10.5005/jp-journals-10017-1086

CASE REPORT

Iatrogenic Talar Avascular Necrosis Secondary to Lateral Ligament Reconstruction Suture Anchor Placement requiring Total Talar Replacement

[1]Sawley A Wilde, [2]Evan M Guerrero, [3]Selene G Parekh

ABSTRACT

Lateral ankle instability is a common sequela of ankle sprains. Surgical treatment may be required if nonoperative treatment fails, and the modified Broström procedure is considered the gold standard. Many techniques have been described, with a suture anchor in the lateral malleolus commonly utilized. More recently, suture implants with surgical tape have been introduced. These are proposed to provide immediate stability, allowing more aggressive rehabilitation. However, they require a 3.4 mm drill hole in the talus, along with the 2.7 mm drill hole in the fibula. We present a case of avascular necrosis (AVN) of the talus after utilization of this suture tape construct, requiring total talus replacement.

Keywords: Avascular necrosis, Lateral ligament reconstruction, Talus, Total talus.

Wilde SA, Guerrero EM, Parekh SG. Iatrogenic Talar Avascular Necrosis Secondary to Lateral Ligament Reconstruction Suture Anchor Placement requiring Total Talar Replacement. The Duke Orthop J 2018;8(1):7-10.

Source of support: Nil

Conflict of interest: None

BACKGROUND

Chronic lateral ankle instability is a common sequela resulting from repeated lateral ankle sprains, or an acute moderate or severe ankle ligament injury not appropriately stabilized. Surgical management is required if nonoperative treatment is unsuccessful, and the modified Broström procedure is considered the gold standard, especially in the athletic population.[1,2] Although variability exists, this procedure entails a lateral ligament reconstruction of the anterior talofibular ligament (ATFL) with or without the calcaneofibular ligament to provide mechanical stability to the ankle.[3,4] Sutures in a pants over vest technique, transosseous sutures using a drill hole, and, more recently, the use of suture anchors have been described.[5] Multiple techniques have been used for suture anchor placement, the most popular of which involves anchoring the repair to the lateral malleolus.[6-8] However, talar anchor placement is also utilized, as was described by Angirasa and Barrett[9] Recently, suture implants with surgical tape have been introduced as a solution to provide immediate stability to the ankle, with the hopes of protecting the repair and allowing earlier weight-bearing and more aggressive rehabilitation. This implant requires the use of a 3.4 mm drill hole in the talus and a 2.7 mm drill hole in the fibula. We present the case of a 39-year-old female who underwent a peroneus brevis tendon repair with lateral ligament reconstruction, who subsequently developed AVN of the talus as a complication. After failed attempt at bone grafting and revascularization, the patient underwent treatment with a total talar replacement.

CASE REPORT

A 39-year-old female underwent a peroneus brevis tendon repair with lateral ligament reconstruction for right lateral ankle instability. Magnetic resonance imaging (MRI) prior to that procedure revealed an attenuated state of the ATFL, however, no talus abnormalities were noted (Fig. 1). One and a half years later, she presented to clinic with complaints of right ankle and hindfoot pain. The onset of pain began soon after the procedure, and she noted a gradual, slow progression

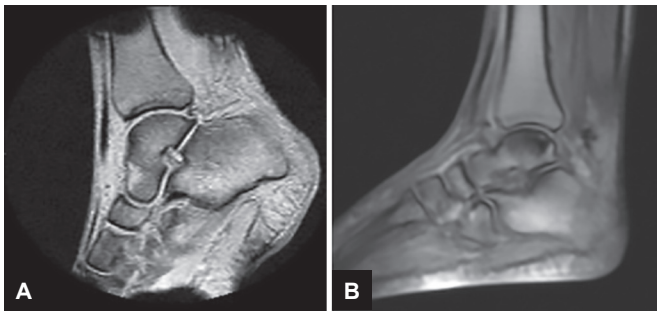
[1,2]Resident, [3]Attending Sugeon

[1]Department of General Surgery, Duke University Medical Center, Durham, North Carolina, USA

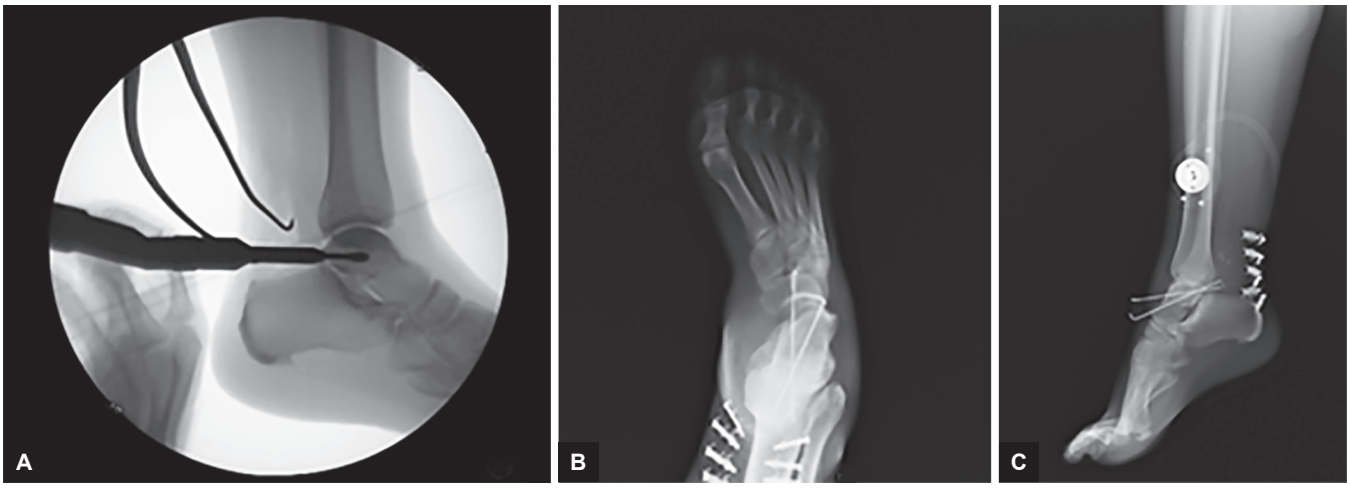
[2]Department of Orthopaedic Surgery, Duke University Medical Center, Durham, North Carolina, USA

[3]Division of Foot and Ankle Surgery, Department of Orthopaedic Surgery, Duke University Medical Center, Durham, North Carolina, USA

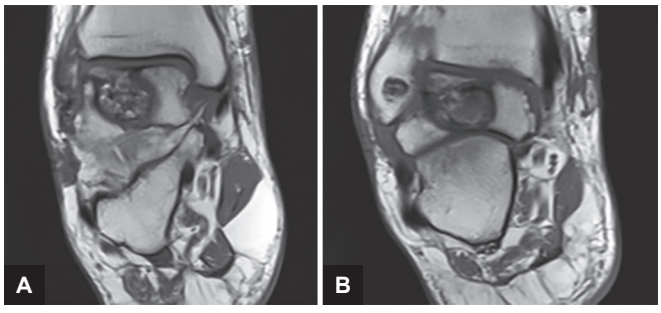
Corresponding Author: Evan M Guerrero, Resident, Department of Orthopaedic Surgery, Duke University Medical Center Durham, North Carolina, USA, Phone: +9492125330, e-mail: evan.guerrero@duke.edu



Figs 1A and B: T2 sagittal ankle MRI. (A) MRI prior to lateral ligament reconstruction. (B) MRI after lateral ligament reconstruction revealing hypointense signal of the talar dome consistent with AVN, no evidence of fractures or articular surface collapse



Figs 2A to C: (A) Intraoperative fluoroscopic lateral view of the right ankle, showing placement of intraoperative burr indicating the location of the suture anchor previously placed. (B and C) anteroposterior and lateral X-ray status post bone grafting from the right femoral condyle to the talus for AVN, with two pins noted through the talus



Figs 3A and B: Magnetic resonance imaging coronal sections of the ankle following removal of suture anchor used in previous lateral ligament reconstruction and vascularized bone grafting. Imaging reveals fracturing and progression of AVN of the talus

of symptoms. The pain was described as constant, but more frequent and more severe with prolonged activity. Physical exam revealed tenderness to palpation of the right lateral malleolus, subtalar joint, peroneal tendon, and anterior ankle. Pain was elicited with dorsiflexion, and range of motion consisted of 5° of dorsiflexion and 50° of plantar flexion. An MRI of the right ankle revealed AVN of the talus and an intact peroneus brevis tendon repair (Fig. 1).

The patient subsequently underwent anchor removal in the talus, which was performed using a longitudinal posterior midline incision, splitting the Achilles tendon. The flexor hallicus longus muscle belly was identified and retracted, and the posterior aspect of the talus was visualized. A guide pin for reamers was placed from the posterior talus into the anterior talus. Once it was positioned, it was over-drilled. The guidewires were removed, and under fluoroscopy, a burr was used to debride more bone, being careful not to violate the joints. The anchor was subsequently removed from the talus. The plastic surgery team then proceeded with right medial femoral condyle graft, anastomosing the superior medial geniculate artery to the posterior tibial artery in an end-to-end fashion (Fig. 2).

Subsequent follow-up encounters over the ensuing 3 months revealed no relief in symptoms, and repeat MRI revealed that the graft had not incorporated, and AVN of the talus had progressed with fracture of the talus (Fig. 3). At this time, different interventions were discussed at length including tibiotalar arthrodesis, tibiotalocalcaneal arthrodesis, total talus replacement, and even amputation. The patient elected to undergo a total talus replacement.

A computed tomography (CT) scan of the ankle was obtained using scan spacing of less than 2.5 mm, and slice thickness of less than 2.5 mm. Using 4WEB™ software, the CT scan was reformatted and a computer-aided design (CAD) drawing was created. Along with the senior author, and using the unaffected limb as a mirror image, the right talus was templated. A three-dimensional (3D) printed cobalt chromium talus was created (Fig. 4).

A standard direct anterior approach to the ankle was utilized. The talus was osteotomized across the neck and the body. The fragments were removed, the wound was irrigated, and a talus replacement implant was placed (Fig. 5). Standard layered closure was performed. The patient was discharged with no complications and will continue follow-up in clinic, where her progression will be monitored.

DISCUSSION

Various surgical approaches have been described for treating lateral ankle instability. Augmentation of lateral ligament reconstruction/repair with suture tape and suture anchors is growing in popularity.[10] Giza et al found no statistical difference in strength or stiffness of a traditional open repair as compared with an arthroscopic anatomic repair of the lateral ligaments of the ankle.[8] Li et al advocated the use of bone anchors in

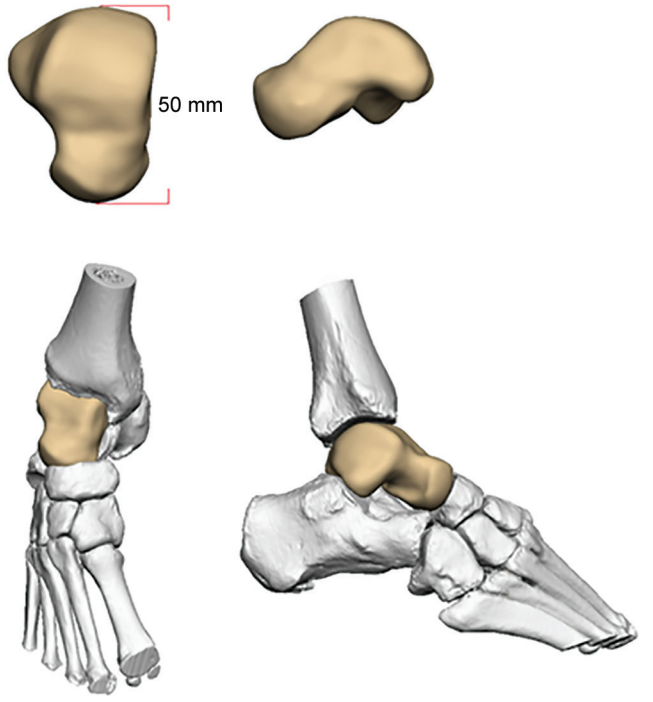
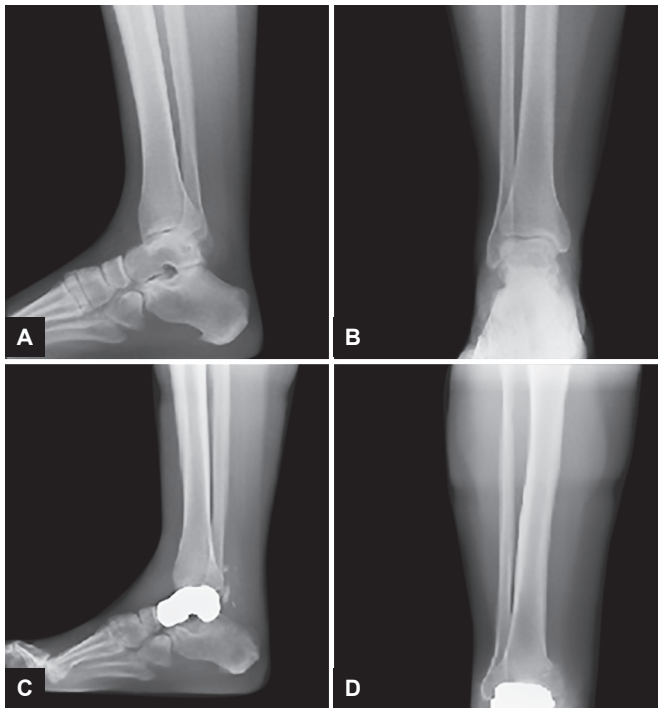


Fig. 4: (Top) The 3D CAD reconstruction of the talus obtained via CT scan and 4WEB™ software used for preoperative planning for total talus replacement. (Bottom) Projection of articulation of talus replacement using reconstruction of patient's ankle anatomy obtained via CT scan, showing both anteroposterior (Left) and lateral (Right) views



Figs 5A to D: Preoperative (Top) and postoperative (Bottom) lateral and anteroposterior X-ray of the ankle, revealing intact total talus replacement in anatomic alignment

high-level athletes, because this provides an anatomic, yet structurally sound construct, allowing athletes to return to their original level of performance.[10] In addition to suture anchor placement, the use of suture tape augmentation or reconstruction has also been described, which involves a ligament repair bridging concept using braided polyethylene/polyester suture tape and knotless bone anchors. These aid to reinforce ligament strength as a secondary stabilizer, and early results have shown that this technique allowed for early rehabilitation and earlier return to sport or activity.[11] Thus far, the reported complications in surgical intervention addressing lateral ankle instability have been minimal, with superficial peroneal nerve injury and sural neuritis being the most common problems.[10] We present a case in which talar placement of a suture anchor led to disruption of blood supply and osteonecrosis. To our knowledge, this is the first such complication reported from this procedure.

The extraosseous blood supply to the talus consists of three main branches: Anterolateral branches from the anterior tibial and perforating peroneal arteries, and posteromedial branches from the posterior tibial artery. Intraosseous supply to the head of the talus comes from the dorsalis pedis branch medially and the artery of the tarsal sinus laterally. The body is mainly supplied from branches of the anastomosis between the arteries of tarsal sinus and tarsal canal.[12] Previous studies of osteonecrosis following talar neck fractures have demonstrated that fractures associated with a dislocated subtalar joint (Hawkins type II or greater) have potential for disruption of blood supply, and thus have an increased risk of AVN.[13] Similarly, talar placement of the suture anchor in this case is suspected to have disrupted the blood supply to the talus, leading to the same result. Talar suture anchor placement is an emerging technique, as implants with anchoring in both the talus and fibula are thought to allow for quicker recovery and rehabilitation. This case resulted in a serious complication, which, with no evidence to date supporting either technique, may suggest that fibular suture anchor placement alone is safer. However, prospective studies comparing the two techniques would provide more definitive answers to which method is superior. Furthermore, there are a number of surgical procedures where a hole is drilled into, and even through, the talus. Given the presented study, the risk of talar AVN must be considered when performing such procedures.

CONCLUSION

Various techniques have been described for lateral ligament reconstruction in the treatment of lateral ankle instability. Among those techniques is the use of suture anchors to provide mechanical stability to the ankle, of which both fibular and talar anchor placement have been described. Suture anchors are thought to allow for quicker recovery and rehabilitation, and have thus far been described with minimal complications. We present

the case of a 39-year-old female who underwent a peroneal tendon repair with lateral ligament reconstruction using talar suture anchor placement, who subsequently developed AVN of the talus. Disruption of blood supply as a result of suture tape augmentation requiring a suture anchor placed in the talar neck is thought to have led to this complication. As neither talar nor fibular suture anchor placement has been shown to be superior in terms of outcomes, fibular suture anchor placement may avoid the risk of AVN of the talus.

REFERENCES

1. Hamilton WG, Thompson FM, Snow WS. The modified Brostrom procedure for lateral ankle instability. Foot Ankle 1993;14(1):1-7.
2. Hassan S, Thurston D, Sian T, Shah R, Aziz A, Kothari P. Clinical outcomes of the modified Broström technique in the management of chronic ankle instability after early, intermediate, and delayed presentation. J Foot Ankle Surg 2018 Apr 11. pii: S1067-2516(17)30697-X.
3. Colville M. Surgical treatment of the unstable ankle. J Am Acad Orthop Surg 1998 Nov-Dec;6(6):368-377.
4. Karlsson J, Bergsten T, Lansinger O, Peterson L. Reconstruction of the lateral ligaments of the ankle for chronic lateral instability. J Bone Joint Surg Am 1988 Apr;70(4):581-588.
5. Lui TH. Modified arthroscopic Brostrom procedure. Foot Ankle Surg 2015 Sep;21(3):216-219.
6. Cho BK, Kim YM, Kim DS, Choi ES, Shon HC, Park JC. Outcomes of the modified Brostrom procedure using suture anchors for chronic lateral ankle instability—a prospective, randomized comparison between single and double suture anchors. J Foot Ankle Surg 2013 Jan-Feb;52(1):9-15.
7. Cottom JM, Rigby RB. The "all inside" arthroscopic Broström procedure: a prospective study of 40 consecutive patients. J Foot Ankle Surg 2013 Sep-Oct;52(5):568-574.
8. Giza E, Shin EC, Wong SE, Acevedo JI, Mangone PG, Olson K, Anderson MJ. Arthroscopic suture anchor repair of the lateral ligament ankle complex: a cadaveric study. Am J Sports Med 2013 Nov;41(11):2567-2572.
9. Angirasa AK, Barrett MJ. Talar anchor placement for modified Brostrom lateral ankle stabilization procedure. J Am Podiatr Med Assoc 2008 Nov-Dec;98(6):473-476.
10. Li X, Killie H, Guerrero P, Busconi B. Anatomical reconstruction for chronic lateral ankle instability in the high-demand athlete: functional outcomes after the modified Brostroem repair using suture anchors. Am J Sports Med 2009 Mar;37(3):488-494.
11. Yoo JS, Yang EA. Clinical results of an arthroscopic modified Brostrom operation with and without an internal brace. J Orthopaed Traumatol 2016 Dec;17(4):353-360.
12. Mulfinger GL, Trueta J. The blood supply to the talus. J Bone Joint Surg Br 1970 Feb;52(1)160-167.
13. Vallier HA, Reichard SG, Boyd AJ, Moore TA. A new look at the Hawkins classification for talar neck fractures: which features of injury and treatment are predictive of osteonecrosis? J Bone Joint Surg Am 2014 Feb;96(3):192-197.