The Effectiveness of a 5.5mm Intramedullary Screw for Fixation of Acute Jones Fractures

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BACKGROUND

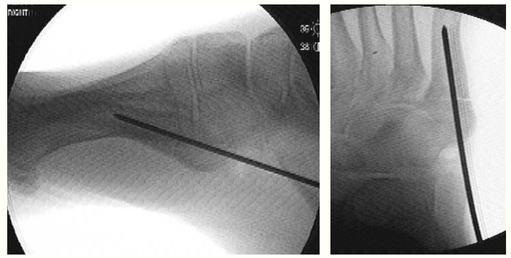
There has been much debate in the literature over various treatment options for acute Jones fractures. Controversies include whether to treat such fractures nonsurgically or surgically, fixing with plates, wire or screws as well as the optimal type of screw. Currently, percutaneous intramedullary (IM) screw fixation is the standard of care for displaced Jones fractures in patients with no contraindications for surgery. Studies have shown that IM screws for Jones fracture fixation should be no less than 4.5mm in diameter.[1] Authors argue that the use of IM screws less than 4.5mm are correlated with delayed or non-union.[2] Further research has shown that the 5th metatarsal can tolerated IM screws up to 6.5mm.[3] However, IM screws that are too large in diameter risk causing stress shielding, further fracturing and ultimately delayed or non-union. Furthermore, solid screws have been shown to be more fatigue resistant than cannulated screws and stainless steel screws more fatigue resistant than titanium screws.[4] The most common complications following acute Jones fracture repair using an IM screw include delayed or non-union, refracture, a prominent screw head and sural nerve injury.[5] Framed within such debates, we sought to examine the effectiveness of a solid 5.5mm partially threaded stainless steel screw on union rates of acute Jones fractures.

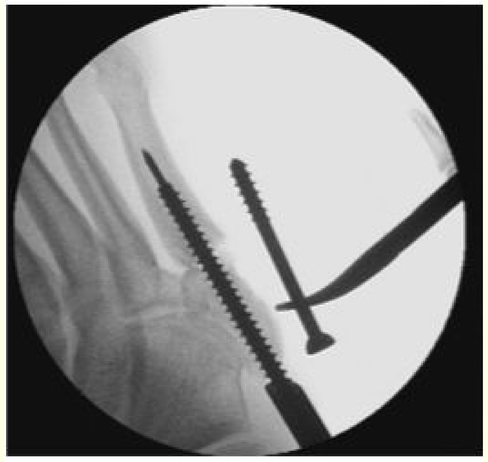
METHODS

Thirty-four patients (11 men and 24 women) who underwent open reduction internal fixation (ORIF) of acute Jones fractures with a solid 5.5mm partially threaded stainless steel IM screw were included in this retrospective, single surgeon review. Patients were excluded from this study if any ancillary procedures were performed on either foot or ankle. All cases were done under MAC with local anesthetic. Patients were placed in the supine position with a bump under the ipsilateral hip and the ipsilateral knee flexed to 90 degrees with foot placed on a mini C arm. A stab incision was made just proximal to the base of the affected 5th metatarsal. A guidewire was then inserted under fluoroscopy using the traditional “high and inside” starting position on the 5th metatarsal base. Next, the corresponding cannulated drill was used to drill across the fracture and prepare the intramedullary canal. A cannulated tap was then advanced across the fracture site and the surgeon then determined the best screw diameter and length for cortical screw purchase. A solid 5.5 mm partially threaded stainless steel IM screw was then inserted under fluoroscopy across the fracture site. All screw threads were placed distal to the fracture site. Patients were kept non-weightbearing for the first two weeks post-operatively and then allowed to transition to protected weightbearing in a CAM Boot until clinical healing had been achieved, defined as the absence of pain and swelling over the fracture site. Post-operative x-rays where then reviewed by an independent, board certified radiologist to assess for radiographic healing. Three standard weightbearing x-rays were used for assessment. Radiographic healing was defined as the absence of a fracture line on x-ray. For purposes of this study, delayed union was defined radiographically as the presence of a fracture line at 12 weeks and nonunion was defined as the presence of a fracture line at 6 months. Complications were also reviewed. Final follow-up was 2 years.

RESULTS

The results of this study demonstrated that 34/34 (100%) of patients were determined to be healed radiographically at final follow-up. Delayed union was diagnosed in 2/34 (5.8%) patients and there was a single nonunion 1/34 (2.9%). These three patients were treated conservatively with a combination of rigid carbon fiber inserts, activity restrictions and one patient was prescribed a bone stimulator. At final follow-up, all three of these patients achieved successful radiographic union and did not require revisional surgery. There were no infections or cases of hardware failure. There were two cases of hardware irritation requiring subsequent screw removal.





DISCUSSION

Setting aside, for the moment, other controversies in acute Jones fracture management, once the decision to use an IM screw has been made there are still difficulties the surgeon faces regarding screw choice. The nuanced anatomy of the 5th metatarsal requires special attention paid to not only how a screw is placed but also what specifications a screw should meet to increase the chances of a positive outcome. It has been argued that the amount of bowing in the 5th metatarsal is strongly correlated with patient height.[6] Moreover, research shows that AP radiographs should be used when assessing proper screw diameter, screws should be as short as possible with at least 16mm of distal threads and screws should rarely be larger than 50mm and more typically around 40mm.[6] Regarding screw diameter, a retrospective study assessing CT scans of 119 patients examined the coronal diameter of the 5th metatarsal and found it to be greater than 4.5mm in 81% of males and 74% of females, suggesting a screw larger than 4.5mm was needed.[7] Similarly, Islein et al examined the parameters of the 5th metatarsal anatomy using CT and found that 93% of patients had an internal 5th metatarsal diameter between 4mm and 7mm with a mean of 5mm.[8] These authors concluded that the 5th metatarsal of most patients would accommodate a 5.5mm screw with a thread diameter of 5.5mm and a core diameter of 4mm. As with any surgery, specific patient characteristics need to be fully evaluated prior to determining the proper screw. If the choice of IM screw is too small the likelihood of poor endosteal thread purchase and fracture instability is increased. Additionally, the largest possible diameter screw should be used to ensure good endosteal purchase without causing further fracturing of the 5th metatarsal. In conclusion, we found that the use of a solid 5.5mm partially threaded stainless steel IM screw in the treatment of acute 5th metatarsal Jones fractures was shown to provide high radiographic union rates with low complication in our retrospective review.

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