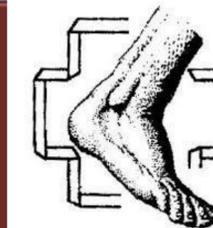


# Evaluation of the Distal Interphalangeal Joint with Medullary Screw Fixation of Toe Deformities without Distal Interphalangeal Joint Takedown



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## Introduction

Medullary implants are increasingly popular for the correction of toe deformities. Many of these devices are difficult to remove without causing harm and do not typically correct the distal interphalangeal joint (1). Easily removable medullary screw fixation has become increasingly utilized for correction of toe deformities. This case series documents several cases of medullary screw fixation of lesser toe deformities without distal interphalangeal joint takedown.

## Literature Review/Discussion

Glissan's principles of arthrodesis delineate that in order to obtain optimal fusion, there should be proper cartilage removal, excellent compression at the fusion site, proper alignment, and maintenance of position until fusion has been achieved (2). K-wires are commonly used devices for fusion of proximal interphalangeal joint (PIPJ) sites, however, the reported success rates have been varied for true fusion. This is likely due to the micromotion that occurs at the fusion site secondary to lack of adequate fixation and compression. The authors believe that a medullary screw is an easy and reliable method for fusion at the PIPJ joint, however, further studies should be performed to evaluate the symptoms that may ensue at the distal interphalangeal joint (DIPJ) without joint takedown.

To the best of the authors' knowledge, there has only been one study that specifically outlines utilization of a medullary screw for proximal interphalangeal arthrodesis that traverses the distal interphalangeal joint (3). In this study by Caterini, et. al., 24 patients encompassing 51 toes were surgically corrected in this manner in which a 3.0mm cannulated screw was utilized. 48 toes demonstrated radiographic union and 3 toes had asymptomatic non-union and the screw was broken in one toe. The authors did not specify DIPJ takedown in the surgical procedure and furthermore did not specifically assess the DIPJ symptoms, if any, at follow-up visits.

Lane described a surgical technique in which a 2.0mm to 3.0mm cannulated screw was used for medullary screw fixation (4). In this study, the screw is inserted from the DIPJ and is oriented proximally such that only the PIPJ is traversed by the screw. In this case, cartilage of the DIPJ is violated without the presence of permanent fixation, however, a study of the symptoms using such a technique at the DIPJ has not been reported.

## Surgical Technique

- Dissection to allow exposure of EDL tendon
- Z-lengthening of the EDL tendon
- Resection of head of proximal phalanx and base of middle phalanx
- *Freehanded pilot hole* to medullary canal of proximal phalanx → fluoroscopic confirmation of guide wire placement for 2.0 mm partially threaded cannulated screw → pre-drill proximal phalanx
- Retrograde guidewire from base of middle phalanx, across DIPJ, out the tip of the toe → DP and Lateral fluoro to confirm guide wire is centered in the bones → make small incision at the tip of the toe → pre-drill middle and distal phalanx
- Guide wire is then place from the tip of the toe in a retrograde fashion to the base of the proximal phalanx → countersink → measure → insert screw
- *NOTE: Care should be taken to stabilize the toe during screw insertion to prevent frontal plane rotation.*

## Case Series

Included in this case series are 4 patient's totaling 9 toes. All the patients were female. The mean age of the patients was 58.5 (55-66). All of the patients underwent PIPJ arthrodesis of one or more lesser toes performed by the lead author (DBL) without DIPJ joint takedown. At a mean follow-up of 12 months, there are no reported symptoms at the DIPJ. No patients required removal of the screw. The patients were satisfied with the clinical appearance of the toe without reoccurrence of the deformities. Furthermore, there was radiographic evidence of fusion at the PIPJ for all 4 patients.

## Conclusion

In most procedures of the foot and ankle, if a joint is crossed with fixation, an arthrodesis has likely been performed. The resultant fusion eliminates the presence of pain. Toe deformities are routinely corrected with arthrodesis of the proximal interphalangeal joint with a Kirschner wire that also crosses the distal interphalangeal joint in which the K- wire is eventually removed. Toe deformities are now often corrected with permanently placed medullary screws and in this series without takedown of the distal interphalangeal joint, none of the patients developed symptoms at the distal interphalangeal joint. The authors believe that one benefit of not taking the joint down is that it prevents unnecessary shortening of the toe by leaving the joint intact. Given these preliminary results, the authors are investigating a larger series.

## REFERENCES

1. Moon, et. Al. (2011). Digital Arthrodesis: Current Fixation Techniques. Clin Podiatr Med Surg 28. 769-783.
2. Glissan. (1949). The Indications for inducing fusion at the ankle joint by operation, with description of two successful techniques. Australian and New Zealand Journal of Surgery 19 (1), 64-71.
3. Caterini, et. Al. (2004). Arthrodesis of the Toe Joints with an Intramedullary Cannulated Screw for Correction of Hammertoe Deformity. Foot and Ankle International. Vol 25. No.4.
4. Lane. (2005). Lesser digital fusion with a cannulated screw. J Foot and Ankle Surgery 44:172-173.



Image 1: Pre-operative radiographic image of one of the patient's in the series which demonstrates the presence of hammertoe contracture of digits 2-5 with associated Tailor's Bunions and 1<sup>st</sup> MTPJ beginning stages of osteoarthritis.



Image 2: Post-operative radiographic image at 12 month follow-up demonstrating evidence of arthrodesis of digits 2-4 PIPJ without DIPJ joint takedown. The patient also underwent 5<sup>th</sup> toe PIPJ derotational arthroplasty, and Tailor's Bunionsectomy.