**Mycoplasma hominis** and **Ureaplasma urealyticum** infections after knee arthroplasty

A case report

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Abstract

**Rationale:** Artificial joint infection caused by **Mycoplasma hominis** and **Ureaplasma urealyticum** is rare and has not been reported.

**Patients concerns:** A 59-year-old man underwent left total knee arthroplasty for 1 year of pain in the left knee joint. The indwelling urinary catheter was removed after 48 hour of the surgery. On day 8 after the surgery, the patient had fever, increased skin temperature, swelling and redness around the surgical site, and floating patella test (+). According to experience, Vancomycin, Ciprofloxacin and Linezolid were administrated. Evident decrease in C-reactive protein was observed after Linezolid administration, while there was no significant improvement in clinical symptoms. Microbiome sequencing was performed, resulting in diagnosis of positive **M hominis** and **U urealyticum**. The patient was then treated with Doxycycline in the following 3 months. During the 11-month outpatient follow-up, there was no evidence of recurrence of infection.

**Diagnosis:** Microbiome sequencing was performed, resulting in diagnosis of positive **M hominis** and **Ureaplasma urealyticum**.

**Interventions:** The patient recovered following with Doxycycline in the following 3 months.

**Outcomes:** During the 11-month outpatient follow-up, there was no evidence of recurrence of infection.

**Lessons:** **M hominis** and **U urealyticum** are common pathogens of the urinary system infections but they are rare in osteoarticular infections. In cases of fever, swelling and heat pain around the surgical site, joint fluid, negative blood culture and being irreversible to anti-bacterial agents against the cell wall, special bacteria-related infection should be highly suspected.

**Abbreviations:** ESR = erythrocyte sedimentation rate, WBC = white blood cell.

**Keywords:** case report, joint infection, **Mycoplasma hominis**, postoperative infection, **Ureaplasma urealyticum**

1. Introduction

Arthroplasty has been increasingly popular in patients with osteoarthritis or arthritis given its excellent efficacy in alleviating pain and improving joint mobility. Prosthetic joint infection is rare. Negative cultures, may result from pre-culture antibiotic administration, or the condition that the routine treatment fails to identify the responsible pathogens.

**Mycoplasma hominis** and **Ureaplasma urealyticum** tend to be adherent to the mucosal epithelial cells of the urogenital tract, leading to urinary system, and gynaecological infections. In addition, they can also cause infections outside the urogenital system, such as sepsis, central nervous system infection, respiratory infection, joint infection, and wound infection, which are mainly due to the mucosal injuries (such as mechanical operation, surgery and trauma) and immune dysfunction.\(^{[1]}\) Here, we report a case who suffered from infections caused by **M hominis** and **U urealyticum** after knee arthroplasty.

2. Case presentation

A 59-year-old man was admitted to Hefei BOE Hospital on May 10, 2021 for 1 year of pain/discomfort in the left knee joint. Admission physical examination revealed body temperature = 36.6 °C, heart rate = 84 beats/minute, respiratory = 20 breaths/minute, and blood pressure = 110/75 mm Hg (1 mm Hg = 0.133 kPa). The patient was conscious with a good spirit, continent, and had a normal diet and body weight. Both lower limbs were basically equal in length. The right lower-limb muscle atrophy was evident with the muscle strength decreased

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\(^{[1]}\) How to cite this article: Luo J, Wu X, Gang X, Zhang N, Wang F, Rong C. Mycoplasma hominis and Ureaplasma urealyticum infections after knee arthroplasty: A case report. Medicine 2022;101:45(e31202).

Received: 19 April 2022 / Received in final form: 12 September 2022 / Accepted: 16 September 2022

http://dx.doi.org/10.1097/MD.0000000000031202
to grade III, while the sensory function of the limb was normal and the end vascular actions were good. Mild edema was observed in the left knee joint, but the skin temperature was normal and there was no tenderness. In addition, the left lower limb was slightly limited in movement with a range of around 5 to 100° and a sensation of bone friction. The sensory function of the left lower limb was normal and the end vascular actions were good. The patient was initially diagnosed with unilateral (left) knee osteoarthritis, which was confirmed after admission.

The patient was in good general condition and had stable vital signs after admission. There was no evidence of abnormality in preoperative examinations. On May 13, the patient underwent left total knee arthroplasty, with prophylactic Cefuroxime (1.5 g, ivgtt, q8h) administrated for 48 hour. In the meantime, a urinary catheter was indwelled during the procedure and then removed 48 hour after the operation. Other treatments included anticoagulation using Nadroparin Calcium (0.4 mL, iv, qd), analgesia with Parecoxib (40 mg, ivgtt, bid) plus Oxycodeone Sustained-Release Tablet (10 mg, po, q12h) and cold therapy as an adjuvant to relieve the swelling and pain. On May 21, the patient had a fever and reached the highest body temperature of 39.1 °C (Fig. 1). Laboratory examination revealed significantly increased white blood cells (WBC), ultra-sensitive C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR) (Fig. 1). There was obvious redness around the surgical site, and positive tenderness and floating patella test were obtained. Movement of the knee joint was good, and the sensory function and end vascular actions of the lower limbs were good as well. Magnetic resonance imaging (MRI) showed hydrops in the joint cavity with swelling of the surrounding soft tissues. On May 21 and 24, knee joint puncture was performed on the joint cavity with swelling of the surrounding soft tissues.

On May 21 and 24, knee joint puncture was performed on the surgical site. The puncture fluid was in dark red and negative results were for bacteria and acid-fast bacilli by blood culture and puncture surgical site. The puncture fluid was in dark red and negative results were for bacteria and acid-fast bacilli by blood culture and puncture surgical site. The puncture fluid was in dark red and negative results were for bacteria and acid-fast bacilli by blood culture and puncture surgical site. The puncture fluid was in dark red and negative results were for bacteria and acid-fast bacilli by blood culture and puncture surgical site. On May 21, Vancomycin (1.0 g, ivgtt, q8h) and Ciprofloxacin (0.4 g, ivgtt, q12h) were given by the operation and then replaced by Doxycycline with a loading dose of 0.2 g followed by 0.1 g, po, q12h. The body temperature recovered to normal on the next day, and the regional redness and heat pain got relieved significantly. On June 15, Linezolid was discontinued. On June 17, the clinical symptoms and inflammatory indicators of the patient gradually recovered to normal. The patient was then discharged and asked to take Doxycycline for 2 more months. During the 11-month outpatient follow-up, there was neither significant adverse drug reaction nor symptomor signs of reinfection.

3. Discussion

Mycoplasma is a general term of any microorganisms of the Mollicutes. It has been established that the Mycoplasma specie are the smallest self-replicating organisms. Currently, there have been four Mycoplasma species identified in human, including Mycoplasma pneumoniae, M hominis, Mycoplasma
Ureaplasma and M. hominis with no cell wall can survive independently, which enables them to be naturally resistant to glycopeptides, such as Penicillin, Cephalosporin, β-lactams, and Vancomycin. In addition, they cannot be detected by Gram staining. To know better about the characteristics of infections with both M. hominis and U. urealyticum after joint arthroplasty, authors of the study searched CNKI, PubMed, etc. and found that there was no relevant report as of July 2021 domestically and abroad. Most reported cases were infected with single pathogens. For example, Lih Xiang et al[4] and Luttrell LM et al[5] analyzed a total of 7 cases who were infected with M. hominis after arthroplasty, including 4 cases receiving knee arthroplasty, 2 cases undergoing hip arthroplasty and 1 case experiencing shoulder arthroplasty. In addition, Farrell et al,[6] MacKenzie et al[7] and Sköldenberg et al[8] reported 3 cases of U. urealyticum infection after arthroplasty. In most cases of infection, the patients will present fever, increase in WBC, ultrasensitive C-peptide and ESR, redness, heat pain, and exudation in the surgical site, and they are generally insensitive to β-lactams. The specific source of infection remains to be clarified. One possible source is the invasive operations to the urinary tract performed before arthroplasty in most patients. Additionally, the reproductive system infection and the hematogenous dissemination to the surgical site are also possible sources.[9] The case reported here had redness and heat pain in the surgical site after knee joint arthroplasty, accompanied by significant elevation of WBC, ESR, and ultrasensitive C-peptides most obvious. In the meantime, the patient was free of any β-lactams and insensitive to Vancomycin and Ciprofloxacin. No Genitourinary infection, a possible primary source of septic arthritis reported in the medical literature, was ruled out in our case by urine culture. However, invasive operation of the urinary system was considered as a possible source of knee joint infection after surgery as the patient carried a urinary catheter during the procedure.

Microbiological tests for M. hominis and Ureaplasma, such as Gram staining and early routine culture, generally are negative or insensitive, given requirements of specific operations and culture medium.[10] Besides, such kinds of pathogens are not covered in most hospitals where microbiological tests are performed for infections outside the urogenital system only. It is believed that microbiome gene sequencing can be a viable option upon negative cultures.[11] Research found that nucleic acid tests, such as PCR, are time-saving (within one day) and commonly highly sensitive to microbiomes than cultures.[11] However, they are not available in a large number of hospitals. In the present case, negative bacterial and fungi cultures were obtained by two times of blood culture and joint puncture fluid smear. Microbiome gene sequencing was then performed and infections caused by M. hominis and U. urealyticum were confirmed.

It has been established that M. hominis and Ureaplasma are generally sensitive to Tetracyclines, Macrolides and Quinolones. Recent studies have revealed that both of the two pathogens are highly resistant to Quinolones but they still have a high sensitivity (>70%) to Doxycycline and Minocycline.[12] Here, the patient had a proper blood drug concentration of M. hominis but inactive on U. urealyticum infection after joint arthroplasty, and there was no related case reported before suffering from infections caused by both pathogens. The present case suggested that, upon negative bacterial/fungal test and failure of treatment with Vancomycin or β-lactams, M. hominis or U. urealyticum infection should be considered. In addition, Tetracyclines (such as Doxycycline) with high sensitivity to these kinds of pathogens can be administered if drug sensitivity test result is not available. Furthermore, microbiome gene sequencing can be an option in cases with negative culture results. It is notable that Linezolid is active on M. hominis but inactive on U. urealyticum. It is not recommended for treatment as there is a high risk of thrombocytopenia when the blood drug concentration is over 8.0 ug/mL.

**Author contributions**

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**References**

[1] Madoff S, Hooper DC. Nongenitourinary infections caused by Mycoplasma hominis in adults. Rev Infect Dis. 1998;10:602–13.

[2] Liu C, Bayer A, Cosgrove SE, et al. Clinical practice guidelines by the Infectious Diseases Society of America for the treatment of methicillin-resistant Staphylococcus aureus infections in adults and children [published correction appears in Clin Infect Dis. 2011 Aug;53(3):319]. Clin Infect Dis. 2011;52:e18–55.

[3] Waites KB, Katz B, Schelonka RL. Mycoplasmas and ureaplasmas as neonatal pathogens. Clin Microbiol Rev. 2005;18:757–89.

[4] Xiang L, Lu B. Infection due to Mycoplasma hominis after left hip replacement: case report and literature review. BMC Infect Dis. 2019;19:50.

[5] Luttrell LM, Kanş SS, Corey GR, et al. Mycoplasma hominis septic arthritis: two case reports and review. Clin Infect Dis. 1994;19:1067–70.
[6] Farrell JJ, Larson JA, Akeson JW, et al. Ureaplasma parvum prosthetic joint infection detected by PCR. J Clin Microbiol. 2014;52:2248–50.

[7] MacKenzie CR, Nischik N, Kram R, et al. Fatal outcome of a disseminated dual infection with drug-resistant Mycoplasma hominis and Ureaplasma parvum originating from a septic arthritis in an immunocompromised patient. Int J Infect Dis. 2010;14(Suppl 3):e307–9.

[8] Sköldenberg OG, Rysinska AD, Neander G, et al. Ureaplasma urealyticum infection in total hip arthroplasty leading to revision. J Arthroplasty. 2010;25.

[9] Asif AA, Roy M, Ahmad S. Rare case of Ureaplasma parvum septic arthritis in an immunocompetent patient. BMJ Case Rep. 2020;13:e236396.

[10] Xiao N, Gai W, Hu WG, et al. Next-generation-sequencing technology used for the detection of Mycoplasma hominis in renal cyst fluid: a case report. Infect Drug Resist. 2019;12:1073–9.

[11] Waites KB, Xiao L, Paralanov V, et al. Molecular methods for the detection of Mycoplasma and Ureaplasma infections in humans: a paper from the 2011 William Beaumont Hospital Symposium on molecular pathology. J Mol Diagn. 2012;14:437–50.

[12] Fernández J, Karau MJ, Cunningham SA, et al. Antimicrobial susceptibility and clonality of clinical Ureaplasma isolates in the United States. Antimicrob Agents Chemother. 2016;60:4793–8.

[13] Kenny GE, Cartwright FD. Susceptibilities of Mycoplasma hominis, M. pneumoniae, and Ureaplasma urealyticum to GAR-936, dalfopristin, dirithromycin, everumycin, gatifloxacin, linezolid, moxifloxacin, quinupristin-dalfopristin, and telithromycin compared to their susceptibilities to reference macrolides, tetracyclines, and quinolones. Antimicrob Agents Chemother. 2001;45:2604–8.

[14] Fang J, Chen C, Wu Y, et al. Does the conventional dosage of linezolid necessitate therapeutic drug monitoring? Experience from a prospective observational study. Ann Transl Med. 2020;8:493.