Case Report

Mycoplasma hominis infection following neurosurgical intervention in a patient with spinal cord compression

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Introduction: Mycoplasma hominis is a rare but recognized cause of post-operative wound infection. There are very few cases reported in the literature of M. hominis infection following neurosurgery.

Case presentation: A 30-year-old woman with a history of chronic low back pain and symptoms consistent with sciatica underwent a microdiscectomy and anterior lumbar inter-body fusion for cord compression. Following surgery she developed an abscess overlying the lumbar surgical wound. Initial microbiological samples were negative on routine culture and the abscess recurred following surgical washout. Culture of a second specimen taken 1 month following the initial surgery revealed small colourless colonies that were not able to be seen on Gram stain. Molecular testing with 16S rRNA gene analysis confirmed M. hominis infection and the patient was treated with long-term oral moxifloxacin.

Conclusion: Infection with M. hominis should be considered in culture-negative cases of post-operative wound infection where routine antibiotics fail. Diagnosis of Mycoplasma can be delayed due to the fastidious nature of the organism and may require molecular techniques. Initiation of appropriate antimicrobial treatment is often associated with a good clinical outcome.

Keywords: moxifloxacin; Mycoplasma hominis; neurosurgery; post-operative infection.

Abbreviation: MRI, magnetic resonance imaging.

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wound. She had no neurological symptoms and no fevers. On examination, a palpable abscess was present with minimal clear discharge from the wound. A swab of the discharge grew mixed enteric organisms and normal skin flora on culture. The white cell count from blood was 8.7 $\times$ 10$^9$ l$^{-1}$ (reference range 4.0–11.0 $\times$ 10$^9$ l$^{-1}$) and the C-reactive protein was 12 mg l$^{-1}$ (reference range <5 mg l$^{-1}$). MRI was performed, and showed inflammatory changes extending along the surgical incision and into the pre- and paravertebral tissues. Two fluid collections were noted in the subcutaneous space and at the laminectomy defect, extending into the epidural space at L3/L4.

A washout and exploration of the incision was performed on day 25 post-operatively. Tissue specimens were cultured at 35 °C with 5 % CO$_2$ supplementation on horse blood, chocolate and MacConkey agar, as well as anaerobically on horse blood agar and in thioglycolate broth. There was no growth on any media after 5 days incubation. The CRP remained minimally elevated during this time at 15–25 mg l$^{-1}$.

Recollection of fluid within the abscess (Fig. 1) necessitated an ultrasound-guided aspiration on day 32 post-operatively. Culture of this specimen on horse blood agar revealed small colourless colonies on day 3 of incubation that were not able to be seen on Gram stain. The patient was commenced on moxifloxacin 400 mg daily for suspected *Mycoplasma* infection and the specimen was sent to a reference laboratory for confirmation. Molecular testing with 16S rRNA gene analysis was performed using UNEX primers, and a 718 bp product was submitted for BLAST analysis using the Hong Kong, BLAST nr, SeqMatch and FASTA databases. This confirmed *M. hominis* (with a 99 % sequence similarity) on day 44 after the initial operation.

A conservative approach with long-term antibiotics was instituted due to the risks associated with removal of the spinal hardware. The patient was treated with oral moxifloxacin for 3 months and has had no further symptoms of infection. Unfortunately, the surgery was unsuccessful in terms of relieving her low back pain and she continues to follow-up with the neurosurgical team.

**Discussion**

*Mycoplasma* species are small, fastidious bacteria that lack a cell wall and are therefore Gram-indeterminate. They are difficult to diagnose and treat, as they are resistant to standard broad-spectrum antibiotics that interfere with cell wall metabolism (Taylor-Robinson & Bébéar, 1997). *M. hominis* is found as a colonizer of the genito-urinary tract in sexually active adults (McKechnie et al., 2011), and is also associated with bacterial vaginosis (Song et al., 2014) and poor outcomes in pregnancy (Capoccia et al., 2013). Extra-genital infections are rare, but respiratory tract infections, central nervous system infections including brain abscesses, septic arthritis, osteomyelitis and wound infections have been reported (Taylor-Robinson, 1996). There is a recognized link between immunosuppression and *M. hominis* infection, with up to half of patients with significant extra-genital infection having an identifiable immunosuppressive risk factor (Meyer & Clough, 1993).

The source of extra-genital *M. hominis* infection is thought to be related to urinary catheterization or trauma to the genito-urinary tract (Madoff & Hooper, 1988; Whitson et al., 2014). Colonization of the genito-urinary tract may allow transient bacteraemia associated with catheterization, resulting in seeding of the bacteria to areas of high blood flow, including surgical wound sites and haematomas. This theory is supported by multiple case reports and series; however, it has not been proven with urinary culture or molecular studies. Risk factors for infection include recurrent urinary tract infections and abnormal vaginal discharge (Díaz et al., 2013). In the case presented, a history of menorrhagia with concurrent menses and repeated urinary catheterization peri-operatively may have increased the risk of *M. hominis* infection.

There have been few case reports of *M. hominis* causing post-operative neurosurgical infections. A recent literature review discussed 11 patients with post-operative brain or spine infections due to *M. hominis* (Whitson et al., 2014). All 11 patients were catheterised peri-operatively.
and three patients (27%) had other risks factors, including trauma, chronic urinary tract infection and abnormal vaginal discharge. Three of the 11 cases involved spine infections; these patients presented with fevers, elevated inflammatory markers and variable levels of neurological involvement. They were all treated successfully with either moxifloxacin or doxycycline.

*M. hominis* is a slow-growing organism that is difficult to identify by traditional techniques, and often requires PCR for diagnosis. A recent case report described the use of matrix-assisted laser desorption ionization time-of-flight MS to diagnose a brain abscess caused by the organism (Pailhorie et al., 2014). Antibiotic sensitivity testing is not necessary in all cases, but can be performed in situations of treatment failure or significant immunosuppression (Samra et al., 2002). Although agar dilution, broth dilution and Etest methods have been used, there is no consensus regarding resistance breakpoints and these techniques can be labour intensive.

Treatment of *M. hominis* infection involves the use of an appropriate antibiotic agent and empiric regimes that are based on broad-spectrum β-lactam antibiotics or other cell wall active agents are often inadequate (Taylor-Robinson & Bébéar, 1997). Commonly recommended surgical prophylaxis with second-generation cephalosporins, as was used in this case, will not prevent *M. hominis* infection. Mycoplasmas are also resistant to sulphonamides due to the absence of folic acid metabolism (Capoccia et al., 2013) and *M. hominis* has been shown to have high levels of resistance to macrolides, including azithromycin and erythromycin (Samra et al., 2002). Mutations in the 23S rRNA which account for macrolide resistance in *M. hominis* are not seen in other species of *Mycoplasma*, and sequencing of this region can aid in both diagnosis and treatment (Pereyre et al., 2002).

Tetracyclines and fluoroquinolones have demonstrated some success in the treatment of post-operative *M. hominis* infection (Krijnen et al., 2006; Whitson et al., 2014). Unfortunately, resistance to ciprofloxacin and doxycycline is increasing in parts of the world where there is high use of fluoroquinolones (Díaz et al., 2013). Clindamycin and pristinamycin have activity *in vitro*, but there are no case reports of their use in post-operative neurosurgical infections (Waites et al., 2008; Song et al., 2014).

Due to its comparatively good cerebrospinal fluid penetration, moxifloxacin is the drug of choice for brain or spinal cord infections (Díaz et al., 2013) and this was the rationale for using it in this case. The quinolones also have the advantage of displaying cidal activity against *M. hominis*, whilst alternatives such as doxycycline are bacteriostatic. Duration of therapy remains uncertain and is dependent on the presence of hardware. In this case, it was decided to leave the metal in situ due to the risks associated with removal and the antibiotic course was prolonged.

This case highlights an unusual cause of post-operative neurological infection that can be difficult to diagnose and is not treated by common broad-spectrum antibiotic regimens. *M. hominis* infection should be considered in cases of culture-negative infection following surgery and may require molecular methods for diagnosis. Treatment with an appropriate antibiotic usually results in a good clinical outcome.

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**References**


