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Short Communication

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Limb Salvage in Complex Femoral and Tibial Pseudarthrosis with Segmental Bone Loss: Reconstruction Using SIGN Intramedullary Nail Fixation, Distraction Osteogenesis, Bone Grafting, and Soft Tissue Coverage in a Resource-Limited Setting

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ABSTRACT

Objective: Management of long bone pseudarthrosis associated with segmental bone loss remains a significant challenge, particularly in low-resource settings where access to advanced limb reconstruction systems is limited. Complex cases frequently involve infection, limb shortening, implant failure, and soft tissue defects. This study presents clinical outcomes of limb reconstruction using SIGN intramedullary fixation combined with distraction osteogenesis, bone grafting, and soft tissue reconstruction.

Keywords: Pseudarthrosis, Long Bone Nonunion, Femoral Nonunion, Tibial Nonunion, Segmental Bone Defect, Limb Lengthening, Distraction Osteogenesis, SIGN Intramedullary Nail, Bone Grafting, Gunshot Injury, Soft Tissue Reconstruction, Orthopedic Trauma Surgery, Low-Resource Orthopedics

Methods

A retrospective case series (n = 4) was conducted at Heal Africa Hospital, Goma, Democratic Republic of Congo. Patients presented with complex post-traumatic pseudarthrosis involving either the femur or tibia.

- **Femur (2 cases, 50%):** One patient required replacement of a broken SIGN intramedullary nail with associated bone loss and One patient presented with segmental bone loss and limb shortening
- **Tibia (2 cases, 50%):** One patient sustained a gunshot injury resulting in bone loss, infection, limb shortening, and soft tissue defect and One patient presented with infected distal tibial pseudarthrosis with major bone loss

Treatment included radical debridement, intramedullary stabilization with SIGN nails, autologous cancellous bone grafting, distraction techniques for limb length restoration when indicated, and soft tissue coverage procedures.

Results

Among the four cases treated:

- Bone union achieved: 3/4 (75%)
- Limb salvage: 4/4 (100%)
- Infection at presentation: 2/4 (50%)
- Soft tissue reconstruction required: 2/4 (50%)
- Additional reconstructive procedure required: 1/4 (25%)

All patients demonstrated progressive improvement in limb stability, alignment, and weight-bearing capacity during follow-up. Limb length discrepancy was successfully corrected in cases presenting with shortening.

Conclusion

Combined reconstructive strategies integrating SIGN intramedullary fixation, distraction osteogenesis, bone grafting, and soft tissue reconstruction provide a practical limb salvage solution for complex pseudarthrosis with significant bone loss in resource-limited environments. These techniques allow restoration of limb function without reliance on advanced limb reconstruction systems.

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Further studies with larger cohorts are needed to validate these findings and assess long-term functional outcomes.