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CASE REPORT

A Case of Urinary Tract Infection Caused by Multidrug Resistant *Streptococcus mitis/oralis*

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Abstract: *S. mitis/oralis* has been previously reported in isolated cases of bacterial endocarditis and liver abscesses. Its presence in urine is generally considered a contaminant. A 66-year-old male patient was admitted to the hospital due to recurrent chest tightness and four-year history of exertional dyspnea. On the second day of admission, the patient presented with urgent and frequent urination, as well as dysuria. Both initial and subsequent urine cultures showed *S. mitis/oralis* infection, with polymorphonuclear leukocyte phagocytosis observed in the second sample. MALDI-TOF results confirmed the isolated strain as *S. mitis/oralis*. Drug susceptibility testing revealed multidrug resistance to penicillin, ceftriaxone, cefepime, levofloxacin, ofloxacin, and tetracycline, but sensitivity to quinupristin/dalfopristin, vancomycin, and linezolid. The clinician then prescribed vancomycin for anti-infective treatment, which proved effective. Keywords: *S. mitis/oralis*, UTI, MDR, phagocytosis

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Introduction

S. mitis/oralis belongs to the family of viridans group streptococci (VGS), commonly found in the oral cavity, digestive tract and female reproductive tract, which are typically considered normal flora and are not generally pathogenic. The isolation of S. mitis/oralis in urine is usually attributed to commensal or contaminating bacteria, resulting in limited studies on urinary tract infections (UTIs) caused by this bacterium.[1,2] Here, we report a case of UTI complicated by *S. mitis/oralis* in a patient with hydronephrosis.

Case Report

A 66-year-old male patient was admitted to the hospital due to recurrent chest tightness and four-year history of exertional dyspnea. Medical treatment involving coronary artery dilation alleviated these symptoms. On the second day of admission, the patient presented with urgent and frequent urination, as well as dysuria. The patient was instructed to provide a clean mid-stream urine sample for routine examination and culture. Urinalysis revealed leukocyte esterase 3+, occult blood 1+, urine protein 1+, and a white blood cell count exceeding 30/HP. On the third day, Gram staining of the urine culture revealed positive cocci chains (Figure 1A and B). MALDI-TOF results identified the colonies as *S. mitis/oralis*. Although *S. mitis/oralis* is generally considered a contaminant when isolated from urine samples in clinical practice, additional tests were conducted to determine whether the bacterium was a pathogen or contaminant in this case. The patient provided another urine sample for re-examination. Upon centrifugation and sediment Gram staining, a high number of polymorphonuclear leukocytes and positive cocci chains were observed (Figure 1C and D). Interestingly, polymorphonuclear leukocyte phagocytosis was also detected, indicating *S. mitis/oralis* as the causative agent of the UTI. MALDI-TOF results further confirmed the presence of *S. mitis/oralis*. Drug susceptibility tests were performed using the E-Test and K-B susceptibility

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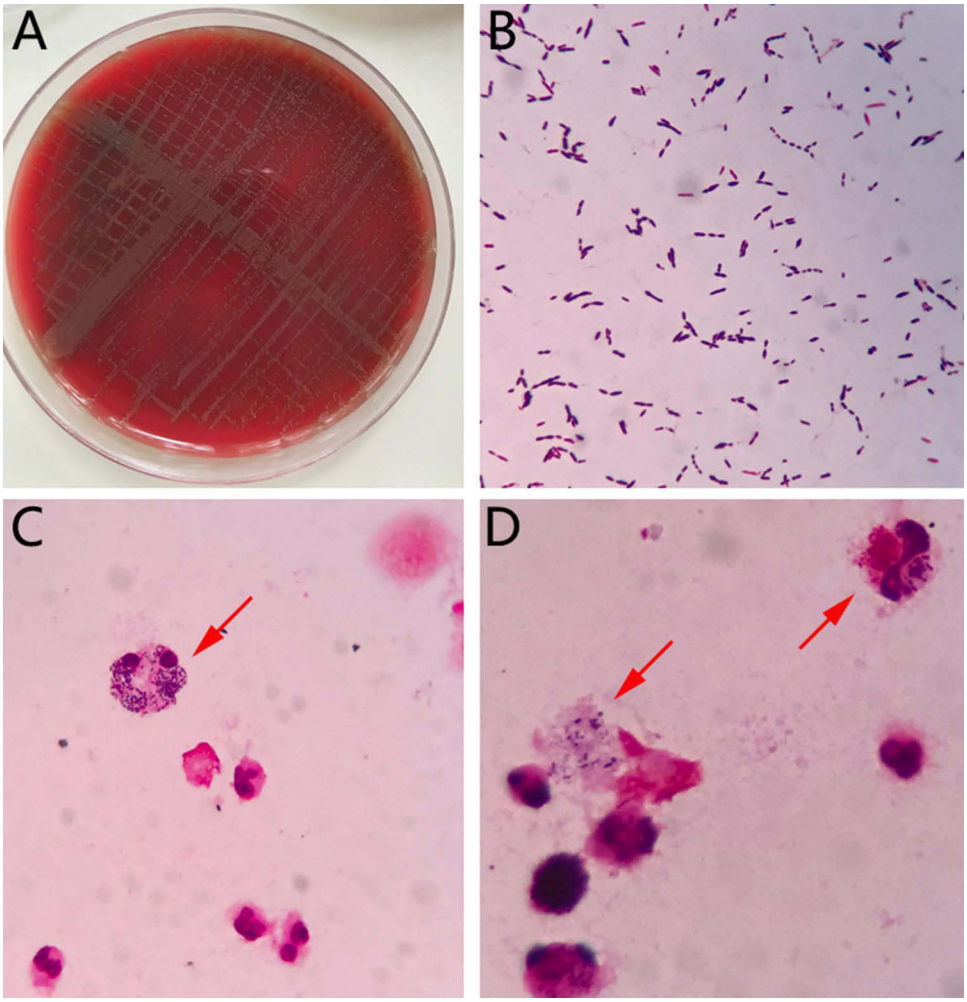

Figure 1 (**A**) Culture of the first urine specimen on blood plate; (**B**) Gram stain result of the first cultured strain; (**C** and **D**) phenomenon of polymorphonuclear Leukocyte phagocytosis under microscope. Red arrow point to the phenomenon of polymorphonuclear Leukocyte phagocytosis.

test, which revealed multidrug resistance (MDR) to penicillin, ceftriaxone, cefepime, levofloxacin, ofloxacin, and tetracycline, but sensitivity to quinupristin/dalfopristin, vancomycin and linezolid. Based on the patient's condition, the clinician prescribed vancomycin 1.0g every 12 hours for three days as an anti-infective treatment. Three days later, a subsequent urine culture was negative, and the patient was discharged.

Discussion

Infections caused by *S. mitis/oralis* were primarily associated with infective endocarditis,[3,4] but recent case reports have documented sepsis, liver abscesses, and endophthalmitis caused by this bacterium.[5–7] Common urinary tract infection (UTI) pathogens include *Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis, Enterococcus faecalis, Staphylococcus saprophyticus*, and some of them demonstrate multidrug resistance.[8–10] *S. mitis/oralis* is not a typical cause of UTIs, and when isolated from urine cultures, the white blood cell count is usually normal, suggesting contamination from the digestive or reproductive tracts.

In this case, microscopic examination of the patient's urine samples revealed numerous streptococci and white blood cells, with bacterial phagocytosis by white blood cells also observed. Two urine cultures tested positive for *S. mitis/oralis*, confirming a UTI caused by this bacterium. Further investigation revealed that the patient had alcoholic liver disease and diabetes, both of which can compromise the immune system. A stool test also detected *Strongyloides stercoralis*, suggesting a possible weakened immune system. The patient had a history of bilateral multiple kidney stones,

bilateral hydronephrosis, urinary retention, and benign prostatic hyperplasia. The patient developed obstructive hydronephrosis at the bladder outlet during this episode. The combination of a weakened immune system and urinary obstruction likely contributed to the *S. mitis/oralis* infection in this case.

S. mitis/oralis demonstrated resistance to penicillin, cephalosporins, quinolones and tetracyclines, indicating multi-drug resistance. Initial treatment with piperacillin-tazobactam did not improve urinary symptoms. Subsequent treatment with vancomycin led to significant improvement, further confirming *S. mitis/oralis* as the UTI-causing pathogen.

There have been previous case reports of *S. mitis/oralis* causing urinary tract infections. One such case involved an 11-year-old child who was a kidney transplant recipient and had been continuously on immunosuppressive drugs post-transplantation.[11] Another patient was a 55-year-old woman with diabetes and a urethral protrusion.[12] These cases suggest that *S. mitis/oralis* can cause urinary tract infections when the patient's immune function is suppressed or compromised. Unlike the above two cases, we not only used an increase of white blood cells in routine urine tests and the presence of a large number of bacteria in urine cultures to diagnose urinary tract infections, but we also used the phenomenon of phagocytosis by leukocytes under the microscope, which provided direct evidence that the urinary tract infection was indeed caused by *S. mitis/oralis*. The phagocytosis by leukocytes refers to the process where white blood cells (leukocytes) ingest harmful microorganisms or foreign particles, a key mechanism in the immune response against infections. This process allows the immune system to effectively destroy or neutralize potential pathogens.[13–15]

In conclusion, *S. mitis/oralis* should not be dismissed as a contaminant when isolated from urine cultures. Urinalysis results must be considered, and additional urine samples should be collected to observe potential bacterial phagocytosis by white blood cells. Given *S. mitis/oralis*' multi-drug resistance, clinicians should select antibiotics based on drug sensitivity test results.

Data Sharing Statement

The datasets used and analyzed during the current study are available from the corresponding author Dr. Shucai Yang on reasonable request.

Ethics Statement

Human Ethics approval was obtained from the Pingshan General Hospital of Southern Medical University Committee and the study was performed in accordance with the 1964 Declaration of Helsinki. Informed consent for publication of the personal information and clinical data have been obtained from the patient.

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Disclosure

The authors report no conflicts of interest in this work.

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