Recurrence of Jones Fracture After Intramedullary Screw Fixation

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The “Jones Fracture” is one of the most common sport-related foot fractures. The fifth metatarsal is involved in 40–75% of all metatarsal fractures, which typically occur in one of five specific locations.7 By definition, a Jones fracture occurs in the boundary area that separates the fifth metatarsal metaphysis from its diaphysis, approximately 1.5 cm distal to the styloid process.7 A fracture that is proximal to this boundary is referred to as a tuberosity fracture, which is often mistaken for a Jones fracture. The current “gold standard” for medical management of a Jones fracture is intramedullary screw fixation (ISF; see Figure 1), although the rates of refracture and delayed union are high.4 Prior to the early 1990s, non-weight bearing casting was the most common method of management.4 New approaches may allow the injured athlete to return to play sooner and without high risk for refracture.7

Prior to the introduction of ISF, most Jones fracture cases were treated nonoperatively, with a short- leg cast for up to 8 weeks.3 This treatment approach was associated with a nonunion rate of approximately 50%,1,3 which created concern about the potential for refracture upon return to play between 4 to 8 weeks postinjury.1,4,7 One possible complication of ISF is a screw break, which is believed to be less likely if the selected screw size ensures a snug fit within the surgically created bone canal.4,9

Key Points

- Fracture of the fifth metatarsal metaphysis-diaphysis junction (Jones fracture) has a high nonunion rate.
- Surgical intramedullary screw fixation is considered the standard of care.
- Refracture has been linked to use of inadequate screw size and/or excessively early return to activity.
Case Report

A male college basketball player sustained a Jones fracture near the end of the season of his freshman year. He was dribbling along the left baseline, and in the process of making a pass to a teammate in the deep baseline corner on the opposite side of the court, his right foot landed on top of the left foot of an opposing player. As his foot was forced into dorsiflexion, he heard a pop and felt pain. There was not any immediate swelling and he was capable of fully bearing his body weight on the injured foot. As his pain increased, cryotherapy was administered and he was instructed to use crutches for ambulation. A radiograph obtained immediately after the game demonstrated a Jones fracture. The injured was managed with a walking boot and crutches for the first two weeks postinjury, while a decision was being made about whether or not to perform surgery. Following surgical intervention, the athlete was casted for two weeks and then transitioned to a walking boot and partial weight bearing on crutches for the next 4 weeks. After removal of the walking boot, 2 more weeks of partial weight bearing on crutches was imposed, before allowing return to full weight bearing. The athlete was then slowly reintroduced to sport-specific movement patterns and drills.

Two days before the athlete received full clearance to return to play, he fractured the fifth metatarsal in his left foot. The mechanism of injury involved stepping on a stray basketball, which forced his foot into extreme inversion. The athlete reported having experienced the same sensation as that associated with the first fracture and stated that he knew his foot had fractured immediately after the injury incident had occurred. He related that the injury was not as painful as the first incident and that he could walk relatively well with his body weight shifted to the inner side of his foot. A radiograph revealed a Jones fracture, and surgery was performed at 5 days postinjury. After surgery, the athlete was placed in a cast for 2 weeks, a walking boot for 4 weeks, and then partial weight bearing without the walking boot for 2 weeks before return to full weight bearing activities.

The athlete stated that his right foot felt normal when the second fracture occurred in the early summer and when he was cleared to return for his sophomore basketball season in the fall. At the beginning of the season, he reported feeling “not as explosive” from lack of participation in summer workouts. His coach allowed him to withdraw from some practice drills because his feet bothered him. The athlete related that he noticed changes in his physical abilities and his mindset due to the bilateral foot injuries. Although he experienced aching discomfort from time to time throughout the season, which was greatest in the right foot, he became progressively more confident in his foot function.

The athlete’s third injury occurred during a mid-season game. After stepping forward with his right foot and pushing off his trailing left foot to make a pass, he reported the same symptoms in his right foot that he had previously experienced. Radiographs demonstrated that the athlete had sustained a fracture that extended the lateral side of the fifth metatarsal to the screw that had been placed through the first Jones fracture he had sustained.

Rehabilitation

Rehabilitation for the first injury primarily emphasized pool workouts during the partial weight bearing phase of fracture management, which involved walking and sprinting in the shallow end, swimming laps, jumping, defensive slides, AquaJogger® (Excel Sports Science, Inc., Springfield, OR) flotation exercise, and kickboard swimming. After full weight bearing was permitted, ankle strengthening exercises were performed against elastic band resistance and postural balancing exercises were performed on a BAPS® wobble board (Spectrum Therapy Products, Inc., Jasper, MI). Rehabilitation for the second injury was similar to that for the first, except more of the exercises were in the pool at the athlete’s home.

Management of the third injury included use of the EXOGEN® Ultrasound Bone Healing System (Smith & Nephew, Inc., Andover, MA) for 20-minute treatments that were administered two times per day. Low-level bone stimulation has been reported to facilitate fracture healing.13-15 Pool workouts were performed three to four times per week. During the latter portion of the rehabilitation process, the athlete performed weight bearing squats and calf raises without additional resistance.

Discussion

Varus Foot Alignment

Raikin et al.1 reported that 90% of patients with a Jones fracture (16/20) had hind foot varus. Orthotics were
Deemed beneficial, because no refractures occurred in any of the cases. The authors suggested that failure to use a lateral wedge orthotic increases risk of refracture.\(^1\) Measurement of “calcaneal pitch” and “Meary’s angles” according to the procedures used by Raikin et al.\(^1\) revealed that the patient had mild varus alignment and a high medial longitudinal arch.

Individuals with high-arched feet tend to exhibit a high degree of midfoot stiffness (i.e., very little movement within the midfoot joints; see Figure 2).\(^1,12\) Varus foot alignment can be easily identified by viewing the feet head with the patient in a standing position. If the edge of the heel is visible on the medial aspect of the foot when viewed from the front (i.e., a “peek-a-boo” sign), the calcaneus has a varus inclination.\(^1,16\) The joints on the medial aspect of a high-arched foot are quite stiff and are often plantar flexed. The stiff medial joints collectively act like a “bicycle kickstand” to tip the foot toward a varus position, which can be the cause of a number of foot problems.\(^1,16\)

Excessive compressive loading at the base of the first metatarsal can predispose individuals with varus foot alignment to sesamoiditis and sesamoid fractures. Repetitive traction loading of the peroneal tendons on the lateral side of the foot can lead to development of tendinosis. Elevated compressive force on the medial aspect of the ankle may increase susceptibility to osteochondral lesions and arthritic degeneration on the dome of the talus. The loading patterns associated with varus alignment also increase susceptibility to inversion ankle sprain and fracture of the fifth metatarsal.\(^1,16\)

**Intraosseous Blood Supply**

The metaphyseal, periosteal, and the nutrient arteries provide blood flow to the fifth metatarsal. The nutrient artery, which runs along the diaphysis and does not converge with the other two arteries, can be compromised when a Jones fracture occurs. If the blood supply from the nutrient artery is disrupted, the amount of time required for Jones fracture healing will increase.\(^5,8\)

**Cannulated Screw Versus Solid Screw**

The choice between use of a cannulated screw or a solid screw is point of controversy among surgeons.\(^2,9,10\) A cannulated screw fits over a previously placed guide

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**Figure 2** A high arched foot (per cavus) could identify a varus foot alignment and/or “peek-a-boo” sign, which can predispose an individual to a number of foot pathologies.

pin, which has been shown to provide higher resistance to stress than a solid screw.10

**Tension Band Wiring**

The displaced ends of the fifth metatarsal fracture need to be approximated as closely as possible by the surgical procedure. Tension band wiring involves drilling two holes into the fractured bone segments and spanning the fracture site with wire that is passed through the drilled holes in a figure-eight configuration. The wire ends are pulled together and tied with a knot on the outer surface of the skin to avoid irritation.6

**Summary**

Intramedullary screw fixation is widely accepted as the gold standard for management of a Jones fracture. Although other management options exist, ISF is the one most frequently utilized for athletes.

Further research is needed to identify the best approach to allow return to play without high risk for reinjury. Use of a bone stimulator may enhance the rate of bone healing.

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**References**