

# Treatment of Multidrug-Resistant Polymicrobial Diabetic Foot Ulcer with Multiple Antibiotic Allergies

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## Abstract

Diabetic foot ulcers complicated by polymicrobial infection, multidrug resistance, and medication allergies represent a significant therapeutic challenge. We present the case of a 60-year-old woman with type 2 diabetes, peripheral neuropathy, rheumatoid arthritis, lymphedema, and tobacco use who developed a full-thickness plantar ulcer of the left great toe following thermal injury. Initial management failed, and PCR wound culture demonstrated a heavy polymicrobial burden with resistance to multiple antibiotic classes. Because systemic options were limited by documented penicillin and sulfa allergies, a culture-directed compounded topical antimicrobial strategy was implemented alongside limited systemic therapy. Over a four-month period, the wound area decreased from 23.5 cm<sup>2</sup> to 3.9 cm<sup>2</sup>, with resolution of drainage and progressive granulation tissue formation. This case highlights the potential role of personalized topical anti-infective therapy as an adjunctive approach in complex diabetic wounds when systemic antibiotic choices are constrained.

## Introduction

Diabetic foot ulcers remain a major source of morbidity, hospitalization, and amputation risk, particularly when complicated by polymicrobial infection and antimicrobial resistance. Management becomes increasingly complex in patients with drug allergies that restrict systemic treatment options. In this case, the patient's documented allergies to penicillin and sulfa agents significantly narrowed antibiotic choices at presentation. PCR culture identified an extensive polymicrobial burden, including both Gram-positive and Gram-negative organisms, with resistance to extended-spectrum beta-lactams, macrolides, and tetracycline. In this clinical context, a personalized, culture-directed topical antimicrobial strategy was considered to provide high local drug concentrations, reduce reliance on prolonged systemic therapy, and support wound healing.

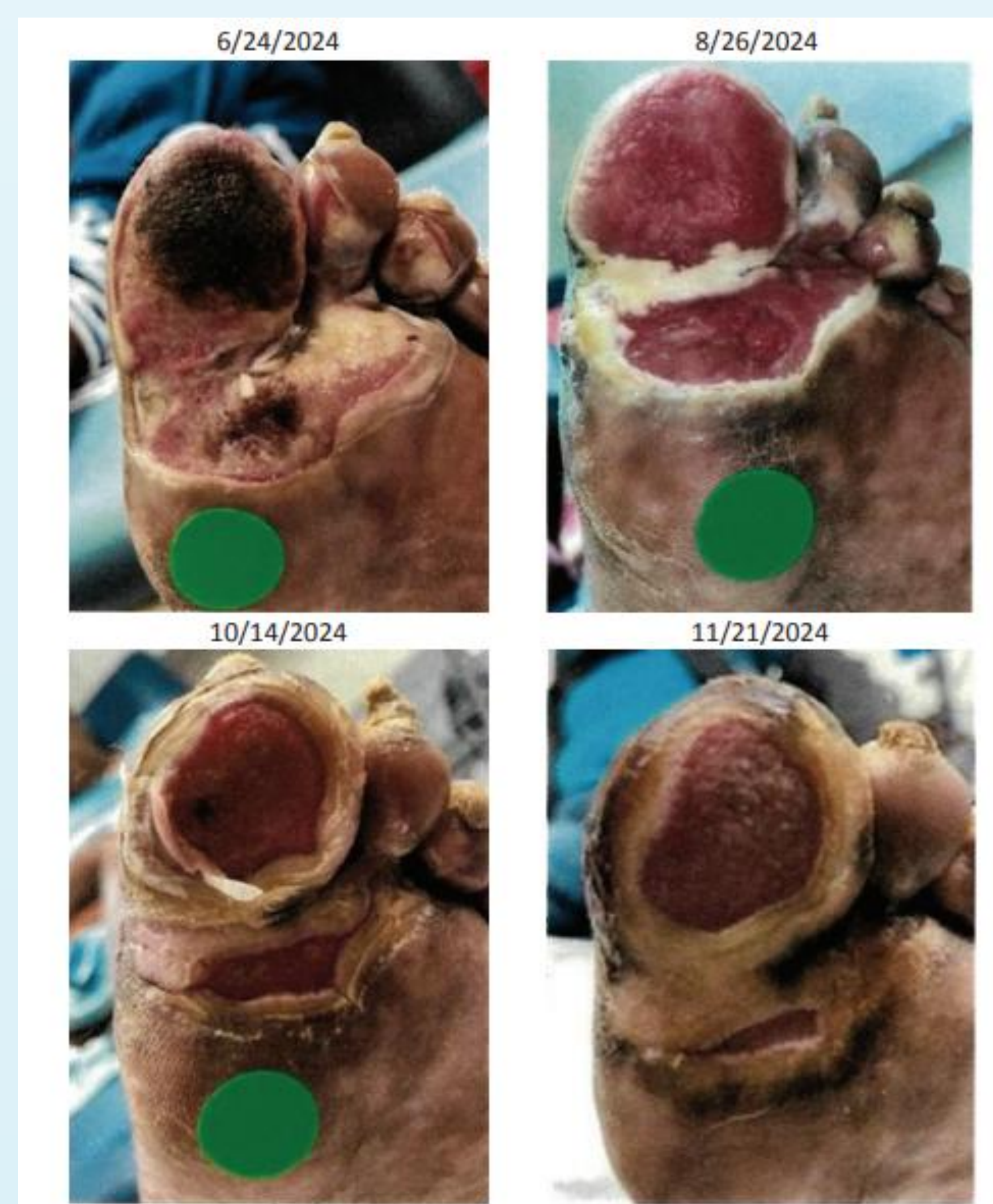
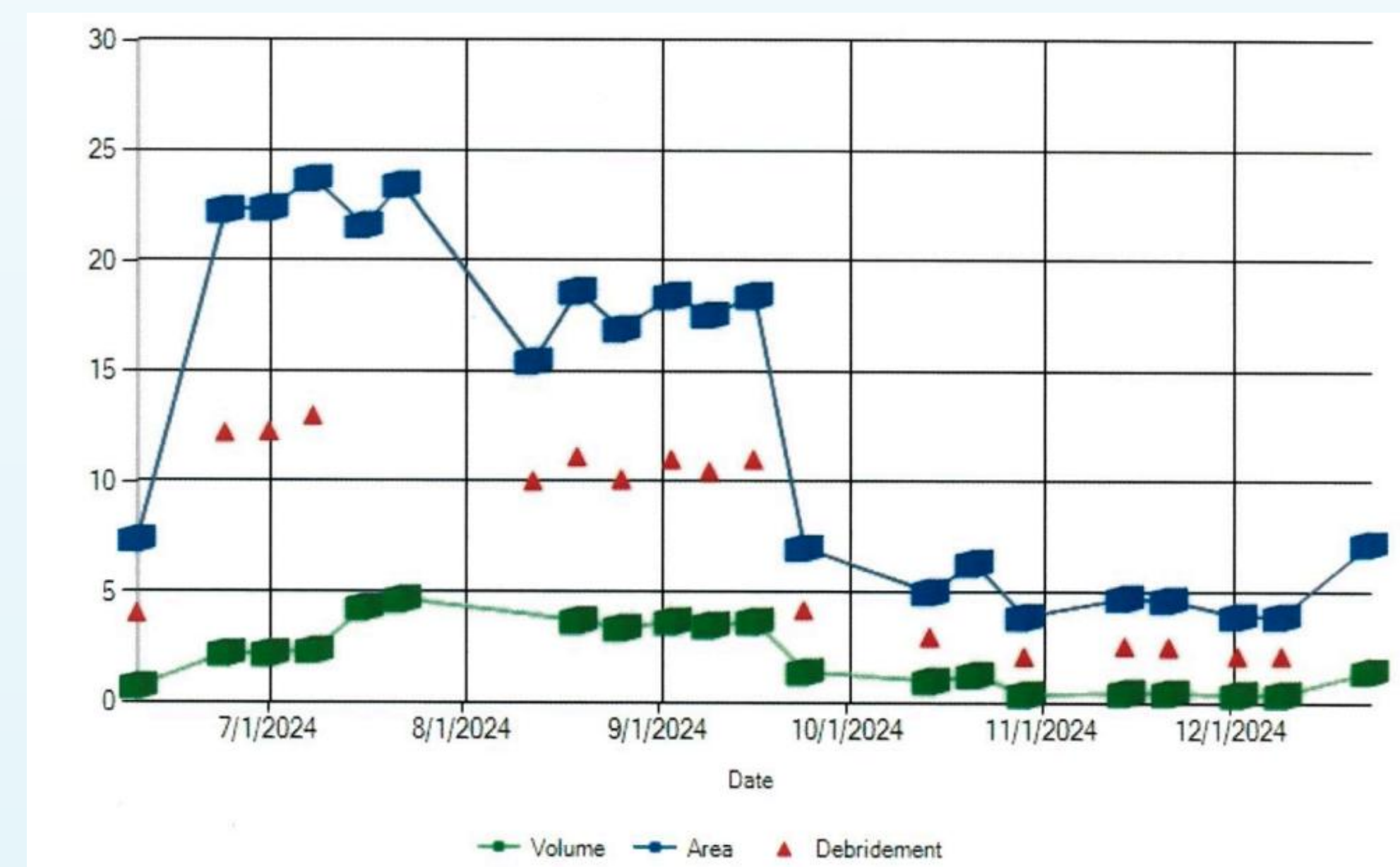
## Methodology

A 60-year-old woman presented on June 10, 2024, with a blister on the plantar surface of the left great toe, likely secondary to a space heater injury. The blister was drained and initially treated with Betadine-soaked dressings. The wound measured 3.5 × 2.7 × 0.1 cm at presentation but progressed despite therapy. By early July, it had enlarged to 6.1 × 4.9 × 0.2 cm, corresponding to an area of 23.5 cm<sup>2</sup>, and developed thick drainage. PCR wound culture revealed a heavy polymicrobial burden with resistance to multiple antibiotic classes. Oral levofloxacin and omadacycline were prescribed, and a customized compounded topical solution containing gentamicin and metronidazole was initiated to target identified organisms. When clinical symptoms recurred in October, repeat PCR culture demonstrated persistent multidrug-resistant organisms including *Acinetobacter baumannii*, *Escherichia coli*, and *Pseudomonas aeruginosa*. Therapy was adjusted to a saline-based spray containing linezolid and meropenem. Standard wound care was continued throughout.

RESULT SUMMARY	
Wound Plus	Detection Level (Low/Moderate/High)
<i>Bacteroides fragilis</i>	High
<i>Citrobacter species (Citrobacter freundii/ koseri)</i>	High
<i>Enterococcus species (Enterococcus faecalis/ faecium)</i>	High
<i>Escherichia coli</i>	High
<i>Klebsiella oxytoca</i>	Low
<i>Klebsiella pneumoniae</i>	High
<i>Morganella morganii</i>	High
<i>Proteus species (Proteus vulgaris/ mirabilis)</i>	High
<i>Pseudomonas aeruginosa</i>	High
Coagulase Negative Group ( <i>Staphylococcus epidermidis/ haemolyticus/ saprophyticus/ lugdunensis</i> )	Low
<i>Staphylococcus aureus</i>	Low
Wound Antibiotic Resistance	
CTX-M-1/2/9/8 (blaCTX-M-3/ blaCTX-M-9/ blaCTX-M-35/ blaCTX-M-63)	Extended-Spectrum Beta-Lactamases Antibiotics (ESBLs)
mecA	Beta-Lactamases Antibiotics
ermA/ ermB/ ermC	Macrolide Antibiotics
tetM	Tetracycline Antibiotics

## Results

Over the subsequent four months, the wound demonstrated progressive clinical improvement. Drainage diminished, granulation tissue increased, and overall wound size steadily decreased. By early December, the ulcer measured 2.4 × 2.1 × 0.1 cm, corresponding to an area of 3.9 cm<sup>2</sup>, representing approximately an 83 percent reduction in wound area. The patient tolerated all topical therapies without adverse effects, and systemic antibiotic exposure was limited to short, culture-directed courses. Serial photographic documentation demonstrated clear wound contraction and epithelial progression.



## Conclusion

This case demonstrates successful management of a complex, multidrug-resistant polymicrobial diabetic foot ulcer in a patient with significant systemic antibiotic limitations due to drug allergies. Culture-directed compounded topical antimicrobial therapy provided effective local pathogen coverage, supported wound healing, and allowed systemic therapy to be minimized. Localized delivery of high-concentration antimicrobial agents may represent a valuable adjunctive strategy in select patients with resistant organisms or restricted systemic options.

## Recommendations

Clinicians managing complex diabetic foot infections should consider culture-directed strategies, including PCR diagnostics when standard therapy fails. Personalized compounded topical antimicrobial formulations may provide meaningful benefit in cases involving multidrug resistance or allergy-limited systemic options. Future research should evaluate comparative outcomes against systemic-only therapy, assess cost-effectiveness, and examine impacts on hospitalization and amputation rates in larger patient cohorts.

## For More Information

