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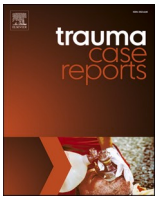

Case Report

Posteromedial approach for the surgical management of posterior talar body fractures

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ABSTRACT

Posterior talar body fractures are challenging with regards to optimal surgical approach, especially fractures involving the articular surface for which anatomical reduction is required. These fractures are often reduced surgically utilizing either the medial malleolus osteotomy (MMO), or posteromedial approach (PMA). While the MMO exposes the medial aspect of the body of the talus and avoids compromising the blood supply to the anterior talus through the deltoid ligament, it provides minimal access to the posterior process and to the posteromedial talar dome. Furthermore, by definition this approach results in iatrogenic damage to the articular cartilage and a trace loss of bone at the osteotomy site, which may preclude an anatomic reduction. The PMA on the other hand provides visualization of the entire posterior talus, including the posterior process and posterior aspect of the talar dome, thus it may indicated for appropriate reduction and visualization of fractures of these sites. This article describes the technique and reports on outcomes in the largest series of patients reported in the literature to our knowledge who sustained posterior talar body fractures that were managed through this approach.

Introduction

Case presentation

Technique

Patients were positioned in the lateral decubitus position with the injured extremity down and the contralateral extremity up and in 90-degree knee flexion (Fig. 1a). This positioning facilitates intraoperative imaging and access for dual posteromedial and anteromedial incisions [1].

A longitudinal skin incision was made along the medial border of the Achilles tendon, over the subtalar joint, followed with superficial dissection. The flexor hallucis longus tendon (FHL) was identified. The dissection was extended between the FHL tendon medially and the Achilles tendon laterally. The FHL tendon sheath was incised allowing retraction of the tendon anteriorly with the neurovascular bundle, exposing the inter-tubercle groove, and enhancing the visualization of the fracture lines and articular surface. A posteriorly based carbon fiber distractor was used for enhancing visualization of the tibiotalar and subtalar joints (Fig. 1b).

The fractures were anatomically reduced and temporarily fixed with anterior to posterior Kirschner wires. An additional anteromedial approach was utilized in some cases as needed. Once anatomical reduction was obtained, fractures were fixed with posterior

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to anterior screws or a plate/screws construct. The FHL sheath, deep fascia and subcutaneous tissue were closed using absorbable sutures followed with 3.0 Nylon for skin. Sterile dressing and below knee splint were applied. Patients were instructed to be non-weight bearing for 10–12 weeks. Range of motion exercises of the ankle and subtalar joints started as early as wound healing. All patients provided written consent.

Patient 1

A 58 year old male fill off his bike and sustained a left subtalar fracture dislocation. Initial radiographs showed posterior comminuted talar body fracture with extrusion of the posteromedial fragment and a medial malleolus fracture (Fig. 2). Computed tomography (CT) scan was obtained for preoperative planning (Fig. 3). Once swelling improved on day 16 he underwent operative fixation via dual PMA and AMA approaches. The medial malleolar component was mobilized to visualize the talar dome. Via PMA, and upon mobilization of the FHL tendon, which was coursing within the fracture and blocking reduction, the dislocated posterior fragment was identified fully. The fracture was fixed posterior to anterior using three 2.4 mm screws through a 2.0 mm plate (Fig. 4a). The patient was discharged on day 3 postoperative. Early postoperative course was unremarkable and full union was achieved. At 11 months postoperatively, radiographs demonstrated posterior talus collapse. The patient was relatively asymptomatic and declined any further treatment (Fig. 4b). At 2 years 6 months postoperatively, the patient scored 75 of 84 points on the Foot and Ankle Ability Measure (FAAM) Activities of Daily Living Scale (ADLS) and reported 95 % ability to perform daily activities.

Fig. 1. a. Left lateral decubitus position, right contralateral leg flexed to 90 degrees on well-padded Mayo stand, **b**. Posteriorly based distractor, intraoperative images (left) and florouscopy (right).

Fig. 2. Initial post-injury mortise (left) and lateral (right) radiographs demonstrating a posterior comminuted talar body fracture with extrusion of the posteromedial fragment as well as a medial malleolar fracture.

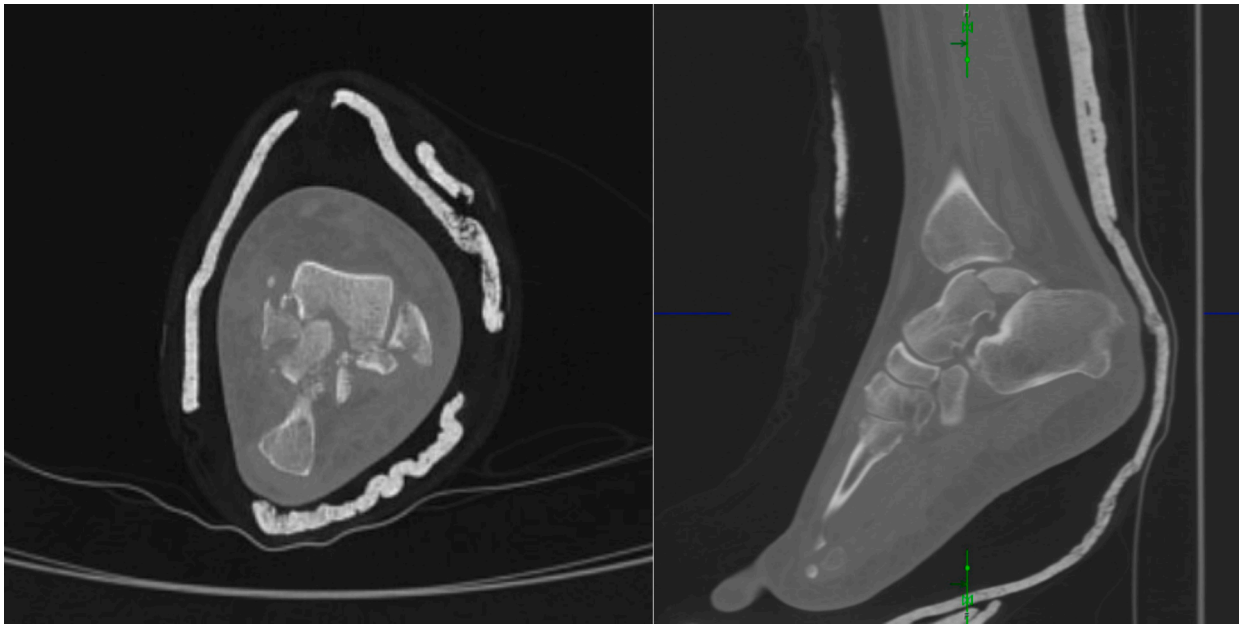

Fig. 3. Preoperative axial (left) and sagittal (right) computed tomography without contrast noting a coronally oriented displaced fracture of the talar dome/body.

Patient 2

A 31 year old female patient fell off the edge of a sea wall and caught her left foot in rocks. Radiographs and CT scan revealed medial malleolus and posterior talar body fracture with a dislocated posterior process fragment (Fig. 5). The patient underwent operative fixation via dual PMA and AMA approaches. Through the PMA the fracture exit point of the posterior talar body was

Fig. 4. **a** Representative intraoperative fluoroscopic AP (left) and lateral (right) images demonstrating reduction and fixation, **b** Postoperative radiographs at 1 year postoperative demonstrating posterior talar collapse and broken screws.

identified with respect to the more stable segment anteriorly. Antegrade and retrograde screws were used for fixation (Fig. 6). The patient was discharged on day 1 post-operative without complications. At 1 year 4 months postoperatively, the patient was experiencing occasional click and soreness in the front of her ankle. Radiographs demonstrated fracture union with intact implants and no evidence of collapse. At 1 year 9 months, the patient scored 80 of 84 points on the FAAM ADLS and reported 95 % ability to perform daily activities (Fig. 7).

Patient 3

A 58 year male patient fell off a ladder and sustained a left ankle injury. Radiographs and a CT scan revealed an open left comminuted fracture dislocation involving the talar head and posterior talar body (Fig. 8). The patient was closed reduced, irrigated, and debrided and an external fixator was applied. The patient's soft tissues allowed for operative intervention via a PMA. During operative intervention, the patient's posterior talar body was noted to be in 3 separate osteochondral fragments. A posterior fragment with its attachment to the FHL groove and an osteochondral fragment consisting of 80 % of the subtalar joint posterior facet were identified and removed, and then pieced together on the back table utilizing point to point reduction clamps and buried subchondral Kirschner wires. Reduction was achieved followed by two posterior to anterior lag screws (Fig. 9). The patient was discharged on day 6 postoperative without complications. At 1 year 3 months, he reported some start up stiffness and soreness with improvement in his symptoms with use of a dynamic AFO. Radiographs demonstrated some collapse of his subtalar joint and broken screws (Fig. 10). At 1 year 3 months, the patient scored 68 of 84 points on the FAAM Activities of Daily Living Scale and reported 60 % ability to perform

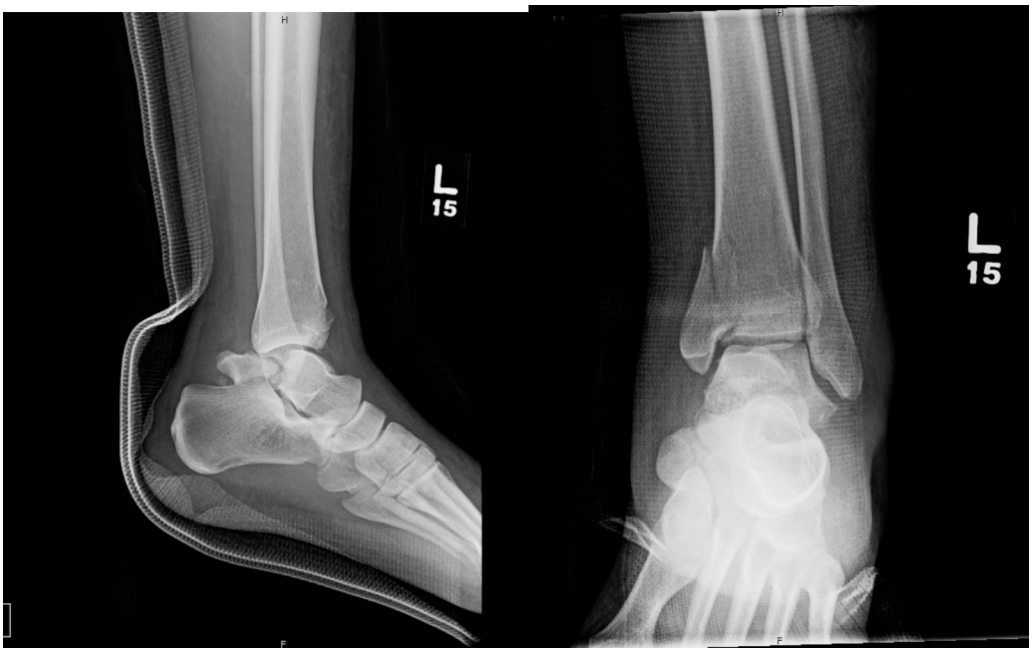

Fig. 5. Injury films patient two, medial malleolus and posterior talar body fracture with a dislocated posterior process fragment.

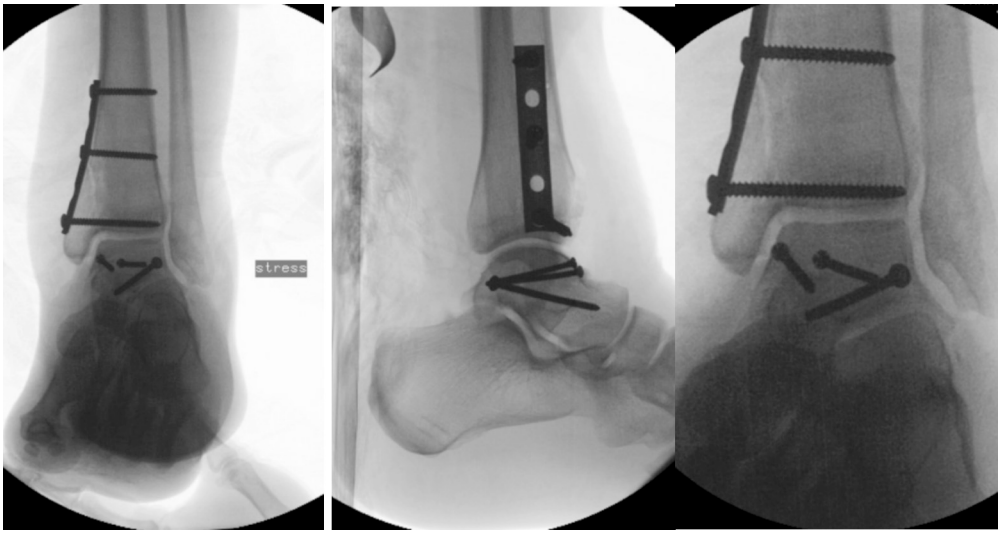

Fig. 6. Intraoperative florouscopic images demonstrating AP and PA screw fixation.

daily activities.

Patient 4

A 32 year female experienced a high-speed motor vehicle crash and sustained injuries to her left foot. Radiographs and CT scan revealed a multi fragmentary talar neck and body fractures with significant amounts of comminution present on the posteromedial body (Fig. 11). The patient underwent operative fixation via a dual PMA and AMA approaches to the posterior talar body in conjunction with an anterolateral approach to the talar neck. During operative fixation, a segmental posterolateral fragment of the posterior dome as well as a posteromedial fragment was noted (Fig. 12). This fragment was reduced relative to the posterolateral piece, utilizing the lateral side to visualize the articular surface. Fragments were secured first utilizing Kirschner wires then posterior to anterior lag screws. At 1 year postoperative, radiographs demonstrated fracture fixation without evidence of hardware failure or collapse of the talar dome (Fig. 13). At 1 year 4 months, the patient scored 64 of 84 points on the FAAM Activities of Daily Living Scale and reported 70 % ability to perform daily activities.

Fig. 7. Postoperative follow up images at 1 year 9 months.

Fig. 8. Injury films demonstrating open left comminuted fracture dislocation involving the talar head and posterior talar body.

Discussion

This article reports on four cases of posterior talar body fractures treated through the posteromedial approach, the largest reported in the literature to our knowledge. Our data showed encouraging results with surgical reduction of posterior talar body fractures utilizing the PMA at 1 year follow up. Only one patient's radiographs demonstrated some posterior talus collapse, however this patient was relatively asymptomatic and declined further treatment.

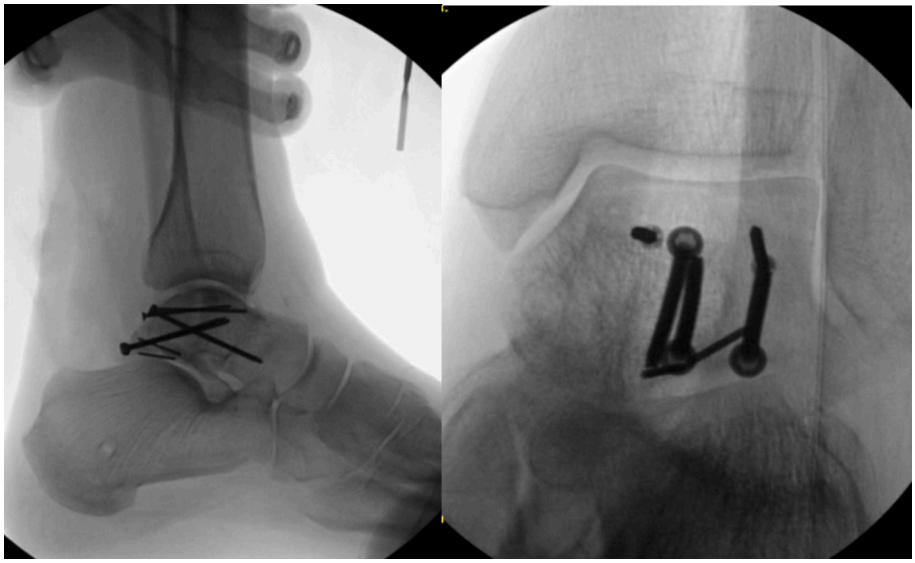

Fig. 9. Intraoperative films demonstrating screw and buried Kirschner wire fixation.

Fig. 10. Follow up standing radiographs demonstrating postoperative talar body fracture fixation with some posterior talar body collapse and two broken screws.

Talar fractures are rare [2], high energy fractures [3] which pose several challenges. Close to 60 % of the talar surface is covered by articular cartilage [4,5], resulting in a tenuous blood supply, increasing the risk of avascular necrosis. Talus fractures are associated with high rates of post-traumatic hind foot arthritis, osteonecrosis, malunion, or nonunion [6,7]. Optimizing surgical management of these injuries is critical.

Fig. 11. Injury films, multi fragmentary talar neck and body fractures with significant posterior talar body comminution.

Fig. 12. Intraoperative fluoroscopic images of fixation construct.

Fractures of the posterior talar body are commonly reduced surgically utilizing medial malleolus osteotomy (MMO) [8], or posteromedial approach (PMA) [1]. The MMO exposes the medial aspect of the body of the talus, allowing for exposure of the body as well as complex talar neck fractures with posterior extension. MMO provides minimal access to the posterior process and to the posteromedial talar dome, results in iatrogenic damage to the articular cartilage and a trace loss of bone at the osteotomy site, precluding anatomic reduction.

The PMA provides visualization of the entire posterior talus, including the posterior process and posterior aspect of the talar dome, and allows for improved exposure for anatomical reduction of intra-articular fractures of the tibiotalar and subtalar joints. Previous studies have suggested that posteromedial approach, especially with distraction with gastrocnemius recession, may provide similar or enhanced visualization of the entire posterior talar body compared to MMO [9]. In our patients presenting with a medial malleolus

Fig. 13. Follow up standing postoperative radiographs.

fracture, the posterior fracture fragment was only able to visualize via the posterior incision.

Obtaining access posteriorly facilitates placement of posterior to anterior lag screws for fixation, which provide the strongest and most robust fixation of the talus in biomechanical studies [10].

There are no clinical series for fractures treated utilizing the PMA to our knowledge. We hope that our highlighted cases will benefit other surgeons in optimizing surgical management of posterior talar body fractures and provide insight into this viable alternative to MMO.

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CRediT authorship contribution statement

Meera M. Dhodapkar: Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization. **Motasem Salameh:** Writing – review & editing, Writing – original draft, Visualization, Investigation, Conceptualization. **Brad J. Yoo:** Writing – review & editing, Writing – original draft, Supervision, Investigation.

Declaration of competing interest

Meera M Dhodapkar (Richard K. Gershon, M.D. Fund at Yale University School of Medicine, Associate Editor Visual Abstracts North American Spine Society Journal), Motasem Salameh (None), Brad J Yoo (None).

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