Construct Selection in Charcot Foot Surgery: A Comparative Case Analysis of Medial Column Beaming and Plate-and-Screw Approaches

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Background

Charcot neuroarthropathy (CN) is a progressive, destructive condition of the foot and ankle most commonly associated with diabetic neuropathy. Osseous fragmentation, joint instability, and collapse of the pedal architecture frequently result in severe deformity and ulceration. Surgical reconstruction is often required to restore alignment and create a durable, plantigrade, brace-able foot. However, optimal fixation strategies remain debated due to compromised bone quality, deformity variability, and high complication rates.

Introduction & Significance

Successful reconstruction of Charcot neuroarthropathy relies heavily on appropriate construct selection. Common fixation strategies include medial column beaming and plate-and-screw constructs, each offering distinct biomechanical advantages. Beaming provides axial support in osteopenic bone, while plate-and-screw constructs allow for rigid, multiplanar correction. Limited comparative clinical guidance exists to assist surgeons in selecting the most appropriate construct based on deformity pattern and bone quality. This poster presents two cases highlighting individualized construct selection in Charcot foot reconstruction.

Case Background, History, & Diagnostics

Case 1

- 50-year-old patient with Charcot neuroarthropathy
- Collapse of the medial longitudinal arch
- Instability at the first tarsometatarsal and naviculocuneiform joints
- Imaging demonstrated midfoot collapse without significant hindfoot involvement
- Intraoperative findings: markedly softened, osteopenic bone

Surgical Management:

- Medial and lateral column beaming with intramedullary screws

Goal: restore alignment and provide axial support while minimizing reliance on cortical purchase

Figure 1. Postoperative AP radiograph demonstrating medial and lateral column intramedullary beaming for Charcot midfoot reconstruction with grafting in place. Axial fixation restores medial arch alignment in the setting of osteopenic bone.

Figure 2. Lateral view demonstrating intramedullary beaming with restoration of sagittal plane alignment following Charcot midfoot reconstruction.

Case 2

- 53-year-old patient with Charcot neuroarthropathy
- Fragmentation and multiplanar deformity involving the midfoot and hindfoot transition zone
- Imaging demonstrated instability requiring rigid multiplanar control

Surgical Management:

- Open reduction and internal fixation using dorsal locking plates
- Supplemental screws for stabilization
- Subtalar joint fusion performed

Goal: achieve rigid fixation and correction of complex deformity

Figure 3. Postoperative AP radiograph demonstrating dorsal plate-and-screw fixation for Charcot midfoot and hindfoot reconstruction, providing rigid stabilization and correction of complex multiplanar deformity.

Figure 4. Lateral radiograph following Charcot reconstruction demonstrating plate-and-screw fixation with restoration of sagittal plane alignment and stabilization across the midfoot–hindfoot transition zone.

Results

Case 1 achieved restoration of medial and lateral column alignment

- Beaming construct provided reliable stability despite poor bone quality

Case 2 demonstrated successful correction of complex multiplanar deformity

- Plate-and-screw construct allowed rigid fixation but required greater surgical exposure

Both patients achieved:

- Plantigrade foot
- Ability to brace
- Successful progression to protected weightbearing

Feature	Beaming	Plate-and-Screw
Bone quality tolerance	High	Moderate
Multiplanar control	Limited	Strong
Surgical exposure	Smaller	Larger

Conclusion

These cases highlight the importance of individualized construct selection in Charcot foot reconstruction. Medial and lateral column beaming may be advantageous in patients with severely osteopenic bone by providing stable axial support without extensive cortical fixation. Plate-and-screw constructs may be better suited for complex multiplanar deformities requiring rigid control. Tailoring fixation strategy to deformity pattern and bone quality is critical to optimizing outcomes in Charcot neuroarthropathy.