

Background and aims

- Diabetic foot ulcer (DFU) and osteomyelitis (DFO) are major drivers of morbidity and amputation, with infection eradication complicated by polymicrobial biofilms, neuropathy and peripheral arterial disease. Antibiotic loaded calcium sulfate (ALCS) beads provide high local antibiotic delivery and dead space management as an adjunct to standard care.

Curative intent (Pathway 1)

Forefoot DFO – conservative management (A,B) and post-surgical management (C)

A. Seven patients presented with toe DFU+DFO

- Mean age 64 (range 49-87 years)
- 4 interphalangeal (Fig.1) and 3 apical ulcers;
- SINBAD score = 3 (5 cases) and SINBAD score = 4 (2 cases). (Figure 1).
- Infection clearance 22 (7-32) days; mean (range)
- Mean duration of systemic antibiotics - 34 days;
- Mean duration of ALCS therapy - 44 days.



Figure 1. Infected DFU (A) with osteomyelitis (+probe-to-bone-test; X-ray destruction (B); heavy growth of Pseudomonas aeruginosa; systemic antibiotics for 3 weeks + ALCS with Vancomycin (V) and Gentamycin (G) beads in situ (C); resolution of infection (D); healed ulcer (E).

Outcome: All seven ulcers healed within 77 days with 100% admission avoidance and amputation avoidance.

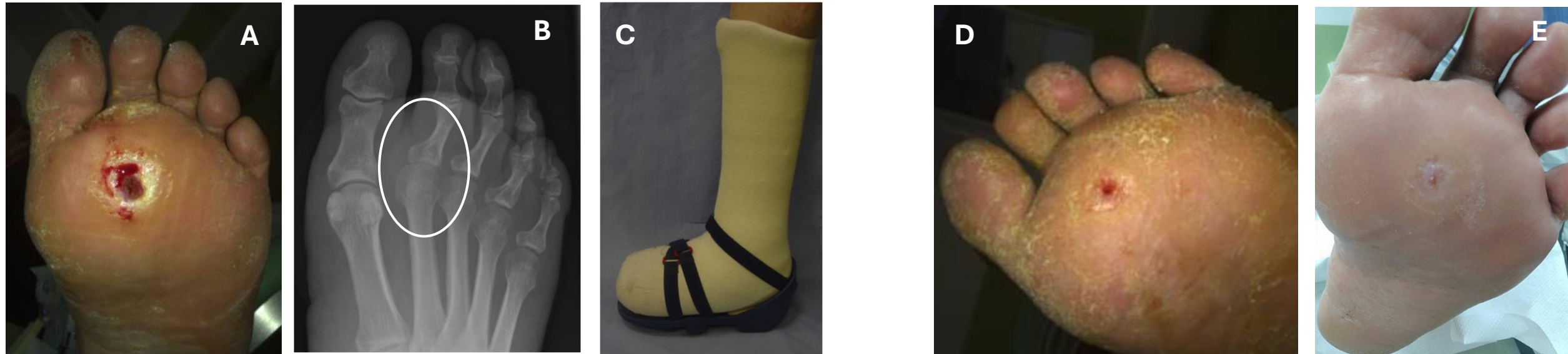


Figure 2. Infected DFU (A) with lucency of 2nd metatarsal head (B); heavy growth of Staphylococcus aureus; systemic antibiotics for 3 weeks+ALCS (VG) and total contact casting therapy (C); resolution of infection (D); healed ulcer (E).

Outcome: one patient healed within 100 days (Fig. 2); one patient with poor adherence had infection recurrence



Figure 3. Type 2 DM, end-stage renal failure on dialysis with infected 3rd toe (A). Postamputation site with ALCS VG beads in situ (B). Wound healing (C,D, E).

Outcome: Both patients healed within 200 days (Fig.3)

B. Two patients presented with plantar metatarsal head DFU+DFO

Management: total contact casting; systemic antibiotic therapy & local application of ALCS; (Figure 2).

Cost drivers avoided for scenarios A and B

- Inpatient admission for IV antibiotics/ theatre costs
- OPAT (PICC line, nurse visits, monitoring)
- Cost-savings from reduced amputation rates
- Reduced long-term disability-associated healthcare use

C. Post-surgical management of DFO

Two patients with peripheral artery disease and DFU+DFO required toe amputation. Post-surgical management included offloading, wound control and ALCS alone (1) and ALCS + short systemic antibiotic course (1), (Figure 3).

Cost drivers reduced for scenario C

- Shorter postoperative antibiotic therapy
- Reduced OPAT dependency (PICC line, nurse visits, monitoring)
- Reduced need for reoperation and readmission

Aim and methods

- To identify clinical pathways for ALCS use in real-world DFU world applications.
- Retrospective review of newly registered DFUs (01/07/2024–25/02/2025) of whom 61 received standard care and 15 received standard care and adjunctive ALCS. The latter formed the pathway analysis.

Palliative intent (Pathway 2)

- Four patients received ALCS as a palliative strategy due to frailty, no option ischaemia, multiple c0-morbidities and multi-drug resistant gram-negative DFO (Figures 4 and 5).



Figure 4. T2 DM, aged 90. No-option limb ischaemia, multiple co-morbidities and frailty. Multiple sites DFUs +DFO. Prolonged local therapy with ALCS (VG) for infection control and admission avoidance.



Figure 5. Bed-bound nursing home resident with T2 DM, aged 94, dementia, hypertension, allergic to Penicillin and Amoxicillin; 1st and 5th metatarsal heads infected DFUs –pre- (A, B) and post-debridement (C, D). C-reactive protein 150 mg/L. Microbiology: Staphylococcus caprae and Escherichia coli. ALCS beads (VG) applied post-debridement. No systemic antibiotics.

Cost drivers avoided or reduced

- ALCS therapy contributed to longer infection free intervals, reduced systemic toxicity, avoidance of hospital admissions, avoidance of amputation, and improved quality of life.
- Recurrent admissions for deep infection
- Prolonged OPAT cycles
- Progression to below knee amputation

Conclusions

- Integration of ALCS beads into outpatient diabetic foot pathways supported improved healing, reduced systemic antibiotic exposure and associated antimicrobial-resistance risk, enhanced limb salvage and cost-efficiencies.
- This approach is particularly valuable for complex patients with multiple morbidities, antibiotic intolerance, multi-drug resistant DFO, non-compliance or no surgical options..

Discussion

- Health-economic evolution and projected conservative savings per patient based on recent health-economic evaluation (1).

Indication	Conservative cost-savings per patient
Toe osteomyelitis (non-surgical management)	£5,000-£10,5000
Post-surgical management of toe osteomyelitis	£4,089-£8,161
Second-opinion limb salvage	£9,089-£17,161
No-option ischaemia/ frailty/ multi-morbidity	£9,517-£10,589
1-2 avoided admissions per year (per episode)	£9,517-£10,589

1. Dimitrova M, Gilchrist M, Seaton RA. Outpatient parenteral antimicrobial therapy (OPAT) versus inpatient care in the UK: a health economic assessment for six key diagnoses. BMJ Open. 2021 Sep 28;11(9):e049733.