



# “Keeping Up With the Joneses”



Nicholas Sowers, BSc, BA; and Sam G. Campbell, MB BCh, CCFP(EM), CHE

## B.R.'s Case

B.R., an otherwise healthy, 55-year-old female, presents to the ED after sustaining an injury to her right foot. She described the mechanism as plantar flexion and inversion as she tripped while walking downstairs. She experienced pain to the lateral aspect of her foot and was only able to ambulate with significant discomfort.

The X-rays (Figure 1) demonstrate a comminuted fracture at the base of the fifth metatarsal, with minimal separation of the fracture fragments.

Read on for more on B.R.



Figure 1: X-ray of Jones' Fracture of Fifth Metatarsal

## Questions and Answers

### 1. What are these fractures, and what do we call them?

Patients presenting to the ED with proximal fifth metatarsal fractures may do so with a variety of complaints, particularly pain, swelling and ecchymosis on the lateral side of the foot, and difficulty walking. The physical examination may demonstrate swelling and tenderness over the base of the metatarsal. The point of maximum tenderness should be determined and, as with all orthopedic injuries, a careful neurovascular exam should be performed.

Not all proximal fifth metatarsal fractures are created equal. The management of fractures in this area is often complicated by nomenclature, particularly the inappropriate universal use of the label “Jones’ fracture” for all proximal fifth metatarsal fractures. It is important that anyone working in the ED is able to differentiate avulsion fractures from the true Jones’ fracture, a less common, but specific disruption of

### 2. What do we need to remember about the fifth metatarsal?

The fifth metatarsal can be separated into five anatomical components: the metaphysis, comprised of the base and the tuberosity or styloid; the diaphysis; the neck; and the head. The metaphyseal base articulates proximally with the cuboid and medially with the fourth metatarsal, and the fifth metatarsal additionally consists of the insertion sites of three tendons: peroneus brevis, peroneus tertius, and the lateral band of the planter aponeurosis.

The proximal aspect of the fifth metatarsal can be further subdivided into three anatomic zones (Figure 2), which coincide with three different fracture patterns typically observed in patients.

The first zone is located most proximally, and includes the metatarso-cuboid articulation and the insertion of the peroneus brevis tendon. This is by far the most commonly fractured location, and injuries are typically avulsion



Figure 2: Fracture Patterns of the Proximal Fifth Metatarsal  
 Zone 1: Tuberosity Avulsion Fracture  
 Zone 2: Jones' Fracture  
 Zone 3: Stress Fracture of Diaphysis

fractures of the bony styloid, as the bone fractures before the stronger tendon tears. This fracture may extend into the fifth metatarso-cuboid articulation, and typically results from indirect forces applied during inversion injuries of the foot and ankle; the patients often report “rolling their ankle.”

When examining X-rays for avulsion fractures, fracture fragments should have a rough “scaloped” edge; if not, consider whether the fragment may be an accessory ossicle. The os peroneum is a normal finding, with a smooth, corticated edge, lateral to the cuboid within the peroneus brevis tendon. Figures 3 and 4 show examples of Zone 1 avulsion fractures.

Zone 2, distal to the metatarso-cuboid articulation, is where the true Jones' fracture occurs; it typically begins laterally at the approximation of the metaphysis and diaphysis and orients transversely, without extending distally to the articulation of the fourth and fifth metatarsal on the medial aspect (Figure 2). These injuries require a large direct adduction force applied to the forefoot with the ankle in plantar flexion, and are commonly seen during pivoting maneuvers in football and basketball players.

The third zone represents the first 1.5 cm of the diaphysis beyond the metaphyseal-diaphyseal



Figure 3: Zone 1 Avulsion Fracture



Figure 4: Zone 1 Avulsion Fracture

border. Injuries to this area typically represent stress or fatigue fractures secondary to repetitive loading forces.

### 3. *Why do we care about these 'minor' anatomical differences?*

Differentiating in which zone of the fifth metatarsal the fracture has occurred is important because the blood supply, and consequent healing ability, varies in each area. In the proximal fifth of the bone, the vascular supply is provided by the nutrient artery, which enters from the medial cortex at the junction of the proximal and middle thirds of the diaphysis. It supplies the bone shaft, as well as the metaphyseal perforating and periosteal arteries, which supply the base and tuberosity.

The nutrient artery courses proximally upon entering the diaphysis before quickly bifurcating into a distal and shorter proximal branch. Fractures that occur at the proximal metaphyseal-diaphyseal junction (Zone 2) may cause disruption of the diaphyseal nutrient artery, particularly the proximal branch (distal to the ‘watershed’ between the nutrient artery and the metaphyseal arteries), resulting in an area of hypovascularity at the fracture site.

### Back To B.R.

B. R. was placed in a short leg cast, advised not to bear weight on the injured foot and after an explanation of the potential complications (as well as showing her, her x-rays), she was referred for follow-up with an orthopedic surgeon the following week. She was advised that she would likely have to remain in the cast for eight weeks.

### 4. *How do fracture specifics alter treatment?*

There is the potential for significant morbidity in patients presenting with proximal fifth metatarsal fractures, if the type is not recognized and treated appropriately.

Simple avulsion fractures within Zone 1 will typically do well if treated symptomatically. Dressings, stiff soled shoes and casting have all been effective in symptom alleviation. In many cases, these fractures do not need immobilization and patients will often do well if treated with a walking boot from the ED, with analgesia and early ambulation as tolerated. These injuries should heal fully in an average of four weeks, although symptoms may last for up to eight weeks.

Occasionally, more complex Zone 1 fractures, such as those that are significantly comminuted or displaced, may require surgical intervention. These cases can be splinted and referred to an orthopedic surgeon within a day or two.

True Jones' fractures should be considered at risk for delayed, or non-union as a result of disruption of the vascular supply at the metaphyseal-diaphyseal border. The disruption is

**Mr. Sowers** is a Fourth Year Medical Student, Memorial University of Newfoundland, St. John's, Newfoundland.

**Dr. Campbell** is an Associate Professor of Emergency Medicine, Dalhousie University, Halifax, Nova Scotia.

### No Pain, No Name: A Historical Context

Jones' fracture was first described by Sir Robert Jones (of the Robert Jones Splint) in 1902, reflecting an injury that he himself sustained while dancing around a maypole at a military garden party. The mechanism that he described was that of bearing weight on the lateral aspect of his foot, with his 'heel at the moment being off the ground.'

exacerbated by focal forces applied to this region by various tendonous insertions.

As a result, Jones' fractures should be aggressively immobilized with a short leg, non-weight bearing cast for an average of eight to ten weeks with orthopedic follow-up. Even with the proper immobilization applied in the ED, patients should be informed that the successful rate of union has been cited between 72 to 93%. For patients in whom casting fails to alleviate symptoms or for those, such as competitive level athletes, who need to return to normal activity sooner, surgical fixation may be indicated.

Stress fractures within Zone 3 are relatively rare, typically seen in athletes, and a careful history will often reveal a history of prodromal symptoms for weeks to months from micro-fractures that are, with continued loading forces, extended medially through the bony cortex.

The initial treatment is similar to the Jones' fracture and should include a non-weight bearing, short leg cast in the ED for up to three months and referral to an orthopedic surgeon. Depending on the orientation of the fracture fragments, these injuries may require internal fixation and compression to facilitate return to previous athletic activity. **Dx**

Publication Mail Agreement No.: 40063348  
Return undeliverable Canadian addresses to:  
STA Communications Inc.  
955 boulevard St-Jean, Suite 306  
Pointe-Claire, QC, H9R 5K3