Surgical Treatment of Posteromedial Talus Fractures: Technique Description and Results of 10 Cases

Abstract

Background: The aim of this study is to describe a surgical technique for successful treatment of posteromedial talar body fractures and establish treatment recommendations for fractures of the posterior aspect of the talus. **Materials and Methods:** Ten patients treated operatively for a posteromedial talar body fractures entering both the subtalar and ankle articulations with a minimum of 1-year followup were identified from a trauma database. Age, mechanism of injury, associated injuries, time to surgery, complications, the range of motion, secondary procedures, and need for arthrodesis were evaluated. **Results:** Followup averaged 4.8 years (1–10). Eight of ten patients had high-energy mechanisms of injury. Six patients had associated medial subtalar dislocations with two open. Associated injuries were common. No surgical complications occurred. The range of motion was present but decreased. No arthrodesis procedures were performed. **Conclusions:** Operative fixation of posteromedial talus fractures with the described surgical technique resulted in acceptable outcomes in this series of patients with improved outcomes when compared to prior reports in the literature.

Keywords: *Fracture, posterior, subtalar dislocation, talus*
MeSH terms: *Fracture fixation; fractures, bones; dislocation; talus*

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Introduction

The posterior process of the talus consists of medial and lateral tubercles. The medial tubercle is smaller and is the attachment site for the posterior portion of the deltoid. The lateral tubercle is larger and is the attachment site of the posterior talofibular ligament. Between the two tubercles is the groove for the flexor hallucis longus (FHL) tendon. Fracture patterns of the posteromedial talus vary. Radiographs often underestimate or miss these injuries entirely. Computed tomography (CT) scans are essential in cases where posteromedial talar body fractures are suspected to aid in diagnosis and gain further understanding of fracture complexity.

Fractures of the posterior aspect of the talus are not well described in the literature, totaling 35 cases. Most papers are case reports or small series of patients[1-17] [Table 1]. In these reports, the fractures are not uniformly described. The same names are used to describe different fractures. For clarity medial tubercle fractures are extraarticular. Fractures of the posterior process of the talus are intraarticular at the subtalar joint. Posteromedial talus fractures consist of a larger fracture that is intraarticular at both the subtalar and ankle joints and have the most potential morbidity.

Complication rates for this injury are unacceptably high if missed or treated in nonoperative fashion due to subtalar instability and development of arthritis.[14]

A surgical technique for treatment of posteromedial talus fractures involving both the ankle and subtalar articulations is described in detail and results in 10 patients treated successfully with this technique are reviewed.

Materials and Methods

A trauma database inquiry was performed of all talus fractures treated operatively by the senior author (SKB) with a minimum of 1-year followup after surgical treatment. Radiographs were then reviewed to identify fracture the posteromedial talar body fracture pattern involving both the ankle and subtalar articulations. Mechanism of injury was recorded. The presence or absence of a subtalar dislocation was also

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Table 1: Summary of reported cases of posterior talus fractures

Author	Number of fractures	Fracture type	Treatment	Diagnosed at presentation	Medial subtalar dislocation	Complications	Associated foot injuries
Cedell (1974)	4	Medial tubercle	Excision	No	No	Nonunion in all 4 treated by late excision	
Nasser (1990)	1	Posteromedial body	ORIF	Yes	No	Subtalar arthritis, decreased dorsiflexion great toe, hardware impingment (6.5screw and washer)	
Ebraheim (1994)	1	Posterior process	ORIF	Yes	Yes	Subtalar stiffness	
Ebraheim (1995)	4	2 Posterior process, 2 medial tubercle	2 ORIF 2 casted	2/4	2 open medial dislocations, 1 total talus dislocation	2 patients nonunion after casting, 1treated by excision and tarsal tunnel release, 1 patient arthritis after ORIF had subtalar arthrodesis	1 patient talar neck and body fractures
Stefko (1994)	1	Medial tubercle	excision	No	No	Tarsal tunnel syndrome	
Jimulia (1995)	1	Posterior process	Cast	Yes	No	none	
Kanbe (1995)	2	Medial tubercle	ORIF	1/2	No	none	
Kim (1996)	5	Medial tubercle	Cast for 2 identified at presentation	2/5	No	Late excision of nonunion in 3 late diagnosis cases. 1 asymptomatic nonunion in pt treated with a cast	
Naranja (1996)	1	Posterior process	ORIF	Yes	Yes	Pain, stiffness	
Dougall (1997)	1	Medial tubercle	ORIF	Yes	No	None	
Wolf (1998)	1	Medial tubercle	excision	No	No	None, late excision	
Nadim (1999)	1	Posterior process	ORIF	Yes	No	Subtalar joint stiffness	Fractures of sustentacumtali, distal fibula
Cohen (2000)	1	Medial tubercle	ORIF	Yes	No	none	Fracture of sustentalulumtali, distalCFL avulsion
Giuffrida (2003)	6	Posteromedial body		All 6 missed		All patients developed arthritis. 4 patients had subtalar arthrodesis 1 also havingatarsal tunnel release, 1 patient tibialtalar calcaneal arthrodesis, 1 patient with painful arthritis without surgery	1 patient talar neck fracture, 1 patient talar body fracture, medial malleolus fracture
Park (2016)	1	Posteromedial body	ORIF	Yes	Yes	None	
Bhanot (2004)	2	Posteromedial body	ORIF	No	No	1 patient stiffness of subtalar joint, 1 patient stiffness of ankle joint	1 patient traumatic foot wound, 1 patient medial malleolus fracture

OIRF=Open reduction internal fixation. Fracture types listed in the table are based on review of the descriptions and illustrations in the included studies. Fractures are classified to be consistent with the fracture definitions provided in this manuscript

recorded. Charts were reviewed to identify interval from injury to surgery in days. Any complications from surgery or the injury itself were noted. The range of motion of the ankle and subtalar joint as a percentage of normal were recorded at the last followup visit. Charts were reviewed to identify any patients requiring arthrodesis from the development of posttraumatic arthritis. All patients were treated with the same surgical technique.

Operative procedure

The patient is placed in the prone position on the operative table. Care is taken to pad all bony and neurologic prominences. A tourniquet is placed on the thigh of the operative extremity. A small bump is placed under the contralateral iliac crest to allow improved access to the posteromedial aspect of the ankle. A pillow is placed under the mid-tibia shaft to elevate the operative ankle off the bed to prevent the noninjured limb from obstructing intraoperative lateral fluoroscopy images. The operative extremity is prepped and draped in the usual fashion. A longitudinal incision is made on the posteromedial ankle [Figure 1]. Care is taken to ensure the incision is made perpendicular to the skin. Dissection is carried just medial to the Achilles tendon which is retracted laterally and left in the tendon sheath. Dissection continues down to the posterior ankle utilizing the interval between the FHL and the Achilles. The FHL muscle belly is mobilized laterally off the posterior surface of the tibia. The inferior retinaculum of the FHL is released allowing for improved retraction of the FHL medially. The FHL protects the posterior tibial artery and tibial nerve, and unnecessary dissection of these structures should be avoided to prevent injury. The entire posterior portion of the talus is well visualized. A surgical headlight is generally worn to improve the ability to examine the ankle and subtalar articulations. If improved visualization is needed a medial-based external fixator or distractor may be applied with a pin inserted in the medial face of the tibia proximally and in the calcaneus distally. With distraction, both the ankle and subtalar joints are well visualized. The fracture fragments are identified, and fracture lines are cleaned of all hematoma. Each fracture fragment is then reduced anatomically and held into position using small K wires [Figure 2]. The reduction is confirmed in both lateral and mortise projections and by direct visualization. After reduction has been confirmed a mini fragment plate, generally 2.0 mm or 2.4 mm in size is then slid over the K wires. As the talus is dense cortical bone locking plates are seldom necessary except in cases of severe comminution or bone loss. The plate lies in the nonarticular portion of the posterior aspect of the talus. The plate is secured to the bone using screws of 2.4 mm or 2.7 mm diameter. In fractures that do not have comminution, screws may be inserted using lag technique. In comminuted fractures or those with bone loss, screws should be inserted in standard or positional fashion to avoid altering the curvature of the talar dome. If needed, additional independent screws may be inserted outside of the plate, but this is limited by the small amount of extraarticular surface area on the posterior talus. All provisional k wires are removed, and fluoroscopy images are reviewed in lateral and mortise views to ensure all hardware is extraarticular and in a good position. The distractor is then removed. In cases associated with dislocation of the ankle or subtalar joint at the time of injury, stability should be assessed after the distractor is removed. If instability is present an external fixator should be maintained with the foot in neutral position for 4–6 weeks. If the hindfoot is stable after standard closure, the patient is placed in a well-padded splint in neutral position. The range of motion of the great toe is started immediately to prevent adhesions of the flexor hallucis. Sutures are removed at 2 weeks and the patient is placed in a removable fracture boot and range of motion exercises is started. The patient will be nonweight bearing until the union is achieved, typically 10–12 weeks [Figure 3].

Results

Ten patients were treated for posteromedial talar body fractures. All fractures were intraarticular at both the ankle and subtalar articulations. All fractures were diagnosed at presentation. Mean patient age was 34.8 years. All patients

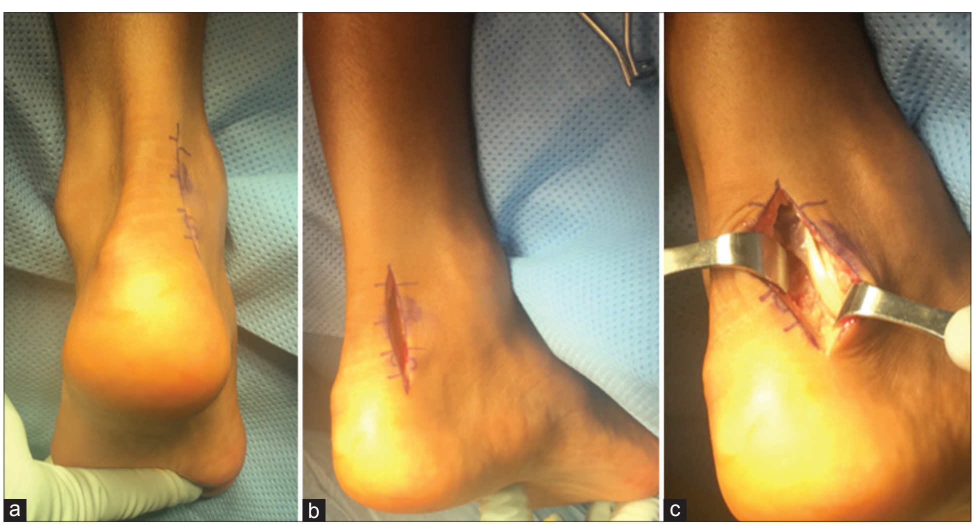

Figure 1: Clinical photograph showing (a) The surgical incision lies just medial to the achilles tendon. (b) Dissection is carried deep through the subcutaneous tissues until the fascia of the deep posterior compartment is encountered. (c) The deep posterior compartment fascia is released and the flexor hallucis longus is identified and mobilized medially

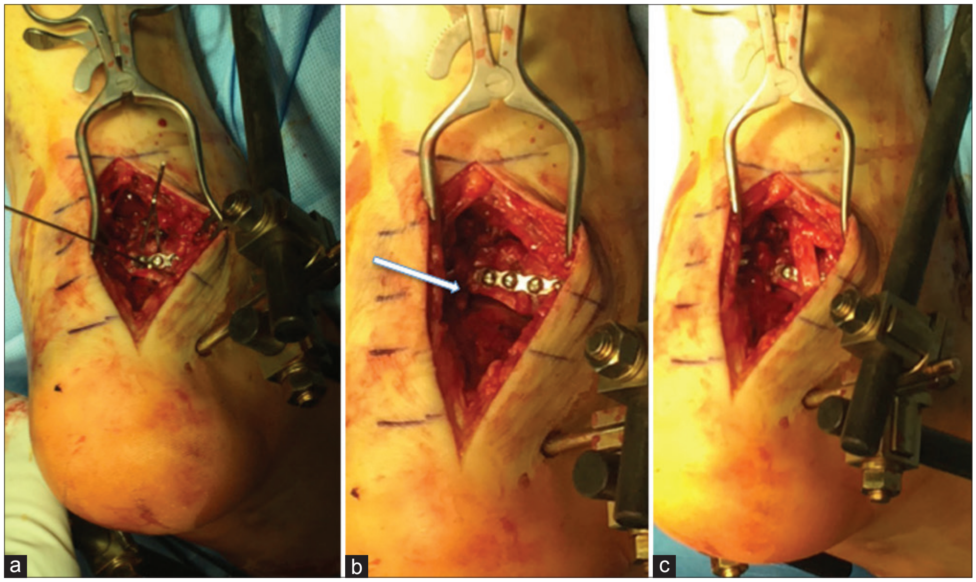

Figure 2: Peroperative photographs showing (a) After reduction provisional fixation is performed using k wires and the plate is then slid over the wires. (b) Rigid fixation is performed using a minifragment plate and screws resulting in a stable fixation. The subtalar joint is congruent and easily visualized (arrow). (c) The flexor hallucis longus runs directly over the plate and it is important to encourage early range of motion of the great toe to prevent adhesions of the tendon

Figure 3: (a and b) lateral and mortise view radiographs of a man who fell from a ladder showing subtle abnormality of the posterior talus. (c and d) Axial and sagittal computed tomography scan images showing a comminuted displaced posteromedial talar body fracture. (e and f) Fluoroscopic mortise and lateral views showing plate fixation using a 2.0 mm plate performed by a posteromedial approach. (g and h) Mortise and lateral view radiographs 2.5 years postoperative showing fracture united (i) Clinical photograph showing a well healed surgical incision at 2.5 years followup

were treated with a posteromedial approach. Surgery occurred at an average of 8.5 days postinjury. Mechanism of injury including five motor vehicle accidents, three occurred from a fall from a height, one injury was the result of the foot being crushed by a log truck and one patient fell while walking. Six patients had a medial subtalar dislocation at presentation, with two being open dislocations. 4/10 patients had other associated foot or ankle injuries including fracture of the cuboid, fracture of the lateral malleolus, navicular avulsion fracture and lateral process talus fracture. Due to the high energy mechanism of injury 5/10 patients had musculoskeletal injuries that were not of the foot or ankle. Followup averaged 4.8 years (range 1–10 years). Subtalar motion was 40% of the contralateral foot. Ankle range of motion averaged 80% of the contralateral ankle. The range of motion tended to be worse in cases with associated dislocation. Two patients, both with associated medial subtalar dislocations, had medial calcaneal nerve paresthesias at the initial examination with 1 fully resolved at the last followup. No patients reported any symptoms associated with the FHL. Two secondary procedures were performed. One patient had an ankle cheilectomy performed, and 1 patient underwent a gastrocnemius recession. Most importantly, No arthrodesis procedures were necessary in this patient series.

Discussion

In total 35 cases of posterior talus fractures have been reported.[1-17] In a detailed review of these reports, it appears 17 are medial tubercle fractures with no articular involvement, six are posterior process fractures involving the subtalar articulation while 12 are true fractures of the posteromedial talar body entering both the ankle and subtalar articulations. 22/35 fractures were missed on initial evaluation. CT scans are essential in cases where posterior talar body fractures are suspected to aid in diagnosis and gain further understanding of fracture pattern and type. Of the 35 reported cases 17 were treated nonoperatively. 12/17 fractures treated nonoperatively went on to develop nonunion. Medial tubercle fractures may be treated with excision as they are extraarticular and have a high rate of nonunion. Of the 17 cases of medial tubercle fractures identified 13 were treated nonoperatively with 11 ultimately requiring excision of the fracture fragment. Two patients had associated tarsal tunnel syndrome and required release at the time of excision. Due to high complication rates medial tubercle fractures should be treated with acute excision as they are extraarticular and have an unacceptably high rate of complications with nonoperative treatment.

Figure 4: (a) X-ray anteroposterior and (b) lateral fluoroscopic view showing a medial subtalar dislocation with associated posterior talus fracture sustained in a motorcycle accident. (c) Lateral fluoroscopic view obtained postreduction showing comminuted fracture of the posterior talus. (d) Mortise fluoroscopic view after an external fixator was placed for temporary stabilization until soft tissues were amenable to surgery. (e) Axial and (f) lateral computed tomography images showing a posteromedial talus fracture with fracture extending into both the ankle and subtalar articulations. (g) Lateral and (h) mortise images showing anatomic reduction and fixation of the fracture and both articulations with mini fragment plate and screw fixation

Posterior process fractures involve the subtalar joint articulation. These are more significant injuries. 5/6 cases were treated operatively. Three patients reported stiffness of the subtalar joint and 1 patient required surgical arthrodesis of the subtalar joint. As this fracture involves the subtalar joint, surgical fixation is necessary to establish normal subtalar joint anatomy.

Twelve patients have been reported with true posteromedial talus body fractures that enter into both the subtalar and ankle articulations. Six were treated operatively. Three patients had no reported complications. One developed arthritis of the ankle while two patients developed arthritis of the subtalar joint. None of the patients in prior reports were treated with mini-fragment fixation. This may allow for a more accurate reduction of the small articular components that could, in theory, explain the absence of arthritis in our 10 patient series.

Giuffrida *et al*. in their study reported on a series of six patients with posteromedial talar body fractures.[14] In their series, all were high-energy injuries, and all were associated with a medial subtalar joint dislocation. Four patients had the initial diagnosis missed. Three patients were treated with closed reduction and casting. Five of six patients revealed persistent subtalar instability. Four required subtalar joint arthrodesis, one required tibiotalar calcaneal arthrodesis. The lone patient who did not require an arthrodesis refused treatment even though an arthrodesis was felt to be necessary. Due to these unacceptably high rates of nonunion and complications, surgical treatment is indicated for these injuries.

Six patients in our series had fractures associated with medial subtalar dislocations with two being open injuries. It is essential that CT scanning is performed on all patients that present with dislocations of the hindfoot. Prior studies have revealed the superiority of CT to identify fractures associated with subtalar dislocation, even when radiographs are normal.[18,19]

In our series, all patients had their fractures identified acutely. CT scans were performed to clearly identify the extent of the fracture and fracture type and plan surgical repair. All patients had surgical fixation using a posteromedial approach, [Figure 4]. No patients required arthrodesis in our series.

Conclusions

Fractures of the posteromedial talar body are rare injuries. A high index of suspicion is necessary for accurate diagnosis. CT scans should be performed in all patients with hindfoot dislocations and in patients where a clinical suspicion for fracture of the posterior aspect of the talus exists. Successful surgical treatment of fractures of the posteromedial talar body is possible using the posteromedial approach and direct articular reduction of both the ankle and subtalar articulations. Compared to historic reports, operative fixation leads to improved outcomes and prevents hindfoot instability and should be performed in all posteromedial talus body fractures.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

Michael Swords is a member of the Foot and Ankle Expert Group and the Foot and Ankle Education Task Force of AOTrauma, a nonprofit organization. As such they receive support for travel and housing to meetings of the respective groups. Michael Swords is a consultant for Depuy Synthes. No financial conflict of interest results for this review article.

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