

Treat the patient, not the culture: staged reconstruction of an infected humeral nonunion using a vascularized fibular graft

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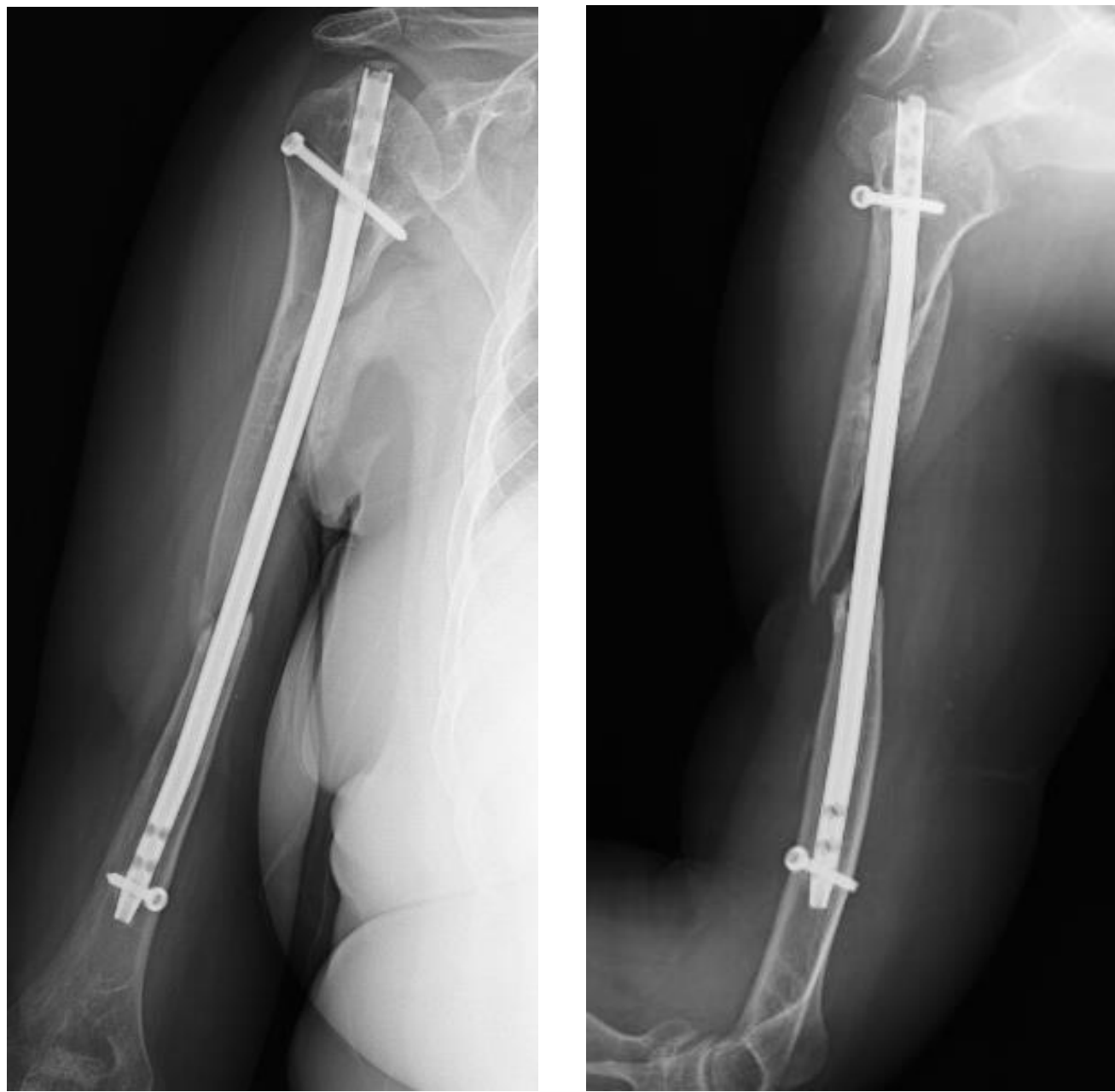
1. Introduction

Infected humeral nonunion remains a challenging condition, with a high risk of persistent infection and failure of bone healing. Infection should be considered even when microbiological cultures are negative, particularly when clinical signs are present. Management requires infection control and stable fixation while restoring the biological environment for healing.

2. Case report

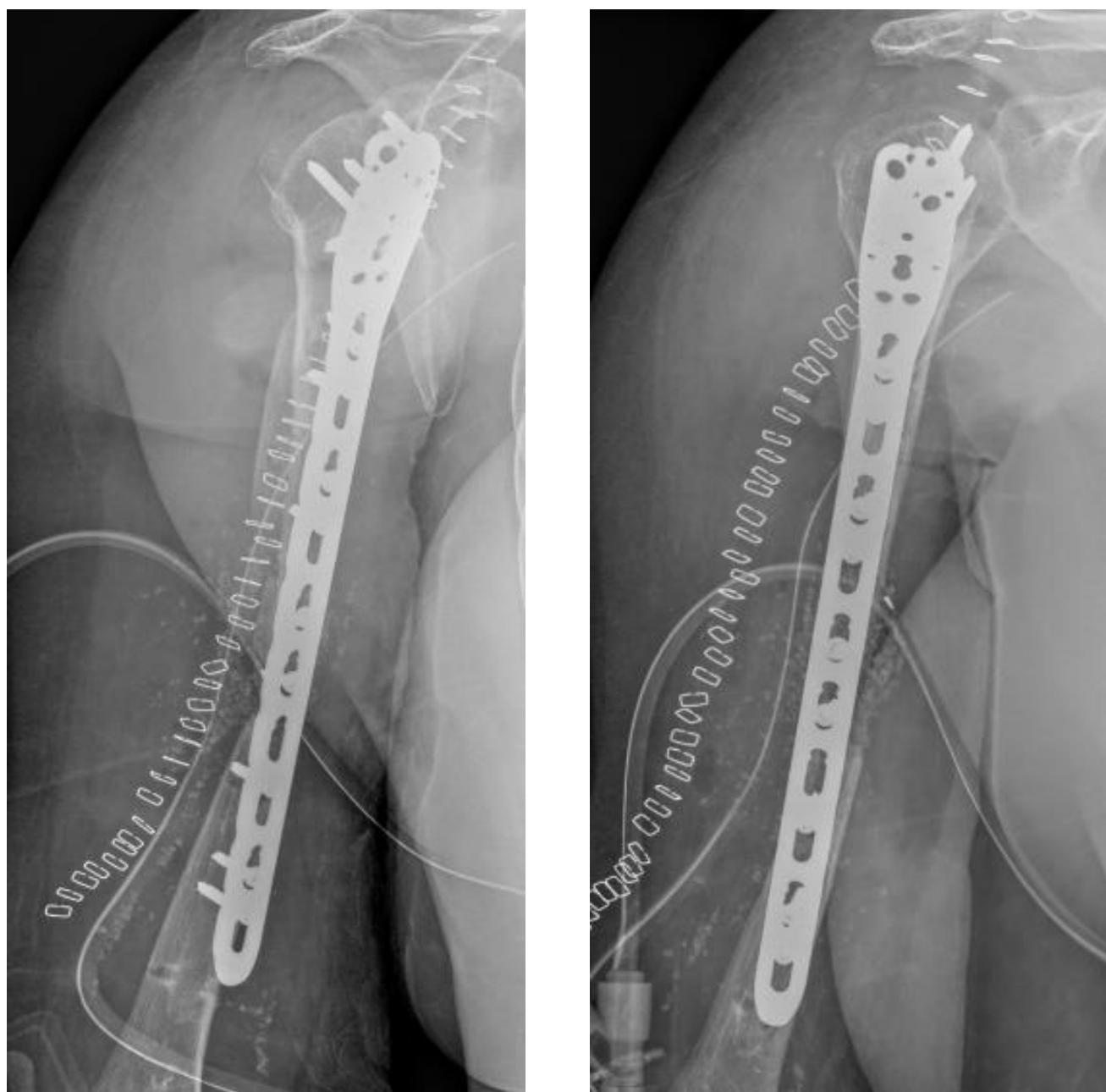
Initial injury – 2021

49-year-old patient.
High-energy road traffic accident -> Open right humeral fracture.
Initial treatment with intramedullary nailing in another institution.
Persistent pain and radiographic nonunion.

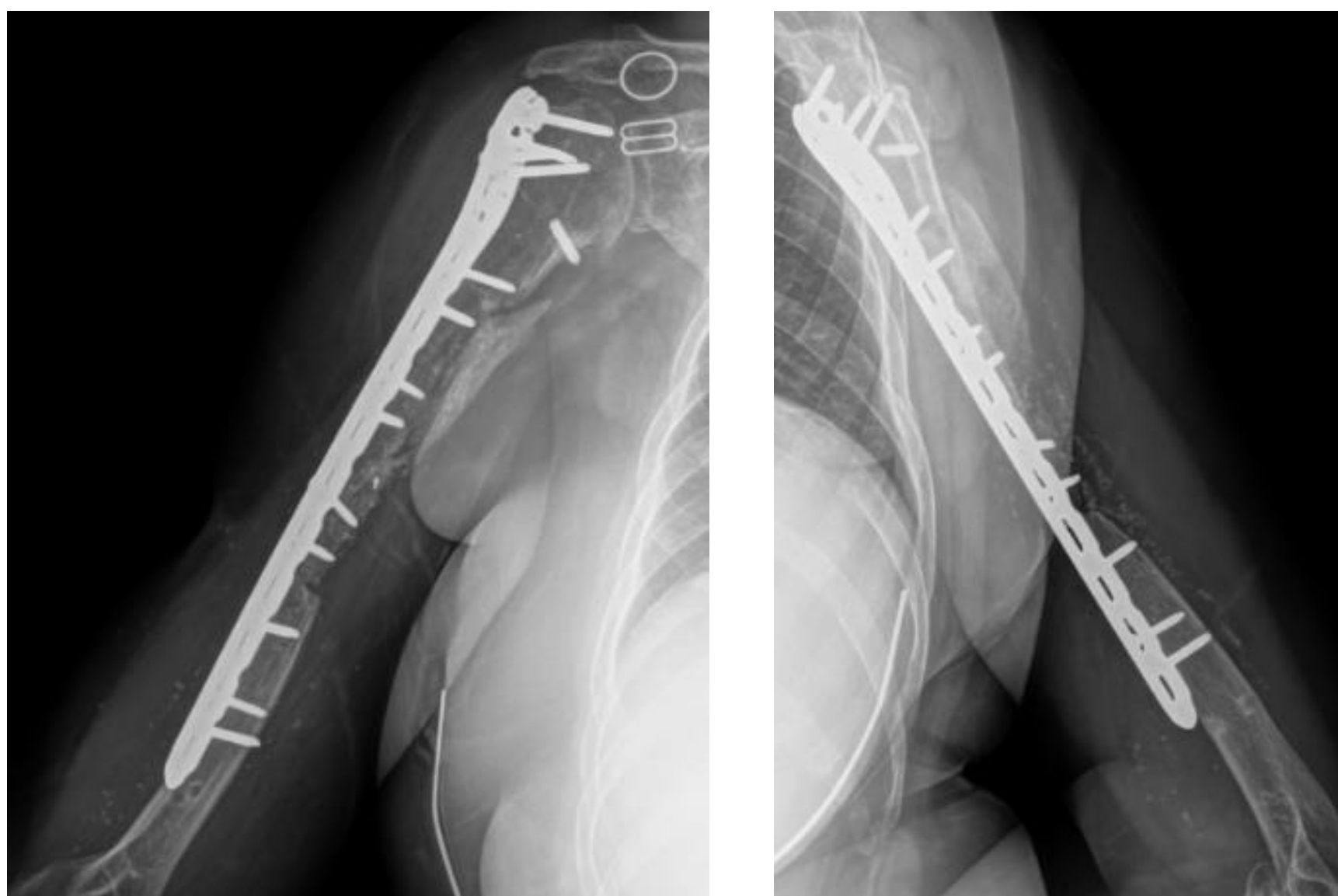


Revision surgery – March 2025

Nail removal and open reduction and internal fixation with locking plate using autologous iliac crest bone graft.

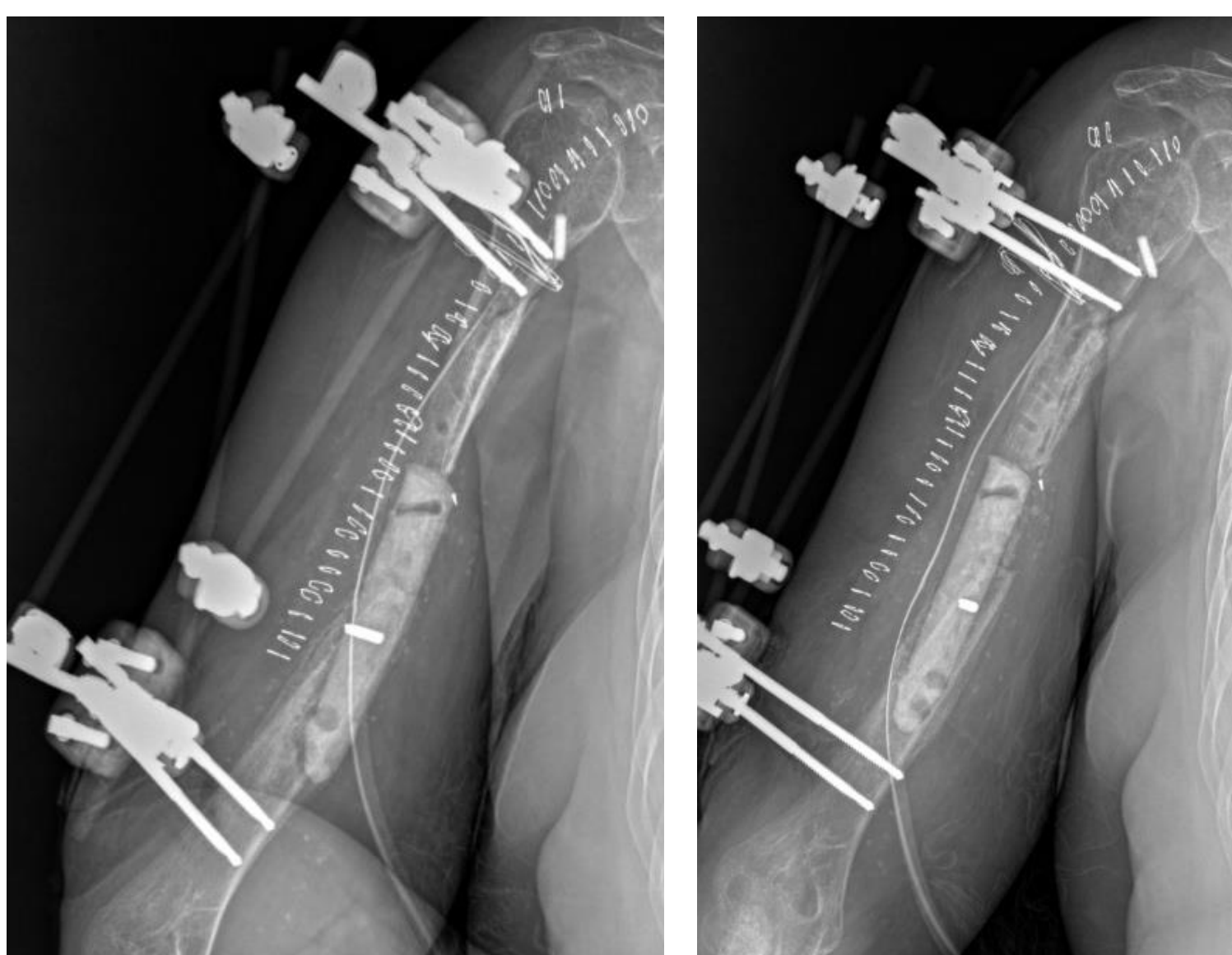


At 6 months with distal plate loosening and graft resorption. Subsequent draining sinus.
Diagnosis: infected humeral nonunion.



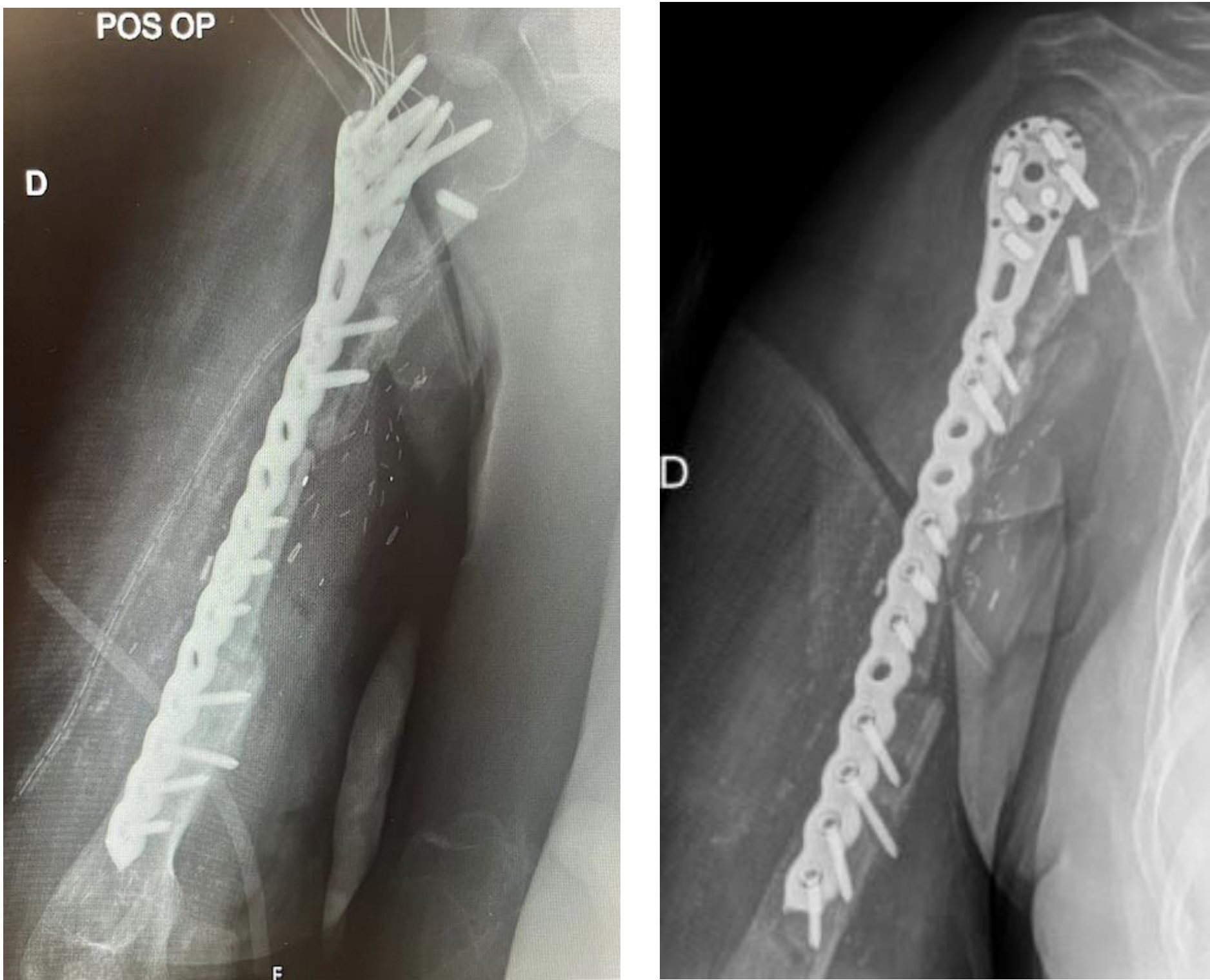
First stage revision – December 2025

Implant removal, extensive debridement with fistula excision and PMMA spacer with vancomycin + gentamicin. Temporary stabilization with external fixator.
Intraoperative cultures: negative.
Empirical treatment with vancomycin pending final microbiological results.

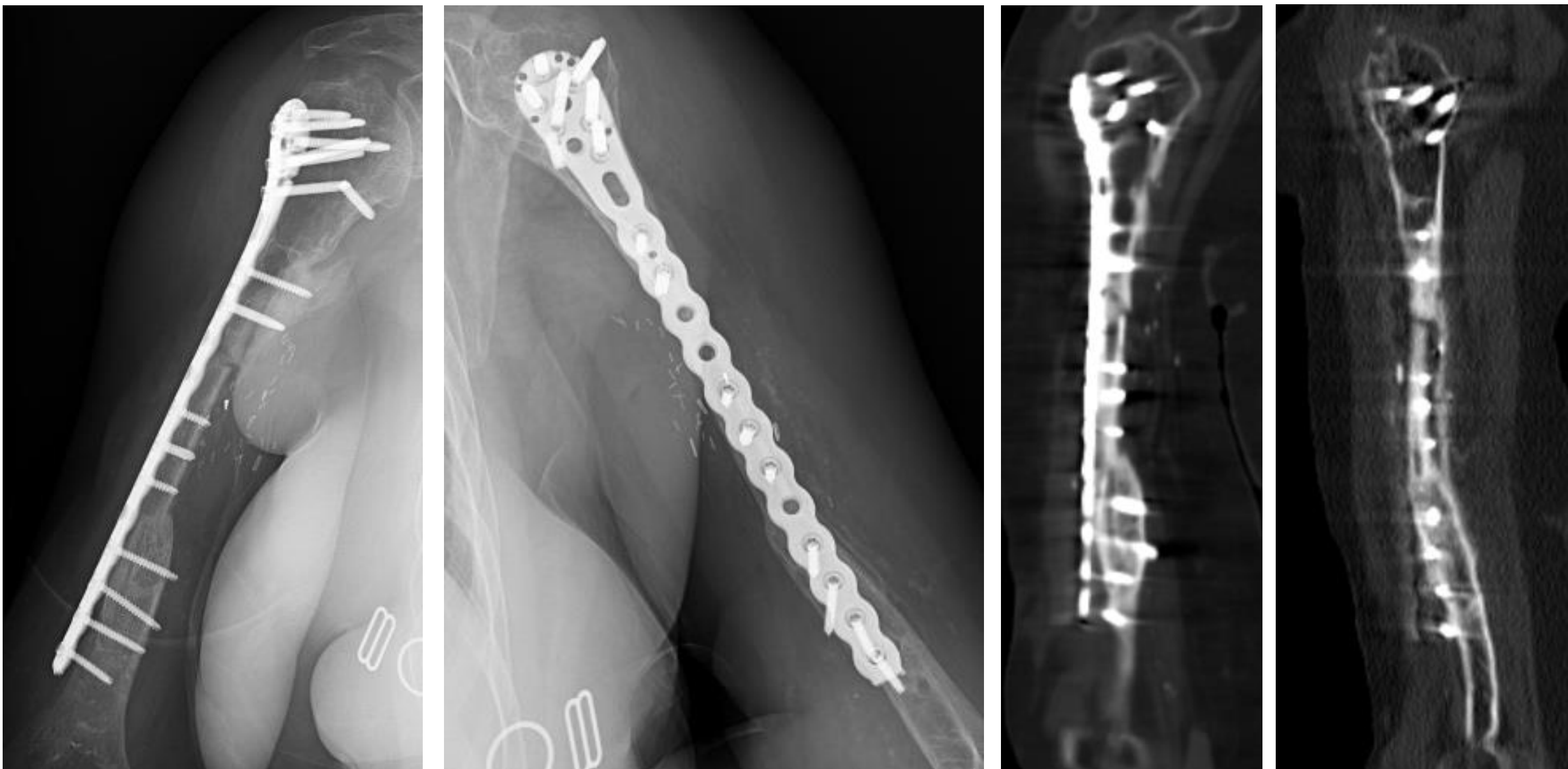


Definitive reconstruction – February 2026

Vascularized periosteal free flap and plate fixation.



Teriparatide was initiated after surgery to support bone healing in the setting of severe osteoporosis.
Scintigraphy at 2 weeks: graft viable.
At latest follow-up, the patient was clinically well, with radiographs with signs of consolidation and maintained implant stability.



3. Discussion

The choice of fixation method should be tailored to the fracture pattern and the biomechanical demands. In this case, the initial fixation strategy failed, with subsequent implant loosening and persistent nonunion, highlighting the importance of selecting a construct appropriate to the fracture configuration.
Infection is a major contributor to treatment failure in humeral nonunion and should always be considered, especially when clinical signs are present. In this case, the presence of a draining sinus, implant loosening and graft resorption was highly suggestive of an infected nonunion.

Given the clinical evidence of infection, a staged approach was considered appropriate to prioritize infection eradication before definitive reconstruction.
Aggressive debridement is essential for infection eradication but may result in significant bone loss and dead space. Local antibiotic delivery with antibiotic-loaded PMMA can support infection control while managing the resulting dead space.
In this setting, reconstruction must address not only the resulting structural defect but also the compromised biology.

Vascularized fibular grafts provide a living bone graft with intrinsic vascularity and osteogenic potential, making them particularly valuable in biologically compromised defects. In this case, a vascularized fibular graft was therefore chosen to restore the biological potential for healing while providing structural support for definitive reconstruction.
In patients with severe osteoporosis and substantial bone defects, teriparatide may provide an anabolic adjunct to reconstruction by promoting bone formation and fracture healing.

4. Conclusions

Infected humeral nonunion requires a treatment strategy addressing both infection and the compromised healing environment.
In this case, staged infection control followed by vascularized fibular graft reconstruction provided a rational approach to restoring the biological potential for union.