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CASE REPORT

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Successful Meropenem Desensitization in an Elderly Patient With Meropenem Hypersensitivity

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ABSTRACT

Drug desensitization enables essential treatment in patients with drug hypersensitivity when alternatives are unavailable. We describe an 81-year-old woman with chronic renal failure and malignancies who developed a Klebsiella pneumoniae infection. She had a remote, unconfirmed history of a penicillin-associated adverse reaction and experienced an immediate hypersensitivity reaction to meropenem. Given her age and comorbidities, direct 12-step meropenem desensitization was performed without prior testing. During the final step, urticaria occurred but was controlled, and therapy was completed after adding an intermediate step. The patient tolerated the full dose without further reaction. This case illustrates the safety and effectiveness of individualized meropenem desensitization in high-risk elderly patients.

Keywords: Meropenem, desensitization, drug allergy

INTRODUCTION

The prevalence of drug allergies in the general population varies between 1% and 6% (1). Drug desensitization is a method used to safely administer life-saving drugs to patients who have developed a reaction but have no alternative. Desensitization protocols aim to reach the target therapeutic dose by starting with low doses of the drug and gradually increasing it. It is frequently used especially in cases where there are no alternative treatment options such as beta-lactam antibiotics, chemotherapeutic agents, and biological agents (2).

CASE PRESENTATION

An 81-year-old woman was being followed up in the urology service due to urinary tract infection. The patient's past medical history was significant for chronic kidney disease (severe), primary hypertension, endometrial cancer, colon cancer, ureteral tumor, and breast cancer. The patient had completed her last course of radiotherapy 7 years ago. At the time of presentation she was not receiving chemotherapy. The patient had urine output for 8 years with a double-J stent implanted due to ureteral obstruction and the stent was replaced every 6 months. Because of recurrent urinary tract infections for the last 2 years, systemic antibiotics were frequently required. Her regular medications were the diosmin-hesperidin combination, acetylsalicylic acid, carvedilol, and furosemide.

The patient reported that 40 years prior, she developed isolated numbness in the chin and lips following intramuscular administration of penicillin for upper respiratory tract infection. She received supportive IV fluid treatment, but the exact diagnosis was not established. Since

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that episode, she had been managed solely with non-beta-lactam antibiotics for subsequent infections. The patient had never been evaluated by an allergist for antibiotic allergy before.

Seven months ago, a few minutes after intravenous administration of meropenem for urinary tract infection, she described a pruritic rash starting from the knee and spreading to the thigh area. The treatment was discontinued, appropriate medical intervention was administered, and the lesions resolved within a few hours.

During her current hospitalization, *Klebsiella pneumoniae* growth was detected in the urine culture. Relevant laboratory tests included: urea, 93 mg/dL; serum creatinine, 2.3 mg/dL; estimated Glomerular Filtration Rate, 19.35 mL/min/1.73 m^2; and C-Reactive Protein, 25.6 mg/L.

Our Allergy and Immunology Department was consulted regarding this patient, given her history of drug allergy and the need for urgent antibiotic treatment. Although meropenem was the drug of choice according to the antibiogram, the patient had a history of an immediate hypersensitivity reaction to the drug. Considering the patient's advanced age and urgent need for treatment with meropenem, it was decided to proceed directly to drug desensitization without prior diagnostic skin testing. A 12-step desensitization protocol was prepared in collaboration with the Faculty of Pharmacy (Table I). Meropenem treatment was initiated at a renally adjusted dose of 1 g intravenously every 12 hours.

Table I: Meropenem rapid desensitization protocol

Step	Solution No (concentration)	Rate (mL/hour)	Infusion Duration (min)	Dose (mg)	Cumulative Dose (mg)
1	1 (0.04 mg/mL)	2	15	0.02	0.02
2		5	15	0.05	0.07
3		10	15	0.1	0.17
4		20	15	0.2	0.37
5	2 (0.4 mg/mL)	5	15	0.5	0.87
6		10	15	1	1.87
7		20	15	2	3.87
8		40	15	4	7.87
9	3 (4 mg/mL)	10	15	10.0	17.87
10		20	15	20.0	37.870
11		40	15	40.0	77.87
12		80	172	917.333	995.203

Solutions were prepared using 0.9% sodium chloride (NaCl) due to the instability of meropenem in 5% dextrose at room temperature. All solutions were protected from light and administered within 6 hours of preparation to ensure stability at room temperature (15-25°C) (10,11).

Prior to desensitization, intravenous pheniramine (45.5 mg) and methylprednisolone (40 mg) were administered along with oral famotidine (40 mg), cetirizine (10 mg), montelukast (10 mg), and a proton pump inhibitor. Vital signs were monitored at 15-minute intervals and dose escalation was performed according to the protocol. At Step 12 of the protocol, at an infusion rate of 80 mL/h, the patient developed diffuse urticarial lesions on the inner thigh and trunk (Figure 1). Desensitization was interrupted. Intravenous pheniramine 45.5 mg and methylprednisolone 40 mg were administered. Following the resolution of the reaction, desensitization was resumed at the previously tolerated rate of 40 mL/h, and an intermediate step at 60 mL/h was added to the protocol. The remainder of the protocol was completed without further complications, and the target dose was successfully administered. Subsequent doses were administered uneventfully as 3-hour prolonged infusions, in line with established practices for optimizing pharmacokinetic/pharmacodynamic efficacy of meropenem against resistant microorganisms. This approach was not intended to prevent hypersensitivity reactions, and no premedication was administered with subsequent doses; antibiotic therapy was successfully completed.

Considering the patient's advanced age, significant multiple comorbidities and general clinical status, further diagnostic evaluation for penicillin allergy could not be performed after the completion of her treatment.

DISCUSSION

Meropenem is a broad-spectrum carbapenem antibiotic that is frequently preferred for the treatment of serious infections, especially in hospitalized patients.

Rapid desensitization protocols have been developed in patients with drug hypersensitivity reactions, and the main aim of these protocols is to protect patients from IgE-mediated or non-IgE hypersensitivity reactions and to ensure the continued use of the necessary drugs in treatment (3). Although desensitization applications performed with antimicrobial agents have been defined more comprehensively, especially for patients with beta-lactam hypersensitivity, there are differences between existing protocols in

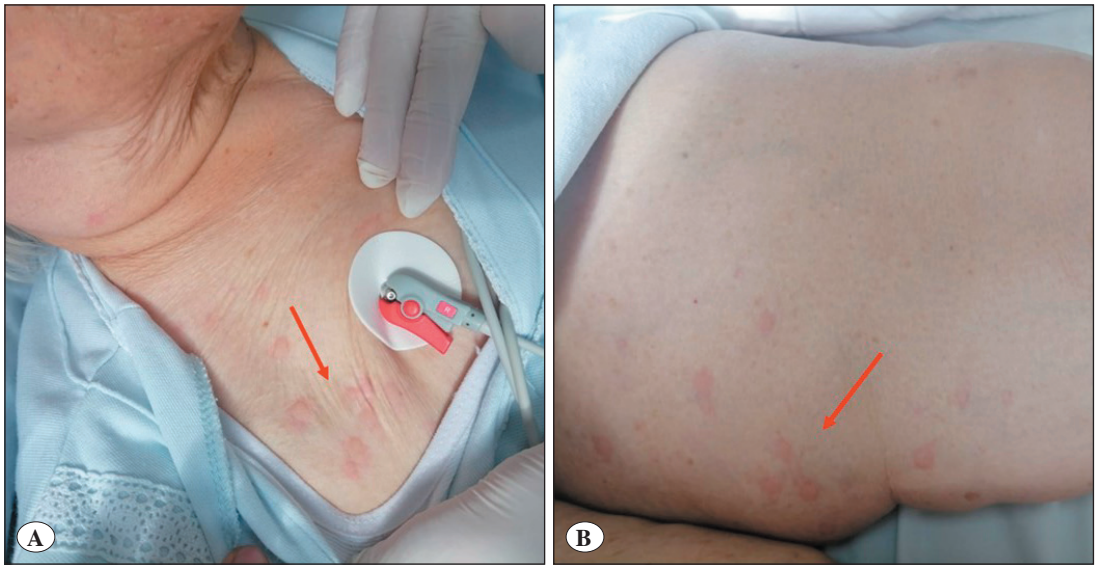

Figure 1. Urticarial lesions during desensitization
A) Erythematous and edematous urticarial plaques developed on the right side of the upper trunk (red arrow),
B) Erythematous and edematous urticarial plaques developed on the inner surface of the left thigh (red arrow).

terms of formulations, initial doses, number of steps, and frequency of dose administration (4). Patients can reach the full therapeutic dose in an average of 5.8 hours in protocols that are administered with three standardized solutions and include a 12-step infusion (3). Success rates of beta-lactam desensitization protocols have been reported as between 58% and 100% (4).

Because of the shared β-lactam ring structure between penicillins and carbapenems (e.g., imipenem), earlier studies suggested that cross-reactivity rates could be as high as 50%. However, more recent prospective studies have demonstrated that the risk of cross-reactivity between penicillins and meropenem or imipenem/cilastatin is substantially lower, with reported rates of approximately 0.9% (5-7).

Due to stability issues, it may not always be possible to use standard desensitization protocols for all carbapenems (8). To date, a very limited number of desensitization applications for carbapenems have been reported. In one of the reported cases, the imipenem dose was increased every 30 minutes (9); in another case, a standard penicillin desensitization protocol was used (5). Our protocol provided the advantage of a practical application by using solutions prepared with 0.9% NaCl solution that remained stable at room temperature for 6 hours. The 12-step protocols consisting of three solutions reported by Castells in the literature are completed in similar times (approximately 6 hours), although they require more intensive resources and monitoring. The urticarial reaction that developed in the last step of the protocol in our case was similar to the reactions reported in the literature. It is known that such reactions can usually be controlled with antihistamine and corticosteroid administration (3).

The number of protocols developed specifically for carbapenems is limited in the literature. In these patients, desensitization is performed with the protocols used for other beta-lactams. The meropenem desensitization protocol presented in this study, which was successfully employed in an elderly patient with multiple comorbidities, appears to be a promising option, and a feasible approach with high clinical utility and a favorable safety profile. We believe that the use of this protocol will provide a significant advantage in optimizing therapeutic strategies for patients with limited treatment options, especially in vulnerable patient populations.

Conflict of Interest

The authors declare that they have no competing interests.

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Consent For Publication

The case report is not under consideration by another publication, and its substance, tables, or figures have not been published

previously and will only be published elsewhere. This case report was previously presented as a poster at the National Congress organized by the National Society of Allergy and Immunology in 2025.

Patient Consent

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2024. Informed consent was obtained from the patient for the publication of this case report, including all accompanying visual elements. Furthermore, all identifying details of the patient have been omitted unless deemed essential for the manuscript's scientific integrity.

AI Statement

The authors used AI and AI-assisted Technologies (ChatGPT and Deepl) in the writing process. These technologies improved the readability and language of the work. Still, they did not replace key authoring tasks such as producing scientific or medical insights, drawing scientific conclusions, or providing clinical recommendations. The authors are ultimately responsible and accountable for the contents of the whole work.

Author Contributions

Concept: **Zuleyha Galata, Aytul Zerrin Sin,** Design: **Zuleyha Galata, Elif Ertuna, Aytul Zerrin Sin,** Data collection or processing: **Yusuf Ozeke, Ozlem Limoncu, Hatice Serpil Akten,** Analysis or Interpretation: **Zuleyha Galata, Elif Ertuna,** Literature search: **Zuleyha Galata,** Writing: **Zuleyha Galata, Elif Ertuna, Aytul Zerrin Sin,** Approval: **Zuleyha Galata, Elif Ertuna, Yusuf Ozeke, Ozlem Limoncu, Hatice Serpil Akten, Aytul Zerrin Sin.**

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