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Case Reports and Series

Suture Anchor Fixation for Fifth Metatarsal Tuberosity Avulsion Fractures: A Case Series and Review of Literature

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A R T I C L E   I N F O

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A B S T R A C T

Fifth metatarsal tuberosity avulsion fractures are common. Despite good outcomes with nonoperative treatment, acute fractures with displacement, intra-articular involvement, comminution, or painful nonunion have been reported to benefit from early open reduction and internal fixation, especially in athletes. No consensus has been reached regarding the best surgical fixation technique. We present a case series of 4 patients with displaced fifth metatarsal tuberosity avulsion fractures and an innovative technique of fixation for the tuberosity avulsion fractures using a suture anchor.

Fifth metatarsal base fractures are among the most common injuries of the foot (1). Although the healing after most of these injuries is uneventful, some can cause significant morbidity owing to nonunion, delayed union, or refracture (2,3). Despite being extremely common, no agreement has been reached in the reported data regarding the classification and the most optimal method of treatment of this fracture. This disparity exists largely because of differences in nomenclature, subtle variations in bone structure, and the multiplicity of external forces that can cause injuries in the proximal end of this unique bone (1–4). Several classification systems are in use, such as those from Torg (5) and Stewart (6); however, the most commonly used has been the classification by Lawrence and Botte (7). The Lawrence and Botte classification divides the injury into 3 types according to the anatomic subgroup: tuberosity avulsion fractures in zone 1, metaphyseal–diaphyseal junction fractures (Jones fractures) in zone 2; and proximal diaphyseal fractures in zone 3 (7).

Although most tuberosity avulsion fractures (zone 1) will heal successfully with nonoperative treatment, several investigators have shown that the tuberosity fractures can require ≤12 weeks to consolidate (8,9). In addition, acute tuberosity fractures in athletes, fractures with displacement of >2 mm, intra-articular incongruity >30% of the joint, comminution, and painful nonunion have been reported to benefit from open reduction and internal fixation (2,7,10–16). Surgical intervention can decrease the bone healing time by providing adequate compression at the fracture site (16). This can reduce the a prolonged “down time” for high-functioning athletic patients to prevent muscle atrophy and loss of conditioning.

However, no unanimity has been reached regarding the preferred modality of fixation for tuberosity fractures. The recommended methods include fixation with Kirschner wires, tension band wiring, cancellous screws, and locking compression plating (7,10–14,16–18). Often, these fixation methods have been complicated by symptomatic implant prominence, fragmentation of the avulsed tuberosity fragment when using screw fixation, and implant and/or wire removal.

Therefore, we describe the cases of 4 patients with displaced fifth metatarsal tuberosity avulsion fractures and an innovative technique of fixation for the tuberosity avulsion fractures using bioabsorbable suture anchors (Bio-Corkscrew™, 5.5 × 14.7 mm; Arthrex GmbH, Munich, Germany).

Case Report

We describe a series of 4 patients with displaced comminuted fifth metatarsal tuberosity fractures who presented to us from July 2011 to April 2012. They were followed up for a mean of 27.3 (range 24 to 31) months. Of the 4 patients, 1 was male and 3 were female. Their mean age was 45.4 (range 18 to 72) years. All our patients had sustained

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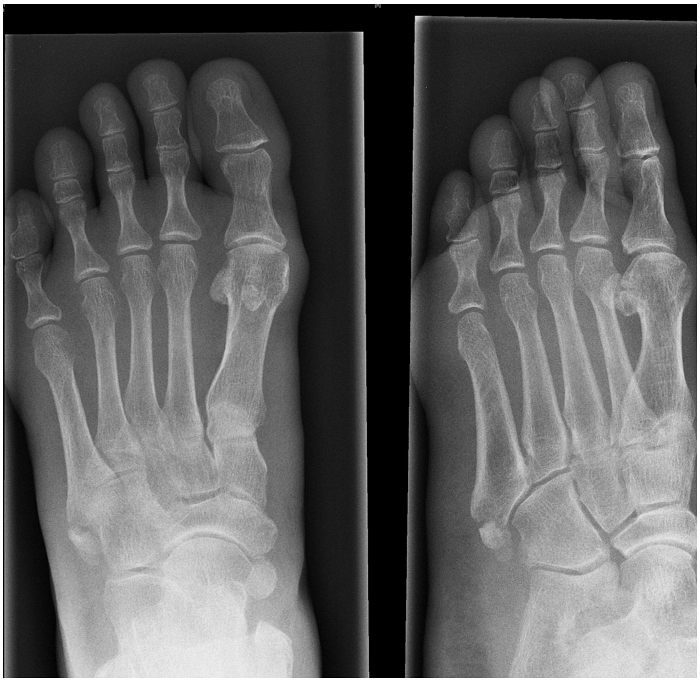

Fig. 1. Standard anteroposterior and oblique radiographs showing the displaced fifth metatarsal base fracture.

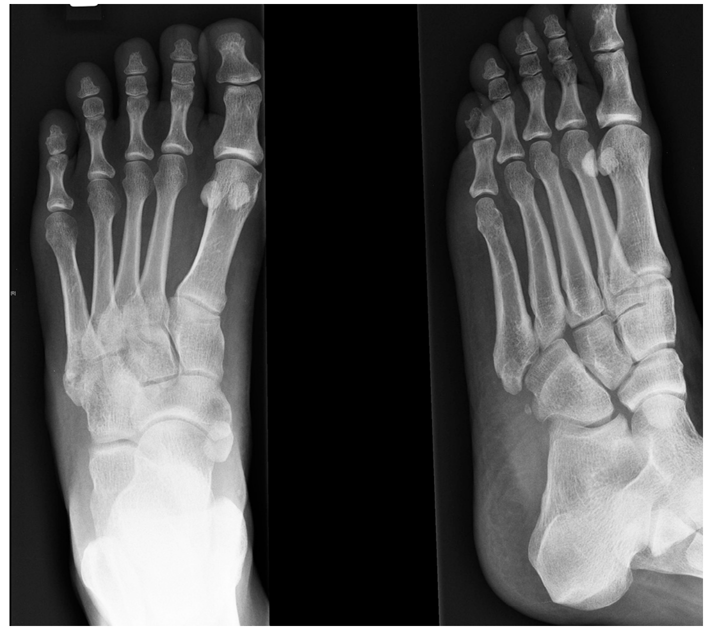

Fig. 3. Standard anteroposterior and oblique radiographs at 3 months postoperatively showing evidence of union, with no secondary displacement of the fracture fragments.

twisting injuries of the foot during sporting activities. The male patient had sustained this injury during a football game, and the other 3 had sustained this injury during basketball, skating, and ballroom dancing, respectively. Standard anteroposterior, oblique, and lateral radiographs were obtained in the emergency room. All 4 patients had comminuted tuberosity avulsion fractures with ≥5 mm of linear or rotary displacement, or both (Figs. 1 and 2). All 4 patients underwent operative fixation with suture anchors. Radiographs were obtained at 6 weeks and 3 months postoperatively, with the latter showing bony union (Fig. 3).

All 4 patients provided written informed consent for the present study and were informed that the necessary data and photographs would be submitted for publication with no patient identifiers. All applicable institutional regulations concerning the ethical use of our patients were followed during the course of this research.

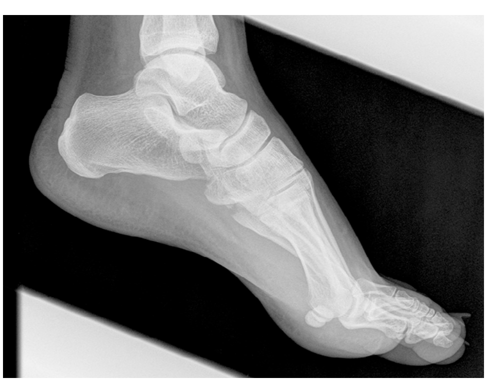

Fig. 2. Standard lateral radiograph of the foot showing the displaced tuberosity fragment.

Operative Technique

After provision of informed consent, the patient was given general anesthesia. Surgery was performed with a thigh tourniquet in place and the patient in the supine position. We routinely placed a small sandbag under the hip to provide internal rotation of the affected leg by ~30°. The affected limb was prepared with povidone-iodine. A 3-cm dorsolateral incision was made over the tuberosity of the fifth metatarsal and continued proximally over the distalmost fibers of the peroneus brevis. The peroneus brevis tendon was identified and retracted inferiorly. The fracture hematoma was debrided and fracture bed cleaned with moist gauze. Dissection of the tuberosity fracture fragments was not performed to preserve the soft tissue attachments.

The entry point for the bioabsorbable (polylactic acid) anchor was created using an awl and tapped. Next, a double-loaded 5.5-mm suture anchor (Bio-Corkscrew™, 5.5 × 14.7 mm; Arthrex) was inserted into the fifth metatarsal fracture bed under direct vision. Once the suture anchor was fully seated, the sutures and needles were released from the anchor driver. Small drill holes were made in the main bony fragment with a 1.6-mm Kirschner wire to pass the sutures. The suture threads were then passed through the tuberosity fragments and its soft tissue sleeve (Fig. 4). We routinely passed sutures, not only through the main bony fragment, but also to provide purchase to the peroneus brevis tendon together with the lateral cord of the plantar aponeurosis. This is particularly useful in cases in which the avulsed fragment is too small or fragmented for the sutures to pass through. Reduction was confirmed under direct vision before securing the sutures with several knots (Fig. 5). The wounds were irrigated and the incision was closed using bioabsorbable suture.

Postoperatively, the patients were kept non-weightbearing in a below-the-knee posterior splint with the foot kept in eversion to protect the repair. They were examined 2 weeks later for wound inspection and fitted with a walking boot and eversion wedge for another 4 weeks. Following that, the patient was allowed full weightbearing with a