

CASE REPORT

Septic arthritis of knee joint due to *Parvimonas micra*Moni Roy,¹ Ashish Kumar Roy,¹ Sharjeel Ahmad²¹Internal Medicine, OSF Saint Francis Medical Center, Peoria, Illinois, USA²Internal Medicine, Section of Infectious Diseases, University of Illinois College of Medicine at Peoria, Peoria, Illinois, USA**Correspondence to**Dr Moni Roy,
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SUMMARY

Parvimonas species are anaerobic, Gram-positive cocci that are a constituent of normal oral and gastrointestinal flora. We present a case of right knee joint septic arthritis due to *Parvimonas micra* in an immunocompromised patient. A 61-year-old male renal and pancreatic transplant recipient on immunosuppressive therapy was admitted to our hospital due to intense pain, joint swelling and inability to move his right knee over the past 9 months. After synovial fluid was drawn, cultures were positive for *P. micra*, an anaerobic pathogen that is part of the flora of the oral cavity. We report a rare causative pathogen for septic arthritis in an immunocompromised patient.

BACKGROUND

Parvimonas micra, a fastidious anaerobic Gram-positive cocci, was previously known as *Peptostreptococcus micros* and *Micromonas micros*. *P. micra* is not a common pathogen for septic arthritis. Isolation of the bacteria from sterile joint fluid in patients on immunosuppressive therapy, malignancies, severe periodontal disease and persistent symptoms should raise suspicion for this being the causative agent. We present a case of knee joint infection in an immunosuppressed host to highlight its importance as a pathogen in appropriate clinical scenario.

CASE PRESENTATION

A 61-year-old man with history of renal and pancreatic transplant, on immunosuppressive medications, was admitted to the hospital with a 9-month history of right knee pain after sustaining an injury to the right knee from falling off a handicap access ramp. He reported immediate pain in the right knee and was seen in the emergency department, and was discharged home with an immobiliser after the X-ray did not show any acute fractures at that time. The patient underwent a deep dental cleaning procedure 3 months after the reported injury. The pain progressively got worse over few months, with significant limitation of mobility due to which the patient sought medical attention again. Initially the patient was misdiagnosed with knee sprain and was advised to use knee immobiliser. Due to progressive worsening symptoms, the patient was seen by the orthopaedic surgeon again, and a hinged knee brace was placed. He also underwent physical therapy, with no clinical improvement. After 6 months, due to progressive worsening of his symptoms, he underwent an MRI that showed complex right knee injury with tibial

plateau fracture, anterior cruciate ligament (ACL) tear and meniscal tear. Multiple soft tissue calcification and significant muscle oedema were noted around the knee joint as well. Based on the MRI findings the patient was scheduled for elective joint arthroscopy with debridement. At this time with no systemic signs of infection, septic arthritis was not considered as the major differential diagnosis for his symptoms. At the time of hospital admission, he reported right knee pain, which was throbbing in nature, rated 10/10 in intensity and exacerbated by movement. He denied any associated fevers, chills or worsening joint redness. Social history was negative for smoking and alcohol use. Family history was non-significant. Home medications included mycophenolate, prednisone, tacrolimus and insulin. Physical examination of the right leg showed nearly full extension and about 95° flexion. Significant valgus instability compared with the left side was noted with significantly associated suprapatellar effusion. The knee joint was minimally warm and no joint erythema was noted.

INVESTIGATIONS

Complete blood count showed no leucocytosis, and the only finding was the elevation of acute phase reactants. Serum C reactive protein (CRP) was 9.68 mg/dL (normal range: <0.50 mg/dL). Two sets of blood cultures were drawn on admission prior to starting antibiotics, with both cultures remaining negative. MRI showed the complex right knee injury with tibial plateau fracture with ACL and meniscal tear. Synovial fluid study results showed more than 30 10⁹/L polymorphonuclear cells. Other findings of synovial fluid study are shown in table 1.

DIFFERENTIAL DIAGNOSIS

Based on the synovial fluid study, the differentials included crystal arthropathy, inflammatory arthritis and septic arthritis. No crystals were noted in the synovial fluid, making acute crystal arthropathy such as gout or pseudogout less likely. The presence of >20 10⁹/L white cells with neutrophilic predominance and Gram stain-positive for heavy Gram-positive cocci in pairs raised concern for septic arthritis.

TREATMENT

The patient underwent right knee arthroscopy with debridement and excision of loose bodies from the right knee joint. In addition, he underwent partial medial and lateral meniscectomy. He was empirically started on vancomycin 1000 mg intravenously



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Table 1 Synovial fluid study

Clarity	Cloudy
Colour	Bloody
Volume	9 mL
Fluid red blood cell count	201 10 ⁹ /L ³
Fluid total nucleated cells	31.341 10 ⁹ /L
Neutrophils (%)	99
Lymphocyte (%)	0
Monocyte (%)	1
Eosinophils (%)	0
Macrophage (%)	0
Plasma cell (%)	0

every 12 hours and cefepime 1 g every 8 hours intravenously. As the operative Gram stain showed Gram-positive cocci in pairs, the antibiotic coverage was changed to ceftriaxone 2 g intravenously every 24 hours. The final operative synovial fluid cultures showed heavy growth of *P. micra* from all four samples of synovial fluid. Prior studies reported that the organism is mostly susceptible to penicillin, metronidazole and clindamycin. Unfortunately drug susceptibility testing was not performed on the operative specimen by the laboratory. Our patient was continued on ceftriaxone, and metronidazole 500 mg every 8 hours was added as a precautionary measure to ensure adequate coverage of anaerobic bacterial infection in this immunocompromised patient.

OUTCOME AND FOLLOW-UP

The patient underwent a central line placement after blood cultures returned negative. Antibiotic coverage with metronidazole and ceftriaxone was initially planned for 6 weeks for septic arthritis. Follow-up CRP after 6 weeks was still elevated at 3.10 mg/dL; therefore, decision was made to extend therapy by 4 weeks. Repeat CRP prior to stopping antibiotic was 0.26 mg/dL and the symptoms had resolved.

DISCUSSION

Initially known as *Peptostreptococcus micros* and *Micromonas micros*, *P. micra* is a Gram-positive anaerobic coccus that is part of normal oral and gastrointestinal flora in humans.¹ The current nomenclature was introduced in 2006 and *P. micra* is the only species in the genus *Micromonas*.² On Gram stain, the organisms can be seen as cocci in chains, pairs or clusters. Culture of bacteria requires an optimal temperature of 37°C on an anaerobic gas mixture. Due to the organism being an oral commensal, most cases of joint infection are reported to be associated with prior dental procedures and other periodontal diseases.^{3,4} Interestingly the blood cultures remained negative on admission. The patient did not have any systemic or local signs of infection further delaying the correct diagnosis. Our patient underwent dental cleaning about 3 months after the initial injury, following which he had progressive worsening of his pain and limitation of range of motion. Haematogenous seeding of injured knee joint after dental cleaning thus was the likely cause of septic arthritis in our patient.

There have been some reports for septic knee joint infection due to the organism. In 1996, Stoll *et al*⁵ reported a case of knee joint infection in a patient with rheumatoid arthritis and knee joint prosthesis. The first case of native knee joint infection was reported by Riesbeck and Sanzén in 1999.⁶ They reported that the joint aspiration done for the inflamed joint

showed Gram-positive bacteria, but no further identification of the bacteria could be performed at that time. The patient was misdiagnosed with pyrophosphate arthritis based on X-ray findings. The patient was readmitted several times over a span of few weeks before the bacteria could be identified. Recently, Baghban and Gupta reported another case of *P. micra* knee joint infection. In this case the initial joint aspiration showed lower nucleated cell count than expected in septic arthritis and some negatively birefringent crystals, leading to misdiagnosis as pseudogout. *P. micra* was identified in the synovial fluid by culture days after first joint aspiration.⁷ As per our literature review, this is the fourth reported case of septic arthritis of the knee joint due to *P. micra*.

The subacute nature of *Parvimonas* infection can cause a delay in diagnosis as evidenced in our case and the case reported by Riesbeck and Sanzén. Presentation of septic arthritis due to *Parvimonas* in our patient was similar to the case reported by Riesbeck and Sanzén,⁶ where the infection was missed for a long time and pain was the chief complaint without typical clinical findings of fever, chills and inflamed joint. Similarly, in the case of spinal vertebral osteomyelitis due to *Parvimonas* reported by George *et al*,⁸ the infection was identified 6 months following spinal instrumentation and the main complaint was chronic pain, showing the subacute nature of infection.

Dietvorst *et al* reported another case of knee septic arthritis due to *Parvimonas*. Similar to Riesbeck and Sanzén, Dietvorst *et al* also showed an association between crystal arthropathy and *Parvimonas* infection, which supports the notion that chronic inflammatory state caused by coexisting crystal arthritis or prior injury increases the risk of infection.^{6,9-11} Our patient had a trauma to the joint prior to the infection, which increased the risk of seeding of bacteria in addition to his immunocompromised status. It was unclear if the extensive damage of knee joint with loose bone pieces noted in joint space was a result of initial trauma or due to a delay in diagnosis.

P. micra has also been implicated in infections such as osteomyelitis and spondylodiscitis in several case reports.¹²⁻¹⁷ An interesting case of delayed-onset surgical site infection after 6 months of spinal instrumentation was reported by George *et al*.⁸ Other recently reported infections include prosthetic hip joint infection, pleural empyema, endocarditis, bacteraemia and meningitis.¹⁸⁻²²

In the year 1998, Murdoch performed a comprehensive review of Gram-positive anaerobic cocci infections and antibiotic susceptibility, including *Peptostreptococcus micros*, now known as *Parvimonas micra*. In this study, the organism was reported to be mostly susceptible to penicillin. Metronidazole and clindamycin were other antibiotics with good susceptibility reported in this review.²³ In another review done by Wren in 1996, 8% of *P. micra* isolates were found to be resistant to penicillin, although

Learning points

- ▶ *Parvimonas* species are anaerobic, Gram-positive cocci that are a constituent of normal oral and gastrointestinal flora. Rarely they can be a causative pathogen for septic arthritis.
- ▶ Pre-existing chronic inflammatory conditions either due to crystal arthropathy or recent joint injury leading to inflammatory changes at the site increases the risk of joint seeding due to the organism.
- ▶ Most cases of *Parvimonas* septic arthritis are associated with prior dental procedures and other periodontal diseases.

another UK-based study in 2003 showed no resistance to penicillin.^{24 25} In an ideal situation, drug susceptibility testing should be performed to help guide antimicrobial therapy. In the case of our patient, drug susceptibility testing was not performed on the operative specimen, but the addition of metronidazole to the regimen ensured adequate coverage and achieved a successful outcome.

Contributors MR wrote the initial manuscript. AKR and SA conducted the literature review, edited the paper and performed paper designing. MR and AKR contributed to data collection. SA revised the manuscript. All authors read and approved the final manuscript.

Competing interests None declared.

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