CHAPTER **20**

THE ARTHROPLASTY WITH HEMI-MIDDLE AND DISTAL PHALANGECTOMY OF THE FIFTH TOE: Update On Indications and Technique

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Fifth digit surgery is a common component of the podiatric surgical practice. Painful lesions laterally on the fifth toe or interdigitally between the fifth and fourth toes can result in significant pain. This pain can limit ambulatory potential in the infirmed patient or athlete alike. The arthroplasty with hemi-middle and distal phalangectomy is a surgical alternative in the many approaches to fifth toe problems (Fig. 1). The role of this procedure will be discussed, surgical techniques will be highlighted, and illustrative cases will be presented.

PRINCIPALS OF FIFTH TOE SURGERY

Repair of fifth digital deformities can be very rewarding or terribly frustrating for the patient and surgeon alike. Recurrence of painful lesions, or new lesion formation about the fifth toe are possible postoperative complications. Some basic principles of fifth toe surgery will be reviewed. The role and indications for arthroplasty with hemi-middle and distal phalangectomy will be presented.

The presence of extensor contracture at the metatarsophalangeal joint (MTPJ) cannot be overlooked. Congenital digiti quinti varus deformity of the fifth toe is the most profound example of extensor contracture of the MTPJ at all soft tissue levels. Painful lesions of similar presentation on the fifth toe may present with and without significant extensor contracture at the MTPJ (Figs. 2A, 2B). The extensor tendon, extensor hood apparatus, MTPJ

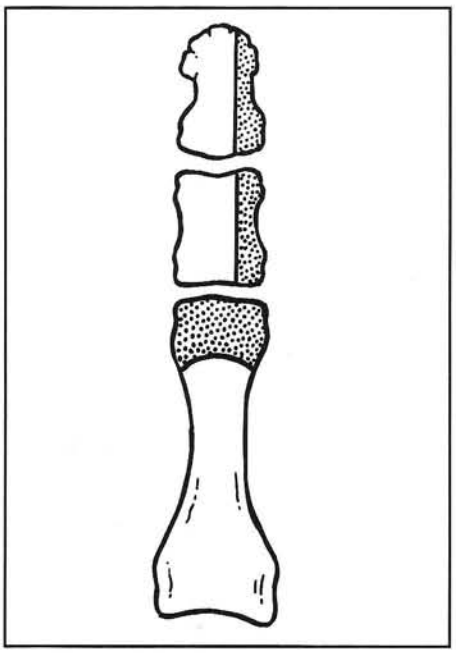

Figure 1. Bone resection involved in arthroplasty with hemi-middle and distal phalangectomy of the fifth toe.

Figure 2A. Dorsolateral lesion at the PIPJ fifth toe, with little MTPJ extensor contracture.

Figure 2B. Dorsolateral lesion at the PIPJ fifth toe with marked MTPJ extensor contracture.

capsule, flexor capsular adhesions, and even the overlying skin may be involved in the MTPJ contracture of a fifth hammertoe deformity.

From the origin in the anterior compartment of the leg, the extensor digitorum longus attaches to the fifth toe in three places. These attachments include the hood apparatus at the MTPJ level and the trifurcation insertion into the dorsal bases of the middle and distal phalanges (Fig. 3). Lengthening of the extensor tendon distal to the MTPJ does not necessarily affect adequate release of contracture that exists more proximally between the origin of the muscle and the extensor hood apparatus. Release of contracture proximal to the MTPJ can only be completed by combined extensor hood and MTPJ capsular release, or lengthening of the extensor tendon proximal to the extensor hood apparatus. If adequate extensor release is not performed, overzealous resection of the proximal phalanx to reduce dorsal clinical prominence of the proximal phalangeal stump may result (Figs. 4A, 4B). Persistence of extensor MTPJ contracture on the proximal phalangeal stump postoperatively can also result in recurrence of the painful dorsal lesions on the toe.

Arthroplasty of the proximal interphalangeal joint (PIPJ) with resection of the head of the proximal phalanx is a mainstay of fifth digit surgery. When the head of the proximal phalanx has been resected as in arthroplasty corrections of hammertoe deformities, the middle and distal phalanges will drop back and fill the void which

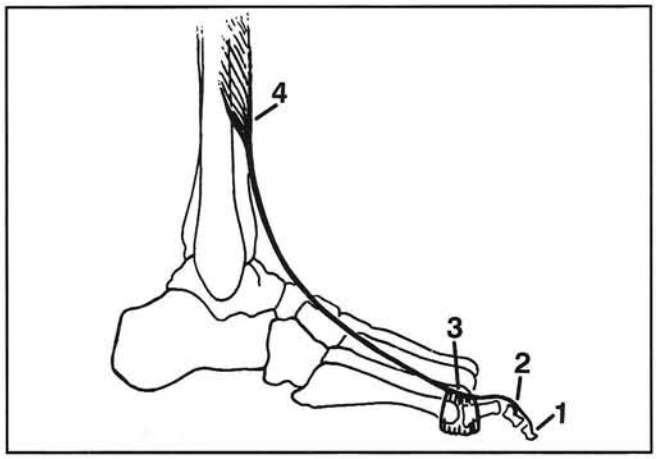

Figure 3. Anatomical attachment of the extensor tendon to the fifth toe. Points 1 and 2 represent the insertion with the distal and middle phalanges. Point 3 is the hood apparatus insertion at the PIPJ. Point 4 is the origin in the leg.

Figure 4A. Radiograph of 5th toe repair with adequate relocation of MTPJ.

Figure 4B. Radiograph showing persistent MTPJ contracture and over- zealous arthroplasty.

Figure 5A. Immediate postoperative 4th and 5th digital arthroplasties, note the position of the middle phalanges.

Figure 5B. Long term follow-up of 4th and 5th digital arthroplasties, note the retracted position of the middle phalanges.

has been created (Figs. 5A, 5B). As in a Keller-type arthroplasty of the great toe, the distal bony segment in the arthroplasty of a lesser toe will retract proximally to fill the void left by the proximal phalangeal head resection.

Proximal retraction of the middle and distal phalanges of the fifth toe following arthroplasty does not always result in postoperative problems. The middle phalanx, however, is just as wide as the head of the proximal phalanx to which it articulates. If transverse plane pressure problems have resulted in interdigital lesions and complaints, the middle phalanx of the fifth toe can provide just as much pressure on the fourth toe postoperatively as the head of the proximal phalanx of the fifth toe did preoperatively. Recurrence of lesions, especially of the interdigital fourth and fifth variety, following simple fifth toe arthroplasty can result.

A similar situation exists for lesions on the dorsolateral aspect of the fifth toe that are large and encompass not only the head of the proximal phalanx, but the middle phalanx as well. Resection of only the head of the proximal phalanx in this clinical situation can leave the middle phalanx even more prominent, and recurrence of the digital lesion postoperatively is likely. Both shortening of the bony column through arthroplasty, as well as narrowing of the middle and distal phalanges through hemi-middle and distal phalangectomy, is possible. Combining the arthroplasty with the hemi-middle and distal phalangectomy not only shortens the bony column, but narrows the bony column of the fifth toe as well. In certain clinical scenarios, this combination of shortening and narrowing may help prevent recurrence of lesions, or the development of new lesions postoperatively.

TECHNIQUE

Location of the skin incision is critical to obtaining adequate exposure of all three phalanges within the fifth toe in order to perform the arthroplasty with hemi-middle and distal phalangectomy. The incision is S-shaped on the dorsolateral aspect of the fifth digit (Fig. 6). The incision is centered proximally on the extensor tendon dorsally. The incision is centered distally between the lateral nail fold and plantar digital tuft laterally. A curved contour brings these two linear incisions together over the PIPJ region.

Deep dissection through the subcutaneous tissue should be initiated proximally over the extensor tendon (Fig. 7). Dissection is carried down through the superficial fascia to the deep fascia over the extensor tendon, completely exposing the PIPJ level (Fig. 8). Once adequate PIPJ area exposure is established, dissection is carried distally over the deep fascial tissue plane to expose the lateral aspect of the middle and distal phalanges (Fig. 9). Two skin flaps are created, one dorsally and one plantarly, which include the skin and superficial fascia. This level of dissection is critical to help prevent swelling and induration of the toe postoperatively, which can be difficult to resolve. The exposure must be carried distal enough to expose the lateral condyle of the base of the distal phalanx. This condyle must be resected to perform adequate narrowing throughout the entire bony segment of the fifth toe, from the proximal phalangeal stump to the tip of the distal phalanx.

The extensor tendon is then transected proximal to the PIPJ with the collateral ligaments of the PIPJ (Fig. 10). The collateral ligament insertions are preserved as a tag of tissue proximally about the head of the proximal phalanx, and distally at the base of the middle phalanx, for repair aids in postoperative stability. Minimal deep dissection over the lateral aspect of the middle and distal phalanges is required or possible. Only the base area of the middle phalanx is exposed. Care is taken here to maintain the insertion of the collateral ligament onto the base of the middle phalanx (Fig. 11).

The head of the proximal phalanx is resected (Fig. 12). The amount of bone removed from the proximal phalanx is determined by the degree of flexor contracture present at the PIPJ. Adequate extensor release should already have been determined by release at the MTPJ level. The lateral aspect of the middle and distal phalanges is then resected (Fig. 13). The amount of bone removed from the middle and distal phalanges is determined by the width of the remaining stump of the proximal phalanx, following phalangeal head resection (Fig. 14). The newly contoured bony column of the fifth toe should be narrow equivocally from the shaft of the proximal phalanx to the distal phalanx (Fig. 5B). Special care must be taken to ensure adequate resection of bone all the way distally past the lateral condyle of the base of the distal phalanx. All sharp margins of bone are rasped smooth with careful attention to the exposed cortical margins. Percutaneous pinning of the fifth toe postoperatively is generally difficult through the surgically-narrowed bony column of the middle and distal phalanges.

Deep repair includes reapproximation of the medial and lateral collateral ligaments of the PIPJ, as well as the extensor tendon, with 3-0 absorbable suture of choice. A mattress-type repair is utilized on the extensor tendon (Fig. 15). A simple, or an over-and-over type suture on the collateral ligaments of the PIPJ is utilized, with the toe held in a corrected position (Figs. 16A, 16B).

The subcutaneous tissue is reapproximated with simple sutures of 4-0 absorbable suture of choice (Fig. 17). These sutures are needed to reapproximate the subcutaneous fat padding over the hard remaining bony column of the fifth toe. Subcutaneous sutures should be used sparingly due to their superficial location and the thin nature of the soft tissues within the fifth toe. Due to the curvilinear nature of the incision, 4-0 non-absorbable simple sutures are recommended for skin closure (Figs. 18A, 18B).

A povidone/iodine splint dressing is employed immediately postoperatively. This dressing is converted to a sterile gauze forefoot compression dressing at the first dressing change in 5 to 7 days. The sterile gauze type of dressing is maintained over a three-week period. A light splint-type dressing of adhesive gauze is recommended for an additional 10 to 14 days to allow complete healing of the collateral ligaments after discontinuing the sterile gauze dressings. Accommodative shoes may be used at this point. The final dressing is removable and replaceable, and consists of elastic strips and a tubular compression sock of the forefoot in a good supportive and accommodative shoe. This final dressing is maintained for a variable time until edema control and comfort permit. Sutures can be removed in two weeks.

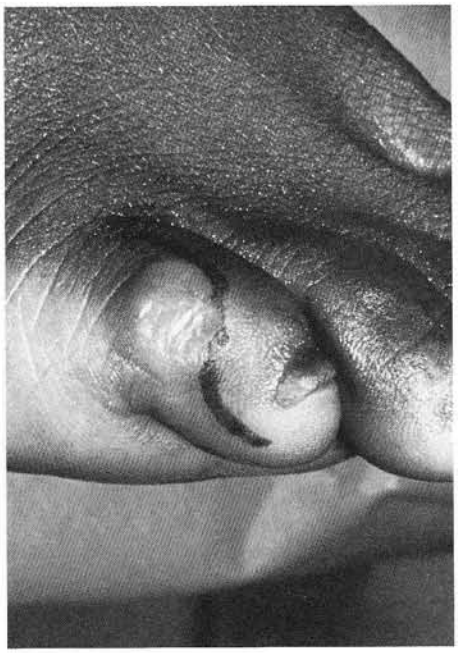

Figure 6. Lazy-S skin incision approach to an arthroplasty with hemi-middle and distal phalangectomy.

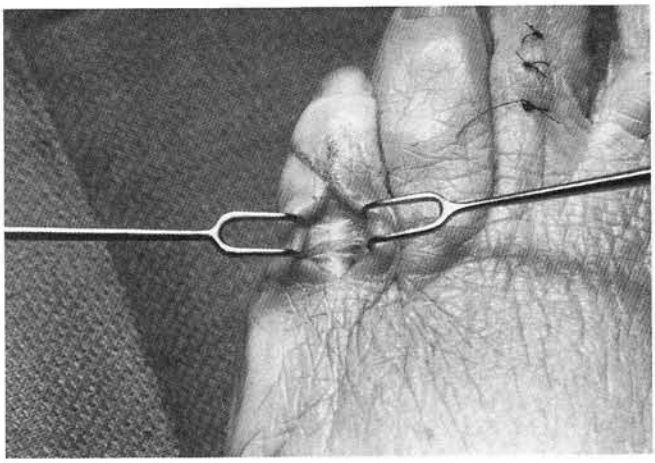

Figure 7. Initial dissection dorsally and proximally over the extensor tendon area to the deep fascial layer.

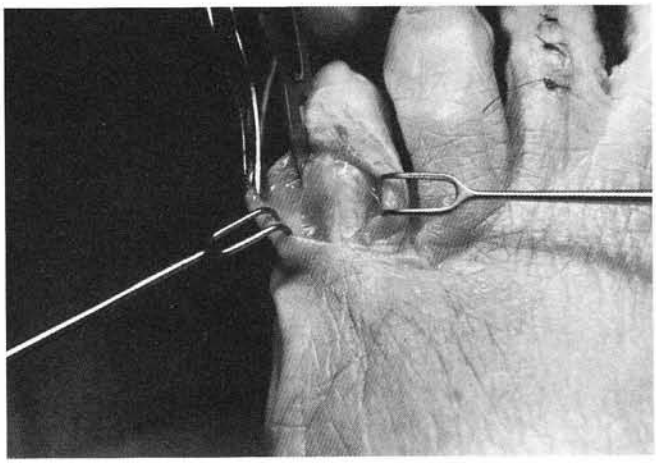

Figure 8. Dissection is carried distally over the deep fascia about the PIPJ area.

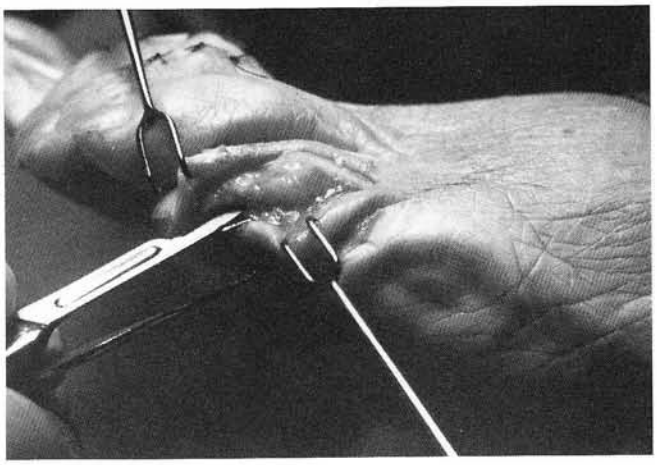

Figure 9. The deep fascial level of dissection is carried distally and laterally over the middle and distal phalanges.

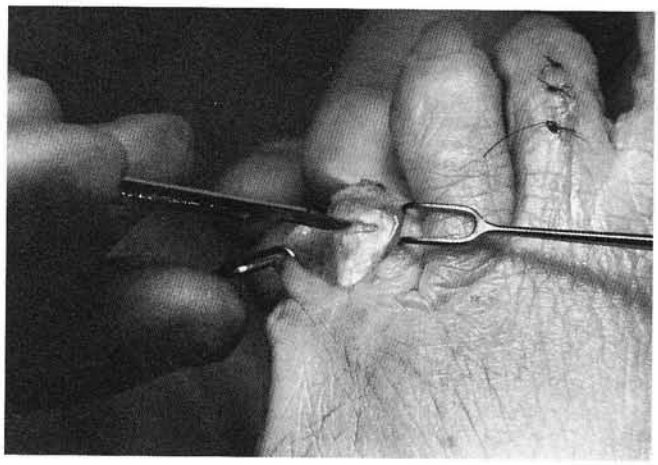

Figure 10. Transverse extensor transection just proximal to the PIPJ.

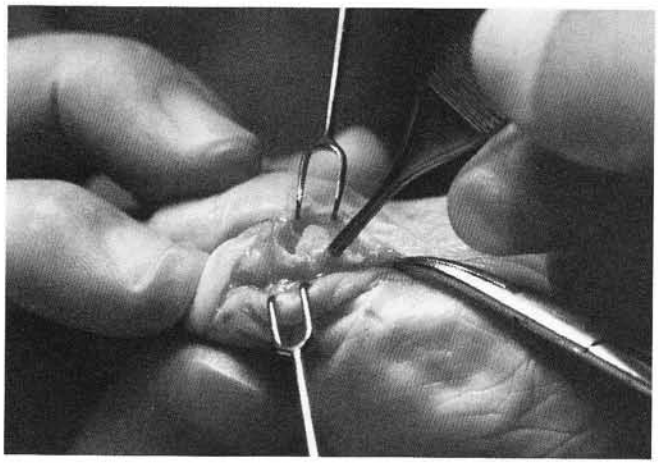

Figure 11. Maintenance of insertion of the lateral PIPJ collateral ligament into the base of the middle phalanx (in forceps).

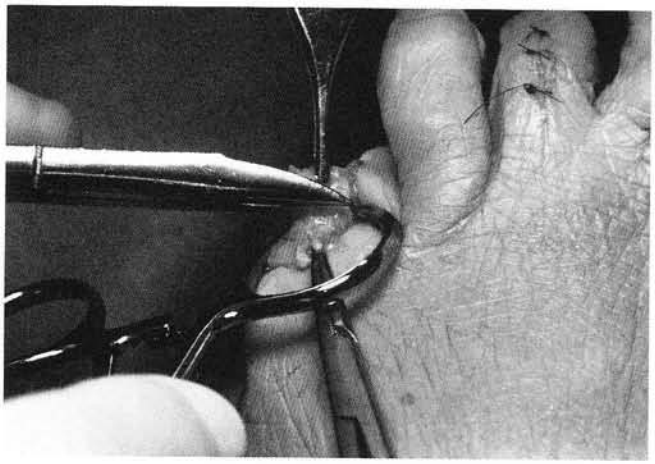

Figure 12. Resection of the head of the proximal phalanx.

Figure 13. Resection of the lateral aspect of the middle and distal phalanges.

Figure 14. Palpation of the adequacy of the resection of the middle and distal phalanges relative to the proximal phalanx.

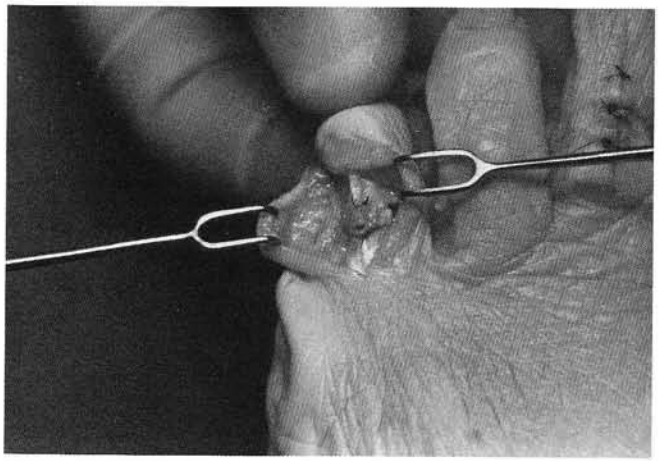

Figure 15. Mattress suture repair of the long extensor tendon.

Figure 16A. Lateral collateral ligament repair of the PIPJ.

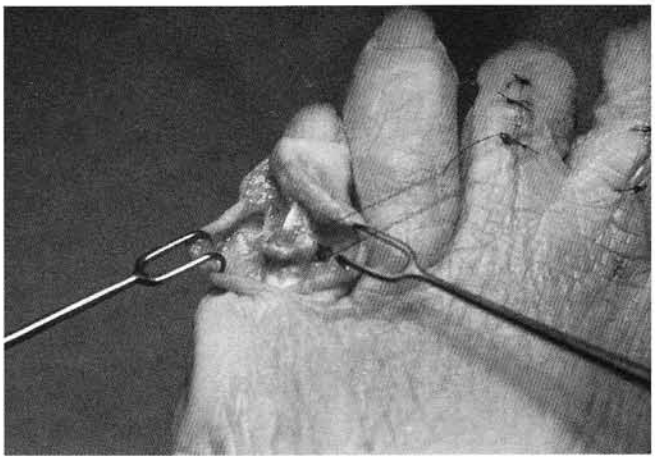

Figure 16B. Medial collateral ligament repair of the PIPJ.

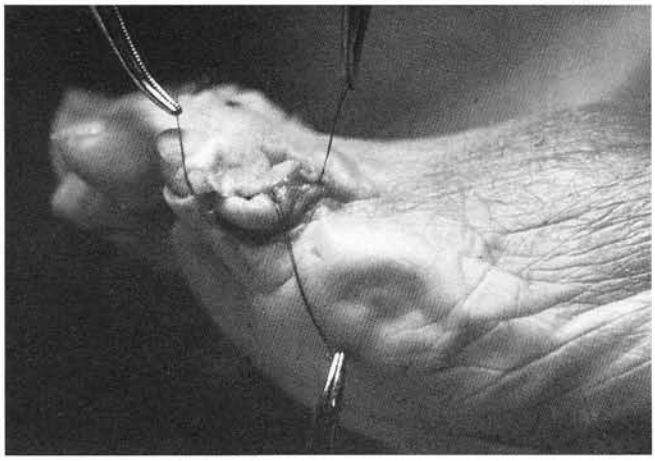

Figure 17. Location of the superficial fascial sutures, note that there are only three in this case.

Figure 18A. Repair of the skin with simple non-absorbable sutures.

Figure 18B. Fourteen-month follow-up of scar healing.

CONCLUSION

The arthroplasty with hemi-middle and distal phalangectomy of the fifth toe is a versatile procedure with definite indications. Clinical presentations such as fourth and fifth toe interdigital lesions, combination fifth digital lesion problems, and enlarged dorsolateral fifth digital keratoses are possible indications for this procedure. The bony column of the fifth toe can be shortened as well as narrowed with this procedure. Attention to extensor contracture release at the MTPJ is as important with this approach to fifth toe surgical repair as with any hammertoe repair. Careful attention to anatomic dissection technique is critical to help avoid persistent postoperative edema and induration. The arthroplasty with hemi-middle and distal phalangectomy of the fifth toe is time-tested and highly recommended for consideration.