

## Intramedullary Screw Fixation and Relevant Diameter of the Proximal Phalanges of the Foot

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**Category:** Midfoot/Forefoot

**Keywords:** proximal phalanges, intramedullary fixation, phalanx, surgical planning

**Introduction/Purpose:** The average intramedullary diameter of the proximal phalanges of the foot has not been well documented in the literature. This dimension has important implications for surgical fixation devices, such as intramedullary screws. By design, intramedullary fixation devices rely on endosteal fit to provide stability. The precise intramedullary diameter is not readily identifiable on plain radiographs. A better understanding of the average diameter of the proximal phalanges of the foot can assist surgeons in surgical planning and appropriate screw diameter selection to provide more satisfactory patient outcomes.

**Methods:** Twenty below-knee cadaveric specimens were dissected to expose each proximal phalanx. A sagittal saw was used to transect the diaphysis at its narrowest portion. The dorsal to plantar and medial to lateral diameters were measured using a digital manometer.

**Results:** The average diameter dorsal to plantar for each digit was  $6.25 \pm 2.24$  mm,  $3.61 \pm 1.25$  mm,  $2.94 \pm 0.70$  mm,  $2.72 \pm 0.77$  mm, and  $2.48 \pm 0.80$  mm, respectively. The average diameter medial to lateral for each digit was  $7.83 \pm 2.13$  mm,  $3.08 \pm 0.93$  mm,  $2.47 \pm 0.74$  mm,  $2.33 \pm 0.73$  mm, and  $2.62 \pm 0.69$  mm, respectively. The overall average diameter for toes one through five was  $7.04 \pm 1.95$  mm,  $3.35 \pm 1.04$  mm,  $2.71 \pm 0.66$  mm,  $2.52 \pm 0.71$  mm, and  $2.55 \pm 0.63$  mm, respectively.

**Conclusion:** Understanding the intramedullary diameters of the proximal phalanges of the foot is a valuable tool when utilizing intramedullary surgical stabilization. The hallux proximal phalanx demonstrated the largest, and most variable, diameter, which could make selection intramedullary fixation difficult. In addition, the hallux proximal phalanx may lend itself better to 2 smaller fixation devices rather than one larger one. The lesser phalanges demonstrated smaller diameters more consistently, which is more amenable to a single smaller (2.5 mm) intramedullary device. This data can provide surgeons with an expected intramedullary diameter during surgical planning.

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Foot & Ankle Orthopaedics, 3(3)  
DOI: 10.1177/2473011418S00169  
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