

Statement of Purpose:

The purpose of this investigation is to demonstrate a modified flexor digitorum longus (FDL) transfer technique that allows for complex hammertoe correction without an arthroplasty.

Methodology:

A single surgeon's cases were retrospectively reviewed between 2013-2017. Thirty patients with thirty-nine flexible to semi-rigid hammertoes were included. Age ranged between 36 to 90 with a mean age of 70.1. There were 13 males and 17 females.

Procedure:

Based on whether the digit was medially or laterally deviated, an incision was made on the opposite side of deformity in the interspace at approximately the proximal interphalangeal joint (PIPJ). The FDL was harvested and transferred to the proximal phalanx utilizing a 2.2mm by 4.0mm micro corkscrew anchor. This allowed for some correction in the transverse plane. The flexor digitorum brevis (FDB) was released at it's insertion to assist with further correcting the sagittal plane deformity.

In cases with continued deformity, a K-wire was placed within the phalanges without crossing the metatarsophalangeal joint. This was removed approximately 1-2 weeks post-operatively.



Figure 1: Incision placement over the PIPJ to harvest FDL



Figure 2: FDL harvest



Figure 3: Pre-surgical sagittal plane deformity

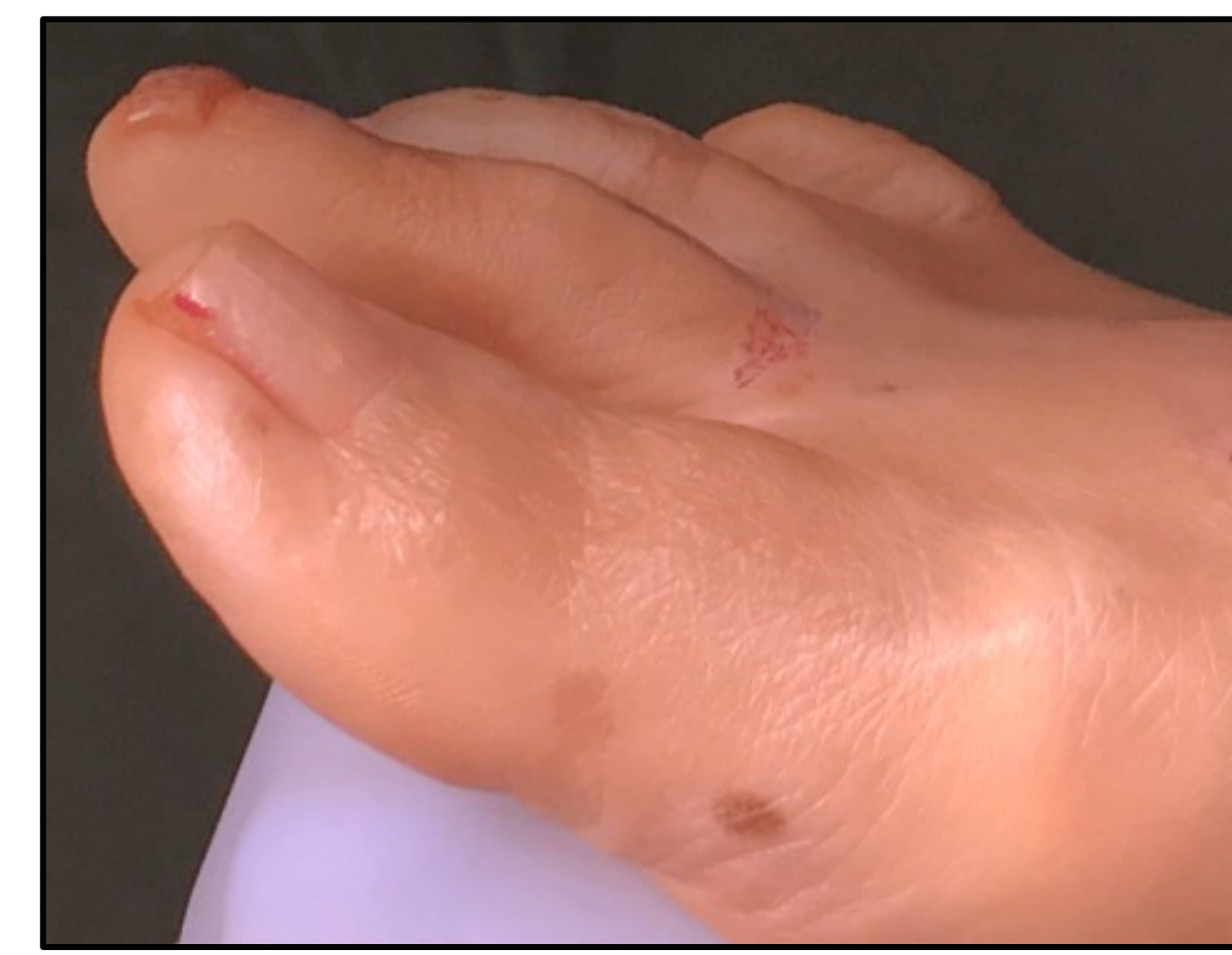


Figure 4: Post-surgical sagittal plane correction



Figure 5: Pre-operative radiographs of 2nd digit hammertoe contracture



Figure 6: Post-operative radiographs of 2nd digit hammertoe correction with micro-anchor and k-wire placement

Literature Review:

Arthroplasty/arthrodesis of the PIPJ can produce complications including over-correction, and digits that are often too rigid or un-naturally straight.^{1,2}

This technique combines the concept of a flexor tenotomy with a flexor transfer. There have been good results with flexor tenotomies, but this is mainly reserved for flexible contractures with only sagittal plane deformity.³ Boyer et al⁴ did a study on flexor transfers without arthroplasty in 29 flexible hammertoe contractures. Their results were promising with 1/29 having recurrent deformity; however, 8/29 were dissatisfied with the procedure predominantly due to stiffness. Furthermore, their procedure required significant dissection with both plantar and dorsal incisions.

Results:

Average follow up was 19 months (range 1 to 49 months). There were four (4/39, 10.3%) recurrences of deformity at time of last follow up . Two of these were asymptomatic and required no further intervention. The other two required minor revisions with extensor releases.

Complications included one anchor that retracted (1/39, 2.6%) but none that required hardware removal. There were no infections or other vascular complications (0/39, 0%).

Analysis and Discussion:

The results are promising with 35/39 (89.7%) of repairs showing satisfactory results without recurrence or need for revision. These results are comparable with arthroplasty/arthrodesis of the PIPJ. Kramer et al¹ showed a recurrence rate of 5.6% (150/2,698 digits). Other studies including Klammer et al⁵ had a recurrence rate of 47.8% (11/26 digits), where k-wire fixation was used for 3 weeks. In digits where the k-wire fixation was 6 weeks, the recurrence rate was 8.7% (2/26). In our study, k-wire fixation duration ranged from 1-2 weeks and did not appear to effect the recurrence rates.

As for complications, 1 anchor pulled out (1/39, 2.6%). When comparing complication rates of other implants, this is quite low. Scholl et al⁶ showed that fracture of an hammertoe implant occurred in 20.7% (12/58 digits).

In conclusion, this is a viable procedure for complex hammertoe correction that is joint sparing. The procedure gives a more naturally aligned digit that can be corrected in both the sagittal and transverse planes of deformity.

References:

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3. Tamir E, Vigler M, Avisar E, Finestone AS. Percutaneous tenotomy for the treatment of diabetic toe ulcers. *Foot Ankle Int.* 2014 Jan;35(1):38-43.
4. Boyer ML, DeOrto JK. Transfer of the flexor digitorum longus for the correction of lesser-toe deformities. *Foot Ankle Int.* 2007 Apr;28(4):422-30.
5. Klammer G, Baumann G, Moor BK, et al. Early complications and recurrence rates after Kirschner wire transfixion in lesser toe surgery: a prospective randomized study. *Foot Ankle Int.* 2012 33(2):105-112.
6. Scholl A, Mccarty J, Scholl D, Mar A. Smart Toe® implant versus buried Kirschner wire for proximal interphalangeal joint arthrodesis: a comparative study. *J Foot Ankle Surg.* 2013; 52(5):580-583.