Infection and Drug Resistance

Dovepress
Taylor & Francis Group

Open Access Full Text Article

CASE REPORT

# Postoperative Disseminated *Mycoplasma hominis* Infection with False-Negative Blood Cultures: A Case Report

Yefu Yu, Yanan Wang, Weifang Mao, Huiyu Wang, Faxiang Jin, Wenfang Xu

Department of Clinical Laboratory, Affiliated Hospital of Shaoxing University, Shaoxing, 312000, People's Republic of China

Correspondence: Wenfang Xu, Department of Clinical Laboratory, Affiliated Hospital of Shaoxing University, 999 Zhongxing South Road, Yuecheng District, Shaoxing, 312000, People's Republic of China, Tel +8613857589470, Email 0052019050@usx.edu.cn



**Background:** *Mycoplasma hominis* commonly colonizes the genitourinary tract and primarily affects immunocompromised individuals. It is mostly confined to localized infections, with bloodstream dissemination being rare. Because of its fastidious nutritional requirements, the organism is seldom recovered by routine blood culture, and the absence of a cell wall renders it intrinsically resistant to many first-line antimicrobials. Consequently, the diagnosis and treatment of *M. hominis* bloodstream infections remain challenging.

**Case Description:** A 72-year-old man developed persistent fever and marked systemic inflammation after lumbar spine surgery. Despite empirical broad-spectrum antibiotics, he progressed to severe incisional infection, pulmonary infection, and effusions in multiple serous cavities—including the left interlobar fissure, pleural space, and pericardium. Routine blood and urine cultures remained negative until two weeks after surgery, when *M. hominis* was first isolated from incisional exudate and definitively identified by MALDI-TOF MS. The patient ultimately recovered after surgical debridement and combination therapy with doxycycline plus moxifloxacin. During this period, we used Mycoplasma-specific liquid media combined with Columbia blood agar and subsequently recovered *M. hominis* from the patient's sputum, urethral swabs, and initially culture-negative blood samples. MALDI-TOF MS cluster analysis confirmed that all isolates belonged to a single clonal group responsible for disseminated infection.

**Conclusion:** Immunocompromised patients with postoperative indwelling catheters constitute a high-risk population for hematogenous dissemination of *M. hominis*. In patients with persistent fever and negative routine cultures, *M. hominis* infection should be actively suspected. Timely targeted mycoplasma culture and MALDI-TOF MS confirmation are essential.

**Keywords:** *Mycoplasma hominis*, postoperative infection, hematogenous dissemination, MALDI-TOF MS

## Introduction

*Mycoplasma hominis* is one of the common colonizing organisms of the genitourinary tract and usually causes associated infections in the genitourinary tract.[1] Recently, infections caused by *M. hominis* outside the urogenital tract have been on the rise, including postoperative infections,[2–5] arthritis,[6] pneumonia,[7] meningitis.[8] However, *M. hominis* infections transmitted via the bloodstream are relatively rare, and their source is often difficult to identify.[9] Such infections predominantly occur in immunocompromised individuals with indwelling urinary catheters.[6,10] Due to the fastidious nutritional requirements and slow growth of *M. hominis*, routine blood cultures seldom recover the organism, rendering bloodstream infections easily overlooked. As an atypical pathogen, *M. hominis* remains under-recognised clinically, especially at non-genitourinary sites. Moreover, the absence of a cell wall confers intrinsic resistance to many first-line antimicrobials, so bloodstream infections caused by this organism continue to pose substantial diagnostic and therapeutic challenges.

MALDI-TOF MS is a rapid identification technique based on microbial proteomic fingerprinting and has become a transformative tool in clinical microbiology, enabling fast and accurate characterization of atypical pathogens such as *M. hominis*. We report a case of disseminated infection caused by *M. hominis* in a patient following lumbar spine surgery, with a false-negative blood culture result. The patient experienced severe infection leading to wound tissue necrosis and

Received: 19 June 2025
Accepted: 27 August 2025
Published: 30 August 2025

substantial effusion, with the surgical site remaining unhealed for an extended period. In addition, the patient developed pulmonary infection and effusion in multiple serous cavities. The investigation revealed that microtrauma to the urethral mucosa caused by catheterization allowed the colonization of *M. hominis* to invade the bloodstream, which was identified as the primary cause of disseminated infection.

## Case Presentation

A 72-year-old male patient presented to our hospital on July 27, 2024, with complaints of recurrent lower back pain and radiating pain in the left lower limb for over 1 year. He was diagnosed with lumbar disc herniation with radiculopathy and lumbar spondylolisthesis and was subsequently admitted for surgical treatment.

On admission, the patient reported good overall health, with no history of hypertension, diabetes, or other underlying diseases. The patient was not taking any immunosuppressive agents or other medications, and his medical history was unremarkable. A physical examination after admission revealed no significant abnormalities. Preoperative imaging revealed that the patient had mild fatty liver disease and mild regurgitation into the mitral and tricuspid valves. Laboratory tests, including liver function, renal function, routine blood tests, and routine urine tests, showed no significant abnormalities. A urinary catheter was placed preoperatively and cefazolin sodium (1.0 g iv bid) was administered prophylactically to prevent infection. The patient underwent lumbar fusion surgery, combined with laminoplasty and decompression, on July 29, 2024.

On postoperative day 2, the patient developed a fever with a peak temperature of 39.2°C. Laboratory tests revealed a white blood cell (WBC) count of $13.4\times10^9$/L, with 78% neutrophils, 12.8% lymphocytes, and a C-reactive protein (CRP) level of 65.9 mg/L (reference range 0–6 mg/L). Examination of the surgical site showed that the wound was clean and dry with no significant bleeding or exudate. Based on empirical judgment, the antibiotic was changed to ceftriaxone (2.0 g iv bid) to prevent wound infection. However, the patient continued to experience recurrent chills and fever 2 weeks after surgery, with the highest temperature reaching 38.7°C and persistent elevation of blood inflammatory markers. Specifically, the WBC count peaked at $9.4\times10^9$/L, CRP reached a maximum of 155.3 mg/L, and serum amyloid A (SAA) peaked at 320 mg/L (reference range 0–10 mg/L). Urinalysis revealed abnormalities including occult blood 2+. Urine flow cytometry revealed red blood cell (RBC) counts of 45.8/μL (reference range 0–18/μL) and WBC counts of 22.3/μL (reference range 0–13/μL). On postoperative day 5, the urine and the first set of blood samples (BacT/ALERT bioMérieux, France) were cultured. The antibiotic regimen was adjusted to piperacillin/tazobactam (4.5g iv q8h) combined with vancomycin (1g iv q12h). Despite negative urine and blood cultures (both aerobic and anaerobic) after two and five days, respectively, the patient's condition remained unchanged. On postoperative day 10, the patient's temperature and inflammatory marker levels remained elevated, and he developed intermittent cough, unbearable pain, and swelling at the surgical site. Chest CT (Figure 1A and B) revealed scattered patchy high-density shadows in both lungs, left interlobar effusion, bilateral pleural effusion, a small amount of pericardial effusion, and multiple enlarged mediastinal lymph nodes. Lumbar MRI (Figure 1C) revealed soft tissue swelling and subcutaneous effusion in the lumbar and dorsal regions. Examination of the surgical site revealed mild redness and swelling of the surrounding skin with a fluctuating sensation in the subcutaneous tissue. On that afternoon, the surgical wound began to exude fluid and dehisced the following day. We performed debridement and collected exudate samples for culture on two consecutive days while also obtaining the second set of blood cultures. Considering the wound and pulmonary infections, as well as the potential for pleural or pericardial infection based on the comprehensive examination results, we adjusted the antibiotic regimen to imipenem/cilastatin (1.0 g iv q8h) in combination with vancomycin (1 g iv q12h) after a multidisciplinary consultation.

On the morning of postoperative day 13, debridement surgery was performed following multidisciplinary discussion of the complex case. Preoperatively, laboratory tests revealed pinpoint colonies on Columbia blood agar (AnTu Bio, China) from two exudate samples (Figure 2A), with no bacterial cells detected by gram staining (Figure 2B). Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) (Bruker, Germany) identified the pathogen as *Mycoplasma hominis*, with a mass spectrometry score of 2.4 (scores above 2.0 are considered reliable for species-level identification), and the mass spectrometry protein fingerprint is shown in (Figure 2C). During debridement, poor healing of the subcutaneous tissue and deep fascia was observed, with a cavity formed over the spinous process, containing a large amount of dark red effusion, odorless and partial necrosis, and inflammatory changes in the soft tissues

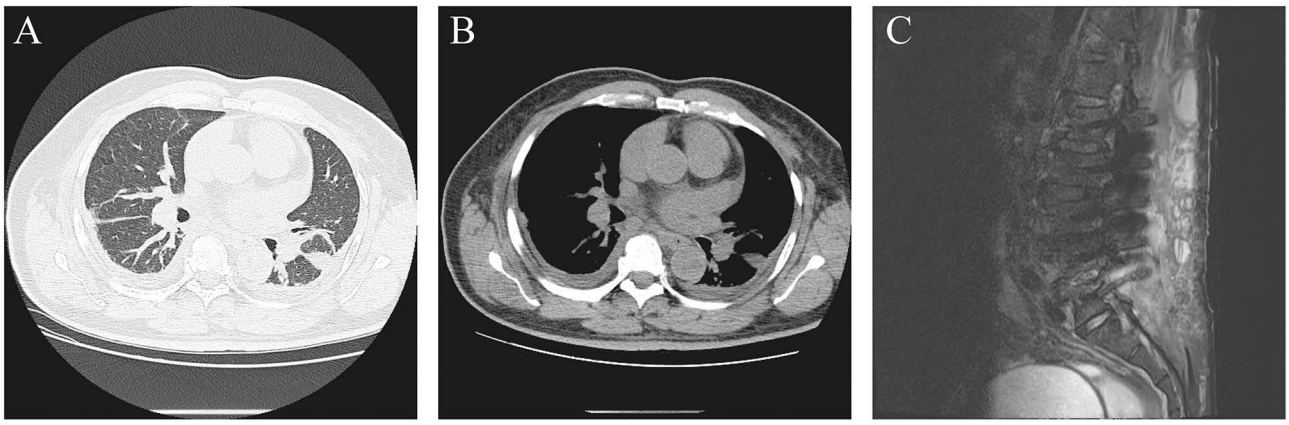


**Figure 1** Chest CT and surgical site MRI. Chest CT (**A**) lung window (**B**) mediastinal window showing bilateral scattered patchy opacities with thickened bronchovascular markings, focal pleural thickening bilaterally, and minimal bilateral pleural effusion, including left interlobar fissure effusion, slight pericardial effusion, and mediastinal lymphadenopathy. (**C**) Surgical site MRI showing postoperative soft tissue swelling and fluid collection at the lumbar incision site.

within the wound. The inflammatory tissues and exudates within the wound were thoroughly removed, and the wound was irrigated with copious amounts of normal saline, hydrogen peroxide, and povidone-iodine solution, followed by re-suturing of the deep fascia and wound. Deep effusion samples from wounds were collected and inoculated into routine bacterial and mycoplasma cultures (Zhuhai Yinke Bio, China). Considering all factors, the antibiotic regimen was adjusted postoperatively to moxifloxacin (400 mg iv qd) in combination with doxycycline (100 mg PO q12h) to target Mycoplasma infection and prevent other bacterial infections.

On postoperative day 15, deep exudate samples obtained during debridement surgery were positive for *M. hominis* and no other bacterial growth was detected. Drug sensitivity testing (Zhuhai Yinke Bio, Figure 3A) revealed that *M. hominis* was susceptible to doxycycline, minocycline, josamycin, and spectinomycin; showed intermediate sensitivity to gatifloxacin; and was resistant to ciprofloxacin, sparfloxacin, levofloxacin, roxithromycin, azithromycin, and clarithromycin. To explore the source of *M. hominis* infection and the possibility of pulmonary *M. hominis* infection, we cultured urethral swabs, coronal sulcus mucosa, and sputum samples, all of which yielded positive results for *M. hominis*, and no other suspicious pathogens were detected. Interestingly, although the second set of blood cultures remained negative after 5 days according to the instrument (BacT/ALERT bioMérieux), both bottles of the culture, when inoculated onto blood agar plates and Mycoplasma culture media, yielded positive results for *M. hominis* (Figure 3B). Moreover, the drug sensitivity results for *M. hominis* cultured at different sites are consistent. We also performed a simple cluster analysis of the strains isolated from the four different sites using MALDI BIOTYPER OC3.1 software, and the results showed that these strains belonged to the same cluster (Figure 3C). After 15 days of combined drug therapy, the patient's infection symptoms disappeared, inflammatory marker levels gradually decreased, and the wound healed. Although body temperature fluctuated during this period, two consecutive cultures were negative. The patient was discharged on postoperative day 31 after suture removal and continued to take doxycycline for another 20 days. On postoperative day 55, he came to the hospital for a follow-up visit and the recovery is good. The timeline of the diagnosis and treatment process is shown in (Figure 4).

## Discussion

The diagnosis of *M. hominis* infection outside the urogenital tract is challenging. First, *M. hominis* infection often presents with fever and elevated inflammatory markers, such as WBC, CRP, and neutrophil percentage (NEUT%).[10] These clinical manifestations are nonspecific, and infections outside the urogenital tract are relatively rare and easily overlooked. Second, traditional detection methods are limited by the fastidious growth requirements of mycoplasmas, which require specialized culture media and are difficult to grow in routine cultures. *M. hominis* is the only mycoplasma that can be detected in routine cultures, such as on blood agar plates and in blood cultures.[10] The growth of *M. hominis* on blood agar is slow, often requiring about 3 days to form visible colonies, which are extremely small and easily

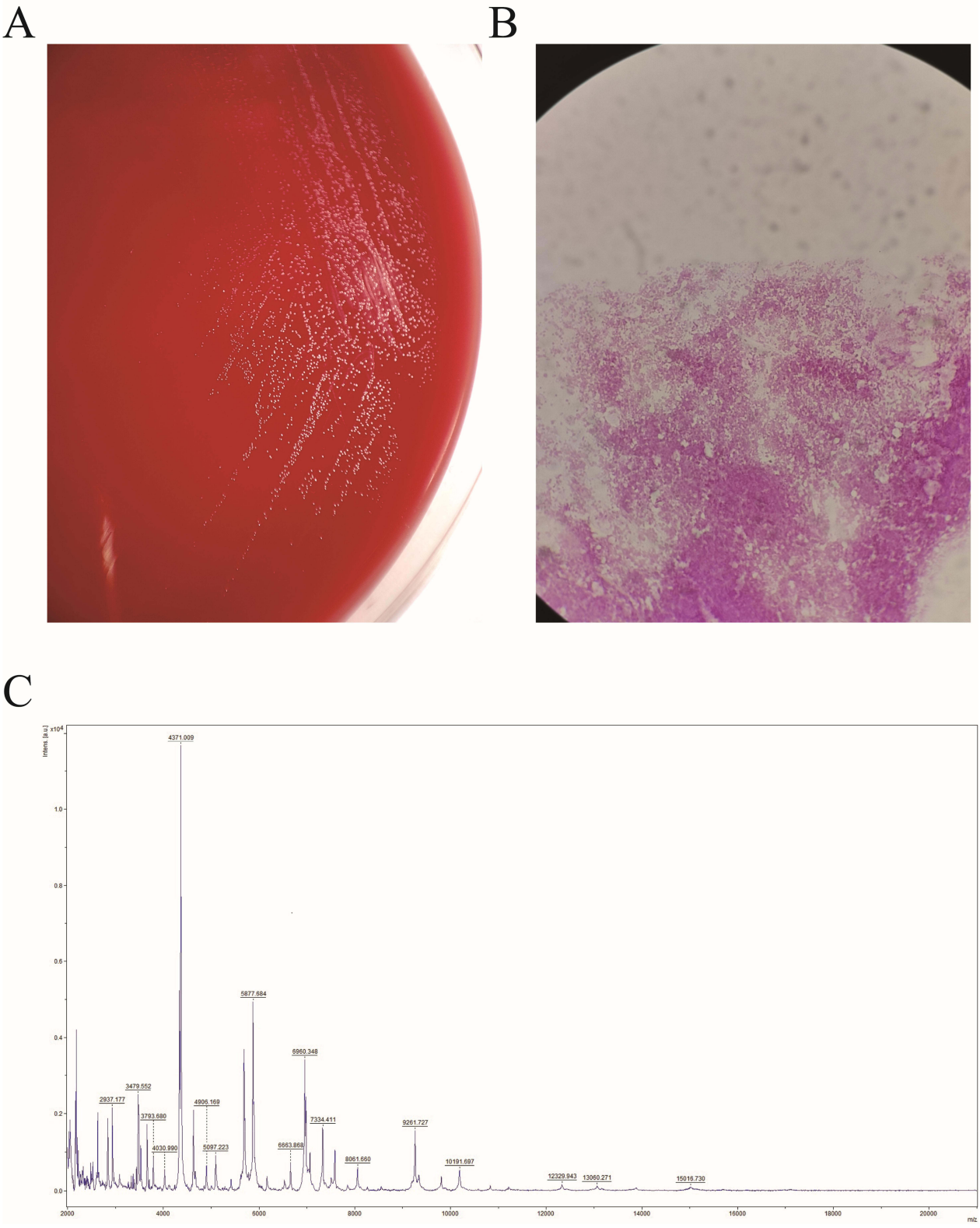


**Figure 2** Laboratory Characteristics of *M. hominis*. (**A**) After 3 days of culture on Columbia blood agar with incision exudate, pin-like, non-hemolytic, transparent colonies appeared (4-fold macro photography). (**B**) Gram staining of the colony smear showing no bacterial body structure under the microscope. (**C**) Protein fingerprints detected by MALDI-TOF.

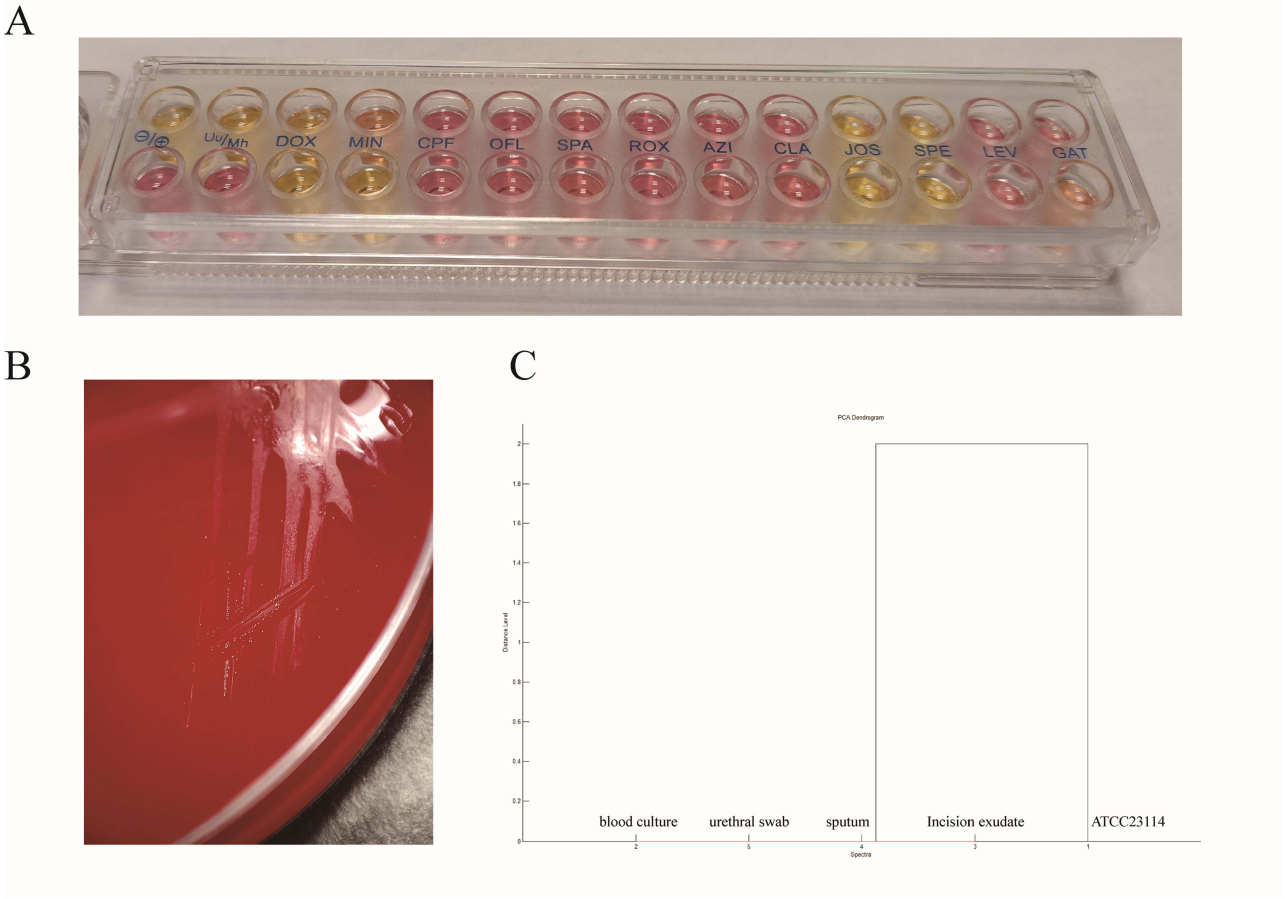


**Figure 3** Blood Culture and Antimicrobial Susceptibility Results of *M. hominis* and MALDI BIOTYPER clustering analysis dendrogram. (**A**) Results of antibiotic susceptibility testing for *M. hominis*. Red wells indicate the growth of *M. hominis*, corresponding to drug resistance; yellow wells indicate no growth of *M. hominis*, corresponding to drug sensitivity. (**B**) After 5 days of negative results reported by the blood culture instrument, the culture grew a small number of pinpoint-like, non-hemolytic, transparent tiny colonies on Columbia blood agar after 3 days of culture (4-fold macro photography). (**C**) MALDI BIOTYPER clustering analysis dendrogram.

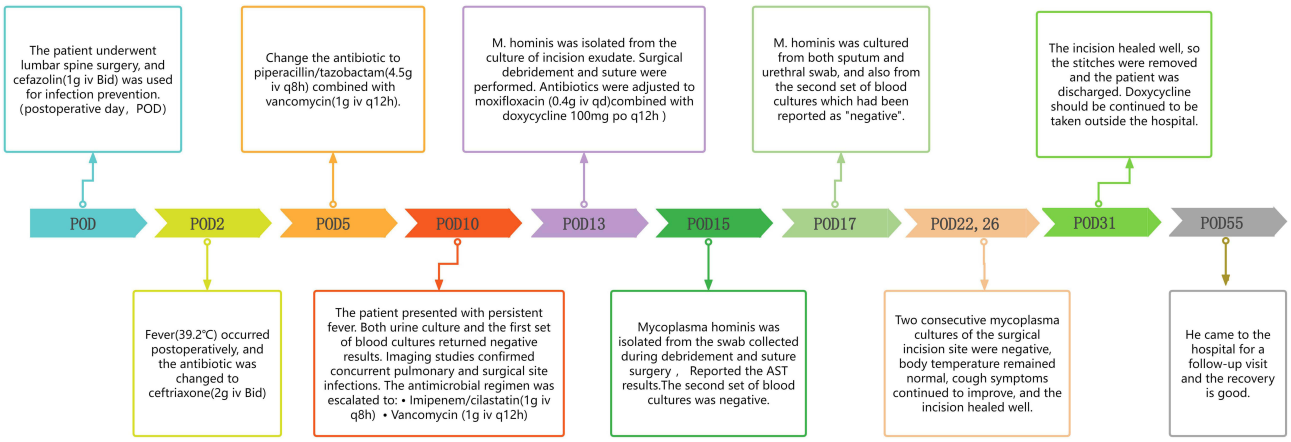


**Figure 4** Timeline showing the entire diagnosis and treatment process for this case.

overlooked. Moreover, sodium polyanethole sulfonate (SPS), an anticoagulant commonly added to commercial blood culture bottles, may inhibit the growth of *M. hominis*, leading to poor culture outcomes.[11] In addition, the relatively low amount of $CO_2$ produced during the growth of *M. hominis*, which is below the detection threshold of the instruments, may also result in false-negative results.[12] In this case, two sets of blood cultures were tested using the BacT/ALERT


https://doi.org/10.2147/IDR.S548195

microbial culture monitoring system, and both yielded negative results. Had it not been used for the isolation of *M. hominis* from wound exudate, which prompted further culturing, this infection would have been difficult to detect. This highlights the significant challenge of diagnosing *M. hominis* bloodstream infections. Furthermore, the lack of a cell wall in mycoplasmas means that Gram staining cannot detect identifiable bacterial cells, which is also one of the reasons for the diagnostic difficulties. To address this issue, MALDI-TOF MS can be used to confirm the cultured colonies with rapid and reliable results. Nevertheless, MALDI-TOF MS requires visible colonies before analysis and is therefore less expeditious than molecular approaches such as PCR or next-generation sequencing (NGS). On postoperative day 5 the physician intended to order NGS to determine the cause of fever. However, the test was not available in our laboratory, so the plan was abandoned.

Given that Mycoplasma species lack a cell wall, they exhibit intrinsic resistance to β-lactam antibiotics and vancomycin, both of which target the cell wall. Antibiotics are frequently used for the prevention and empirical treatment of surgical site infections. Thus, in this case, the patient's condition did not improve despite multiple antibiotic changes. Commonly used antibiotics against *M. hominis* include tetracyclines, quinolones, and macrolides. However, *M. hominis* often exhibits resistance or low susceptibility to 14- and 15-membered macrolides (such as erythromycin, roxithromycin, clarithromycin, and azithromycin). This is because the target site of these antibiotics is the 23S rRNA V domain of the *M. hominis* ribosome, which has specific structural alterations (eg, methylation at the A2058 site or nucleotide mutations) that prevent the drugs from effectively binding to the 50S ribosomal subunit, thereby inhibiting their ability to suppress protein synthesis.[13] With the emergence of resistance gene mutations, increasing cases of *M. hominis* resistance to quinolones and tetracyclines have been reported.[14–16] Therefore, antimicrobial susceptibility testing should be performed whenever possible to guide precise treatment. In the absence of susceptibility results, a combination of fluoroquinolones and doxycycline may be the preferred regimen for treating *M. hominis* infections.[9] It is important to note that *M. hominis* is intrinsically resistant to aminoglycosides. However, many commercially available mycoplasma susceptibility testing kits contain gentamicin. The apparent susceptibility results can lead to misleading clinical treatment and should be avoided.

Although the sources of infection have been identified in a few cases of *M. hominis* infection, such as prostatic abscesses[17] and transplant donors,[18,19] the source of *M. hominis* infection outside the urogenital tract is generally difficult to determine. Most patients with extragenital infections have a history of surgery and typically undergo preoperative urinary catheter placement. Therefore, it is generally speculated that *M. hominis* may enter the bloodstream via the urethra during catheterization or be introduced through contaminated surgical instruments.[20] In this case, *M. hominis* colonization was confirmed in the patient's urinary tract, and the antimicrobial susceptibility results of *M. hominis* isolated from other sites were consistent. MALDI-TOF MS cluster analysis showed that these strains belonged to the same clade, thereby confirming that the source of infection was *M. hominis*, which colonizes the urinary tract. The patient's urinalysis and pulmonary imaging results were normal at admission; however, postoperative urinalysis revealed hematuria and elevated red blood cell (RBC) counts, suggesting that urethral catheterization may have caused mucosal damage in the urinary tract. Colonized *M. hominis* likely invaded the bloodstream through the damaged mucosa, causing an infection and subsequent persistent fever. Postoperative immunosuppression facilitates dissemination of the pathogen via the bloodstream, leading to infections at the surgical site and in the lungs. The patient's pleural and pericardial effusions may have been caused by pulmonary infection, but in light of the literature,[21] the possibility of *M. hominis* causing pleuritis and pericarditis could not be ruled out. The limitation of the present study is that more reliable molecular biology-based homology analyses were not carried out.

## Conclusion

In this case, urethral mucosal damage caused by catheterization enabled colonized *M. hominis* to invade the bloodstream, leading to postoperative bacteremia. The patient's transient immunosuppression after surgery facilitated the spread of infection. Therefore, patients who have undergone catheterization are at high risk of *M. hominis* infection. When such patients present with persistent fever and negative routine cultures, *M. hominis* infection should be suspected. Notably, blood cultures may produce false-negative results, leading to underestimation of its true incidence. Therefore, targeted mycoplasma culture followed by MALDI-TOF MS identification should be performed promptly.

## Ethics Approval and Informed Consent

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images. The study was reviewed and approved by the Ethics Committee of the Affiliated Hospital of Shaoxing University, with the ethical approval number (2024(Research)-015-01), and was conducted in accordance with the principles of the Declaration of Helsinki.

## Acknowledgments

We acknowledge the contributions of other clinical and laboratory staff at the Affiliated Hospital of the Shaoxing University. We are grateful for the understanding and consent of the patient and his family.

## Author Contributions

All authors made significant contributions to the work reported, whether in the conception, study design, execution, data acquisition, analysis, and interpretation, or in all these areas; have drafted, revised, or critically reviewed the article; have given final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

## Funding

This study was supported by the Shaoxing Municipal Health and Family Planning Science and Technology Project (Grant No. 2024SKY084) and the Medical Science and Health Science Program of Zhejiang Province (Grant No. 2024KY485).

## Disclosure

The authors report no conflicts of interest in this work.

## References

1. Lee JY, Yang JS. Prevalence and Antimicrobial Susceptibility of *Mycoplasma hominis* and Ureaplasma Species in Nonpregnant Female Patients in South Korea Indicate an Increasing Trend of Pristinamycin-Resistant Isolates. *Antimicrob Agents Chemother*. 2020;64(10). doi:10.1128/AAC.01065-20
2. Kantor J, Tkadlec J, Hurych J, et al. Rare case of postoperative Meta*Mycoplasma hominis* surgical site infection after bilateral lung transplantation. *Folia Microbiol*. 2024;69(3):693–696. doi:10.1007/s12223-024-01160-5
3. Hua D, Zou Q, Wu Z, et al. Application of metagenomic high-throughput sequencing in a rare case of multisite infection with two microorganisms after total knee arthroplasty. *Orthopedics*. 2024;47(1):e52–e56. doi:10.3928/01477447-20230531-04
4. Li G, Yu W, Ye Y, et al. Postoperative mediastinitis and sternal osteitis caused by *Mycoplasma hominis*: a case report. *Diagn Microbiol Infect Dis*. 2024;108(3):116170. doi:10.1016/j.diagmicrobio.2023.116170
5. Li S, Yang L, Guo Y, Feng X, Ye L, Li K. Sternal wound infection caused by *Mycoplasma hominis* in an adult patient: a case report and literature review. *BMC Infect Dis*. 2025;25(1):212. doi:10.1186/s12879-025-10607-0
6. Muramatsu E, Sakurai A, Kawabe Y, et al. Periprosthetic joint infection due to *Mycoplasma hominis* in a patient with multiple sclerosis treated with fingolimod. *J Infect Chemother*. 2022;28(12):1672–1676. doi:10.1016/j.jiac.2022.08.020
7. Pachunka J, Hankins R. *Mycoplasma hominis* necrotising pneumonia in an immunocompetent adult male. *BMJ Case Rep*. 2023;16(6):e250107. doi:10.1136/bcr-2022-250107
8. Diab A, AlMusawi SSM, Hudhaiah D, Magzoub R, Al Rashed AS, Al Musawi TS. Iatrogenic ventriculitis due to *Mycoplasma hominis*: a case report and literature review Am. *J Case Rep*. 2019;20:406–411. doi:10.12659/AJCR.914284
9. Sampath R, Patel R, Cunningham SA, et al. Cardiothoracic Transplant Recipient *Mycoplasma hominis*: an Uncommon Infection with Probable Donor Transmission. *EBioMedicine*. 2017;19:84–90. doi:10.1016/j.ebiom.2017.04.026
10. Xuehong D, Wang L, Ning F, et al. Bloodstream and thoracic infections caused by *Mycoplasma hominis*: a case report and literature review. *Infect Drug Resist*. 2024;17:5795–5801. doi:10.2147/IDR.S478555
11. Waites KB, Canupp KC. Evaluation of BacT/ALERT System for Detection of Mycoplasma hominis in Simulated Blood Cultures. *J Clin Microbiol*. 2001;39(12):4328–4331. doi:10.1128/JCM.39.12.4328-4331.2001
12. Waites KB, Katz B, Schelonka RL, et al. Mycoplasma and Ureaplasma are neonatal pathogens. *Clin Microbiol Rev*. 2005;18(4):757–789. doi:10.1128/CMR.18.4.757-789.2005
13. Qiu Y, Mao S, Li X, et al. Chinese advances in understanding and managing genitourinary tract infections caused by Mycoplasma genitalium, *Mycoplasma hominis*, and Ureaplasma urealyticum. *Arch Microbiol*. 2025;207(5). doi:10.1007/s00203-024-04204-z
14. Yang T, Pan L, Wu N, et al. Antimicrobial Resistance in Clinical Ureaplasma spp. and *Mycoplasma hominis* and the Structural Mechanisms Underlying Quinolone Resistance. *Antimicrob Agents Chemother*. 2020;64(6):e02560–19. doi:10.1128/AAC.02560-19
15. Meygret A, Peuchant O, Dordet-Frisoni E, et al. A high prevalence of integrative and conjugative elements encoding transcription activator-like effector repeats in *Mycoplasma hominis*. *Front Microbiol*. 2019;10:2385. doi:10.3389/fmicb.2019.02385

16. Chalker VJ, Sharratt MG, Rees CL, et al. Tetracycline Resistance Mediated by tet (M) Has Variable Integrative Conjugative Element Composition in Mycoplasma hominis Strains Isolated in the United Kingdom from 2005 to 2015. *Antimicrob Agents Chemother*. 2021;65(4):e02513–20. doi:10.1128/AAC.02513-20
17. Wang Q, Tang X, van der Veen S. *Mycoplasma hominis* bloodstream infection and persistent pneumonia in a neurosurgery patient: a case report. *BMC Infect Dis*. 2022;22(1):169. doi:10.1186/s12879-022-07137-4
18. Vecchio M, Koutsokera A, Touilloux B, et al. Bronchial anastomosis dehiscence and stenosis caused by donor-transmitted Mycoplasma hominis infection in a lung transplant recipient: case report and literature review. *Transpl Infect Dis*. 2021;23(2):e13475. doi:10.1111/tid.13475
19. Hinić V, Seth-Smith HMB, Damm S, et al. Unexpected *Mycoplasma hominis* infection in the two renal transplant recipients was traced back to the same donor using whole-genome sequencing. *Eur J Clin Microbiol Infect Dis*. 2021;40(5):1097–1102. doi:10.1007/s10096-020-04116-y
20. Lyon GM, Alspaugh JA, Meredith FT, et al. *Mycoplasma hominis* pneumonia complicating bilateral lung transplantation: case report and review of the literature. *Chest*. 1997;112(5):1428–1432. doi:10.1378/chest.112.5.1428
21. García-de-la-Fuente C, Miñambres E, Ugalde E, Sáez A, Martinez-Martinez L, Fariñas MC. Postoperative mediastinitis, pleuritis, and pericarditis due to *Mycoplasma hominis* and Ureaplasma urealyticum have fatal outcomes. *J Med Microbiol*. 2008;57(Pt 5):656–657. doi:10.1099/jmm.0.47632-0