

# Treatment of Rigid Hammer-Toe Deformity

## Permanent Versus Removable Implant Selection



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### KEYWORDS

• Hammer toe • Interphalangeal • Fusion • Implant • Rigid

### KEY POINTS

- The type of surgical intervention is determined by the relative flexibility of the deformity and the presence or absence of associated metatarsophalangeal joint deformity or instability.
- Patients must have adequate vascularity to heal surgical sites before successfully addressing hammer-toe deformity.
- Fixed hammer-toe deformities can be successfully treated with proximal interphalangeal joint resection arthroplasty or fusion, with high patient satisfaction and low complication rates.
- Patient satisfaction does not depend on proximal interphalangeal joint bony fusion, as fibrous unions often remain asymptomatic; but malalignment is often poorly tolerated.
- Temporary Kirschner-wire fixation remains extremely popular for hammer-toe correction, but multiple permanent implants exist with high efficacy rates.

### INTRODUCTION

A hammer toe is defined as either a rigid or flexible deformity of the lesser toes involving flexion of the proximal interphalangeal (PIP) joint. Anatomic or neuromuscular abnormalities lead to an imbalance in the intrinsic and extrinsic forces exerted on the toe. The intrinsic muscles of the foot (ie, lumbrical and interosseous musculature), through their tendinous orientation to the metatarsophalangeal (MTP), PIP, and distal interphalangeal (DIP) joint centers of rotation in the sagittal plane, act to flex the MTP joint and extend the PIP and DIP joints. The extensor digitorum longus (EDL) muscle via the extensor sling provides the primary MTP joint extension force. When

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the MTP joint is in an extended position, excursion of the EDL and the extensor sling is limited; thus, the EDL can only effectively function to extend the PIP and DIP joints when the MTP joint is in a neutral or a flexed position. The flexor digitorum longus (FDL) and flexor digitorum brevis muscles act as flexors of the DIP and PIP joints, respectively. An imbalance in these forces with respect to the hammer-toe deformity favors the stronger extrinsic muscles resulting in a PIP joint flexion deformity with possible MTP joint hyperextension<sup>1</sup> (Fig. 1).

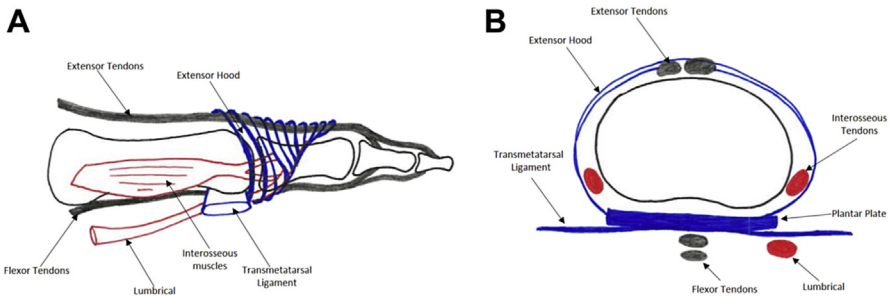
Flexible hammer toes are passively correctable and may only be present with weight bearing. The distinction between the fixed and flexible deformity may help guide surgical intervention. Although flexible deformities may be amenable to correction through tenotomies, tendon transfers, resection arthroplasty, or fusions,<sup>2</sup> fixed deformities may only be amenable to resection arthroplasty or fusion to maintain successful correction of the underlying PIP joint flexion deformity.<sup>3</sup> The hammer toe can be further characterized as simple or complex depending on the presence of associated MTP joint hyperextension. The complex variant of the hammer-toe deformity causes some loss of clarity about the classic definitions of hammer-toe versus claw-toe deformities. Both entities are characterized by a PIP joint flexion deformity with associated MTP joint hyperextension deformity. However, although claw toes have simultaneous MTP joint hyperextension and DIP joint flexion deformities, hammer toes will exhibit either MTP joint hyperextension or DIP joint flexion but generally not both concurrently.<sup>4</sup> Furthermore, although both hammer-toe and claw-toe deformities can be associated with underlying neuromuscular disorders, inflammatory arthritides, and metabolic dysfunction, the claw toe is often more severe and more frequently involves multiple toes on bilateral feet.

## PREOPERATIVE EVALUATION

Not all hammer-toe deformities are the same, and although hammer-toe correction can be straight forward, it is crucial to understand the nature of the deformity to achieve a successful outcome. The preoperative evaluation should involve not only the evaluation of the involved toe but a full history and examination of patients should also be performed to assess for pathology that could be contributing to the lesser toe deformity.

History should emphasize

- Medical comorbidities
- History of trauma, neuromuscular, and vascular disease
- Functional level



**Fig. 1.** Lesser-toe anatomy. (A) Lateral view. (B) Axial cut through metatarsal head. (Courtesy of Chase Kluemper MD, Department of Orthopedic Surgery, Erlanger Hospital, University of Tennessee, Chattanooga, TN.)

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