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Case report

Mycoplasma hominis vertebral spine infection: Case report and a review of infections of bone and joints

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ABSTRACT

Background: Mycoplasma hominis (*M. hominis*) is a common commensal that colonizes the human urogenital tract, wherein it is also known to cause genito-urinary infections. It has rarely been reported to cause spinal infections.
Case description: We describe the case of a 53-year old diabetic woman who developed spontaneous, culture-negative L3-4 osteomyelitis that progressed clinically and radiographically despite debridement, stabilization, and empiric broad-spectrum antimicrobial therapy. After her third debridement procedure, cultures of the multiple intraoperative specimens yielded *M. hominis*.
Literature review: A PubMed search identified a total of 4 reports of *M. hominis* causing spinal osteomyelitis and 22 other cases involving bones and joints.
Clinical relevance: M. hominis is a rare cause of bone and joint infections. Because of low clinical suspicion for this pathogen, combined with its fastidious nature and the difficult growth characteristics of this organism, *M. hominis* infections may be unrecognized and untreated, resulting in high morbidity. In addition to bacterial culture, molecular tests are available to detect *M. hominis* in clinical samples. This case report and review of the literature suggest that, in some cases of purulent culture-negative osteomyelitis, especially if not responding to standard empiric antibacterial therapy, *M. hominis* should be considered as a potential pathogen.

1. Introduction

Spinal osteomyelitis is associated with significant morbidity, and treatment often involves invasive procedures and prolonged systemic antibiotics. About 95% [1] of spinal osteomyelitis have a defined microbiologic diagnosis, which include Gram positive cocci [*Staphylococcus aureus* (42%), coagulase-negative staphylococcus such as *Staphylococcus epidermidis* (8%), *Streptococcus* species (12%), and Enterococcus (0.7%)], less commonly Gram-negative bacilli [*Escherichia coli* (9%), *Proteus* species (1%), *Klebsiella* species (4%), and *Pseudomonas* species (6%)], and much less commonly, *Candida* or other fungi (1%) [1]. Approximately 5% cases of spinal osteomyelitis have no defined microbial etiology (termed culture-negative spinal osteomyelitis), and this is often presumed to be due to prior antibiotic exposures that reduce the yield of routine bacterial cultures. As such, the suggested empiric regimens of culture-negative spinal osteomyelitis often include vancomycin plus a broad-spectrum beta-lactam antimicrobial to cover most of the aforementioned etiologic pathogens [2].

Mycoplasma hominis is a human pathogen that is most commonly associated with urogenital tract infections [3]. It has rarely been recognized as an atypical cause of spinal osteomyelitis [4]. *M. hominis* is fastidious and very difficult to isolate on routine bacterial cultures and it does not respond to standard empiric "cell-wall acting" antibacterial regimens because it lacks a peptidoglycan layer [5]. Sensitive molecular tests are available to detect *M. hominis* in clinical specimens, thus allowing the organism to be reliably treated with inexpensive oral antibiotics that are typically not used to treat osteomyelitis.

The purpose of this clinical report and literature review is to highlight the role of *M. hominis* in vertebral osteomyelitis and other bone and joint infections, and discuss diagnostic considerations,

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especially when routine bacterial cultures do not yield the usual pathogens (i.e., culture-negative osteomyelitis).

2. Case report

A 53 year-old diabetic woman (Hemoglobin A1c 7.7) was evaluated by her primary care physician for progressive dull low back pain. There was no preceding trauma, or accompanying systemic symptoms of fever, sweats, or chills. An MRI of the lumbosacral spine demonstrated osteomyelitis of the L3-L4 region with an epidural abscess. Bacterial and fungal cultures of a CT-guided aspiration biopsy were reported as negative. Bacterial cultures were completed on sheep blood agar and were held for 5 days of incubation. She was commenced on an empirical antibacterial regimen consisting of ceftriaxone, vancomycin, and metronidazole. Despite this therapy for 4 weeks, she gradually developed bilateral lower extremity weakness, and was subsequently referred to the Mayo Clinic. A repeat MRI showed progression of her L3-L4 disk space infection (Fig. 1). In an attempt to define her microbiology, her antibiotics were discontinued with a plan to undergo open debridement in 2 weeks, however due to spinal instability she underwent urgent surgical debridement 4 days after discontinuing antibiotics. She underwent posterior lumbar decompression with arthrodesis and transforaminal interbody fusion of L2-L5. Intraoperatively, she was found to have a phlegmon, which was debrided and sent for aerobic and anaerobic bacterial, fungal, and mycobacterial stains and cultures. All cultures were again without any growth (presumed to be due to prolonged antibiotic exposure). Bacterial cultures were completed using sheep blood agar and were incubated for 5 days. She was therefore continued on an empiric antibacterial coverage, targeting the most common bacterial pathogens, with ertapenem and vancomycin.

Four weeks later, while still on ertapenem and vancomycin, she developed low-grade fevers, associated with elevated inflammatory markers, leukocytosis, and progressive bowel and bladder incontinence. A white fibrinous exudative material was coating her poorly-healing surgical wound. A repeat MRI of the lumbar spine demonstrated interval worsening of spinal canal narrowing with worsening paraspinal myositis. She underwent repeat surgical debridement, where the intraoperative field was grossly purulent and foul smelling. An estimated 200 mL of infected-looking material was evacuated, including necrotic muscle, and was sent for culture. After five days of incubation on routine aerobic bacterial culture media, eight of 10 surgical specimens grew *M. hominis* as a monomicrobial pathogen. No other organism was isolated.

The microorganism was confirmed as *M. hominis* by culture and PCR at the Mayo Clinic. Her antibiotic regimen was modified to a combination of vancomycin (to complete 8 weeks of empiric antistaphylococcal therapy), plus oral levofloxacin and doxycycline (for *M. hominis*). Ertapenem was eventually discontinued. Antimicrobial susceptibility testing (The Diagnostic Mycoplasma Laboratory, University of Alabama, Birmingham, AL) showed *M. hominis* to be susceptible to clindamycin (MIC, 0.031 mcg/mL), tetracycline (MIC, 0.5 mcg/mL), and levofloxacin (MIC, 1 mcg/mL). She completed 6 weeks of levofloxacin (750 mg by mouth daily) and remains on oral doxycycline (100 mg by mouth twice daily) as lifelong suppression in the setting of an infected spinal instrumentation (to suppress *M. hominis* and a potentially undiagnosed staphylococci).

3. Discussion

Mycoplasma species are the smallest known free-living organisms in nature, and they belong to the class Mollicutes [6]. They are biologically unique among bacteria for their lack of a cell wall, with only a plasma membrane binding them together. This characteristic makes these bacteria atypical, in terms of the routine diagnostic methods and empiric antibiotic regimens. In particular, their lack of cell wall renders them invisible to routine Gram stain for bacterial detection, as the crystal violet and safranin used in this staining method functions by binding to the peptidoglycan layer of the bacterial cell wall (which is lacking in Mycoplasmas) [6]. This lack of cell wall also renders "cell-wall acting" β-lactam antibiotics, which are commonly used for empiric antibacterial therapy, ineffective against this organism since this class of antibiotics function by disrupting the peptidoglycan layer.

M. hominis colonizes and infects the genitourinary tract. Infrequently, it may cause infections outside of the urogenital tract [7]. We conducted a review of the literature using the search terms "*M. hominis*" and "osteomyelitis" and restricted the selected articles to adult patients. This revealed a total of 78 cases of extragenitourinary infection, with 28 cases involving bone and joints (Table 1), and five involving the spine (Table 2). It is difficult to assume and prove that our case has been due solely to *M. hominis* infection from the onset of spinal disease, since it is also likely that it may have developed later in the course of her underlying illness and *M. hominis* may have been merely superimposed over an undiagnosed pathogen. Over 50% of sexually active adult females have genital colonization with *M. hominis*. Hence, our patient may have been colonized with *M. hominis* in her urogenital tract, and her

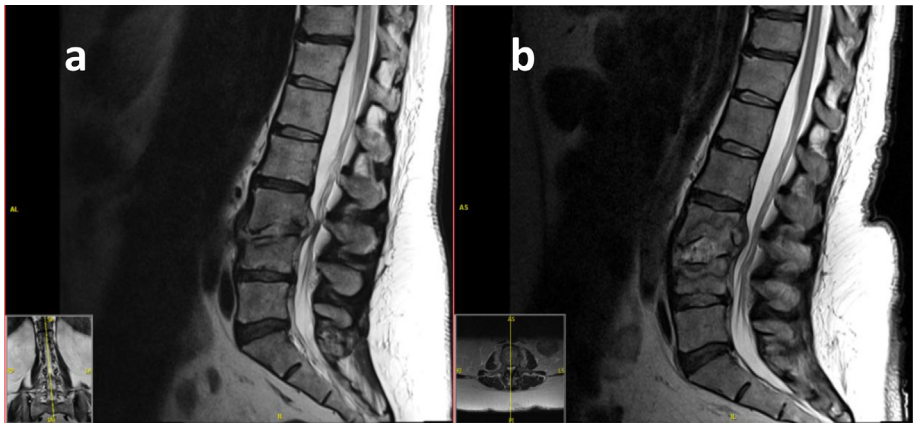

Fig. 1. Magnetic Resonance Imaging of lumbar spine with IV gadolinium contrast showing discitis/osteomyelitis at the L3-L4 disc space before (a) and after (b) four weeks of empiric intravenous "cell-wall acting" antibiotics. Imaging after antibiotics (b) demonstrates possible disc space abscess and paraspinal phlegmon with interval progression.