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CASE REPORT

# Inevitable Late Miscarriage Associated with *Mycoplasma hominis* Bacteremia Following Cervical Cerclage: A Case Report and Literature Review

Dongjie Hao, Aiyun Li, Nan Jiang, Xiangzhe Huang, Yaqi Qian, Bo Zhu

Department of Laboratory Medicine, Women's Hospital School of Medicine Zhejiang University, Hangzhou, Zhejiang, 130006, People's Republic of China

Correspondence: Bo Zhu, Department of Laboratory Medicine, The Women's Hospital School of Medicine Zhejiang University, Xueshi Road, Shangcheng District, Hangzhou, 310006, Zhejiang, People's Republic of China, Tel +86-15857153226, Email 5202054@zju.edu.cn



**Background:** *Mycoplasma hominis* (*M. hominis*) is predominantly isolated from the genitourinary tract; however, the incidence of extragenital infections has risen notably in recent years. Despite this trend, bloodstream infection caused by *M. hominis* during pregnancy remains exceptionally rare. Due to its fastidious nutritional requirements, this organism is rarely detected by conventional blood culture systems. Furthermore, the inherent absence of a cell wall confers resistance to many first-line antimicrobial agents, thereby complicating the diagnosis and management of *M. hominis* bloodstream infections in pregnant patients.

**Case Description:** A 31-year-old pregnant woman at 17 weeks and 4 days gestation experienced irregular lower abdominal pain due to a dilated cervical canal. This required cervical cerclage. After the procedure, she developed a fever and signs of infection, identified as a severe *M. hominis* bloodstream infection. This led to the termination of efforts to save the fetus, resulting in a late-term miscarriage.

**Conclusion:** In clinical practice, pregnant patients with cervical insufficiency represent a high-risk population for *M. hominis* infection, and active pathogen screening is warranted for early diagnosis. Mastery of the antimicrobial susceptibility patterns of *M. hominis* allows the transition from conventional empirical treatment to personalized precision medicine, which is key to improving cervical cerclage outcomes and ensuring the well-being of both mother and fetus.

**Keywords:** cervical cerclage, *Mycoplasma hominis*, bloodstream infection, inevitable late miscarriage

## Introduction

*Mycoplasma* represents a group of the smallest prokaryotic microorganisms characterized by their lack of cell walls.[1]*Mycoplasma* is a significant pathogen associated with sexually transmitted diseases and is among the most prevalent microorganisms responsible for reproductive tract infections.[2–4] Notably, *Mycoplasma hominis* (*M. hominis*) are the most commonly identified species within this group.[5] Furthermore, *M. hominis* infections have been implicated in adverse pregnancy outcomes, including miscarriage, endometritis, premature birth, embryonic arrest, chorioamnionitis, and intrauterine growth restriction.[6,7] *M. hominis* infections have also been documented in various anatomical sites, including the central nervous system, thoracic cavity, and musculoskeletal system.[8–11]

Attributable to *M. hominis* fastidious nutritional requirements, this organism is infrequently detected by conventional blood culture systems. Moreover, the inherent absence of a cell wall confers resistance to numerous first-line antimicrobial agents, thereby complicating both the diagnosis and clinical management of *M. hominis* bloodstream infections in pregnant patients.[6,12,13] This article presents a case study of an 18-week pregnant woman who developed a bloodstream infection due to *M. hominis* following a cervical cerclage procedure, which resulted in an unavoidable

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late miscarriage. A retrospective analysis of the case, including the pathogenic characteristics of *M. hominis* and its antibiotic resistance profile, has been conducted to offer insights for clinical diagnosis and management.

## Case Presentation

The patient experienced menarche at the age of 13, with regular 30-day menstrual cycles and 5-day bleeding duration. Her last menstrual period was on February 23, 2022. She married at 26 years old and had only one long-term sexual partner, with no history of unprotected or high-risk sexual intercourse. Her husband was healthy and had no family history of hereditary diseases, yet he had never received any genital tract microbial screening or culture tests. The couple did not use contraceptive measures. She had an obstetric history of gravida 4, para 1. In 2014, she delivered a full-term male infant weighing 3900 g via cesarean section with unremarkable postpartum recovery. She underwent medical abortion at 7+ weeks of gestation in 2015 and artificial abortion at 7+ weeks in 2020, with satisfactory recovery after both procedures. One month after her missed current menstrual cycle, a urine pregnancy test confirmed gestation, and she denied obvious discomforts or typical early pregnancy symptoms at initial presentation.

Routine prenatal examinations revealed no abnormalities. On June 26, 2022, at 17 weeks and 4 days of gestation, the patient experienced irregular lower abdominal pain without any noticeable vaginal bleeding or fluid discharge. At an external hospital, the cervical canal was measured at 11 mm in length, exhibiting a slight V-shape and a separation of 3 mm. Cervical secretion culture, chlamydia, mycoplasma, and gonorrhea examinations showed no obvious abnormalities. The patient was treated with oral Duphaston and intravenous magnesium sulfate; however, uterine contractions did not show significant improvement. Irregular uterine contractions persisted on the night of June 28, at 17 weeks and 6 days of gestation, prompting the patient to seek emergency care at our hospital on June 29, at 18 weeks of gestation.

Protocol Upon admission, the patient received magnesium sulfate, progesterone, and drotaverine to support fetal health, while cefoxitin sodium was administered as a prophylactic measure against infection. Ultrasound imaging indicated that the cervical canal of the pregnant patient was dilated in a "Y" shape, with the closed segment measuring approximately 1.2 cm in length. In response to "cervical incompetence during pregnancy," a transvaginal cervical cerclage was performed under epidural anesthesia on July 4, 2022, at 18 weeks and 5 days of gestation, with the procedure being deemed successful. On the same day, an examination of cervical secretions for pathogenic microorganisms revealed a positive result for *Ureaplasma urealyticum* DNA, with a concentration of 149,000 copies, while tests for *Chlamydia trachomatis* DNA and *Neisseria gonorrhoeae* DNA were negative, each with fewer than 500 copies detected (Fluorescence Quantitative PCR, Sansure Biotech, China). Azithromycin is used to treat this positive pathogen. On July 6, 2022, at 19 weeks of gestation, the patient's body temperature was recorded at 38.1°C, although no additional symptoms were reported. Consequently, Cefoperazone sulbactam sodium was administered for infection control. On July 7, a microbial culture of vaginal secretions indicated a substantial growth of *Candida albicans* (Sabouraud Dextrose Agar, Zhengzhou Antu Biology, China). To address fungal infections, Nifuratel Nystatin is utilized. On July 8, 2022, at 19 weeks and 2 days of gestation, laboratory results indicated a white blood cell count of 12.0×10^9/L, a neutrophil percentage of 87.7%, and a high-sensitivity C-reactive protein level of 74.7 mg/L. In light of the intrauterine infection and increased uterine contractions during pregnancy, it was advised to remove the cervical cerclage suture and discontinue efforts to protect the fetus, to which the pregnant woman consented. Three hours following the removal of the cerclage suture, the patient's body temperature increased to 38.6°C. (Figure 1) Consequently, oxytocin was administered intravenously to enhance uterine contractions and facilitate the termination of the pregnancy. The patient was informed of her scarred uterus and the associated risk of uterine rupture during labor. At 17:52 on July 8, 2022, a fetus weighing 350g was delivered vaginally. The placenta was expelled spontaneously, with intact fetal membranes, and the estimated blood loss during childbirth was approximately 100mL, with an additional 30mL of vaginal bleeding observed postpartum. Postoperative placental histopathological results: chorioamnionitis. (Figure 2) On July 8, a microbial culture of cervical secretions demonstrated the presence of *M. hominis* (Columbia Blood Agar, Zhengzhou Antu Biology, China). *M. hominis* was found to be resistant to macrolide antibiotics and responsive to doxycycline, tetracycline, and quinolone antibiotics according to susceptibility tests. (Table 1) Additionally, a blood culture set was obtained at 16:22 on the same day. A positive result was obtained from the anaerobic bottle on July 10, indicating the

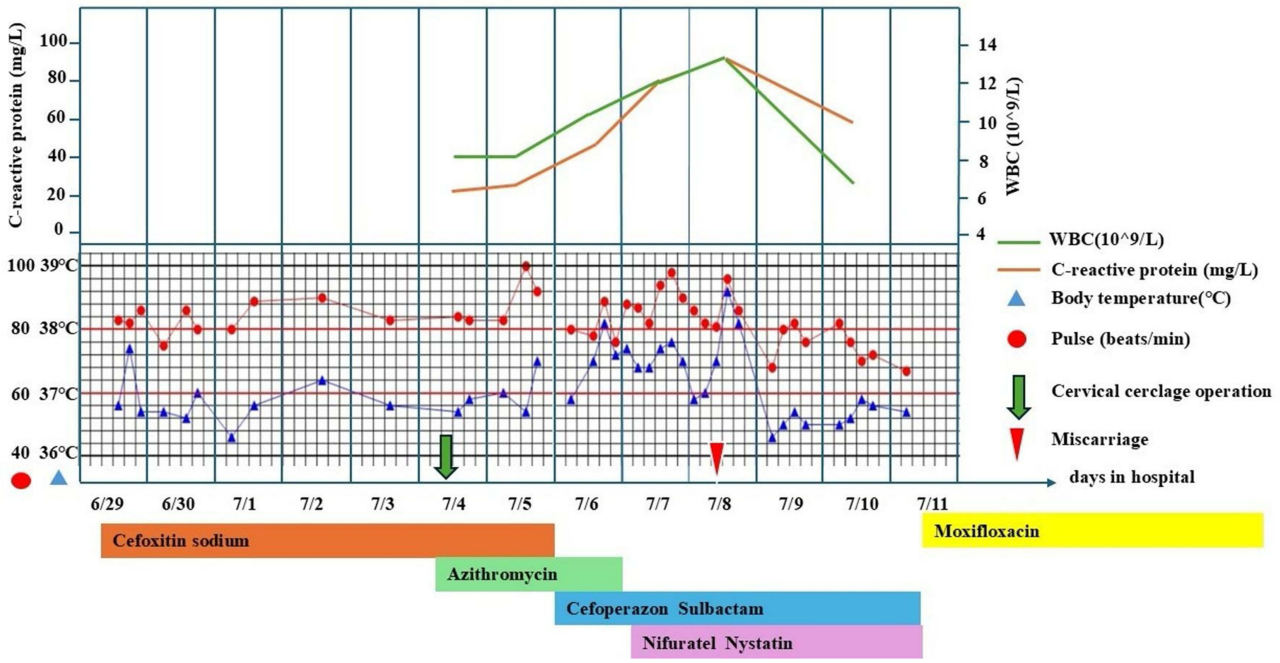


**Figure 1** Dynamic changes of inflammatory markers and vital signs during the patient's hospitalization. The chart shows the trends of C-reactive protein (CRP), white blood cell (WBC) count, body temperature, pulse rate, and the timeline of antibiotic administration during admission. 1–6.

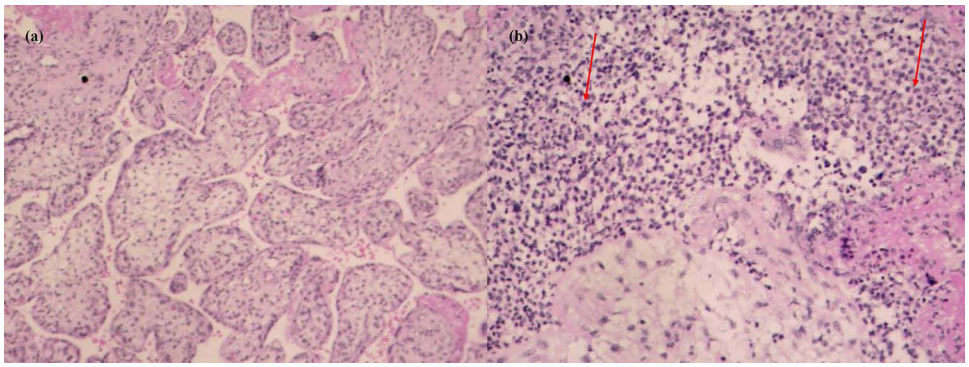


**Figure 2** Histopathological features of placental chorioamnionitis. (**a**) Panoramic view of the placental tissue, HE staining, total magnification ×100, scale bar=200 μm. (**b**) High-magnification view of the lesion area, HE staining, total magnification ×400, scale bar=50 μm. Abundant inflammatory cell infiltration in the chorionic and amniotic membranes is indicated by the arrow. 1–6.

growth of *M. hominis* as identified by matrix-assisted laser desorption ionization time-of-flight mass spectrometry. (MALDI-TOF MS) (MALDI Biotyper Sirius/microflex, Bruker Daltonics GmbH & Co. KG, Germany) (Figure 3).

After a miscarriage, the patient's body temperature was recorded at 37.5°C, and her vital signs remained stable Cefoperazone sulbactam sodium was continued for its anti-infective properties. On the second day following the miscarriage, the patient experienced minimal vaginal bleeding without any associated symptoms such as fever. Laboratory tests indicated an improvement in the white blood cell count and other parameters, although levels of high-sensitivity C-reactive protein remained elevated. Doctors select moxifloxacin for oral administration for one week after obtaining the *M. hominis* drug susceptibility results. After receiving appropriate medical treatment, the patient was discharged from the hospital.

## Discussion

*Mycoplasma hominis* (*M. hominis*) is a prevalent colonizing bacterium of the urogenital tract, frequently isolated from sexually mature women.[14] Approximately 21% to 53% of asymptomatic women are colonized with *M. hominis*, and the


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**Table 1** Antibiotic Sensitivity of the *M. hominis*

| Types of Antibiotics | Doxycycline | Josamycine | Ofloxacin | Erythromycin | Tetracycline | Ciprofloxacin | Azithromycin | Clarithromycin | Pristinamycin |
|---|---|---|---|---|---|---|---|---|---|
| MIC (ug/mL) | 4 | 2 | 1 | 4 | 4 | 1 | 4 | 4 | 2 |
| Result | S | S | S | R | S | S | R | R | S |

**Note**: S stands for susceptible strains and R for resistant strains.


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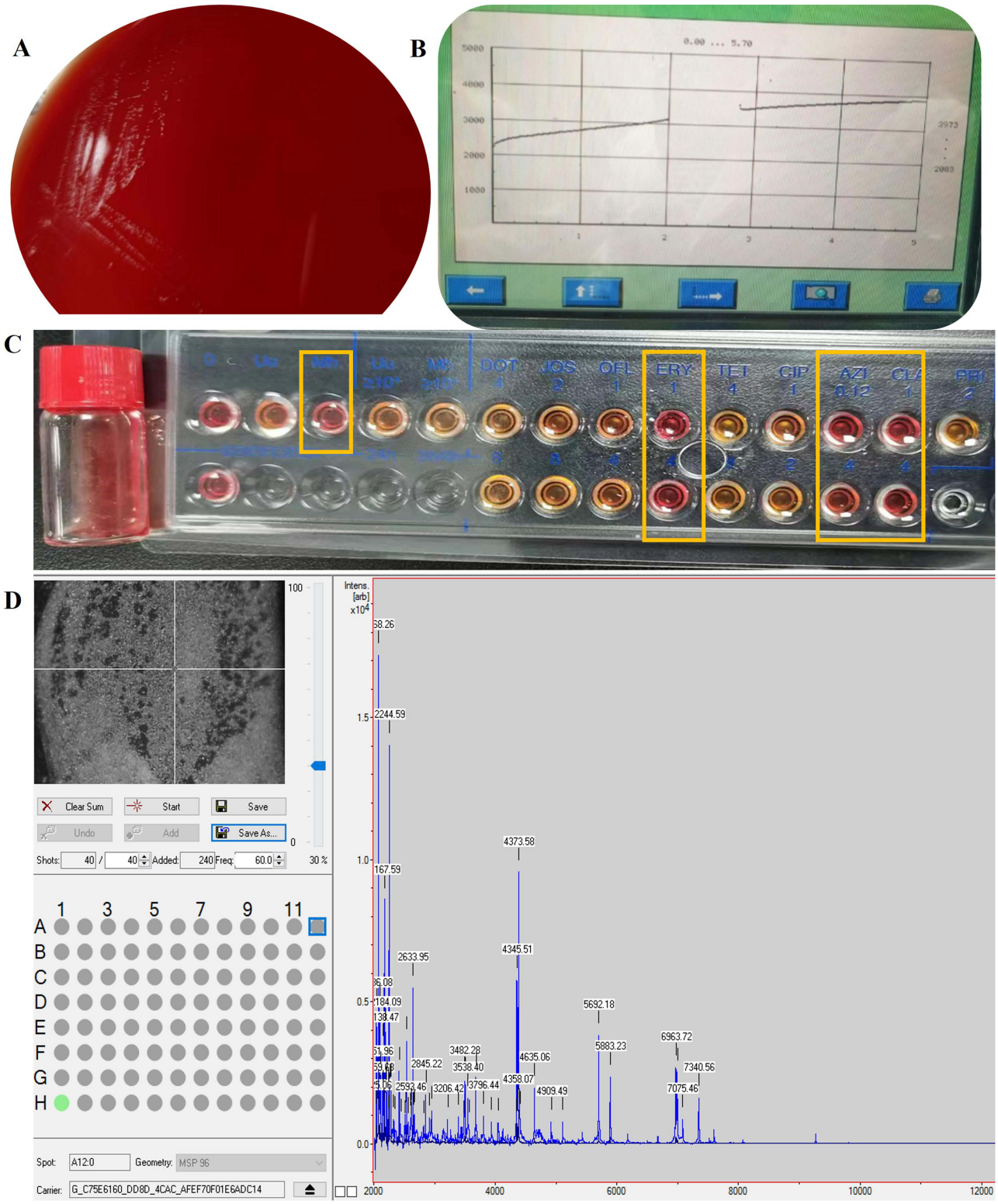


**Figure 3** Identification and antibiotic susceptibility testing of *M. hominis*. (**A**) Needle-tip colonies of *M. hominis* after 48 h of anaerobic incubation. (**B**) Positive signal of the anaerobic blood culture bottle at 48 h, with a flat growth curve of the automated culture system. (**C**) Antibiotic susceptibility testing results of the *M. hominis* isolate. (**D**) *M. hominis* identified by matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF MS). 1–6.


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colonization rate in the male urethra can reach up to 20%.[15,16] Under certain conditions, *M. hominis* can lead to urogenital tract infections, such as pelvic inflammatory disease and cervicitis.[17] Typically, it causes infections confined to the mucosal surfaces of the genital tract and does not invade tissues or the bloodstream.[18] We reviewed cases of *M. hominis* bloodstream invasion reported in the literature from 1994 to 2005 and synthesized this information with our findings (Table 2).

This case is clinically important because *M. hominis* bacteremia following cervical cerclage during pregnancy is extremely rare but can cause life-threatening intrauterine infection and inevitable late miscarriage.

In this case, persistent cervical structural damage caused by multiple prior pregnancy events, including one cesarean delivery and two first-trimester induced abortions, gradually impaired cervical tissue elasticity and mechanical integrity over time. Such cumulative injury significantly weakened the cervical barrier function and resulted in cervical insufficiency during the current gestation. The unique virulence characteristics of *M. hominis* mediate immune evasion and tissue invasion, and this risk is further amplified by cervical cerclage—a necessary invasive procedure for treating cervical incompetence. As an invasive intervention, cervical cerclage inevitably disrupts the integrity of the cervical mucosal epithelium, which not only impairs the local physical barrier but also creates an additional pathway for pathogen invasion, thereby increasing the chance of infection. *M. hominis* can adhere to genital epithelial cells via surface adhesins and secrete a variety of virulence factors, including phospholipase C,

**Table 2** Summary of Published Cases of *M. hominis* Bloodstream Infections (1994–2025)

| Case No. | Reference | Age (Years) | Sex | Underlying Clinical Condition | Pathogen Identification Method | Targeted Antimicrobial Treatment | Treatment Duration (Days) | Clinical Outcome |
|---|---|---|---|---|---|---|---|---|
| 1 | Chen Y et al 2023 [19] | 63 | Male | ANCA-associated vasculitis | Blood culture, MALDI-TOF MS, mNGS | Levofloxacin | 25 | Cured |
| 2 | Wang Q et al 2022 [18] | 56 | Male | Left basal ganglia hemorrhage, pneumonia | Blood culture, MALDI-TOF MS | Doxycycline + Moxifloxacin | 40 | Cured |
| 3 | Duan X et al 2024 [20] | 56 | Male | Multiple pelvic and rib fractures, pleural effusion | Blood culture, MALDI-TOF MS, 16S rRNA sequencing | Moxifloxacin | 40 | Cured |
| 4 | Fan Y et al 2025 [21] | 71 | Male | Hyperammonemic encephalopathy | Blood culture | Imipenem | 3 | Dead |
| 5 | Yu Y et al 2025 [22] | 72 | Male | Lumbar spine surgery | Blood culture, MALDI-TOF MS | Doxycycline + Moxifloxacin | 55 | Cured |
| 6 | Huang SM et al 2023 [23] | 43 | Male | Multiple open traumas from traffic accident | Blood culture, wound sample culture, MALDI-TOF MS, 16S rRNA sequencing | Minocycline + Polymyxin B | 37 | Cured |
| 7 | Muramatsu E et al 2022 [24] | 48 | Female | Multiple sclerosis, total hip arthroplasty | Blood culture, joint aspirate culture | Doxycycline + Levofloxacin | 42 | Cured |
| 8 | Posse T et al 2018 [25] | 19 | Male | Incomplete miscarriage | Blood culture, MALDI-TOF MS | Ampicillin + Gentamicin + Metronidazole | 7 | Cured |
| 9 | Fernández Guerrero ML et al 1999 [26] | 31 | Female | End-stage renal disease, kidney transplantation | Blood culture | Doxycycline | 42 | Cured |
| 10 | Fernández Guerrero ML et al 1999 [26] | 24 | Male | Multiple injuries, pneumonia | Blood culture | Gentamicin + Cloxacillin | 12 | Dead |
| 11 | Kolben M et al 1994 [27] | 24 | Female | Puerperal ovarian vein thrombophlebitis after cesarean section | Blood culture | Doxycycline | 27 | Cured |

aminopeptidase, and hydrogen peroxide. These factors not only further damage the already impaired epithelial cell barrier (exacerbated by cerclage-related trauma) but also induce the release of pro-inflammatory cytokines such as interleukin (IL)-1β, IL-6, and tumor necrosis factor-α, triggering a sustained inflammatory cascade. Unlike other common genital pathogens, *M. hominis* lacks a rigid cell wall, enabling it to evade phagocytosis by host immune cells and survive in both intracellular and extracellular environments, leading to persistent infection that is difficult to clear.[14] This physiological immune adaptation, combined with the pre-existing cervical structural damage, significantly reduces the host's ability to control the proliferation and invasion of colonizing *M. hominis*, making pregnant women more susceptible to the progression from asymptomatic colonization to invasive infection. In this case, the sustained elevation of inflammatory markers after surgery not only reflects the failure of the host immune system to limit the spread of *M. hominis* infection but also correlates with the placental inflammatory changes induced by the pathogen.

Other than that, the diagnostic approach failed to encompass common pathogens of the lower reproductive tract, such as bacterial vaginosis (BV), fungi, and *Group B Streptococcus* (*GBS*), and notably omitted screening for *M. hominis*. Consequently, the clinician was unable to administer precise treatment for the pathogens actually present in the patient in a timely manner, resulting in reliance on empirical treatment strategies. This oversight allowed *M. hominis* to persist and continue infecting the patient. By this stage, the patient had developed a severe infection, and the miscarriage was irreversible.

Additionally, the antibiotic resistance characteristics of *M. hominis* present a significant challenge.[28] It is evident that *M. hominis* is neither a well-recognized nor a common pathogen in clinical practice. Therefore, understanding its drug resistance profile is essential for the appropriate application of antibiotics in its treatment. It is well established that *Mycoplasma* species exhibit intrinsic resistance to β-lactam antibiotics due to the absence of a cell wall in *Mycoplasma*.[29] Doxycycline and moxifloxacin are commonly used in the literature to treat *M. hominis* infections.[8,26] In the present case, oral administration of Azithromycin tablets was employed for a duration of three days to address the *Ureaplasma urealyticum* infection, while Cefoperazone and Sulbactam were utilized as prophylactic agents. However, the *M. hominis* strain in this instance demonstrated resistance to macrolide antibiotics, rendering the empirical treatment regimen ineffective against this pathogen.

Several limitations of this study should be noted. First, as a single-case report from a single center, the generalizability of our findings is inherently limited, and a definitive causal link between *M. hominis* bacteremia and post-cerclage late miscarriage cannot be established. Second, comprehensive pre-operative genital pathogen screening (including *M. hominis*) and sexual partner pathogen detection were not performed, so the baseline colonization status and transmission source of the pathogen could not be clarified. Third, we did not apply mNGS or other sensitive molecular methods for early pathogen detection, nor did we obtain direct pathological evidence of placental *M. hominis* infection. Finally, our literature review only included English-language reports, with no long-term follow-up of the patient, which may lead to incomplete data summary and insufficient evaluation of the long-term prognosis of the disease.

In conclusion, this case highlights that *Mycoplasma hominis* bloodstream infection is a life-threatening complication of cervical cerclage that can lead to life-threatening late miscarriage. For pregnant patients with cervical insufficiency, routine screening for *M. hominis* and timely pathogen identification should be prioritized. Mastery of its unique antimicrobial resistance profiles enables prompt targeted therapy, replacing ineffective empirical treatment. This clinical paradigm is critical for reducing infectious complications, improving the prognosis of cervical cerclage, and ultimately protecting the health and safety of pregnant women and their fetuses.

## Ethics Approval and Consent to Participate

This report was approved by the Women's Hospital School of Medicine Zhejiang University, Hangzhou 310006, China. Consent for publication Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

## Author Contributions

Bo Zhu is co-corresponding authors. All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in

drafting, revising or critically reviewing the article; gave 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.

## Disclosure

The authors declare that they have no competing interests.

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