Evidence of a Loose Total Ankle After Tibial Intramedullary Nail Insertion

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Introduction

Total ankle replacements (TARs) are a reliable surgical solution for patients with arthritis of the ankle.[1] Rates of TARs are increasing as the procedure becomes more popular and patients seek to maintain range of motion of the tibiotalar joint unavailable with ankle arthrodesis.[2] With the increasing volume of total ankle arthroplasties, there has been a concomitant increase in the number of total ankle revisions.[3]

Total ankle revision procedures are usually indicated in the setting of infection, evidence of peri-implant loosening on imaging, or persistent ankle pain following a traumatic event with a prior total ankle already in place.[4] Preoperative work-up should include evaluation for potential infection prior to a revision procedure. This generally includes obtaining a CBC, ESR, and CRP. X-rays and CT scans are helpful to evaluate component positioning, evidence of cyst formation, as well as evidence of radiolucency around the implant.

During revision procedures, the tibia and the talar components can be exchanged. However, due to the bone loss associated with infection or from the act of removing the components, the components may need to be revised to a stemmed total ankle arthroplasty that incorporates a larger footprint into the distal tibia to fill in any residual voids. Even though total ankle replacements are usually performed by foot and ankle trained orthopedic surgeons, surgeons that participate in fracture care should also be aware of these implant designs due to the potential for peri-implant fractures. The following case demonstrates a complication with a total ankle replacement after an ipsilateral lower extremity fracture with subsequent intramedullary nail fixation.

Patient Presentation

The patient is a 56-year-old male with polymyalgia rheumatica (on chronic steroids) with left ankle pain. The patient has a remote history of a myocardial infarction and a liver transplant. He underwent a left total ankle replacement for post-traumatic arthritis at an outside hospital (OSH) in January 2020. The patient denied any ankle pain post-operatively. Two months post-operatively, he sustained a left tibial shaft fracture after a fall. He underwent a left tibial intramedullary nail (IMN) by a general orthopedist at the same OSH.

After the tibial nail insertion, the patient started developing worsening ankle pain as well as a feeling of a loose sensation about his ankle. The pain persisted without any improvement. The patient presented to the foot and ankle service in late 2023 and was noted to have maximal tenderness to palpation at the anterior ankle. An infection workup was obtained in the form a CBC, ESR, CRP. These lab values were within normal limits. X-rays and CT of the left tibia/fibula were obtained. X rays of the left ankle and distal tibia showed evidence of a tibial nail as well as an ipsilateral total ankle arthroplasty. The tibial nail was in close proximity to the ankle prosthesis. There was evidence of lucency around the tibial component of the total ankle replacement. Callous formation was noted over the midshaft tibia suggesting healing at the prior fracture site (Figure 1). A CT scan revealed lucency and cyst formation around the tibial component of the TAR (Figure 2). Due to the patient's persistent pain, sensation of looseness, and imaging that suggested lucency around the tibial component, the decision was made to perform a revision total ankle replacement.

Surgery

Prior to addressing the total ankle, the tibial nail was removed. Three of the four interlocking screws were removed under fluoroscopic guidance. A suprapatellar approach was then used to approach the proximal portion of the tibial nail. The end cap was removed, and a jig was inserted in the cannulated portion of the nail. The final interlocking screw was removed and the nail was removed without issue.

The total ankle replacement was then approached through the prior anterior incision. Evidence of metallosis was found

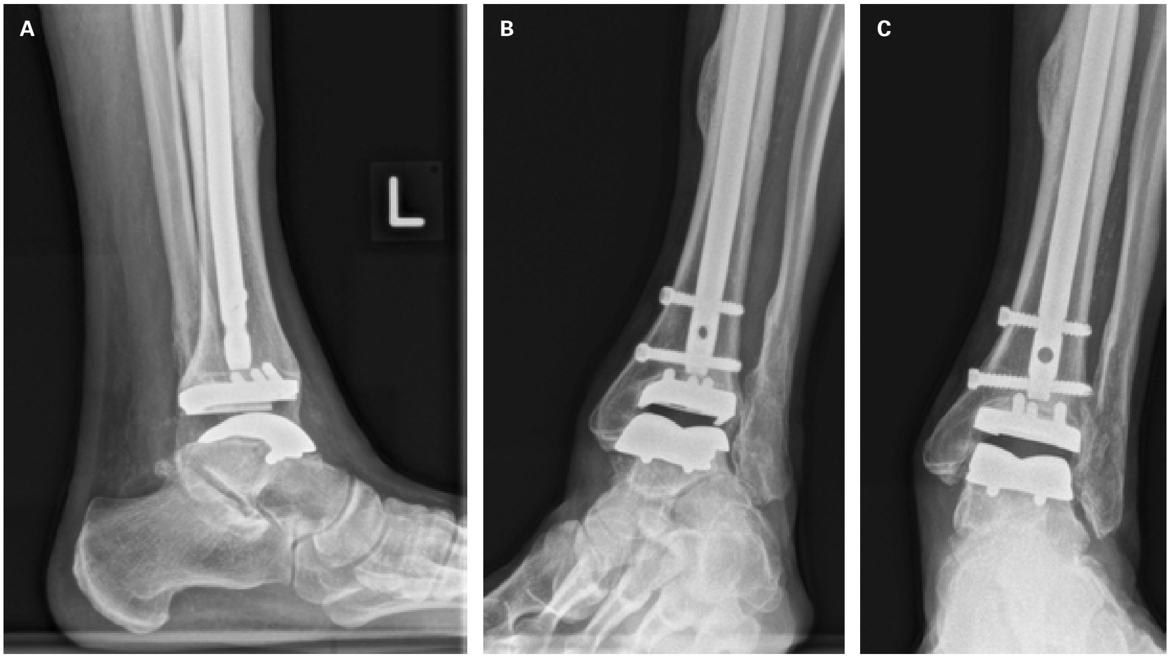

Figure 1. (A) Lateral, **(B)** mortise, and **(C)** AP x-rays of the left ankle/distal tibia. The tibial nail is in close proximity to the ankle prosthesis. There is evidence of lucency around the tibial component of the total ankle replacement. Callous formation is noted over the midshaft tibia suggesting healing at the prior fracture site.

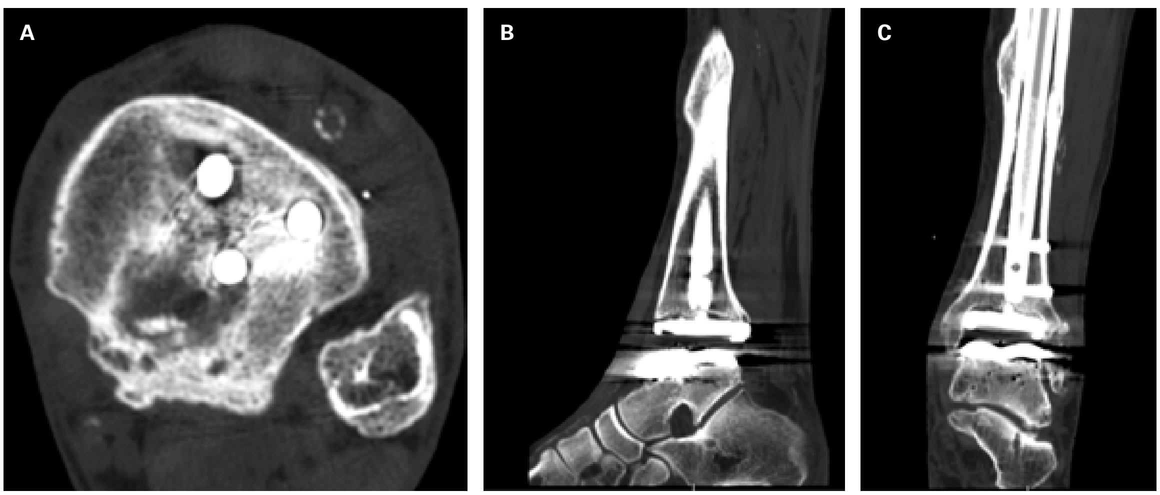

Figure 2. (A) Axial, **(B)** Lateral, and **(C)** AP CAT scan of the left distal tibia. The tibial nail is in close proximity to the ankle prosthesis. There is evidence of lucency around the tibial component of the total ankle replacement. Cyst formation is also noted around the tibial component of the TAR.

in the ankle joint. The tibial component easily dislodged with removal of the polyethylene component. There was a notable amount of cement present on the tibial component. A freer was used to probe the talar component which was also found to be loose. A cement mantle was found on the talar implant as well. A saw was used to freshen the cuts on the tibia and the talus and all the cement was removed. Deeper peg holes were created and a new tibial component was placed. The talar drill holes were re-drilled anteriorly and filled with bone graft after careful removal of surrounding bony overgrowth. A size four tibia and size four talus were implanted which were the same sizes used for the index total ankle arthroplasty. The polyethylene was upsized from a six millimeter to a ten-millimeter implant. Adequate fixation and range of motion was achieved intraoperatively.

Post-operative imaging showed the total ankle components in appropriate alignment (Figure 3). The patient was placed into a short leg splint and made non-weightbearing. On most recent follow up at six-weeks post operation, the patient was doing well. He has been working with physical therapy and denies ankle pain. He notes some pain over the plantar fascia as well as mild pain over the Achilles. X-rays obtained at that time showed early bony ingrowth surrounding the tibial component (Figure 4).

Discussion

Total ankle arthroplasties have longevity if indicated in the right patient population. According to a study analyzing rates of total ankle revisions in the short term, the mean survival rate at two years was 0.94, 0.86 at five years, 0.82 at seven years, and 0.77 at ten-year follow up. Long term survival rates were 0.66 at fifteen years and 0.62 at nineteen-year follow-up.[5] One of the most common indications for revision total ankle arthroplasty is loosening of the components.[6] It was noted in the operative report of the tibial IMN that the nail avoided the

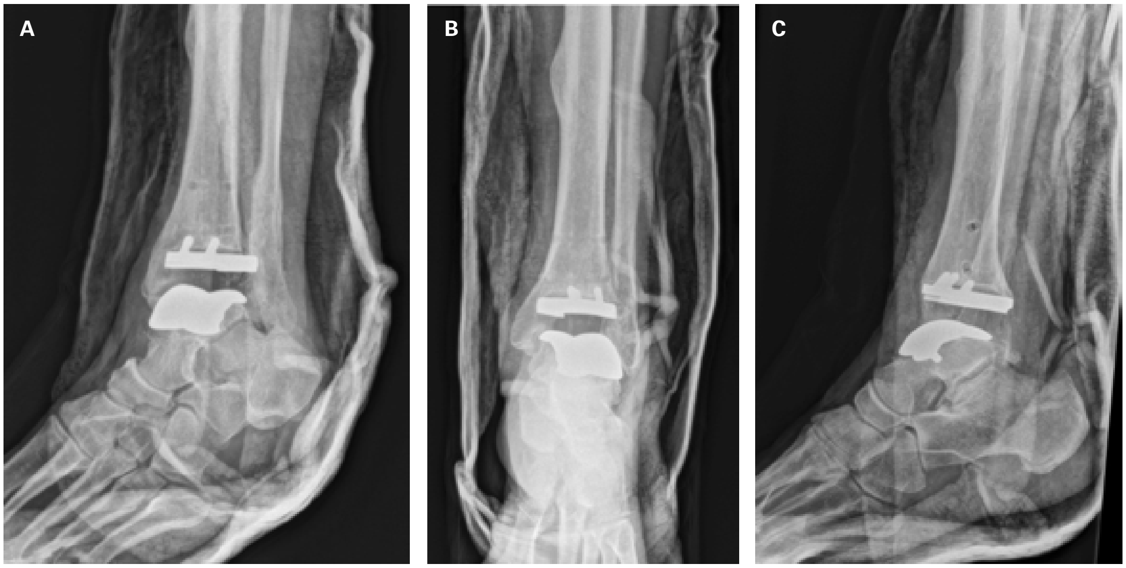

Figure 3. Postoperative **(A)** mortise, **(B)** AP, and **(C)** lateral x-rays of the left ankle. The tibial nail has been removed with residual defects in the tibia from prior interlocking screws. The revision total ankle components are in adequate position.

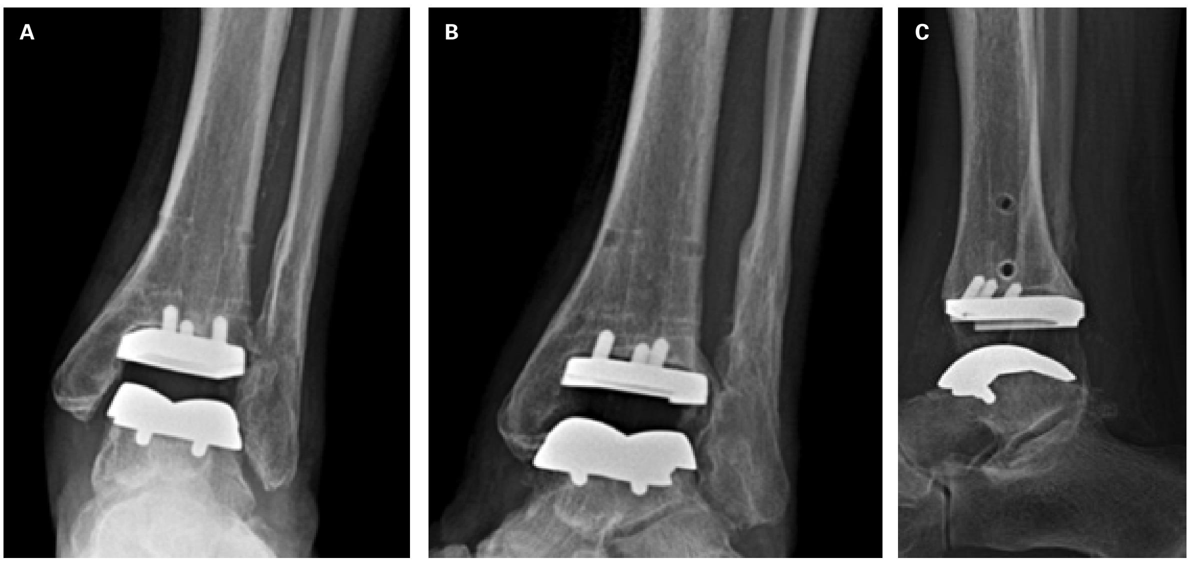

Figure 4. Six-week postoperative **(A)** AP, **(B)** mortise, and **(C)** lateral x-rays of the left ankle. Total ankle components are in adequate position. Progression of the bony ingrowth surrounding the tibial component of the TAR is best appreciated on the lateral x-ray compared to the immediate postop images in Figure 3.

total ankle prosthesis. However, on x-ray and CT imaging, the tibial nail was in close proximity to the tibial pegs of the total ankle replacement. The fact that the patient's ankle pain and feeling of looseness occurred immediately after tibial nail insertion further suggests that the implant was loosened during tibial nail insertion. Adequate intraoperative fluoroscopy must be utilized to ensure that the total ankle prosthesis is not disrupted during guidewire insertion, reaming, or final nail seating.

While nearly all TAR implants were approved for use with cement, anecdotally, most orthopaedic surgeons do not utilize cement for their TARs. Cemented arthroplasties are, however, common in total knee and total hip procedures. In knee and hip arthroplasty, the main argument for the use of cement is immediate fixation. Drawbacks include osteolysis and aseptic loosening at the bone-cement interface. Uncemented technique benefits include preserving bone stock, avoiding cement fragmentation, and reducing the risk of implant loosening via the process of bony ingrowth. The main drawback is bony ingrowth takes a longer time compared to the immediate fixation from cement.[7] This patient had a cemented ankle prosthesis that removed easily on intra-operative evaluation. It is possible that the complete separation of the cement mantle to the distal tibia seen intraoperatively may not have occurred with an uncemented approach. Postoperative physical exam with new onset pain or sensory changes should also be noted as potential consequences of iatrogenic damage to total ankle arthroplasty components.

Conclusion

This case demonstrates a loose total ankle replacement after the insertion of a tibial IMN. As the rates of total ankle replacements increase, foot and ankle surgeons and device companies should be ready for the increase in revisions as well. As no case of a loose total ankle replacement after tibial nail insertion has been reported, this report serves as a reminder that care must be taken by orthopedists when inserting tibial IMN to avoid loosening of a total ankle prosthesis.

References

1. Barg A, Wimmer MD, Wiewiorski M, *et al.* Total ankle replacement. *Dtsch Arztebl Int*. 2015;112(11):177-84.

2. Karzon AL, Kadakia RJ, Coleman MM, *et al.* The Rise of Total Ankle Arthroplasty Use: A Database Analysis Describing Case Volumes and Incidence Trends in the United States Between 2009 and 2019. *Foot Ankle Int*. 2022;43(11):1501-1510.

3. Ratnasamy PP, Maloy GC, Oghenesume OP, *et al.* The Burden of Revision Total Ankle Replacement Has Increased From 2010 to 2020. *Foot Ankle Orthop*. 2023; 8(3):24730114231198234.

4. Richter D, Krähenbühl N, Susdorf R, Barg A, Ruiz R, *et al.* What Are the Indications for Implant Revision in Three-component Total Ankle Arthroplasty? *Clin Orthop Relat Res*. 2021; 479(3):601-609.

5. Perry TA, Silman A, Culliford D, *et al.* Survival of primary ankle replacements: data from global joint registries. *J Foot Ankle Res*. 2022;15(1):33.

6. Myerson MS, Aiyer AA, Ellington JK. Revision Total Ankle Replacement. *JBJS Essent Surg Tech*. 2015;5(2):e7.

7. Chen K, Xu J, Dai H, *et al.* Uncemented Tibial Fixation Has Comparable Prognostic Outcomes and Safety Versus Cemented Fixation in Cruciate-Retaining Total Knee Arthroplasty: A Meta-Analysis of Randomized Controlled Trials. *J Clin Med*. 2023;12(5):1961.