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A Case Report on Citrobacter Koserii Causing Urinary Infection

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Abstract: The increased occurrence of urinary tract infections (UTIs) among older male patients, particularly in those with numerous comorbidities, has led to a greater awareness of these illnesses. The 76-year-old man patient in this case had a complex UTI brought on by the multidrug-resistant bacterium Citrobacter koserii, who also had underlying disorders. This case highlights the difficulties in diagnosing and treating UTIs in older men, especially those who have immunosuppressive diseases and incontinence. Despite being thought of as having low virulence, C. koserii has shown signs of growing resistance to antibiotics. Managing such infections requires prompt empirical treatment with broad-spectrum antibiotics such as piperacillin/tazobactam, with culture-guided de-escalation guaranteeing the best results. For elderly patients with complex UTIs brought on by multidrug-resistant organisms, early detection and focused antibiotic treatment are crucial. In order to avoid therapeutic failure, this instance highlights the significance of individualized empirical therapy and careful follow-up.

Keywords: *Citrobacter Koserii, Urinary Tract Infection, Eldery Patient, Antibiotic Sensitivity, Piperacillin/Tazobactam.*

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I. INTRODUCTION

About 150 million people worldwide suffer from urinary tract infections (UTIs), one of the most prevalent bacterial illnesses. [1] Citrobacter koserii is a gram-negative and non-lactose fermenting bacteria it is frequently found in the natural flora of humans. It mostly always infects immunocompromised hosts particularly newborns and infants, mainly causing meningitis. [2] A distinct group of aerobic, Gram-negative bacilli belonging to the Enterobacteriaceae family, the genus Citrobacter is found in food, water, soil, and the digestive tracts of both humans and animals. [2] One of the most frequent Citrobacter infection sites in adult patients is the urinary system. In a study, 78 individuals with Citrobacter infections had urinary tract infections, primarily pyelonephritis, accounting for 53% of the cases. Additionally, ileal conduits and other urinary tract anomalies were present in 20% of the individuals. [3] Emerging pathogens that cause brain abscesses, septicaemia, newborn meningitis, gastroenteritis, and UTIs are bacteria from the genus Citrobacter.[4]

Recently, multidrug-resistant (MDR) strains of this disease have been appearing, and its isolation in hospital settings worldwide has increased. Because of their increased potential to produce both nosocomial and community-acquired infections, these strains pose a challenge to both clinical microbiologists and physicians.

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In 1961, 12% of patients had a UTI brought on by Citrobacter spp., and since then, the frequency has been steadily rising. [5] Patients with a specific level of immunological being susceptible have been linked to complicated UTIs by the species Citrobacter Koserii, which has been described as saprophytic flora in humans. [6,7] The elderly, particularly the frail elderly with disabilities like incontinence, immobility, or cognitive impairment, are at a higher risk of developing complicated UTIs that require hospitalization, systemic antibiotic treatment, urosepsis, or even death. They are also susceptible to urinary tract infections in general and Citrobacter koserii.[8]

II. CLINICAL CASE

The patient was a 76 years old male with a history of acute pulmonary edema, CAD, heart failure-right ventricular failure BPH, CLD and hypertension. He admitted with the complaints of fever (101.6 F), Vomiting 3-4 episodes, burning urinary retention, breathlessness. On physical examination patient was consious, oriented, pallor, cyanosis, icterus, clubbing, pedal edema. Laboratory tests were recommended because of the age group and clinical circumstances, which suggested a urinary tract infection. Because of the patient's neurological deterioration and incontinence, a bladder catheterization was performed to obtain the urine sample following asepsis and antisepsis.

Urine analysis reported Bacteria ++, WBC, RBC, Sugar +, Acetone Negative, Albumin +++, urea 76mg/dl, creatinine 1.5mg/dl. Blood report showed Haemoglobin 11.8g/dl, lymphocytes 17%, GRBS 225mg/dl, FBS 203mg/dl, sodium 136MEq/L. Urine culture was reported at 72 hours with growth of Citrobacter koserii heavy> 100,000 CFU/ml. Pus cells 1-2 high power field. The organism found is Citrobacter koserii.

Table 1 Antibiotic Sensitivity Report

Antibiotic	MIC	Result
Amoxicillin/Clavulanic Acid	16	I
Amikacin	4	S
Cefoperazone/Sulbactam	≤ 8	S
Cefuroxime	4	S
Trimethoprim/Sulfamethoxazole	≤ 20	S
Fosfomycin	≤ 16	S
Gentamicin	≤ 1	S
Cefepime	≤ 0.12	S
Ceftriaxone	≤ 0.25	S
Ciprofloxacin	0.12	S
Piperacillin/Tazobactam	≤ 4	S

Note:
S: Sensitive
I: Intermediate
R: Resistant

With the urine culture report the antibiotic given was Inj piperacillin/Tazobactam (2.25g IV Q8H) for 7 days. Attaining the patient's full recovery, at which point discharge was recommended.

III. DISCUSSION

Although older women have been reported to have a higher prevalence of UTIs [8], male UTI rates have been rising recently. This appears to be age-related; the older a male patient is, the more attention he receives in emergency rooms; in fact, the rates of UTI in male patients between the ages of 85 and 94 double those of patients under this age [9]. Our index patient is a 76-year-old male who is at an age where UTIs are more common. The presentation of a UTI is thought to be problematic in the male population, as in the example at hand; additional risk factors for UTIs include advanced age, cognitive impairment, urine incontinence, and immunosuppression, all of which our patient possessed. [10]

Benign prostatic hyperplasia (BPH), which leads to urinary stasis and increases susceptibility to infection, is one of the structural or functional urinary tract abnormalities that frequently aggravate UTIs in older men [11]. The risk is further increased by aging, metabolic dysregulation (e.g., hyperglycemia), and chronic illnesses (e.g., heart failure, CLD), all of which compromise immune response [12]. The patient in this instance had systemic and obstructive risk factors, which increased his susceptibility to serious infections.

Another risk factor for UTI in the fragile elderly population appears to be urinary incontinence, which is present in our case. [8] In a prospective follow-up study, found that the strongest predictor of UTI was urinary incontinence in at least 86-year-olds. In this case, it is thought that the buildup of urine in the lower urinary tract serves as a breeding ground for bacteria that infect ascending pathways. [15] The case's index patient had a suspected severe urinary tract infection (UTI) that required empirical therapy with multidrug-resistant bacteria. The patient was a male with immunosuppressive symptoms and urine incontinence. [16]

The patient's neurological deterioration and urine incontinence necessitated bladder catheterization. Up to 80% of nosocomial UTIs are connected with catheter usage, according to studies, making catheterization a significant risk factor for CAUTIs, particularly in older patients [17]. In order to lower the risk of CAUTIs, aseptic catheter insertion and timely removal are crucial.

Citrobacter koserii, a very uncommon but increasingly recognized uropathogen, was found to be heavily growing (>100,000 CFU/mL) in this patient's urine culture. The Enterobacteriaceae family includes Citrobacter species, which are typically regarded as opportunistic, low-virulence infections. They have, however, been demonstrated to result in severe infections, especially in older or immunocompromised people [18].

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According to a research by Liu et al., the urinary tract was the most frequently isolated location of C. koserii, accounting for 46.2% of Citrobacter-related illnesses [19]. Piperacillin/tazobactam, which is often advised for empirical antibiotic therapy in this disease, was therefore used to begin treatment [15]. Before initiating the treatment test dose of penicillin was done. The patient does not develop any allergic reaction.

Citrobacter Kosseri, a facultative anaerobic bacillus that is motile, non-spore-forming, oxidase negative, and uses citrate as its only carbon source, was isolated from the urine culture. It is a member of the genus Citrobacter and belongs to the Enterobacteriaceae family. Citrobacter species are frequently found in water, soil, and food. They can also occasionally colonize the gastrointestinal tracts of humans and animals. Although these strains are thought to be low virulence, they can cause a variety of infections, including bloodstream, urinary tract, respiratory, intra-abdominal, skin and soft tissue, ocular, bone, and central nervous system infections. [16] 46.2% of Citrobacter infections in 205 individuals were isolated in the urine, 16.3% in the respiratory tract, 15.8% in the blood, and 4.3% in wounds, according to one study. [20] The majority of illnesses are caused by C. koseri and C. freundii. An underlying medical condition, such as diabetes, heart illness, lung disease, kidney disease, hepatobiliary disease, neurological disease, cancer, or anatomical abnormalities of the urinary system, is present in over 80% of individuals with Citrobacter infections. [20,21]

Citrobacter spp. resistance has been rising over time, with species of Citrobacter freundii showing more resistance than those of Citrobacter Koserii. Similarly, the mortality rate from these species is less than 10%, but it can rise to 56% in cases of bacteremia. Antimicrobial resistance has a stronger correlation with mortality than Citrobacter species. Multiple antibiotic resistance can be conferred by these species' inducible chromosomal genes of b-lactamase ampC, which can be constitutively produced at high levels due to mutational alterations. Other plasmid-mediated resistance mechanisms can also coexist. [22]

Third-generation cephalosporins, piperacillin–tazobactam, fluroquinolones, and carbapenems are among the antibiotics that have been demonstrated to be effective against Citrobacter spp. Another option is to employ aminoglycosides. [23,24] Because of their resistance to antibiotics, this group of microbes presents a problem to the doctor. Piperacillin/tazobactam, which is advised for complex UTIs, was used to initiate empirical antibiotic therapy in the case at hand. As the patient improved, the antibiotic was switched to a quinolone (ciprofloxacin) after the urine culture result showed that Citrobacter Koserii was isolated. Quinolones have a broad antibacterial range (including gram-negative bacilli, particularly Enterobacteriaceae, Gram-negative cocci, and staphylococcus) and inhibit the enzymatic activity of bacterial DNA gyrase and topoisomerase IV, which are necessary for bacterial DNA replication. [25]

They have been used successfully and safely to treat a variety of Citrobacter Koserii infections, and no cases of treatment failure have been documented.

In line with recent reports showing its safety and effectiveness in older patients with renal or hepatic impairment, the patient finished a 7-day course of intravenous piperacillin/tazobactam after clinical improvement with no negative medication responses [26]. The favorable result was probably influenced by the prompt start of suitable empirical treatment, which is consistent with research by Johnson et al. that demonstrated that the use of targeted antibiotics at an early stage considerably lowers morbidity in complex UTIs [27].

Overall, the case is consistent with research showing that C. koserii can cause drug-sensitive, clinically severe UTIs, especially in older, systemically sick male patients. Despite being uncommon, this virus should be recognized by doctors as a possible cause of urosepsis, particularly when treating complex patients with other comorbidities.

IV. CONCLUSION

This case illustrates that broad-spectrum antibiotics should be used to treat complicated UTIs because, although the index patient was from the community, C. Koserii, a bacterium with multiple resistance mechanisms, was isolated in his urine culture. Fortunately, the clinical team took the right approach, which resulted in the patient's successful recovery. Complicated UTIs provide the necessary criteria to establish the appropriate empirical antibiotic treatment, preventing the possibility of being faced with multiresistant microorganisms and also a potential therapeutic failure.

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