6:00 pm:

**Radiographic Study of the Fifth Metatarsal for Optimal Intramedullary Screw Fixation of Jones Fracture**

**Presenting:**

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**Introduction:**

Jones fractures occur in the relatively avascular metadiaphyseal junction of the fifth metatarsal (MT), which predisposes them to delayed union and nonunion. Thus, surgical treatment with intramedullary (IM) compression screw fixation is recommended in certain cases. Incorrect IM screw selection can lead to refractures, nonunion, and cortical “blowout” fractures. The purpose of this study is to gain a more in-depth understanding of the anatomy of the fifth MT through radiographic analysis. This would aide in preoperative planning and guide size screw selection in order to decrease these complications.

**Methods:**

We retrospectively identified 119 consecutive patients without pre-existing fifth metatarsal deformity that had obtained computed tomographic (CT) scans of the foot. Using interactive three-dimensional models, the following measurements were calculated: 1) MT length, 2) “bow length” (distance from the base of the MT to the distal curvature), and 3) coronal and sagittal canal diameters at both the distal curvature and 40 mm distal from the MT base. Of the 119 patients, 74 patients also had plain radiographs available for review. Patient characteristics were analyzed for any correlations with their anatomy. Statistical analysis using unpaired Student’s t-tests and Pearson’s product-moment correlation coefficient was performed.

**Results:**

The average length of the fifth metatarsal was 76.0 ± 5.6 mm. The diaphysis has a plantar-lateral distal curvature where the medullary canal begins to taper. The average “bow length” was 52 ± 4.4 mm, and corresponds to 68% of the overall length of the MT from its proximal end. The medullary canal is elliptical rather than spherical, with increased width in the sagittal plane. The average coronal canal diameter at the isthmus was 5.0±0.9 mm. Eighty-one percent of males and 74% of females had a coronal diameter greater than 4.5 mm at the isthmus. Metatarsal diameter and length was greater in males compared to females (p< 0.01). Age did not correlate with diameter or length. The AP plain radiograph provided the closest correlation to true CT values, although radiographs overestimated true measurement values by an average of 10%.

**Conclusion:**

To our knowledge, this is the first anatomic description of the fifth metatarsal based on three-dimensional imaging. Excessive screw length can be theoretically avoided by keeping screw length less than 68% of the length of the fifth metatarsal as this avoid the distal bow of the fifth metatarsal. In the absence of a CT scan, measuring the coronal diameter at the isthmus on an antero-posterior radiograph can perform for
preoperative planning for screw size. Our results provide an improved understanding of the fifth metatarsal anatomy in order to guide screw size and length selection. This may help maximize screw fixation, while minimizing cortical perforation and fracture site distraction, leading to improved patient outcomes.