Persistent infection with metallo-beta-lactamase and extended spectrum β-lactamase producer Morganella morganii in a patient with urinary tract infection after kidney transplantation

Hamed Ebrahimzadeh Leylabadlo, Hossein Samadi Kafil¹, Mehdi Yousefi², Mohammad Aghazadeh, Mohammad Asgharzadeh

Infectious Disease and Research Center, Tabriz University of Medical Sciences, ¹Drug Applied Research Center, Faculty of Medical Sciences, Tabriz University of Medical Sciences, ²Immunology Research Center, Tabriz University of Medical Sciences, ³Biotechnology Research Center, Tabriz University of Medical Sciences, Tabriz, Iran

Address for correspondence: Dr. Hossein Samadi Kafil, Drug Applied Research Center, Faculty of Medical Sciences, Tabriz University of Medical Sciences, Tabriz, Iran. E-mail: Kafilhs@tbzmed.ac.ir

Abstract

Organ transplant recipients under immunosuppressive therapy have a highly increased risk of acquiring unusual opportunistic infections. Diagnosis of the etiology of infection may be difficult in clinical manifestations, which need further histological and biological investigations. Here in we report, for the 1st time in the Iran, a Morganella morganii isolate harboring blaVIM, blaCTX-M, and blaSHV genes after kidney transplantation with persistent urinary infections.

Key words: Carbapenems, kidney transplant, Morganella morganii, opportunistic infection

INTRODUCTION

Morganella morganii is a Gram-negative facultative anaerobe that is commonly found in the environment and in the intestinal tracts of humans as normal flora and belongs to the family of Enterobacteriaceae. Despite its wide distribution, it has been considered a rare cause of human infections.[¹] M. morganii is naturally resistant to tetracyclines, tigecycline, polymyxins, and nitrofurantoin.[²] Moreover, by chromosomally encoded AmpC beta-lactamases and possesses the ability to develop resistance on exposure to broad-spectrum cephalosporins.[³]

Urinary tract infection (UTI) after kidney transplantation is a common cause of patient morbidity and represents a potential risk factor for poorer graft and recipient outcome.[⁴] Several species of bacteria that cause UTI in kidney transplant patients have been isolated from Enterobacteriaceae family have been reported as the main isolates in UTI among transplant patients.[⁵] However, there
is an emerging evidence suggesting that *M. morganii* may become an important opportunistic pathogen in several infections but UTI is probably the most common infection caused by *M. morganii* in humans and it was first described in the late 1930s as a pathogen of urinary infections.\(^6,7\)

Patients with kidney recipient are at high risk of UTI. Here, we describe a rare case of UTI caused by *M. morganii* in a patient with a kidney transplant.

**CASE REPORT**

A 53-year-old male with a history of received kidney in early 2006 and after 5 years he had chronic renal failure. He had been on hemodialysis from 2010 until 2014 years and in 2014, the patient received the second kidney transplant. Before kidney transplant surgery, the initial immunosuppressive therapy was with antithymocyte globulin (ATG) and this person received ganciclovir. Due to leak of the site of graft, duration of hospitalization was extended to 24 day. His posttransplantation course was uneventful until he presented to us with the above-mentioned complaints. One month after, the placement chest radiography was normal but computed tomography of abdomen and pelvis showed in the upper left kidney stone and calcification around double-J stent (DJS). Three times attempted for removed the DJS and in the 2nd time, the patient received ATG that reduced level of red blood cell in this person. After removed the DJS, three times consecutively (7, 13, and 24 days after of removed DJS), the urine cultures revealed *M. morganii* and these isolated were susceptible to amikacin and trimethoprim – sulfamethoxazole only and resistant to cefotaxime, cefotaxime, cefazolin, ceftriaxone, gentamicin, imipenem, nitrofurantoin by disc diffusion method, but testing of susceptibility to colistin and ciprofloxacin was not done. Patient received trimethoprim-sulfamethoxazole 160 mg-800 mg (1 double-strength tablet) orally every 12 h for 14 days and was treated which a follow-up urine culture on 1 week after discontinuation of treatment was negative. Unfortunately, 28 days after discontinuation of treatment patient presented with symptoms of dysuria and urine culture after 48 h, again the isolated was *M. morganii* and isolate was resistant to trimethoprim – sulfamethoxazole, cefotaxime, cefotaxime, cefazolin, ceftriaxone, gentamicin, imipenem, nitrofurantoin, and only susceptible to ciprofloxacin and colistin that was started with a dose of ciprofloxacin 500 mg/day and was continued for 7 days and a follow-up urine culture 9 days later no growth of *M. morganii*.

A genetic analysis using enterobacterial repetitive intergenic consensus polymerase chain reaction (PCR) revealed that all four *M. morganii* isolated from urine culture were identical and *M. morganii* in this patient was stable [Figure 1] that initial treatment with trimethoprim-sulfamethoxazole was ineffective, but the patient UTI was successfully treated by ciprofloxacin. Detection of β-lactamase resistance genes (*bla*CTX-M, *bla*SHV, *bla*TEM, *bla*OXA, and *bla*CMY) and carbapenemases such as the *bla*SIM, *bla*SPM, *bla*GIM, *bla*VIM, *bla*KPC, and *bla*NDM was determined using PCR and sequencing was performed using consensus primers and amplification conditions as described\(^8,9\) that *M. morganii* was positive for *bla*VIM, *bla*CTX-M, and *bla*SHV but was negative for other β-lactamase and carbapenemases genes.

**DISCUSSION**

*M. morganii* has recently become an important opportunistic pathogen that being frequently in immunocompromised individuals and also because of various invasive procedures.\(^10\) Majority of *M. morganii* infections are related to postoperative wound and UTI and several study showed.

*M. morganii* is known to cause opportunistic infection, especially in the immune-compromised host.\(^11\) In this case, the patients were immunocompromised due to immunosuppressive therapy that had a highly increased risk of acquiring unusual opportunistic infections. This patient had UTI with *bla*VIM and *bla*CTX-M and *bla*SHV-producing *M. morganii* that was permanent for a long time.

Carbapenemases, such VIM, are the most powerful β-lactamase, being able to hydrolyze nearly all β-lactamase.\(^12\) VIM-producing *Enterobacteriaceae* have been isolated in several countries with high prevalence.

**Figure 1:** Enterobacterial repetitive intergenic consensus polymerase chain reaction pattern of *Morganella morganii* in four clinical isolates with 100% identity
noted in the Mediterranean and Middle East region.[13,14] Seija et al. in a study reported a case of blood and urine cultures grew an M. morganii isolate with harboring NDM-1 and qnrD1 that the patient was treated successfully with fosfomycin and double doses of meropenem.[15] In Greece, the first report chromosomal location of blaVIM-1 was confirmed after hybridization of the chromosomal band with the blaVIM-1 probe.[16] To our knowledge, this is the first clinical report of a carbapenem-resistant M. morganii case in immunocompromised kidney transplant in Iran. It is probable that the blaVIM carbapenemase has arisen within our hospitals where the spread of this strain and its resistance elements are of great concern for public health. Therefore, early detection, characterization, and surveillance of these resistance elements are extremely important in future for prevention and treatment.

Acknowledgment
We thank staves of Microbiology Laboratory in Imam Reza Educational Hospital and Drug Applied Research Center for their supports and collaboration.

Financial support and sponsorship
We thank staves of Microbiology Laboratory in Imam Reza Educational Hospital and Drug Applied Research Center, Tabriz University of Medical Sciences, Tabriz, Iran for their supports and collaboration. The present study was done in support of Drug Applied Research Center.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Falagas ME, Kavvadia PK, Mantadakis E, Kotteridis DP, Bliziotis IA, Saloustros E, et al. Morganella morganii infections in a general tertiary hospital. Infection 2006;34:315-21.
2. Leclercq R, Cantón R, Brown DF, Giske CG, Heisig P, MacGowan AP, et al. EUCAST expert rules in antimicrobial susceptibility testing. Clin Microbiol Infect 2013;19:141-60.
3. Power P, Galleni M, Ayala JA, Gutkind G. Biochemical and molecular characterization of three new variants of AmpC beta-lactamasmes from Morganella morganii. Antimicrob Agents Chemother 2006;50:962-7.
4. Golebiewska J, Debska-Slizien A, Komarnicka J, Samet A, Rutkowski B. Urinary tract infections in renal transplant recipients. Transpl Proc 2011;43:2985-90.
5. Nampoory MR, Johny KV, Costandy JN, Nair MP, Said T, Homoud H, et al. Infection related renal impairment: A major cause of acute allograft dysfunction. Exp Clin Transplant 2003;1:60-4.
6. Cox CE. Aztreonam therapy for complicated urinary tract infections caused by multidrug-resistant bacteria. Rev Infect Dis 1985;7 Suppl 4:S767-71.
7. Hakyemez IN, Sit M, Aktas G, Tas T, Mengeloglu FZ, Kucukbayrak A. A case of giant hepatic hydatid cyst infected with Morganella morganii and the literature review. Case Rep Gastrointest Med 2012;2012:595161.
8. Bialvaei AZ, Kafil HS, Asgharzadeh M, Aghazadeh M, Yousefi M. CTX-M extended-spectrum β-lactamase-producing Klebsiella spp, Salmonella spp, Shigella spp and Escherichia coli isolates in Iranian hospitals. Braz J Microbiol 2016;47:23-8.
9. Poirel L, Walsh TR, Cuvillier V, Nordmann P. Multiplex PCR for detection of acquired carbapenemase genes. Diagn Microbiol Infect Dis 2011;70:119-23.
10. Rivera-Cavazos R, Delgado-Ochoa D, Flores-Paz RR, García-Jiménez EE, Espinosa-Hernández R, Bazan-Borges AA, et al. Prospective study of urinary tract infection surveillance after kidney transplantation. BMC Infect Dis 2010;10:245.
11. Kim JH, Cho CR, Um TH, Rhu JY, Kim ES, Jeong JW, et al. Morganella morganii sepsis with massive hemolysis. J Korean Med Sci 2007;22:1082-4.
12. Bialvaei AZ, Kafil HS, Asgharzadeh M, Memar MY, Yousefi M. Current methods for the identification of carbapenemases. J Chemother 2016;28:1-19.
13. Nordmann P, Naas T, Poirel L. Global spread of carbapenemase-producing Enterobacteriaceae. Emerg Infect Dis 2011;17:1791-8.
14. Zahedi Bialvaei A, Samadí Kafí H, Ebrahizmádez Leylabadí H, Asgharzadeh M, Aghazadeh M. Dissemination of carbapenemases producing gram negative bacteria in the Middle East. Iran J Microbiol 2015;7:226-46.
15. Seija V, Medina Presentado JC, Bado I, Papa Ezdra R, Batista N, Gutierrez C, et al. Sepsis caused by New Delhi metallo-ß-lactamase (blaNDM-1) and qnrD-producing Morganella morganii, treated successfully with fosfomycin and meropenem: Case report and literature review. Int J Infect Dis 2015;30:20-6.
16. Tsakris A, Ikonomidou A, Spanakis N, Poulou A, Pournaras S. Characterization of In3Mor, a new integron carrying VIM-1 metallo-beta-lactamase and sat1 gene, from Morganella morganii. J Antimicrob Chemother 2007;59:739-41.

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

Access this article online

Quick Response Code: 

Website: 
www.jnsbm.org

DOI: 
10.4103/0976-9668.184707

How to cite this article: Leylabadí HE, Kafi HS, Yousefi M, Aghazadeh M, Asgharzadeh M. Persistent infection with metallo-beta-lactamase and extended spectrum β-lactamase producer Morganella morganii in a patient with urinary tract infection after kidney transplantation. J Nat Sc Biol Med 2016;7:179-81.