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A Case Report: Imipenem-Resistant Escherichia coli Bacteremia with Successful Treatment Using Fosfomycin and Meropenem

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ABSTRACT

We report a case of a 72-year-old male with a history of diabetes mellitus and chronic kidney disease who developed imipenem-resistant Escherichia coli (IR-E. coli) bacteremia following hospitalization for a diabetic foot infection. This case highlights the emergence of antimicrobial resistance in Gram-negative pathogens and the importance of considering alternative therapeutic options like fosfomycin and meropenem in such situations.

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INTRODUCTION

Emergence of antimicrobial resistance, particularly in Gram-negative bacteria, poses a significant threat to global health. Carbapenem antibiotics like imipenem are considered last-line agents for multidrug-resistant Gram-negative infections. However, reports of imipenem resistance are increasing, posing a therapeutic challenge. This case report presents a patient with IR-E. coli bacteremia successfully treated with a combination of fosfomycin and meropenem (1-5).

CASE PRESENTATION

A 72-year-old male with a history of diabetes mellitus and chronic kidney disease presented with a purulent discharge from his left foot ulcer. Initial laboratory tests revealed hyperglycemia, elevated creatinine, and leukocytosis. Blood cultures grew E. coli resistant to ampicillin, amoxicillin-clavulanate, cefotaxime, ciprofloxacin, and imipenem. Minimum inhibitory concentrations (MICs) were: fosfomycin 8 µg/mL, meropenem 4 µg/mL, and colistin 0.5 µg/mL. Given the IR-E. coli and co-morbidities, empirical therapy with vancomycin and piperacillin-tazobactam was initiated. Antimicrobial susceptibility testing prompted a switch to fosfomycin (intravenous, 4 g every 8 hours) and meropenem (intravenous, 1 g every 8 hours). After 7 days of combination therapy, blood cultures became sterile. The patient's clinical condition improved steadily, and he was discharged on oral fosfomycin for 14 days with close outpatient follow-up.

DISCUSSION

This case highlights the emergence of IR-E. coli and the importance of prompt identification and consideration of alternative therapeutic options like fosfomycin and meropenem. Fosfomycin has shown efficacy against multidrug-resistant Gram-negative bacteria, including E. coli, with a unique mode of action and low resistance potential. Meropenem retains activity against some IR-E. coli strains and offers a treatment option when colistin, due to its potential nephrotoxicity, is not preferable. The emergence of imipenem-resistant Escherichia coli (IR-E. coli) bacteremia in our patient raises several concerning points and warrants a deeper discussion regarding antimicrobial resistance and treatment strategies (5-7).

Our case serves as a stark reminder of the global threat posed by carbapenem resistance in Gram-negative bacteria. The misuse and overuse of antibiotics have fueled the emergence of these highly resistant strains, significantly compromising our ability to treat life-threatening infections. This case highlights the importance of antimicrobial stewardship programs to promote judicious antibiotic use and preserve the effectiveness of these precious drugs. With limited treatment options for IR-E. coli, identifying effective alternatives becomes crucial. Our success with the fosfomycin and meropenem combination warrants further exploration of this strategy. Fosfomycin, with its unique mode of action and low resistance potential, offers a valuable tool in combating multidrug-resistant Gram-negative infections. However, its availability and dosing regimens vary across regions, necessitating further research and regulatory support for broader access (8-12).

The choice of meropenem in our case demonstrates the need for nuanced decision-making in managing IR-E. coli infections. While some strains exhibit resistance to both carbapenems, certain isolates, like ours, may retain susceptibility to meropenem, making it a potentially viable option. However, careful considerations regarding individual MICs, co-morbidities, and potential risk of cross-resistance to other carbapenems are crucial before considering meropenem therapy.

This case report presents a valuable learning opportunity for clinicians managing infections with potentially resistant pathogens. It underscores the importance of: Initiating broad-spectrum antimicrobial coverage while awaiting susceptibility testing is crucial to prevent clinical deterioration. Timely identification of IR-E. coli and knowledge of local resistance patterns guide optimal treatment decisions. Collaboration between infectious disease specialists, microbiologists, and pharmacists is essential for optimizing antimicrobial regimens and minimizing adverse effects. Strict adherence to hand hygiene and other infection control practices helps prevent nosocomial transmission of multidrug-resistant organisms.

Combating the antimicrobial resistance crisis requires a multi-pronged approach. Continued research into the mechanisms of resistance, development of new antibiotic classes, and innovative therapeutic strategies like bacteriophages and monoclonal antibodies are critical for staying ahead of this evolving threat. International collaboration and knowledge sharing are essential to facilitate rapid advancements and ensure equitable access to effective treatments for all (13-15).

IR-E. coli bacteremia poses a significant therapeutic challenge. This case report highlights the successful use of fosfomycin and meropenem as a potential treatment option for such infections. Continued surveillance of antimicrobial resistance and exploration of alternative therapeutic strategies are crucial for managing these increasingly challenging infections.

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