

9TH ORTHOPEDICS & RHEUMATOLOGY ANNUAL MEETING & EXPO

July 12-13, 2017 Chicago, USA

Circular arc nailing for stable fixation of hindfoot fusions

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Background: Normal anatomy of the hindfoot demonstrates alignment of the heel, the subtalar joint facet, the talus, the ankle joint and the distal tibia on a circular arc. In tibio-talo-calcaneal arthrodesis, using straight or bent nails may cause plantar neuropraxia, hold poorly and tend to create a misaligned hindfoot varus.

Methods: Instrumentation was designed to create a circular arc bore hole crossing the heel, the posterior subtalar joint facet, the tibio-talar joint and the distal tibia metaphysis. During the operation, the desired definitive position of the hindfoot is fixed temporarily with Kirschner wires. A guiding frame is fixed to three critical spots of the hindfoot to drill the central hole. Using an image amplifier the hole is bored using a motor driven end cutting flexible reamer which is seated within a rigid curved hull. The nail has the same shape than the hull and is impacted up to the distal tibia. A distal locking screw crosses the subtalar joint and a proximal locking screw crosses the tibia. We controlled the follow-up of 18 patients.

Results: The pathology of the operated patients include post-traumatic, congenital and metabolic (diabetes) conditions. The mean follow-up is 12 months. All cases went to consolidation without malunion or other complications. All patients were treated for 2 weeks post-op with a closed circular cast without weight bearing. After 2 weeks our patients did practice partial weight bearing using a cam walker for 6 other weeks.

Conclusion: Fusing the bones of the hindfoot by tibio-talo-calcaneal arthrodesis can be successful using a central circular arc shaped nail respecting form fit function within the bones. The anatomical bony alignment of the hindfoot is corrected or preserved. The technique may prevent shortcomings such as neurological complications and non-unions. We expect a shorter period between surgical fixation and full weight bearing.

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