

Dr. Paul J. Carroll, DPM, AACFAS¹, Dr. Jonathan J. Sharpe, DPM, FACFAS²

¹Fellow, Northern Ohio Foot and Ankle Foundation Foot and Ankle Reconstruction Fellowship
²Director, Northern Ohio Foot and Ankle Foundation Foot and Ankle Reconstruction Fellowship

Purpose & Literature Review

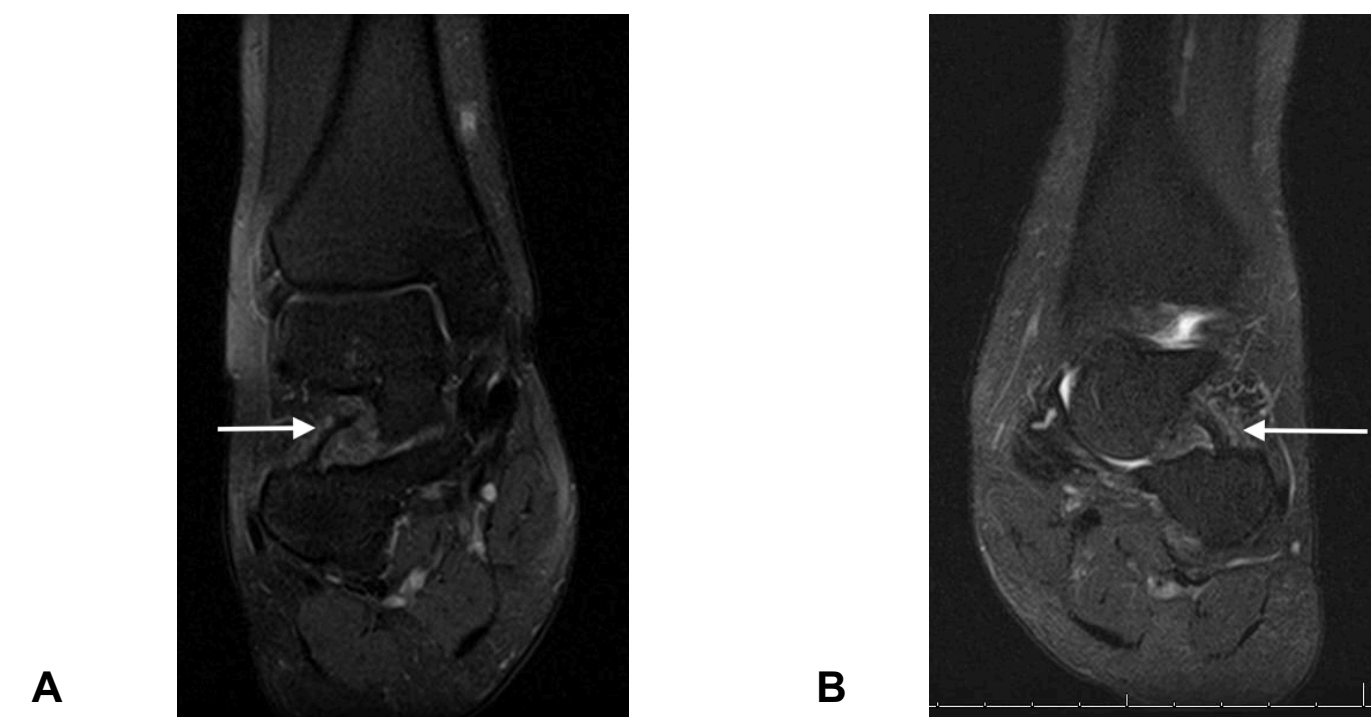
In an acute inversion ankle injury, the most commonly injured structure is the anterior talofibular ligament (ATFL). Approximately, 80% to 85% of these injuries go onto heal with conservative treatment with rehabilitation (1). However, 74% of these injuries develop some degree of chronic joint instability (1,2). Up to 75% to 80% of recurrent injuries have chronic subtalar joint instability (1,2). Many experts argue the calcaneofibular ligament (CFL) is the primary stabilizer of the subtalar joint (3). However, others suggest the primary stabilizers of the subtalar joint are the interosseous talocalcaneal ligament (ITCL) and cervical ligament. This has led to the debate as to which injured ligament is the cause of subtalar instability. The function of the ITCL is poorly understood. It has been hypothesized that the ligament limits eversion and maintains apposition of the talus and calcaneus in all positions (4). In several cadaveric studies, sectioning the talocalcaneal interosseous ligament increased supination. The cervical ligament has been identified to limit supination and limit excessive motion of the subtalar joint (5). There is debate on which of these is two ligaments is the primary secondary stabilizer of the subtalar joint (3). This is a unique case study of a patient who underwent a interosseous talocalcaneal ligament and cervical ligament repair with a novel exogenous ligament repair technique using non-absorbable suture made of Ultra High Molecular Weight Polyethylene (UHMWPE) and suture anchors.

Case Presentation

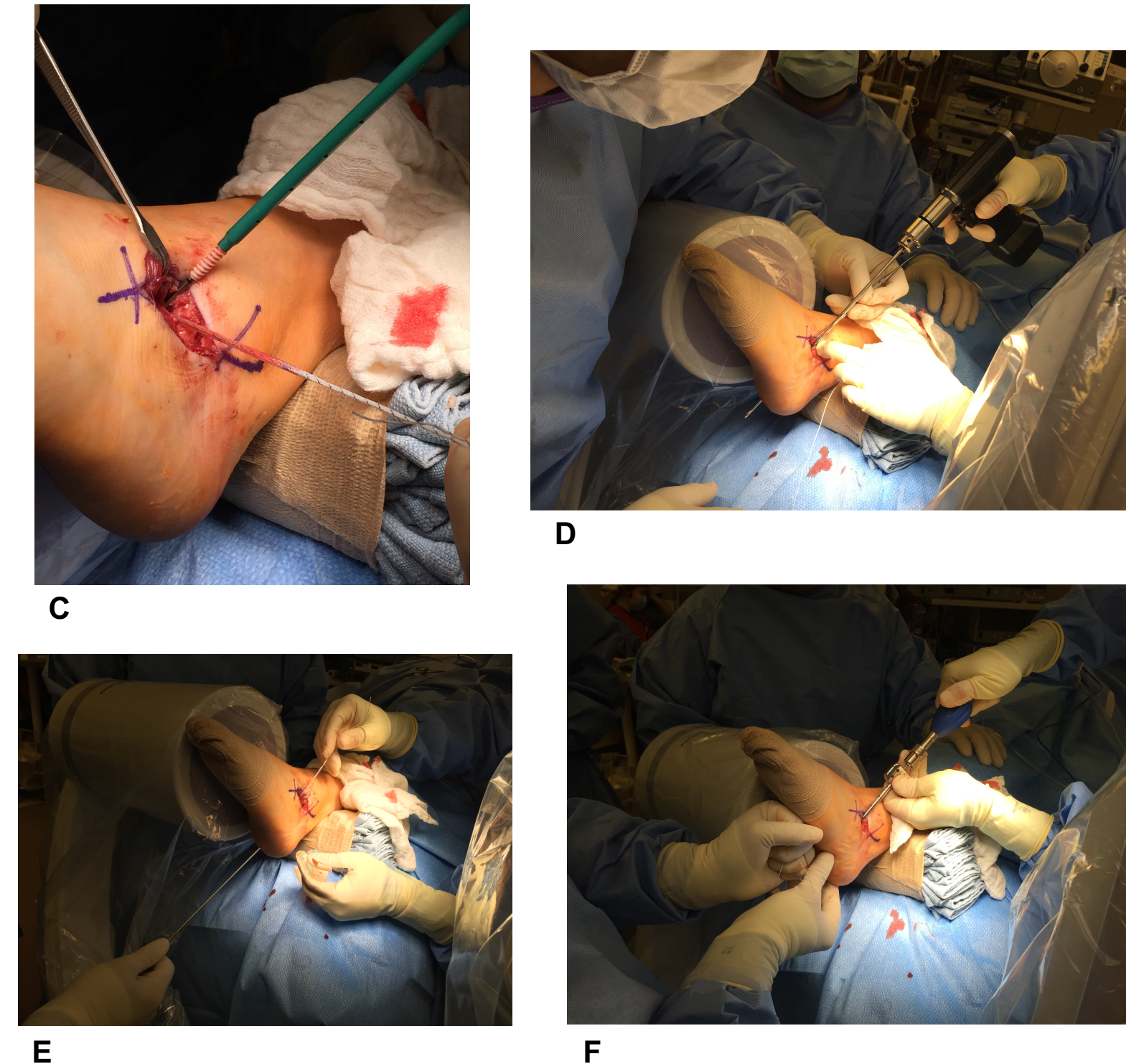
A 17-year-old female with Pott's disease was seen by seen author (JJS) with a one year history of right foot pain after being hit in the foot with a softball and spraining her ankle. Her previous treatment consisted of ankle wrapping. X-rays at the time of the injury were negative for fractures. Upon physical examination, there was pain on stressing of the subtalar joint, inversion and eversion and palpation of the sinus tarsi. She was prescribed custom orthotics and started a regiment of physical therapy. After 17 sessions of physical therapy, she noted minimal improvement. An MRI showed chronic, mild thickening of the cervical ligament. The patient and family at this point opted for surgical exploration and stabilization of the subtalar joint. The patient was placed supine on the operating room table with a ipsilateral hip bump. A well padded mid thigh tourniquet was placed. A four centimeter lazy S incision was made over the subtalar joint. Blunt dissection was carried down to the subtalar joint. Inspection of the subtalar joint ligaments revealed an intact ITCL, however extensive scarring of cervical ligament was seen. The cervical ligament was repaired with a Arthrex 4.75 bio-swivel lock anchor.

Case Presentation

A punch tap was utilized in the anterior process of the calcaneus. The Fibertape was then looped through the cervical ligament and inferior extensor retinaculum and secured in the anterior process. Following repair, the joint was irrigated with normal saline and a layer closure was performed. Post-operatively, the patient remained non-weight bearing for seven weeks. Following completion of physical therapy, the patient was able return to her normal activities in orthotics with minimal pain. Six months following stabilization of her right ankle, the patient returns to clinic with a left ankle sprain. The patient fell and heard a pop inside her ankle. Following a period of protected weight bearing and formal physical therapy, the patient still reported pain and instability in her left ankle. An MRI demonstrated chronic thickening of the cervical ligament of the left subtalar joint. The patient continued conservative treatment of orthotics and physical therapy without relief. One year after the injury and no improvement of symptoms, the patient opted for surgical reconstruction of the subtalar joint ligaments. The patient was positioned on the operating room table in a similar position as the previous foot surgery. A curvilinear incision was made over the sinus tarsi. Blunt dissection was carried down to the subtalar joint. Both the interosseous talocalcaneal and cervical ligaments were noted to be scarred and thickened. The joint was debrided and an Arthrex 3.75mm bio-composite tenodesis screw with accompanying fibertape was inserted in the inferior portion of the neck of the talus. Next, an osseous tunnel was drilled with 4.5mm drill through the anterior process of the calcaneus from dorsal to plantar. The fibertape was fed through the tunnel, tensioned and secured with a 4.75 bio-composite interference screw. The joint was irrigated. The inferior extensor retinaculum was imbricated into the repair. A layered closure was performed.



Figures A-B: Chronically thickened cervical ligament in each foot.



Figures C-F: Reconstruction of the Interosseous Talocalcaneal ligament

Case Presentation

The patient remained non-weight bearing for seven weeks and transitioned to protected weight bearing in a boot, During her recovery period the patient fractured her anterior process of her calcaneus on her right foot after a fall. This limited her rehabilitation of her ligament repair on her left foot. Eighteen months after surgery the patient reports her joint is stable, but painful. At this point she has not returned to full activity. She reported a foot function score of 47 eighteen months after surgery.

Discussion

This case study discusses our surgical treatment of subtalar joint instability using a suture anchor construct. Our surgical technique and outcomes are presented. Following the repair of the cervical ligament for the stabilization of the subtalar joint of the right foot the patient was able to return to her normal activities without limitations.

DISCUSSION

However, after her ITCL ligament repair and subtalar joint stabilization of her left foot, she continues to have pain which limits her activity. We hypothesize the patient's continued pain of her left foot is due to several factors including no formal physical therapy, an avulsion fracture to the right anterior calcaneal process as well as intermittent non-compliance. While each of these factors individually may not cause a complication, cumulatively may have impacted her outcome. Similar repairs have been discussed in the literature. Jung et al. reported great results in 20 ankles that underwent subtalar instability reconstruction with a semitendinosus allograft (6). In their technique, the graft was placed between the ITCL and cervical, through the distal fibula and inserted in the calcaneus. The average pre-operative AOFAS score was 66 and improved 89 post-operatively. Liu et al. reported excellent results in 1 patient who underwent arthroscopic repair of the ITCL using gracilis tendon autograft. AOFAS improved from 55 pre-operatively to 100 post-operatively (7). Many other procedures have described in the treatment of subtalar instability. Following any repair of the subtalar joint ligaments, aggressive physical therapy is recommended to regain mobility and decrease pain following the procedure. If subtalar joint instability goes undiagnosed, this can lead to additional sprain as a result of altered subtalar joint mechanics (3). Exogenous ligament repair of the ITCL and cervical ligament spurs harvesting tendons, which can jeopardize their function in various capacities in the body. We advocate for these types of repairs when clinically possible. The use of UHMWPE suture for the repair of ITCL and cervical ligaments is an acceptable treatment option. This joint sparing procedure is an alternative to arthrodesis and tendon autograft and can be used in younger active individuals.

REFERENCES

1. Choisne J, Hoch M, Bawab S, Alexander I, Ringleb S. The Effects of a Semi-Rigid Ankle Brace on a Simulated Isolated Subtalar Joint Instability. *J Orthop Res* 31:1869-1875, 2013
2. Choisne J, Hoch M, Alexander I, Ringleb. Effect of Direct Ligament Repair and Tenodesis Reconstruction on Simulated Subtalar Joint Instability. *Foot Ankle Int.* 38(3)324-330, 2017
3. Keefe D, Haddad S. Subtalar instability Etiology, diagnosis, and management. *Foot Ankle Clin.* 7: 577-609, 2002
4. Y, Amendola, Rudert M, Baer T, Brown T, Hillis S, Saltzman C. The Role of the Interosseous Talocalcaneal Ligament in Subtalar joint Stability. *Foot Ankle Int.* 25: 588-596, 2004
5. Knudson G, Kitaoka H, Lu C, Luo Z, An K. Subtalar joint stability Talocalcaneal interosseous ligament function studied in cadaver specimens. *Acta Orthop Scand.* 5:442-446, 1997
6. Jung H, Park J, Shin M, Lee S, Eom J, Lee D. Outcome of subtalar instability reconstruction using the semitendinosus allograft tendon and biotenodesis screws. *Knee Surg Sports Traumatol Arthrosc.* 23:2376-2383, 2015
7. Lui C, Jiao C, Hu Y, Guo Q, Wand C, Yingfang A. Interosseous Talocalcaneal Ligament Reconstruction With Hamstring Autograft Subtalar Arthroscopy: Case Report. *Foot Ankle Int.* 32 (11) 1089-1094