10 Base of 5th metatarsal fracture

10.1 Introduction

Fractures of the proximal fifth metatarsal are quite common and usually can be divided into one of three patterns:

- Avulsion fractures of the base of the metatarsal
- Fractures at the junction of the metaphysis and diaphysis (Jones fractures)
- Pure diaphysis fractures

Most of these fractures heal with nonoperative management and will not require surgery. Fractures of the metaphyseal diaphysis junction have a higher rate of nonunion and occasionally do require surgery. Jones fractures treated operatively have been shown to have excellent union rates.\(^1\)

10.2 Anatomy

The anatomy of the proximal fifth metatarsal helps to distinguish the different types of fractures and also the variables influencing their healing. The fifth metatarsal contains a head, diaphysis, metaphysis and tuberosity. The tuberosity is the most proximal and plantar structure of the fifth metatarsal. Soft tissue attachments to the base of the fifth metatarsal consist of the peroneal brevis tendon, which inserts over the dorsolateral tuberosity. The peroneus tertius tendon attaches on the dorsal aspect of the metaphysis, and the lateral band of the plantar aponeurosis. A strong band of the plantar aponeurosis connects the projecting part of the tuberosity with the lateral process of the tuberosity of the calcaneus. Dorsal, plantar, and interosseus ligaments attach between the base of the fourth and fifth metatarsals. Articulations in the area consist of the articulations between the base of the fourth and fifth metatarsal and the fifth metatarsal cuboid bone.\(^1\)
Blood supply plays a crucial role in the healing ability of these fractures. As described by Smith et al., perfusion comes from metaphyseal arteries at the base of the fifth metatarsal. A nutrient artery enters at the proximal diaphysis and tracks proximally across the so called watershed area at the metaphysis-diaphysis junction. This area creates an area at high risk for avascularity and poor healing with disruption of the blood supply.

### 10.3 Clinical Presentation

Patients with fractures to the base of the fifth metatarsal usually present with pain after some sort of trauma to the lateral aspect of the foot. This can be major or minor trauma and is commonly seen in athletes including football and basketball players and gymnasts.

Different types of fractures have been related to different mechanisms of injury:

- **Type 1** fractures are caused by forces that cause pull on the peroneus brevis tendon or lateral band of plantar fascia with foot inversion.
- **Type 2** fractures occur when a large adduction force is applied to the forefoot with the hindfoot in plantar flexion.
- **Type 3** fractures (diaphyseal) are usually caused by overuse but can be related to blunt trauma. Overuse presentation can be acute or chronic.

### 10.4 Classification (Staging)

Stress fractures are commonly seen in the athletic population. They are defined as fractures that occur spontaneously in normal bone as a result of the summation of stresses, any of which by itself would be harmless.

Acute fractures of the proximal fifth metatarsal have sharp margins with no evidence of fracture widening, radiolucency, or periosteal reaction from chronic stress. Several classifications for fractures in this area exist. The classification we use has been described by Torg:

- **Type 1** - Tuberosity fracture of the lateral aspect of the tuberosity extending proximally into the metatarsocuboid joint
- **Type 2** - Jones fracture beginning laterally in the distal part of the tuberosity and extending obliquely and proximally into the medial cortex at the junction of the metaphysis and diaphysis
- **Type 3** - Fracture distal to the fourth and fifth metatarsal base articulation in the diaphyseal part of the bone

### 10.5 Physical Examination

Patients present with painful weight-bearing, tenderness, and swelling over the lateral border of the foot. Localization is usually fairly straightforward; compound fractures are unlikely. Weakness in eversion is often noted with tuberosity fractures as the pull of the peroneus brevis tendon displaces fracture fragments. Significant amounts of bruising and edema are common early in acute presentations and slowly decreases over time.
10.6 Imaging

Plain radiographs are usually sufficient, with weight-bearing AP, lateral, and oblique views frequently used. CT scanning is usually unnecessary unless the differentiation is required between acute and chronic and degree of union or nonunion.

10.7 Conservative Treatment

In Torg type 1 fractures, 6-8 weeks in a removable cast walker is usually sufficient to allow for healing. Non-weight-bearing is advised for 3-4 weeks or until symptoms dissipate enough to allow weight-bearing. For fractures showing minimal healing by 6-8 weeks post injury, some authors advise pulsed electromagnetic therapy. In patients who have minimal pain, tenderness or limitations in activity after 6-8 weeks in a removable cast walker yet radiographically do not show complete healing, the author allows gradual weaning out of the cast walker and avoidance of impact or contact sports for another 8-12 weeks. Some investigators have shown increased rates of delayed or nonunion in athletes treated nonsurgically and recommend screw fixation in athletes or patients with prolonged radiographic healing.¹

Torg types 2 and 3 fractures have been reported to have higher rates of nonunion treated non-operatively than when treated surgically. The literature supports early surgical treatment of Type 2 and 3 fractures in performance athletes and in Type 3 fractures with evidence of delayed union or nonhealing stress fractures.⁷ Non-surgical treatment is also advocated in patients with vascular comprise and neuropathy, as risk of infection and nonunion is elevated. Patients with diabetes are still candidates for fixation providing they have good vascular supply and protective sensation to extremities.

10.8 Operative Treatment

Clapper reported 100% union rate in seven patients who were treated surgically for Jones fractures with an average healing time of 12.1 weeks.¹ The group treated non-operatively healed in a much longer 21.2 weeks. This was supported by Quill, who recommended that all Jones fractures be considered for surgical fixation.¹¹ Surgical fixation indicated for Torg type 2 fractures usually involves placing an intramedullary screw with or without reaming of the metatarsal canal. Placement of a bone graft is also an option. The goal is to achieve reduction and stable compression of the fracture site until union is achieved. Several companies have screws specifically designed for this purpose. For example, a 5.5-mm solid titanium screw for metaphyseal/diaphyseal junction fractures offers a combination of an implant with sufficient strength and suitable diameter for internal fixation. It also uses a low-profile head to decrease prominence. Iatrogenic fractures of the diaphysis during screw placement have been seen and are more likely to happen when larger (6.5-7.0 mm) screws being inserted.⁸
An incision is made just proximal to the base of the 5th metatarsal base. Care must be taken to avoid/protect the sural nerve, which will be located near the incision. A dorsal incision avoids the pitfall of incorrectly starting in the styloid process. A drill bit is used to make an intramedullary entry point for the screw. Depending on the system design, some may use a cannulated system in which an initial guidewire is placed across the fracture site in an intramedullary position. Some systems may need overreaming of the cannulated drill bit or to prepare the hole with a tap. Use of bone graft is optional, however it is crucial to have the screw threads distal to the fracture site. Fluoroscopy is recommended to provide visualization in two planes. This should ensure intramedullary placement is maintained.

Postoperative care after surgical fixation includes a plaster splint for 1 week. No dressing changes are done during this period. At 1 week the dressing can be changed to a simple dry dressing and the patient placed into a CAM walker boot. Sutures are to be removed at the 2-week visit and a postoperative radiograph done as well.

The point at which to begin weight-bearing varies between surgeons. The author prefers strict non-weight-bearing for 4 weeks minimum followed by touch weight-bearing for a 2-week period. At a minimum of 6 weeks postop, the patient can begin full weight-bearing with the CAM walker on. Return to jogging or sports activity can occur only when the combination of radiographic healing and lack of pain or tenderness has been clinically documented.

10.9 Controversy

Diaphyseal stress fractures of the fifth metatarsal have been shown to be increasing in frequency. There has been some controversy in their treatment, whether it be operative or non-operative. Several studies support operative treatment and non-operative treatment of these fractures.

Torg divides these fractures into acute fractures, which are treated non-operatively, and delayed union or nonunion. It is recommended that the latter be treated with debridement, reconstitution of the intramedullary canal, and screw fixation with bone grafting.

Not all authors support the use of bone graft in treating these fractures, and several complications are recognized. Screw pullout, loss of fixation due to fracture around the screw itself, and persistent delayed or nonunion have been well documented.

More recent studies advocate the use of electromagnetic stimulation in treatment of these fractures. Holmes reported the use of pulsed electromagnetic fields to treat nine fractures that had delayed or nonunions. All fractures healed with a mean time of 4 months. More studies evaluating this adjunctive technique are currently underway.

10.10 References
