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Presentation, Diagnostic Dilemma, and a Novel Approach of Fixing a Cedell's Fracture – A Case Report

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Learning Point of the Article:

A high clinical suspicion supported with 30° external rotation lateral radiographs for the diagnosis; a mandatory CT scan for fracture specific treatment planning; and an internal fixation of avulsion fractures with comminution by a mini open approach gives good near native functional outcomes in Cedell's fracture, avoiding the potential complications of conventional approaches, excision of fragments, or conservative management.

Abstract

Introduction: Fractures of the posteromedial tubercle of talus are one of the rarer fractures encountered in clinical practice. They mostly present like an ankle sprain which often leads to missed injuries and delayed diagnosis. We present one such case, incorporating the dilemmas associated with its diagnosis, treatment, approach to the treatment and a novel way of fixation and the outcome. Not much of literature has been published in this regard.

Case Presentation: A 38-year-old Indian military man presented with pain and swelling over posteromedial aspect of his right ankle for 7 days, following an awkward landing during one of his training drills. He was unable to bear weight on the affected limb. On examination, passive flexor hallucis longus tendon movement was painful. A 30° external rotation lateral view radiograph of the ankle showed a hypolucent shadow posterior to the posterior talar process. An avulsion fracture of the posteromedial tubercle of talus was confirmed on computed tomography scan. Internal fixation for the fracture was done by a novel mini open technique and a strict rehabilitation protocol was followed. Twelve weeks postoperatively, he was allowed to resume his work and X-ray confirmed complete bony union. The patient at 6 months follow-up did well with full range of ankle motion.

Conclusion: First, a high clinical suspicion and vigilance are required for the diagnosis of a Cedell's fracture. Missing such injuries could lead to varied morbidities. There is no blanket treatment protocol for such fractures. The ideal treatment should be customized as per the fracture morphology; and internal fixation is one of the options. The mini open technique is a viable approach to fix such fractures.

Keywords: Talar process fractures, Cedell's fracture, ankle sprain.

Introduction

Since the early descriptions by Anderson [1] and others of the "aviator's astragalus," fractures of the talus have earned a reputation as a problematic fracture and are generally thought to be relatively uncommon [2].

The posterior process of the talus is comprised of medial and lateral tubercles and the anatomy of fractures of the posterior process is deceptively complex [2].

Fracture of the medial tubercle of the posterior process was first described in 1974 by Cedell [3] and is sometimes referred to as Cedell's fracture. They usually present with features comparable to an ankle sprain which often leads to missed injuries and

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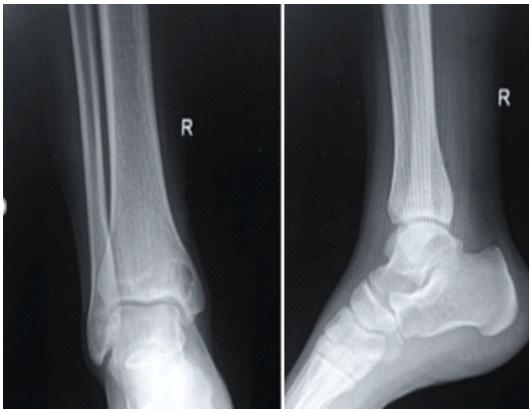

Figure 1: Anteroposterior and lateral radiographs of the patient showing apparent no bony abnormality.

Figure 2: 30° external rotation lateral view radiograph of the ankle, which showed a hypolucent shadow posterior to the posterior talar process.

delayed diagnosis [4, 5, 6].

In this report, we present a case of fracture of the medial tubercle of the posterior process of talus, incorporating the dilemmas associated with the diagnosis, treatment options, and approach to the appropriate treatment in such a fracture; a novel way of fixation of posteromedial tubercle fracture of talus and the outcome.

Case Report

A 38-year-old male military personnel presented to our outpatient department with a complain of pain over the posteromedial aspect of his right ankle associated with swelling, for a duration of seven days following an awkward landing during one of his training drills resulting in forced pronation and dorsiflexion of his ankle. He was unable to bear weight on the affected limb due to pain.

On physical examination, tenderness was elicited diffusely over the posteromedial aspect of his right ankle, however maximum point of tenderness being more posterior compared to the site of a typical sprain. The posteromedial ankle pain intensified with forced plantar flexion but not dorsiflexion. There was pain associated with active flexion of the great toe. Passive flexor hallucis longus tendon movement was also painful.

He had a radiograph, that was done elsewhere four days after the trauma which did not reveal any gross bony abnormality (Fig. 1). We ordered for a 30-degree external rotation lateral view of the ankle7, which showed a hypo lucent shadow posterior to the posterior talar process (Fig. 2).

A computed tomography (CT) of the ankle was scheduled for a more detailed assessment, and a fracture of the posteromedial tubercle of talus was found on CT scan. As it was a displaced avulsion fracture with some comminution (Fig. 3), we planned for an internal fixation of the fracture. The patient had no other medical comorbidity, and all blood investigations were within normal limits. Informed patient consent was taken for the procedure.

Under spinal anaesthesia, the patient was positioned prone on a fluoroscopy assisted table. Considering the vulnerability of talar perfusion, percutaneous fixation of the fracture was planned to reduce the chances of osteonecrosis. No tourniquet was used. A superficial 5mm vertical stab incision was made, about 2 mm proximal to the tip of the medial malleolus and just medial to the Achilles tendon, and the bone was reached by minimal soft-tissue dissection using mosquito artery forceps utilizing the interval between the FHL and Achilles tendon. A 2 mm guide wire was used as a joystick to facilitate fracture reduction under fluoroscopic guidance (Fig. 4). After fluoroscopic confirmation of reduction, the fracture was provisionally fixed with the guide

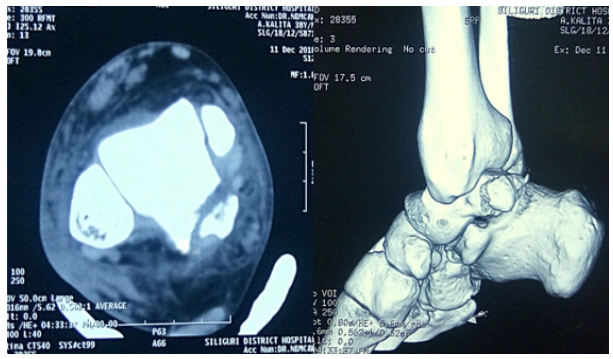

Figure 3: An axial cut section and a 3D reconstructed computed tomographic scan showing a posteromedial tubercle fracture of the talus.

Figure 4: Per-operative image showing a 2mm guide wire being used as a joystick for fracture reduction using a cannulated drill bit as a sleeve for tissue protection.

Figure 5: Intraoperative fluoroscopic image showing provisional fracture fixation with the guide wire.

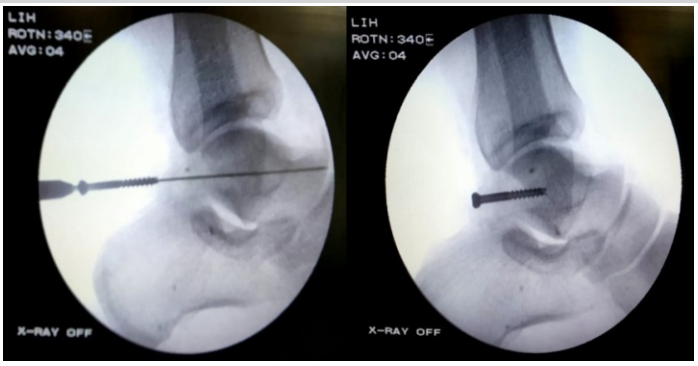

Figure 6: Intraoperative fluoroscopic images showing provisional fixation using guidewire, and lag compressive fixation of fracture using 3.5 mm partially threaded cannulated cancellous screw.

Figure 7: (a and b) Postoperatively, the patient was kept in a below knee pop slab incorporating the great toe for 2 weeks followed by non-weight-bearing crutch walking in a below knee pop cast after stitch off.

wire (Fig. 5), over reamed and a lag compressive fixation was achieved using an appropriately sized single partially threaded cannulated cancellous screw (Fig. 6). Impalement of FHL was avoided by ensuring absence of guide wire movement upon passive great toe movement. Reduction was reconfirmed under fluoroscopy post fixation.

Postoperatively, the limb was immobilized in a below knee plaster of paris back slab incorporating the great toe, for a duration of two weeks. A below knee cast was done after stitch off, with the foot in neutral rotation and the patient was mobilized by non-weight bearing crutch walking (Fig. 7 A & B). Plaster cast was removed and non-weight bearing range of movement exercises for the ankle were begun at four weeks postoperatively. Patient was allowed to bear partial weight at eight weeks postoperatively when the pain had subsided completely. Full weight-bearing was allowed after another 2 weeks, when partial weight-bearing remained uneventful. Twelve weeks postoperatively, he was allowed to perform all activities from our side with no residual pain and X-ray confirmed satisfactory position with good progression of bony union (Fig. 8).

Patient at six months follow up did well with no residual pain and full range of ankle motion (Fig. 9).

Discussion

Even though the talus is the second most common tarsal bone to undergo fracture [2], yet it comprises only 0.32% of all the fractures in the body [8]. Process fractures of talus are even more rarer, with the lateral process of talus being the most common process to undergo fracture. Fracture of the entire posterior process of the talus is an uncommon injury and either the lateral or the medial tubercle usually undergoes fracture [2].

Due to the complex anatomy of the fracture involving the posteromedial process of the talus, it is often missed on routine anteroposterior and lateral radiographs. Moreover, due to to similar clinical presentation, it has a propensity to be misdiagnosed as an ankle sprain. All these often lead to a delay in the diagnosis, and thus, complications prevail in the form of persistent posteromedial ankle pain, non-union, malunion,

Figure 8: Radiograph confirming complete bony union at 12 weeks post-operative follow-up.

Figure 9: Patient at 6 months follow-up with bilateral comparable function and range of motion of ankle joint and no residual pain.

subtalar arthritis, posteromedial ankle impingement, and instability [3, 6, 9, 10, 11].

To address this diagnostic dilemma due to its very rare occurrence, its similarity to ankle sprains, and its obscurity on routine radiographic views, Ebraheim et al. suggested 30° external rotation lateral view for a better delineation of posteromedial tubercle fractures [7]. Computed tomography scan must be done in all suspected cases of Cedell's fracture [4].

The ideal treatment for posteromedial tubercle fracture of talus has been another area of dilemma for years now. Conservative treatment was considered the mainstay; however, studies with long term-follow-up revealed that large intra-articular fragments more frequently ended up into mal union or non-union, if treated conservatively [12, 13, 14, 15]. Moreover, it was seen that in conservatively treated cases, up to one-third of the patients may develop avascular necrosis and up to 75% of the patients initially treated conservatively may subsequently require excision of the fragments [4].

Wolf and Heckman reported surgical excision of the fracture fragment as the best treatment of posteromedial tubercle fracture of talus [16]. The posteromedial tubercle provides attachment to the posterior third of the deltoid ligament superiorly and the medial limb of the bifurcate talocalcaneal ligament inferiorly. Furthermore, the undersurface of the combined tubercles articulates with 25% of the posterior facet of the calcaneus. Thus, surgical excision of the posteromedial tubercle fracture fragment often leads to posteromedial instability [8].

In 2016, Watanabe et al. defined the concept of optimal treatment for specific fracture types depending on computed tomographical assessment of fracture fragment size, displacement, comminution, and also incorporating the duration of the fracture. Internal fixation to achieve anatomical reduction was suggested for large fracture fragments involving whole of the tubercle and a displacement of >2 mm on CT scan [5].

Once fixation of posteromedial tubercle fractures of talus has been established as a treatment modality, the approach to fixation presented with another dilemma over the years. Open surgical treatment through the standard posteromedial approach needs mobilization of the neurovascular bundle [17], which increases the risk of neurovascular damage. Opening up of the fracture site has resulted in increased incidences of osteonecrosis of the posteromedial fragment [4, 8, 17]. Considering the indications of internal fixation in our case and complying with the risk factors for osteonecrosis, and a potential neurovascular injury with the standard approach, the mini-open technique of internal fixation that we have applied yielded near native functional outcome.

Although we have not encountered any complication with this procedure, the major complication that could arise is an injury to the tibial neurovascular bundle. It is recommended to keep the ankle in plantar flexion during the procedure that relaxes the neurovascular bundle. Furthermore, strict adherence to the anatomical landmark usually does not interfere with the neurovascular bundle.

Conclusion

A high clinical suspicion and vigilance is required for the diagnosis of a posteromedial tubercle fracture of talus. With classical tenderness at one finger breadth posterior to the tip of medial malleolus aided with 30° external rotation lateral view of the ankle and CT scan, an early diagnosis can be made possible. The ideal treatment should be customized as per the fracture morphology; and internal fixation of Cedell's fractures is a definite option with near native functional results. The mini open technique is a viable approach to fix posteromedial tubercle fractures of talus, to do away with the potential complications of the conventional posteromedial approach.

Clinical Message

This article would facilitate the understanding, early diagnosis, and formulation of appropriate treatment regimens for posteromedial tubercle fractures of talus.

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

Conflict of interest: Nil **Source of support:** None

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