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Calcaneal avulsion fracture treated with cancellous screws and suture anchors

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Abstract

A 64 year old female patient presented with history of slipping while climbing downstairs.

On examination, there was a swelling proximal to insertion of Tendo Achilles. Radiograph showed Type- 2 calcaneal avulsion fracture (Beavis et al., classification).

She was treated with open resuction and fixation with a cancellous screw and two suture anchors.

Partial weight bearing was started by 8 weeks and full weight bearing was started at 12 weeks. At present, the patient is waking comfortably without any pain or limping, doing her daily routine activities. Karlsson Ankle function Score is 60.

Suture anchor augmentation of cancellous screw fixation is an excellent mode of fixation of calcaneal avulsion fractures, especially in osteoporotic bones. Fixation strength with suture anchors and screw is double that of screw fixation alone. Mobilisation can be started early when compared with screw fixation alone. A drawback of this method of fixation is the cost of implants.

Keywords: Avulsion fracture, calcaneum, internal fixation, suture anchors

Introduction

Avulsion fractures of the calcaneal tuberosity are rare and infrequent injuries. Recent studies have demonstrated that avulsed calcaneal fractures account for 1.3% to 2.7% of all calcaneal fractures.[1,2]

Failure of Tendo Achilles can occur by rupture of the tendon or by avulsion of posterior tuberosity of calcaneum where it inserts. Both type of injuries can be caused by the same loading mechanism. Strong contraction of triceps surae combined with an external loading of the foot can lead to Achilles tendon rupture[3] or calcaneal avulsion.[4,5]

Avulsion fractures of the calcaneal tuberosity are usually caused by sudden muscular contraction of the achilles tendon when the heel is flat on the ground. The achilles tendon has a broad based insertion on the calcaneus, a braided and coiled anatomical pattern with 90^0 rotated collagen fibers, and a variable and sudden distribution of force on each contraction of the triceps. These result in patterns of avulsion fracture which are as diverse as the potential patient treatment options.[6-8]

Conventional treatments for calcaneal avulsion fracture are fixation with cancellous screws, K wires and tension band wiring.[10] The recent options include augmentation of screw fixation with suture anchors[9,11] and locking plates in osteoporotic bones.[12]

Case Report

A 64 year old lady presented to the out patient department with history of slipping while climbing downstairs following which her left heel hit the edge of the step. She developed pain and swelling over the back of heel. She was taken to a nearby hospital and was diagnosed to have fracture heel bone. She was immobilised in a dorsal below knee Plaster of Paris slab and referred to us for further management. There was no history of diabetes mellitus, gout or chronic tendinopathy.

On examination, there was a swelling behind the ankle 4 cm proximal to insertion of Tendo Achilles. Skin over the swelling was tense and dark. There was no local warmth and the area around the swelling was tender. Thompson's test was positive. Other joints were normal. Radiographs showed Type- 2 calcaneal avulsion fracture (Beavis et al., classification).

Patient was planned for open reduction and internal fixation with cancellous screws. Suture

Figure 1. Radiograph of ankle, lateral view, showing the Type 2 calcaneal avulsion fracture. (Beavis et al., classification)

anchors were kept as a back up. The fracture was fixed with one cancellous screw. There was no place to insert a second screw due to the comminution and the single screw was not holding the fragment adequately. So two swive lock suture anchors were used to augment the fixation. These suture anchors held the calcaneal fragments firmly.

In the immediate post operative period, an anterior POP slab was given in plantar flexion for two weeks. At two weeks, sutures were removed and a fresh POP slab was given in neutral position of ankle for another four weeks. At six weeks, range of motion exercises were started.

By eight weeks, partial weight bearing was started and full weight bearing was started at by 12 weeks. At present, the patient

Figure 2. Per operative photograph showing insertion of the suture anchors

Figure 3. Per operative photograph showing the suture anchors in situ

Figure 4. Post operative radiograph of the ankle showing the cancellous screws and suture anchors in situ

is waking comfortably without any pain or limping. The power of dorsiflexion and plantar flexion is comparable to the normal limb. Patient is doing his daily routine activities. Karlsson[18] Ankle function Score is 60.

Discussion

Calcaneal tuberosity fractures have traditionally been classified into 2 types, depending on the location and involvement of the insertion of the Achilles tendon[13, 14.] However, studies have suggested that differences in the behavior of the fracture fragments are due to normal variations in the site of insertion of the Achilles tendon.[14-16]

Beavis et al., have recently proposed a revised classification system for calcaneal avulsion fractures, in which a type I fracture represents a true avulsion fracture or "sleeve" type tuberosity fracture as described by Rothberg. A type II fracture represents a

beak type of avulsion fracture, in which, the oblique fracture line runs posteriorly from a point immediately posterior to the posterior margin of the posterior facet of the subtalar joint (superior to the posterior arm of the lines that intersect to form Böhler's angle). Type III fractures, which are rarely seen, represent infra bursal avulsion fractures that propagate through the middle third of the posterior tuberosity of the body of the calcaneus.

There are various methods of fixation of calcaneal avulsion fractures, but there is no consensus on the ideal method of fixation. Study by Khazen GE et al., have shown that suture anchor augmentation significantly improved the strength of screw fixation in the calcaneal posterior tuberosity avulsion fractures.[11] The specimens treated with lag screws alone failed at 251.3 N(range 66 to 459), whereas specimens repaired with lag screws and suture anchors failed at 441.6 N(range 274 to 661; p = 0.01 N).[7]

Calcaneal fractures, in general, are associated with a high incidence of skin and soft tissue compromise. Fracture blisters and deep contusions are common and play an important role in treatment decisions. Their presence often delays the opportunity to operate because of the high risk of infection associated with the presence of acute fracture blisters. On the other hand, skin complications due to delayed treatment have also been reported in the literature.[19] Fortunately our patient did not have any complications and the wound healed well.

Conclusion

Suture anchor augmentation with cancellous screw fixation is an excellent mode of fixation of calcaneal avulsion fractures, especially in osteoporotic bones. Fixation strength with suture anchors and screw is double that of screw fixation alone. In addition, mobilisation can be started early. The cost of implants can be a limiting factor preventing the routine use of this method of fixation.

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