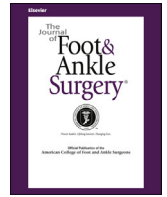




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## Early Weightbearing Protocol in Operative Fixation of Acute Jones Fractures



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### ABSTRACT

The treatment of Jones fractures has been controversial in terms of nonoperative versus operative management, given the high incidence of nonunion secondary to the delicate blood supply to the proximal fifth metatarsal. We report a retrospective review of a patient cohort treated with an early weightbearing protocol after operative intramedullary fixation in acute Jones fractures. Thirty-one consecutive patients with an acute Jones fracture underwent operative fixation with a single intramedullary solid screw. The postoperative protocol consisted of immediate weightbearing in a controlled ankle motion boot for 2 weeks with a gradual transition to regular shoes at 2 weeks postoperative. At 2 weeks, the patients were allowed to perform low-impact activities such as walking, swimming, biking, or elliptical training. Patients were allowed to return to all activities, as tolerated, regardless of radiographic healing, at 6 weeks postoperatively. Serial postoperative radiographs were taken at 2-week intervals to determine radiographic union. Our patient population consisted of 24 males (77.42%) and 7 females (22.58%), with a mean average age of  $37.5 \pm 12.59$  years and mean average body mass index of  $25.7 \pm 2.32$  kg/m<sup>2</sup>. Fracture union was observed in all 31 patients (100%) at a mean average of  $5.7 \pm 1.47$  (range 4 to 10) weeks. Two (6.5%) patients required hardware removal, with one (3.2%) experiencing sural neuritis. This review of patients undergoing early weightbearing after operative fixation of an acute Jones fracture demonstrated a satisfactory incidence of union compared with traditional postoperative protocols at a mean follow-up duration of  $18.58 \pm 5.66$  months.

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First described in 1902 by Sir Robert Jones, the Jones fracture represents a fracture to the proximal fifth metatarsal at the metaphyseal–diaphyseal junction (1). The location is 1.5 to 2 cm distal from the base of the fifth metatarsal. The region is a known watershed, because the blood supply comes from the fifth metatarsal base metaphyseal arteries and a nutrient artery from the fourth plantar metatarsal artery that inserts roughly 26.8 mm from the medial aspect of the fifth metatarsal base (2–4). A fracture to this region can lead to injury of the blood supply complicating the potential for healing. Given the delicate blood supply to the proximal fifth metatarsal, Jones fractures have been a controversial subject regarding nonoperative versus operative management and the weightbearing protocol postoperatively, given the high incidence of nonunion (5–19).

Nonoperative treatment of Jones fractures consists of prolonged immobilization and non-weightbearing for 6 to 8 weeks, followed by an additional 4 to 8 weeks of protected weightbearing (14). The nonunion rate varies widely and has been reported to range from 7% to 44% in all Jones fractures treated through nonoperative and operative methods (17). The time to union has been reported to be an average of 15.6 to 21.2 weeks for nonoperative patients and 7.1 to 12.1 weeks for operative patients (7,13). Prolonged immobilization predisposes patients to joint stiffness, muscle atrophy, decreased bone density, and deficiencies in functional outcomes (20). If nonoperative treatment fails, the patient requires surgical intervention, further prolonging their immobilization and return to full function. Surgical treatment consisting of percutaneous intramedullary (IM) fixation has routinely been reserved for high-level athletes or fractures with significant displacement (10,14,15,17,18). Surgical treatment can consist of an IM screw or plate fixation. The use of an IM screw has been the accepted form of initial surgical treatment (21), although variations in screw material, screw type, and screw size exist. Currently, surgical management is believed to result in higher functional outcomes, increased union

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rates, and a quicker return to sports and full function and is becoming an acceptable treatment option, regardless of the patient’s athletic ability or displacement (15).

The purpose of the present retrospective study was to evaluate the interval to radiographic healing of patients who had undergone operative fixation using a single solid IM screw for an acute Jones fracture with an early weightbearing protocol postoperatively.

**Patients and Methods**

We performed a retrospective analysis of the medical and radiographic records from 31 consecutive patients who had undergone operative IM fixation of an acute isolated Jones fracture from June 2011 and December 2013 (Table 1). We upheld our responsibilities related to keeping protected health information confidential, in accordance with the Health Insurance Portability and Accountability Act of 1996. All procedures and postoperative clinical examinations, including radiographic evaluation, were performed by the senior author (M.D.S.). All the patients had experienced an acute Jones fracture and underwent fixation within 2 weeks of injury. All data abstraction was performed by 1 of us (T.K.S.). The patients who had not adhered to the weightbearing protocol, had <12 months of follow-up data available, had contaminated injuries, or did not have serial radiographs taken every 2 weeks until radiographic healing determined by 1 of us (M.D.S.) were excluded from the present study. We identified 31 patients (out of 33 potentially eligible patients) after application of all exclusion parameters and were included in our study. The risk factors evaluated from the medical records included age, body mass index (BMI), interval to union, and postoperative complications.

*Surgical Technique*

Preoperative foot radiographs consisting of anteroposterior, medial oblique, and lateral views were obtained at the initial presentation (Fig. 1). A 4.5-mm or 5.5-mm solid titanium partially threaded intramedullary screw with cannulated instrumentation was used on all patients. A washer was used on patients with perceived poor bone quality as seen intraoperatively to prevent intrusion of the screw into the bone and optimize the compressive forces. The surgical procedure was performed with the patient in the lateral position with the ability to manipulate the operative extremity to achieve appropriate intraoperative images (Fig. 2). A 2-cm horizontal incision was made just proximal and superior to the fifth metatarsal base. No accessory incisions for debridement of the fracture site or orthobiotics were used in the study group. Under fluoroscopic guidance, a guidewire was inserted down the intramedullary canal past the fracture site. Multiple views are needed to ensure proper placement of the guidewire (Fig. 2A,B). Next, the cannulated drill bit was used and advanced distally to the fracture site under fluoroscopic guidance (Fig. 2C,D). Based on width of the intramedullary canal on the preoperative films, the appropriate size cannulated tap was used, and the screw length can be measured off this device (Fig. 2E). The threaded aspect of the screw should be distal to the fracture. The screw was then inserted at this point (Fig. 2F). A washer can be used with insertion of the screw. Reduction of the fracture site should be observed on immediate postoperative imaging before closure (Fig. 3).

**Table 1**  
Statistical description of the case series (N = 31)

Variable	Mean ± SD and range, count (%)
Age at surgery (y)	
Mean ± SD	37.45 ± 12.59
Range	19 to 61
Gender	
Female	7 (22.58)
Male	24 (77.42)
BMI (kg/m <sup>2</sup> )	
Mean ± SD	25.69 ± 2.32
Range	20.7 to 30.1
Time to union (wk)	
Mean ± SD	5.68 ± 1.47
Range	4 to 10
Follow-up duration (mo)	
Mean ± SD	18.58 ± 5.66
Range	12 to 24
Complications	
Hardware removal	2 (6.5)
Time of removal (mo)	5 ± 1.41
Sural neuritis	1 (3.2)

Abbreviations: BMI, body mass index; SD, standard deviation.

*Postoperative Protocol*

The postoperative protocol consisted of immediate weightbearing in a controlled ankle motion (CAM) boot for 2 weeks. At 2 weeks postoperatively, the patients were allowed to return to athletic shoes and perform low-impact activities such as walking, elliptical training, biking, and swimming. The patients were allowed to return to all shoes as tolerated with a gradual return to increased activities at 6 weeks postoperatively. Running or jumping was restricted until 6 weeks postoperatively. At this point, the patients were allowed to return to all activities as tolerated regardless of radiographic healing. Serial postoperative radiographs were taken at 2-week intervals until radiographic union was determined. The postoperative protocol is outlined in Table 2.

*Union Determination*

Delayed union was defined as partial union that had occurred later than 16 weeks postoperatively. Nonunion was defined as no healing across the fracture site at 6 months postoperatively. Any delayed union or nonunion was further evaluated using computed tomography imaging for confirmation and further treatment planning, if indicated. Clinically, union was determined by the absence of pain and motion with manipulation of the fracture site. Radiographically, union was determined by visualizing bony trabeculation crossing the fusion site on ≥2 views of weightbearing foot radiographs, as determined by the surgeon.

**Results**

The results of our observational investigation are depicted in Table 1. The medical and radiographic records of 31 consecutive patients who had undergone operative IM fixation of an acute Jones fracture with an early weightbearing protocol were reviewed. The weightbearing protocol consisted of 2 weeks of immediate weightbearing in a CAM boot. Patients then transitioned to athletic shoes, with low-impact exercises allowed for the next 4 weeks (Table 2). Using these criteria and applying our exclusion criteria, no further patients were excluded from the study within the specified study period. The mean average patient age was 37.5 ± 12.59 (range 19 to 61) years and included 24 males (77.42%) and 7 females (22.58%). The mean average BMI was 25.7 ± 2.32 (range 20.7 to 30.1) kg/m<sup>2</sup>.

The mean duration of follow-up for the study group was 18.6 ± 5.66 (range 18 to 24) months. The incident of radiographic union was 100% (31 of 31 patients), with a mean time to union of 5.7 ± 1.47 (range 4 to 10) weeks. Two (6.5%) patients experienced painful hardware and required hardware removal at mean postoperative time of 5 ± 1.4 months. Of those 2 patients, 1 (3.2%) experienced sural neuritis, which later resolved after hardware removal. No other complications were noted in our retrospective review.

**Discussion**

Fragile fracture types such as a Jones fracture are typically treated with an extended period of non-weightbearing with either nonoperative or operative treatment. The nonunion rate has been cited at 7% to 44% for all Jones fractures treated through nonoperative and surgical methods (17). Owing to the variability in fracture union, the return to full function is often delayed. The present retrospective review of patients undergoing our early weightbearing protocol after Jones fracture operative fixation demonstrated similar or better union rates compared with traditional postoperative protocols as reviewed in the available published data.

Hunt et al (11) found that a CAM boot is more effective at offloading the fifth metatarsal, with reduced peak pressures and contact pressure with a normal walking and heel walking gait compared with a postoperative shoe. These findings were also seen with a heel walking gait with a CAM boot compared with an athletic shoe. However, the findings were not significant when comparing an athletic shoe and CAM boot with a normal walking gait. An athletic shoe provided the same protection as a CAM boot without the fall risk or associated injury to the knees, hips, or back with prolonged use (11).

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