Rare Incident of Atypical Nontraumatic Avascular Necrosis Within the Distal Tibia: A Case Report

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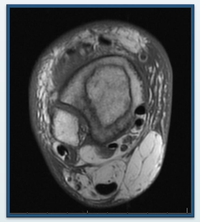
Statement of Purpose

Avascular necrosis (AVN) of the foot and ankle is a relatively rare phenomenon and a majority of reported cases are of traumatic etiology. To the author's knowledge, this is the first reported incidence of distal tibial AVN that resulted in a pathological intra-articular distal tibial fracture.

Literature Review

The existing literature on distal tibial AVN predominantly consists of small case studies of post-traumatic etiology.[1,2,3] The pathogenesis involves a combination of inadequate endosteal perfusion and intra-osseous compartment syndrome[3,4]. Risk factors play an important role with the most common being chronic corticosteroid use (49.3%), alcohol abuse (35.6%), tobacco use (29%), and hypertension (20.5%) but can also include vascular disease, immunosuppression, and hyperlipidemia, among others[4,5].



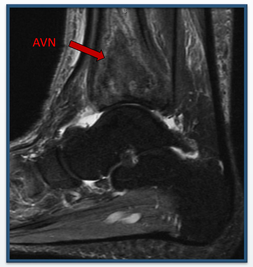
Early detection and treatment can avoid life-changing complications given limited treatment options. Depending on location and the extent of intra-articular involvement, both non-operative and surgical treatments may have variable levels of success and can ultimately require ankle arthrodesis as definitive treatment[6].

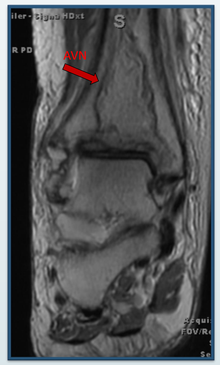
From our literature review, there was only one other reported incidence of non-traumatic AVN of the distal tibia which did not have a clear etiology but could have been associated with a remote history of ulcerative colitis (UC)and previous steroid use[4].

Case Study

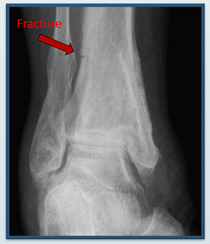
A 64 year-old female with remote history of UC with partial colectomy (1995), prior opioid and alcohol abuse (no relapse for 40 years), right nonoperative nondisplaced weber A fibular fracture (2017, healed uneventfully), hypertension, and pulmonary sarcoidosis (diagnosed April 2018) presented in April 2018 complaining of 1 month history of right ankle pain and edema without history of trauma. Physical exam was significant for localized, moderate ankle edema with anterior tenderness. There was no neurovascular impairment. Her medical and social history were otherwise unremarkable with no history of tobacco use or recent corticosteroid use.

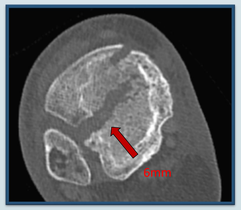
The treating provider performed independent corticosteroid injections to the ankle and subtalar joint for associated pain without relief. An MRI was obtained in May 2018 that revealed AVN to the distal tibial medullary canal. Patient was non-weightbearing in a removable cast boot noting significant pain reduction over the next month. The patient then had recurrent sinus tarsi, subtalar, and posterior tibial tendon pain with minimal improvement after a repeat sinus tarsi injection.





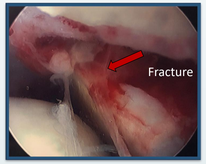
She presented to the ED with ankle pain in September 2018 without history of trauma. Radiographs revealed an intra-articular distal tibial pathologic fracture from the metadiaphysis with 6mm of diastasis. A CT was also obtained and ORIF was recommended.

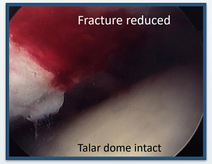




Case Study (cont.)

Surgical technique: An ankle arthroscopy was performed in the supine position using standard anteromedial and anterolateral portals with notable medial gutter fracture hematoma and lateral gutter arthrofibrosis. An anteromedial incision was made over the distal tibia, which was dissected down to the fracture site. The intramedullary bone was noted to have fibrofatty infiltrate, which was debrided to bleeding bone. A bone biopsy was obtained using a Jamshidi. The fracture was reduced and fixated using a 1/3 tubular plate and 3.5 mm screws. A power burr was used to access the intramedullary space, which was filled with cellular bone matrix.





Post-operative course: The patient remained non-weight bearing in a short leg splint / cast for 7 weeks. The surgical pathology read necrotic bone and bone marrow with focal nonspecific reactive change. At 7 weeks, the ankle joint remained pain free and she started weight-bearing as tolerated in a short leg cast. Radiographs showed interval consolidation and maintained ankle joint alignment. The patient had multiple subsequent missed appointments due to hospitalizations for other reasons. She returned to clinic 8 months post-operatively with no residual pre-operative symptoms and a completely healed fracture on radiographs.

8 months post-op

Analysis and Discussion

It is generally agreed upon that the primary etiology of AVN is high energy post-traumatic injuries[7,6]. The posterolateral distal tibia is more commonly involved partially because of variable single or double artery periosteal perfusion[8]. Much of our understanding of distal tibial AVN is based on other anatomic regions. However, the generalizability is limited as there are specific associations between risk factors and location such as steroids with the femoral head and bisphosphonates with the jaw[4].

This is a rare case of atypical distal tibial AVN, and while the patient does not have any clear etiology, she does have remote risk factors. Firstly, it is unclear if the patient was treated with steroids for UC in the distant past prior to the partial colectomy. Even though there was no preceding steroid use, this could play a role given dose-dependent steroid risks based on peak dose and cumulative dose[9]. Secondly, she also had history of trauma when she sustained an isolated fibula fracture. However, it did not appear to involve the distal tibia and the time frame does not correlate as post-traumatic AVN typically manifests on average 6 months after the injury[3].

Furthermore, the location of AVN started intramedullary and ultimately resulted in a pathologic fracture to the medial tibial plafond. While post-operative advanced imaging could have been considered for further management[10], it was not warranted at follow-up as the patient was asymptomatic. This case raises awareness to pathology that is not common and provides an effective technique for management of pathological fractures in setting of distal tibial non-traumatic AVN.

References

1. Gasco J et al. Avascular necrosis of the distal tibial epiphysis: report of two cases. J Pediatr Othop B. 201 Jul;19(4):361-5.
2. Pugely AJ et al. Osteonecrsis of the distal tibia metaphysis after a Salter-Harris I injury: a case report. J Orthop trauma. 2012 Feb;26(2):e11-5.
3. Rajagopalan S et al. Osteonecrosis of the distal tibia after a pronation external rotation ankle fracture: literature review and management. J Foot Ankle Surg. 2011 Jul-Aug;50(4):445-8.
4. McLeod JM et al. Nontraumatic Osteonecrosis of the Distal Tibia: A Case Presentation and Review of the Literature. J Foot Ankle Surg. 2017 Jan-Feb;56(1):158-166.
5. Issa K et al. Clinical characteristics of early-stage osteonecrosis of the ankle and treatment outcomes. J Bone Joint Surg Am. 2014 May 7;96(9):e73.
6. Jaffe D et al. Unipolar allograft reconstruction for post-traumatic avascular necrosis of the distal tibia: A review of the literature, technique, and case series. Foot Ankle Surg. 2019 Aug;25(4):425-433.
7. Blanke F et al. Ostenecrosis of distal tibia in open dislocation fractures of the ankle. Injury. 2014 Oct;45(10):1659-63.
8. Menck J et al. Sectorial angioarchitecture of the human tibia. Acta Anat (Basel). 1992;143(1):67-7
9. Zhang NF et al. Steroid-induced osteonecrosis: the number of lesions is related to the dosage. J Bone Joint Surg Br. 208 Sep;90(9):1239-43.
10. Buchan CA et al. Imaging of postoperative avascular necrosis of the ankle and foot. Semin Musculoskelet Radiol. 2012 Jul;16(3):192-24.

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