



Case report

A rare anaerobic cause of vertebral osteomyelitis and psoas abscess: A case study

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ABSTRACT

Parvimonas micra is an obligate anaerobe that forms part of the normal gastrointestinal flora. The advent of matrix-assisted laser desorption ionization time of flight mass spectrometry (MALDI-TOF) and 16s ribosomal RNA gene sequencing has led to increased detection of many rare anaerobic isolates, including *Parvimonas micra*. Typical risk factors for *Parvimonas micra* bacteremia include dental procedures or spinal instrumentation. Here, we report a case of *Parvimonas micra* spondylodiscitis and psoas abscess in a patient with no obvious antecedent risk factors and explore the challenges in isolation of the organism from tissue samples.

Introduction

Parvimonas micra, formerly known as *Peptostreptococcus micros* and *Micromonas micros* before its final re-classification in 2006, is an obligate anaerobic gram-positive coccus that is part of the normal oral and gastrointestinal flora [1–3]. While bacteremia due to *Parvimonas micra* is extremely rare, it has been implicated in infections of prosthetic joints [1,4,5] as well as rare native joint septic arthritis [1,6,7] and osteomyelitis, often in association with dental procedures [7] or spinal instrumentation [8]. Here, we report a case of invasive *Parvimonas micra* infection of the vertebrae leading to spondylodiscitis and psoas abscesses in a patient with no obvious antecedent risk factors.

Case Presentation

Our patient was a 70-year-old female with a past medical history significant for chronic lymphocytic leukemia in remission, autoimmune hemolytic anemia treated with four months of tapering steroids and rituximab three years prior, diabetes mellitus, hypertension, hypothyroidism, and osteoarthritis of the right hip, status post right hip arthroplasty ten years prior with subsequent superficial infection and hardware replacement. She presented to the emergency department with one week of acute and rapidly worsening lower back pain. The patient reportedly suffered a fall two months prior to presentation but did not develop any significant back pain immediately following this. The patient reported chills and diaphoresis associated with worsening of

her back pain, but denied any history of fever, night sweats, chest pain, shortness of breath, nausea, vomiting, flank pain, limb weakness, bowel or bladder disturbances, headache, or mental status changes. She did not report any recent surgeries, injections, dental instrumentation, or other invasive procedures.

Initial investigations revealed mild leukocytosis with neutrophilia, while subsequent serial blood cultures were negative. Computed tomography (CT) of the head and face revealed dental caries in the left maxillary molar. Magnetic resonance imaging (MRI) of the lumbar spine revealed discitis and osteomyelitis of the T12-L1 spine with adjacent epidural abscess as well as bilateral psoas muscles abscesses (Fig. 1). A biopsy of the infected tissue was performed and sent for aerobic and anaerobic culture. The patient was admitted to the medical floor and started on vancomycin and cefepime, which was adjusted to vancomycin monotherapy at 1.5 g daily after identification of *Peptostreptococcus* species on initial tissue culture. At 48 h of infected spinal tissue culture, colonies appeared on anaerobic media under anaerobic conditions only (ThermoFisher™ Remel™ Brucella agar, Waltham, Massachusetts) (Fig. 2). Gram stain of the colony revealed gram-positive to gram-variable cocci (Fig. 3). The isolate was identified as *Parvimonas micra* with a 99.9% match via matrix-assisted laser desorption ionization time of flight mass spectrometry (MALDI-TOF) with the VITEK MS using library Knowledge Base 3.2 Version 3.0 with Myla version 4.7.1 (bio-Mérieux, Marcy-l'Étoile, France). To confirm the identification, the isolate underwent Sanger sequencing of the 16s rRNA gene. Results revealed greater than 99% similarity between the isolate and *Parvimonas*

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micra, confirming its identity instead of the originally identified *Peptostreptococcus* species. Susceptibility testing was attempted with manual gradient diffusion, but the organism failed to grow on the susceptibility testing media (CDC anaerobic lake blood agar plate, BD BBL™, Franklin Lakes, New Jersey).

On the seventh day of antibiotics, the patient developed low grade fever and lethargy, with repeat imaging showing new L1 compression fracture, worsening phlegmon and spinal cord compression. The patient's antibiotic was changed from vancomycin to meropenem 1 g three times daily, based on the positive *Parvimonas micra* report and the lack of clinical improvement. Upon evaluation by a neurosurgery team, no surgical intervention was recommended. A dental team performed an extraction of the carious left maxillary molar. The patient eventually improved and was discharged on day 19 of admission with a plan for six weeks of IV ertapenem therapy, along with infectious disease and neurosurgery follow-up. The patient's pain worsened shortly after discharge, however, necessitating re-admission to an outside facility where she underwent successful T9-L3 stabilization surgery with T12 laminectomy. At the most recent check the patient was clinically stable, with continuing long-term physical therapy for rehabilitation following the spinal surgery.

Discussion

Anaerobic spondylodiscitis is a rare cause of infectious spinal infection, accounting for less than 3% of all such cases [9,10]. While some cases of direct inoculation during spinal surgery have been noted, anaerobic spondylodiscitis is typically associated with hematogenous spread of normal gastrointestinal flora due to gut translocation. As such, these infections favor individuals with comorbid risk factors involving the gastrointestinal tract and conditions causing immunocompromise such as diabetes, chronic renal insufficiency, or malignancy. Polymicrobial involvement with both aerobes and anaerobes is commonly seen in chronically immobilized patients who develop pressure sores [11]. A reasonable index of suspicion for anaerobic involvement must be maintained in patients with multiple comorbidities who present with an unexplained acute to subacute course of back pain, which may be accompanied by neurological deficits or systemic symptoms such as fever, chills or diaphoresis. Anaerobic spondylodiscitis may be clinically indistinguishable from the more common aerobic infections, and therefore, pose a diagnostic challenge in terms of isolate identification and treatment.

Anaerobes are difficult to grow on solid agar plates, requiring longer

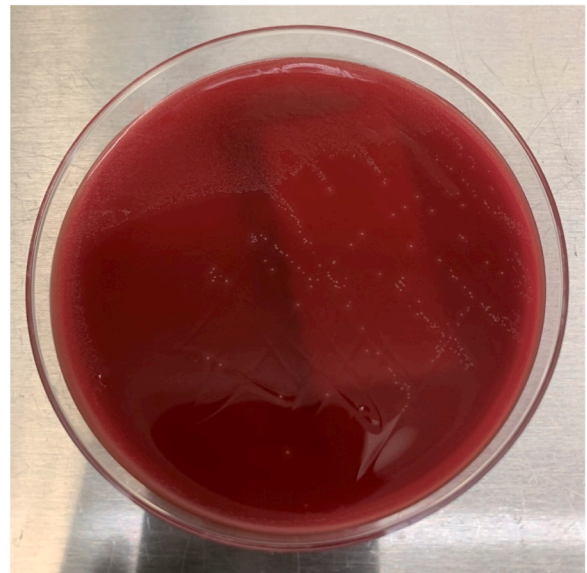


Fig. 2. Colonies of *Parvimonas micra* on Brucella blood agar anaerobic media at 72 h incubation at 37 C under anaerobic conditions.

incubation times and careful regulation of the anaerobic environment to demonstrate adequate growth [12]. Molecular techniques such as MALDI-TOF and 16s sequencing have allowed for rapid detection of many rare anaerobic species that may evade detection on fastidious agar plates [3,12]. Among anaerobes, *Bacteroid fragilis* is the most common cause of bacteremia identified in cases of vertebral osteomyelitis and spondylodiscitis [9,13–15]. Other organisms implicated in anaerobic spondylodiscitis include *Peptococcus* and *Peptostreptococcus* species, *Propionibacterium acnes* and *Fusobacterium* species [16] While earlier reviews suggested a predilection for males compared to females with an incidence ratio of 2:1 [13], a more recent analysis by Chen et al. [9] in a population of Chinese patients showed that females were more commonly affected. This may reflect temporal changes in infection risk, or the relative risk locally within the respective study populations.

Parvimonas micra, which forms part of the natural oral and gastrointestinal flora in humans [17], is an extremely rare cause of anaerobic spondylodiscitis that has been associated with recent dental procedures or spinal instrumentation [8,18]. To date, fewer than 30 cases of

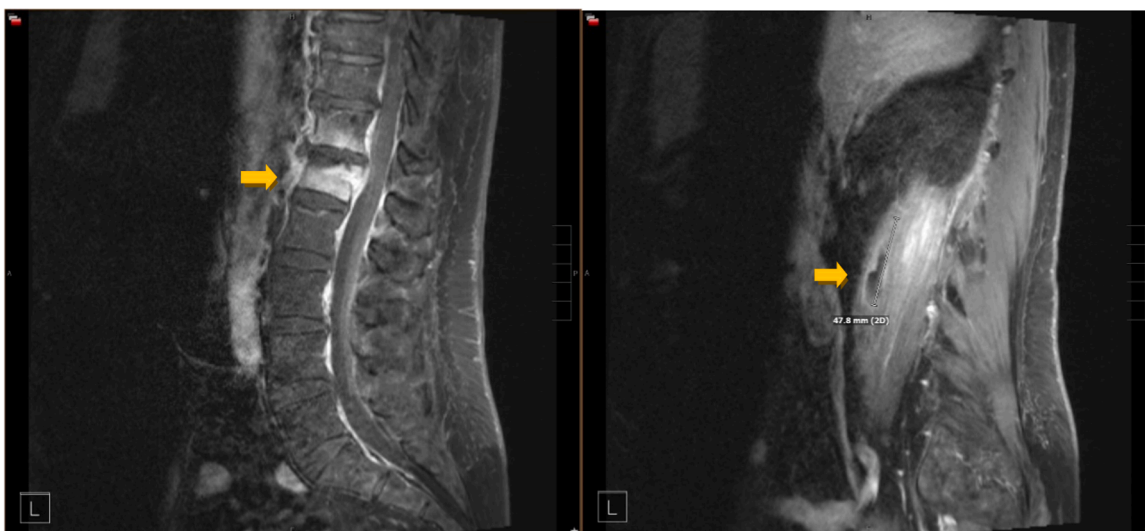


Fig. 1. Magnetic resonance imaging (MRI) of lumbar spine upon admission showed discitis-osteomyelitis at the T12-L1 level with mild compression fracture of the L1 vertebral body (left panel, denoted by yellow arrow); also noted were intramuscular abscesses within the right psoas muscle (right panel, denoted by yellow arrow).

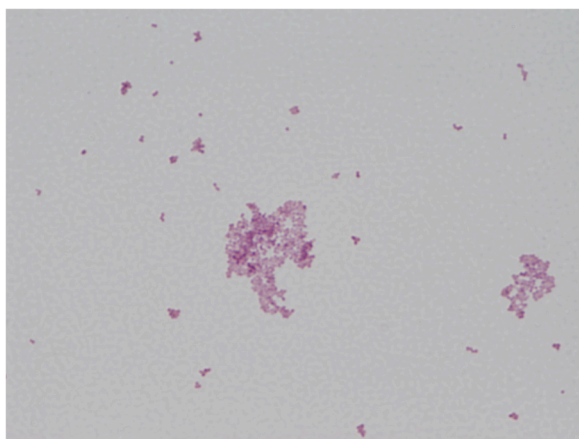


Fig. 3. Gram stain of *Parvimonas micra* directly from colonies. Note the gram-positive to gram-variable cocci.

Parvimonas micra bacteremia have been noted in the existing literature, with discitis and epidural abscess being the most commonly associated complications [18–21]. Although our patient had no obvious etiology for bacteremia, hematogenous spread from dental caries or transient translocation from the gastrointestinal tract remain the most likely sources. As discussed above, diabetes mellitus and malignancy are known risk factors for *Parvimonas micra* bacteremia [18], though in this case we believe the remote history of chronic lymphocytic leukemia in our patient to be non-contributory. The previous hip replacement surgery, ten years prior to the current presentation, was also unlikely to have played a role in the development of this infection [8,22].

Our use of antimicrobials in this case was informed by the initial positive culture report for *Peptostreptococcus* species. While vancomycin provides excellent coverage against several Gram-positive anaerobes including *Peptostreptococcus* [23], its efficacy against *Parvimonas micra* has not been established. Previous studies have suggested that clindamycin and metronidazole are effective against *Parvimonas micra* [18,20,21]. Imipenem has also been shown to be effective in treating iliopsoas abscesses caused by *Parvimonas micra* [20], and in our case the patient initially responded well to meropenem followed by six weeks of ertapenem, although she eventually required surgical intervention for source control.

In conclusion, spondylodiscitis caused by anaerobic bacterial translocation, although typically associated with dental or spinal instrumentation, must be suspected in patients presenting with unexplained, atraumatic acute to subacute back pain. In patients with poor oral dentition or dental caries, especially those with multiple comorbid illnesses or impaired immunity, evaluation of tissue samples should include cultures for both aerobic and anaerobic organisms. Next-generation sequencing techniques such as MALDI-TOF and 16s RNA sequencing are instrumental in identifying rare isolates such as *Parvimonas micra* and may reduce the turnaround time to diagnosis. This enables the clinician to personalize antimicrobial regimens based on lab-confirmed susceptibility testing or prior knowledge of susceptibility patterns of these rare isolates.

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Ethical approval

Not required.

Consent

Written informed consent was obtained from the patient for the publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

CRedit authorship contribution statement

V.P. and P.S. conceptualized the case report. V.P. wrote the original manuscript and provided the image used in Fig. 1. K.K. provided relevant laboratory information and the images used in Fig. 2 and Fig. 3. K. K. and P.S. reviewed and edited the manuscript as necessary. All authors have reviewed and approved the final version of the manuscript.

Declaration of Competing Interest

The authors have no conflicts of interest to disclose.

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