the species of the rapidly growing Runyon Group IV non-tuberculous mycobacteria (NTM).¹ *M fortuitum* is a common inhabitant of the environment and has been isolated in natural water, tap water, soil and dust.²

M fortuitum is an infrequent human pathogen causing opportunistic infections mostly in immunocompromised patients or those with chronic illness.³ Infections in the immunocompetent have been reported but are less common.⁴ Primary skin and soft tissue infections due to *M fortuitum* occur because of surgical wound infections and catheter sepsis.⁵ Commonly, there is a history of accidental injury, or nosocomial injuries with a

contaminated implement which introduces the infection.^{5 6} Distal sequelae and deep organ involvement are rare in the immunocompetent where infection is limited with minimum mortality but variable morbidity.⁷ The respiratory system is usually spared in *M fortuitum* infections and chest radiographs are usually normal distinguishing it from tuberculous infections which have a proclivity to cause respiratory and systematic diseases.⁸

Reported head and neck manifestations include acute and chronic otitis media,^{9 10} mastoiditis¹¹ and cervicofacial lymphadenitis which commonly occurs in otherwise healthy children.¹² Of note, these were nosocomial infections differing significantly from our case where the source of the infection was unexplained.

Unusually, our laboratory identified *R equi* on two separate samples tested by two different biomedical scientists. *R equi* (formerly *Corynebacterium equi*) is a Gram-positive coccobacillus that tends to cause respiratory tract infections in animals (especially young foals) and humans but can also cause soft tissue infections.¹³ With our patient giving a history of riding wild horses before the onset of the infection we concluded that the right pathogen had been isolated.

R equi is known to inhabit macrophages and treatment with macrophage-penetrating antibiotics is key. These include erythromycin, rifampin, fluoroquinolones, aminoglycosides, glycopeptides and imipenem.¹⁴

RGM can occasionally exhibit microscopic features of *Corynebacterium* and *Nocardia* species leading to misidentification and attendant morbidity and mortality.^{5 15–17} Of note, there has been a case report of catheter-related sepsis where *M fortuitum* specifically was initially misidentified as *Corynebacterium jeikeium* with the correct identification confirmed using 16S rRNA.¹⁸

Our experience mandates a high index of suspicion for misidentification when faced with unusual or unresponsive infections especially where *Corynebacterium* and NTM species are implicated. In such cases more novel molecular tests like 16S rDNA sequence analysis used by our reference laboratory but unavailable locally, can be crucial in the accurate identification of unusual organisms resulting in patients receiving the correct treatment immediately.^{5 19} Furthermore, such methods, although expensive and currently unavailable widely, play a key role in the discovery of novel genera and species.¹⁹

Alternative, if not cheaper, methods of identification include incubation in a radiometric automated Becton Dickinson culture system.²⁰ Typically in such instances identification of *M fortuitum* is predicated on its ability to grow in *p*-nitrobenzoic acid and MacConkey's agar.²⁰ Its inability to form any pigment on Löwenstein-Jensen medium; tolerance to 5% NaCl; positive nitrate reduction; and positive arylsulfatase test are also crucial defining characteristics.²⁰ However, these are not always accurate.¹⁹

M fortuitum, as with most rapidly growing NTM, is resistant to standard antituberculous drugs.²⁰ However, these organisms are known to be sensitive to cephalosporins, amikacin, ciprofloxacin, clarithromycin and imipenem.^{20 21} With regard to the optimum management of *M fortuitum* infections, the American Thoracic Society recommends surgical intervention and antimicrobial therapy for a minimum period of 4 months to achieve a high likelihood of cure; antibiotic therapy alone is often associated with recurrences, chronic drainage and sinus tract formation.²¹ Adequate debridement and wide excision of infected tissue and plentiful irrigation are recommended to avoid recurrence.²²

Learning points

- ▶ Genotypic analysis methods like 16S rDNA are recommended for confirmation of bacterial species when unusual clinical infections are encountered.
- ▶ Bacterial identification using phenotypic methods may be limited when dealing with infrequent pathogens.
- ▶ A high index of suspicion for emerging pathogens such as *Rhodococcus equi* and *Mycobacterium fortuitum* is required when treating unusual or non-responsive infections.
- ▶ Surgical debridement is a useful adjunct when managing unusual soft tissue infections which are unresponsive to antibiotics; it yields tissue which can be cultured more readily.

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Competing interests None.

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