CASE REPORT

Postoperative *Mycoplasma hominis* brain abscess: keep it in mind!

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SUMMARY

A temporal lobe abscess was diagnosed in a 57-year-old man. A urethral catheter had been inserted 12 days earlier, just prior to clot evacuation of a subacute haematoma secondary to an arterio-venous malformation. Fever persisted despite debridement and treatment with meropenem and vancomycin. Gram stains of operative samples showed no bacteria. Extended cultures grew pinpoint colonies after 5 days. Meanwhile, sequencing of bacterial 16S rDNA from operative specimens had identified *Mycoplasma hominis*; the bacterial colonies were subsequently similarly identified. The patient responded promptly following addition of oral doxycycline 100 mg two times per day. There is a growing literature of similar cases. Transient bacteraemia, following urinary catheterisation, with seeding of existing sites of inflammation is the proposed explanation. Urethral carriage of *M. hominis* is 15% and catheterisation is a common procedure. *Mycoplasma hominis* maybe more common than appreciated, especially as the need for extended cultures makes a correct diagnosis less likely.

BACKGROUND

Postoperative brain abscess is a potentially devastating condition without early appropriate management. There are a number of recent reports of postoperative *Mycoplasma hominis* infections involving the central nervous system,[1–16] Transient bacteraemia following manipulation of a genitourinary tract colonised with *M. hominis* is suggested as the cause of infection,[2] Empirical therapy for these cases generally includes agents such as β-lactams and vancomycin that act on the bacterial cell wall. However, *M. hominis* lacks a cell wall, so these antimicrobials are ineffective. Considering the high urethral carriage rate of *M. hominis* (15% of healthy adults) and the frequent use of urinary catheters, we suspect that there are a lot more cases of disseminated *M. hominis* infection that go unrecognised.

CASE PRESENTATION

A 57-year-old, previously healthy man presented to the Emergency Department following the sudden onset of headache and left upper and lower limb weakness. Cerebral angiography demonstrated a large subacute haematoma in the right temporoparietal lobe secondary to an arterio-venous malformation (AVM). A urethral catheter was inserted on admission and removed 4 days later. The haematoma was managed expectantly until signs of raised intracranial pressure developed (day 12 of admission), accompanied by increasing perilesional oedema and midline shift on repeat brain imaging. He was re-catheterised and a craniectomy with clot evacuation was performed on day 13 of admission, followed by AVM excision 4 days later. A day later the urethral catheter was removed. Antibiotic prophylaxis with intravenous cefazolin, per hospital guidelines, was given prior to both procedures. On day 1 post-AVM excision, his temperature spiked to 38.5°C but he remained clinically and neurologically stable. Intermittent temperature spikes persisted and day 8 post-AVM excision contrasted CT scan of the brain revealed a 4.4×1.8 cm abscess in the right temporal lobe (figure 1). Immediate debridement was performed and empirical intravenous meropenem and vancomycin started postoperatively.

INVESTIGATIONS

A Gram stain of the intraoperative samples revealed numerous polymorphonuclear cells but no organisms. Samples were inoculated on blood, MacConkey and chocolate agar plates and incubated at 35°C in 5% CO_2. Phenylethyl alcohol and Schaedler's agar plates were incubated anaerobically. At 48 hours incubation, no growth was seen on any of the plates; therefore, incubation was prolonged. Multiple sets of blood cultures prior to antibiotics yielded no growth. Bacterial 16S ribosomal DNA (16S rDNA) was amplified from a pooled sample of intraoperative specimens,[17] PCR products were sequenced using Sanger sequencing. The sequences were compared to known sequences in the National Centre for Biotechnology

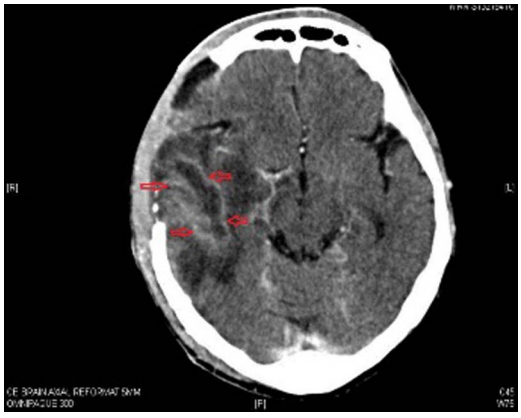

Figure 1 CT brain with contrast. An irregular rim-enhancing lesion is seen in the right temporal lobe measuring 4.4×1.8 cm (indicated with red arrows) which represents the abscess. There is perilesional vasogenic oedema and brain herniation via craniectomy defect.

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Information (NCBI) database and the DNA Data Bank of Japan (DDBJ) database. The isolate was identified as *Mycoplasma hominis* with 99.86% homology (749/750 bases) to the reference strain (ATCC 27545, accession CP009652.1). 16S rDNA sequencing of the AVM tissue did not detect bacterial DNA. On day 5 of incubation, pinpoint colonies were noted on blood agar and Schaedler's plates. No organisms were seen on repeated Gram stains of the colonies. Matrix-assisted light desorption/ionisation time-of-flight (MALDI-TOF) mass spectrometry (Bruker, Bremen, Germany) did not give any reliable identification as the *M. hominis* spectrum is not included in the database. 16S rDNA sequencing on colonies taken directly from the blood agar plate also gave sequences with 99.86% homology with *M. hominis*.

TREATMENT

His antimicrobial therapy was changed to oral doxycycline 100 mg two times per day.

OUTCOME AND FOLLOW-UP

The patient subsequently made a good clinical recovery. C reactive protein (CRP), procalcitonin and neutrophil counts all returned to normal following initiation of doxycycline therapy. The rest of his hospital stay was uncomplicated and he was discharged to complete an 8-week antibiotic course. At follow-up, 2 months after completing doxycycline course he remained in good general health but with residual neurological dysfunction, including a left homonymous hemianopia, as a consequence of the initial haematoma. The craniectomy site had healed and inflammatory markers (including CRP and white cell counts) were within normal limits.

DISCUSSION

Currently there are 17 published reports of central nervous system infections caused by *M. hominis* in adults.[1–16] Our case adds to this body of evidence. These include 13 cases of brain abscess and 4 cases of meningitis. The recent cases describe isolation of *M. hominis* a number of days following hospital admission with patients having contributing factors such as head trauma, neurosurgery, genitourinary or delivery manipulations.[1–16] A separate group at increased risk of extra-genital *M. hominis* infections are those with congenital and acquired immunodeficiency due to impaired cell-mediated and antibody-mediated immunity; these include immune-suppressive therapy post organ transplantation, collagen vascular disease and hypogammaglobulinaemia,[16 18 19]

Infections caused by *M. hominis* are predominately associated with the genitourinary tract, including pelvic inflammatory disease, postpartum fever and pyelonephritis.[20] Extra genital sites of infection include vascular site infections, surgical wounds, joint infection and respiratory tract infections,[16 18 19] As described, *M. hominis* has also emerged as an infrequent but important cause of postoperative central nervous system infections. *M. hominis* asymptomatically colonises the urogenital tract (15%) and more rarely the respiratory tract mucosa of healthy individuals.[1–16] These infections are thought to be secondary to the haematogenous spread of *M. hominis* with transient bacteraemia following disruption of a colonised airway (post intubation) or genitourinary tract (urinary catheterisation, cystoscopy, gynaecological surgery or delivery) resulting in seeding of sites of existing central nervous system injury.[1–16 18] It may also be secondary to direct inoculation at the time of trauma or contamination during surgery.[2] In our case, we believe that the site of the AVM excision was seeded with *M. hominis* following removal of the urinary catheter postoperatively with subsequent abscess formation. Mycoplasmas were first isolated in 1898 from cattle with pneumonia and are the smallest free-living organisms. *Mycoplasma pneumoniae*, *M. hominis* and *M. genitalium* are most commonly associated with human infection. They are included within the class *Mollicutes* meaning 'soft skin' referring to the lack of a rigid cell wall,[20] As a consequence, *Mycoplasma* spp. do not stain with Gram's stain. Similarly, antibiotics targeting the bacterial cell wall are not effective, so mycoplasma infections do not respond to cell wall active antibiotics such as penicillins, cephalosporins and vanocmycin.[20] As these are common empirical choices for a range of infectious syndromes, unexpected isolation of *Mycoplasma* spp. can therefore have significant therapeutic implications.

Laboratory diagnosis of *M. hominis* infection can be challenging. Gram stains of clinical samples will not detect the organism. They may not grow on routine laboratory media and often require prolonged incubation for 3–4 days before the colonies become visible. Despite recommendations to incubate anaerobic plates for 5 days, many laboratories culture samples only for 48 hours so growth of *M. hominis* may not be detected. *M. hominis* is not usually recovered from blood cultures as sodium polyanethol sulfonate, the anticomplementary and antiphagocytic additive that is present in most routine blood culture media, is toxic to mycoplasmas.[20] For suspected mycoplasma infection, samples are best incubated anaerobically for 3–5 days on selective agar. Colonies have a typical 'fried egg' appearance as a result of the organism growing into the agar at the centre of the colony and superficially on the periphery.[20]

Molecular methods, including 16S rDNA sequencing and real-time PCR, have been used to identify unknown mycoplasma isolates from positive cultures and to detect them in samples, including synovial fluid, empyema fluid and cerebral abscess, where cultures were negative. This has led to the recognition of *M. pneumoniae*, *M. salivarium*, *M. fermantans* and *M. hominis* as pathogens when isolated outside their commensal locations.[1 3–4 10–14 16 21 22] MALDI-TOF mass spectrometry can also be used to identify *M. hominis* from culture,[2] as long as the library includes the *M. hominis* spectrum.

Learning points

- *M. hominis* infections are infrequently considered but may be under diagnosed and may be more prevalent than previously thought. Between 15% and 25% of hospitalised patients may receive short-term indwelling urinary catheters,[24] so a substantial number may be at risk of extra-genital infections with *M. hominis*.
- Currently recognised patients at particular risk of extra-genital *M. hominis* infection include postpartum patients, neonates, those post neurosurgical intervention and head trauma and the immune-compromised.
- *M. hominis* should be considered in these groups when Gram stains reveal abundant neutrophils but no bacteria, routine cultures are negative and when there is no response to standard antimicrobial therapy.
- Use of techniques allowing more rapid identification of Mycoplasmas (PCR/MALDI-TOF) should reduce time to diagnosis and initiation of effective antimicrobial therapy in these patients.
- Treatment should include doxycycline or a fluoroquinolone.

Successful management of deep-seated *M. hominis* infection involves surgical debridement and drainage with appropriate antimicrobial therapy.[19] Mycoplasmas are susceptible to antimicrobial agents that affect DNA, RNA, protein synthesis or the integrity of the cell membrane. *M. hominis* is generally susceptible in vitro to tetracyclines, clindamycin and fluoroquinolones, but tetracycline resistance in *M. hominis* varies geographically, ranging from 10% to 40%.[23] This highlights the importance of susceptibility testing, but this is unavailable in routine diagnostic laboratories. Doxycycline is reported as the most active tetracycline against *M. hominis*. Successful treatment of brain abscesses and other central nervous system infections have been reported with doxycycline and/or fluoroquinolones (moxifloxacin/ciprofloxacin).[2–4 8 12–13 15]

Contributors SMB, SMM, BY and EBI contributed to the writing of the manuscript. SMB was involved in the laboratory investigations. EBI and BY were involved in the clinical care and follow-up of patient.

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REFERENCES

1 Reisser S, Masson R, Guerin F, *et al*. Fatal nosocomial meningitis caused by *Mycoplasma hominis* in an adult patient: case report and review of the literature. *Int J Infect Dis* 2016;48;81–3.
2 Pailhoriès H, Rabier V, Eveillard M, *et al*. A case report of *Mycoplasma hominis* brain abscess identified by MALDI_TOF mass spectrometry. *Int J Infect Dis* 2014;29;166–8.
3 Henao-Martínez AF, Young H, Nardi-Korver JJ, *et al*. *Mycoplasma hominis* brain abscess presenting after a head trauma: a case report. *J Med Case Rep* 2012;6:253.
4 Kupila L, Ranakokko-Jalava K, Jalava J, *et al*. Brain abscess caused by *Mycoplasma hominis*: a clinically recognizable entity? *Eur J Neurol* 2006;13:550–1.
5 Paine TJJr, Murray R, Perimutter I, *et al*. Brain abscess and meningitis associated with pleuropneumonia—like organisms: clinical and bacteriological observations in a case with recovery. *Ann Intern Med* 1950;32:554–62.
6 Payan DG, Seigal N, Madoff S. Infection of a brain abscess of *Mycoplasma hominis*. *J Clin Microbiol* 1081;14:571–3.
7 McMahon DK, Dummer JS, Pasculle AW, *et al*. Extragenital *Mycoplasma hominis* infections in adults. *Am J Med* 1990;89:275–81.
8 Cohen M, Kubak B. *Mycoplasma hominis* meningitis complicating head trauma: case report and review. *Clin Infect Dis* 1997;24:272–3.
9 Zheng X, Olson DA, Tully JG, *et al*. Isolation of *Mycoplasma hominis* from a brain abscess. *J Clin Microbiol* 1997;35:992–4.
10 House P, Dunn J, Carroll K, *et al*. Seeding of a cavernous angioma with *Mycoplasma hominis*: a case report. *Neurosurgery* 2003;53:749–52; discussion 752-3.
11 Douglas MW, Fisher DA, Lum GD, *et al*. *Mycoplasma hominis* infection of a subdural haematoma in their peripartum period. *Pathology (Phila)* 2003;35:452–4.
12 McCarthy KL, Looke DF. Successful treatment of post neurosurgical intracranial *Mycoplasma hominis* infection using gatifloxacin. *J Infect* 2008;57:344–6.
13 Al Masalma M, Drancourt M, Dufour H, *et al*. *Mycoplasma hominis* brain abscess following uterus curettage: a case report. *J Med Case Rep* 2011;5:278.
14 Lee EH, Winter HL, van Dijl JM, *et al*. Diagnosis and antimicrobial therapy of *Mycoplasma hominis* meningitis in adults. *Int J Med Microbiol* 2012;6:253.
15 Hos NJ, Bauer C, Liebig T, *et al*. Autoinfection as a cause of post partum subdural empyema due to *Mycoplasma hominis*. *Infection* 2015;43:241–4.
16 Sato H, Iino N, Ohashi R, *et al*. Hypogammaglobulinemic patient with polyarthritis mimicking rheumatoid arthritis finally diagnosed as septic arthritis caused by *Mycoplasma hominis*. *Intern Med* 2012;51:425–9.
17 Louie L, Goodfellow J, Mathieu P, *et al*. Rapid detection of methicillin-resistant Staphylococci from blood culture bottles by using a multiplex PCR assay. *J. Clin Microbiol* 2002;40:2786–90.
18 Noska A, Nasr R, Williams DN. Closed trauma, *Mycoplasma hominis* osteomyelitis, and the elusive diagnosis of Good's syndrome. *BMJ Case Rep* 2012;27:2012.
19 Meyer RD, Clough W. Extragenital *Mycoplasma hominis* infections in adults: emphasis on immunosuppression. *Clin Infect Dis* 1993;17(Suppl 1):S243–9.
20 De la Maza L. *Color Atlas of Medical Bacteriology*. Washington,DC: ASM Press, 2004.
21 Johnson SM, Bruckner F, Collins D. Distribution of Mycoplasma pneumoniae and *Mycolplasma salivarium* in the synovial fluid of arthritis patients. *J Clin Microbiol* 2007;45:953–7.
22 Baracaldo R, Foltzer M, Patel R, *et al*. Empyema caused by *Mycoplasma salivarium*. *J Clin Microbiol* 2012;50:1805–6.
23 Krausse R, Schubert S. In-vitro activities of tetracyclines, macrolides, flouroquinolones and clindamycin against *Mycoplasma hominis* and *Ureaplasma* spp. isolated in Germany over 20 years. *Clin Microbiol Infect* 2010;16:1649–55.
24 Warren JW. Catheter-associated urinary tract infections. *Int J Antimicrob Agents* 2001;17:299–303.