Revision of Failed Externally Fixed Ankle Fusions Using Retrograde Tibial Nail

Abstract
The purpose of the study was to evaluate the efficacy and indication of retrograde intramedullary nailing for the revision of ankle fusions performed initially in conjunction with multi-planar deformity correction using three-ring external fixation. Thirteen patients (13 ankles) were revised utilizing a retrograde intramedullary nail, after failed clinical and radiographic evidence of ankle osseous healing (mean time to revision was 12.25 weeks, range 8.5-18 weeks). All thirteen patients achieved ankle fusion with the retrograde tibial nail, which were based on clinical and radiographic fusion (mean average 15 weeks with a range of 8 to 25 weeks). Complications were found in 48% of patients, which included dehiscence, soft tissue infection, painful hardware, and delayed healing. All patients reported post-operative improvement in pain level and stability. Based on the results presented, we have found retrograde intramedullary nailing to be a viable technique in the revision of failed ankle fusions regardless of the initial presenting deformity.

Materials and Methods
A prospective analysis was performed on patients who underwent revision ankle fusion surgery from 2004 to 2006. A total of 13 patients (6 female, 7 male) were included in the study. The patients were selected consecutively based on the inclusion criteria of having developed an ankle nonunion requiring revision and having received surgical clearance from a primary care physician. The average patient's age was 51 years (range 36 to 65 years). Patients included in the study had a variety of deformities at multiple levels (ankle joint, sub-talar joint, midfoot) which included post-traumatic changes, degenerative joint disease, varus-valgus, neurotendinous and neurovascular conditions.

Results
All 13 patients had a successful revision with a retrograde tibial nail based on revision endpoints of a clinical and radiographically stable ankle fusion. Ankle joint fusion was achieved at an average of 15 weeks (range 8 to 25 weeks). Serial radiographs (3 views: AP, oblique, lateral) were utilized to confirm consolidation of ankle joint fusion. Complications occurred in 48% of patients, which included dehiscence, soft tissue infection, painful hardware, and delayed healing. All patients were able to resume their desired activity level post-operatively with minor concessions. All patients reported post-operative improvements in pain level and stability.

Discussion/Conclusion
We found retrograde tibial nailing to be a viable technique in revision of failed ankle fusion regardless of the initial presenting deformity. The lead author advocates the initial use of multi-planar external ring fixation in order to establish a more functional alignment of the involved extremity. In the event of a failed ankle fusion requiring revision, we feel the retrograde tibial intramedullary nail provides the necessary stability to achieve solid osseous union. In all patients, a clinical and radiographically stable ankle fusion was achieved following revisions with a retrograde tibial nail.

References