

3D-Printed Patient-Specific Total Talus Replacement for Avascular Necrosis of the Talus: A Case Report

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Purpose: Posttraumatic avascular necrosis of the talus presents a challenge to patients and surgeons. Traditional surgical treatment of tibiotalocalcaneal arthrodesis or replacement with generic implants has yielded varying results. The emergence of 3-dimensional (3D) printing presents a new option. Using a CT scan of the contralateral talus, surgeons can now precisely design a customized talar implant to match the patient's anatomy. This allows the patient to retain motion at the tibiotalar joint, avoid complications of related to bony nonunion, and begin early weight-bearing. We present a case report of a 3D-printed patient-specific total talus replacement for posttraumatic avascular necrosis of the talus.

Methods: A 30-year-old man (body mass index 40) presented to clinic 4 months after a fall from 13 feet. CT scan showed >50% talar body avascular necrosis. Ten months after injury, he had persistent pain, which failed to improve with cast immobilization, physical therapy, medication, and ambulatory aids. He was treated with a 3D-printed titanium total talus replacement, designed and manufactured from a mirror image of his contralateral talus.

Results: Postoperatively, the patient began active ankle range of motion at 2 weeks. He was progressed to weight-bearing as tolerated in a controlled ankle motion boot after 1 month. By 6 months postoperatively, he was seeking employment and walking in commercial shoe wear without pain or a limp. His American Orthopaedic Foot & Ankle Society score improved from 32 preoperatively to 96 at 6 months. His range of motion was 5° dorsiflexion and 20° plantar flexion, with full strength to inversion and eversion. Radiographs revealed a stable implant with no bony changes to the tibia or calcaneus.

Conclusion: Total talus replacement with a 3D-printed patient-specific implant provides a viable option for treatment of talar avascular necrosis with good short-term outcomes. Further follow-up is needed to determine whether the anatomically matched implants provide better longevity than generic implants.

