

SUMMARY OF RETROSPECTIVE LONG-TERM REVIEW OF PROXIMAL INTERPHALANGEAL JOINT ARTHROPLASTY AND ARTHRODESIS PROCEDURES FOR HAMMERTOE CORRECTION

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Digital arthroplasties and arthrodesis procedures are the two most commonly performed procedures for the correction of contracted digits in podiatric surgery. Because they are performed so frequently, the intricacies associated with these procedures in terms of procedure selection, etiologic force determination, and long-term results are often overlooked.

In 1994, a retrospective long-term study reviewed 107 digital procedures, including 42 proximal interphalangeal joint arthrodeses, and 65 proximal interphalangeal joint arthroplasties in 55 patients. Arthrodesis and arthroplasty results were compared. All patients reviewed completed a subjective questionnaire and were evaluated objectively via preoperative and postoperative clinical and radiographic means (Fig. 1). Preoperative clinical information was obtained from chart records and preoperative photographs which were available for all patients. Specifically, preoperative evaluations were made with regard to transverse and sagittal plane alignment, foot type/etiology of contraction, and the presence and location of any hyperkeratotic lesions. Postoperative clinical evaluations included sagittal and transverse plane alignments, evaluations of stability at the proximal interphalangeal joints, purchase power, and the presence and location of any hyperkeratotic lesions.

Radiographic evaluations of sagittal and transverse plane angulation, proximal phalanx length, and toe length were evaluated preoperatively, immediately postoperatively, (first postoperative radiographs), and long-term. Sagittal plane evaluations of the phalanges of each the were recorded as mild, moderate, or severe, and evaluated using weight-bearing lateral radiographs

and clinical examination. Transverse plane evaluations were made via measurements of the metatarsal-proximal phalanx angle and the proximal phalanx-intermediate phalanx angle (Fig. 2). Angles were deemed positive if the distal segment was abducted or laterally deviated relative to the proximal segment and negative if the distal segment was adducted or medially deviated relative to the proximal segment. All angles were measured using weight bearing anterior-posterior (AP) radiographs in the angle and base of gait. Proximal phalanx length and toe length were also measured on the AP radiograph. Proximal phalanx length was measured from the center of the base of the proximal phalanx to the center of the head of the proximal phalanx. Toe length was measured from the base of the head of the proximal phalanx to the center of the soft tissue shadow at the end of the toe. Long-term radiographs were also evaluated for evidence of spicules or bony resorption at the proximal phalanx, and for evidence of bony fusion in the arthrodesis procedures.

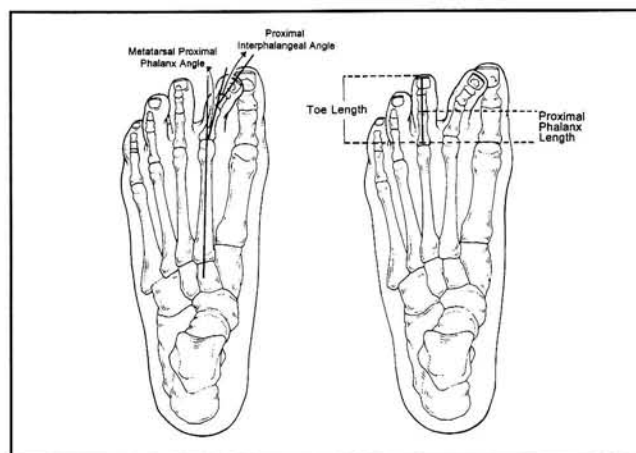


Figure 2. Methods for measurement of angles of deformity (A) and segment lengths (B).

Figure 1

DIGITAL SURGERY PATIENT QUESTIONNAIRE

Patient's Name: _____
 Date of Surgery: _____
 Type of Surgery: _____
 What was your primary complaint prior to your surgery?

How would you describe the discomfort prior to the surgery? Please mark the appropriate box.

| Left foot | Mild | Moderate | Severe | Right Foot | Mild | Moderate | Severe |
|-----------|------|----------|--------|------------|------|----------|--------|
| 2nd toe | | | | 2nd toe | | | |
| 3rd toe | | | | 3rd toe | | | |
| 4th toe | | | | 4th toe | | | |
| 5th toe | | | | 5th toe | | | |

Comments: _____

How would you describe the degree of deformity prior to surgery? Please mark the appropriate box.

| Left foot | Mild | Moderate | Severe | Right Foot | Mild | Moderate | Severe |
|-----------|------|----------|--------|------------|------|----------|--------|
| 2nd toe | | | | 2nd toe | | | |
| 3rd toe | | | | 3rd toe | | | |
| 4th toe | | | | 4th toe | | | |
| 5th toe | | | | 5th toe | | | |

Comments: _____

Did the surgery relieve symptoms of discomfort once the initial healing period was over? Please mark the appropriate box.

| Left Ft | Excellent | Good | Fair | Poor | Right Ft | Excellent | Good | Fair | Poor |
|---------|-----------|------|------|------|----------|-----------|------|------|------|
| 2nd toe | | | | | 2nd toe | | | | |
| 3rd toe | | | | | 3rd toe | | | | |
| 4th toe | | | | | 4th toe | | | | |
| 5th toe | | | | | 5th toe | | | | |

Comments: _____

Did the surgery correct the deformity of the operated toe or toes? Please mark the appropriate box.

| Left Ft | Excellent | Good | Fair | Poor | Right Ft | Excellent | Good | Fair | Poor |
|---------|-----------|------|------|------|----------|-----------|------|------|------|
| 2nd toe | | | | | 2nd toe | | | | |
| 3rd toe | | | | | 3rd toe | | | | |
| 4th toe | | | | | 4th toe | | | | |
| 5th toe | | | | | 5th toe | | | | |

Comments: _____

How would you describe the overall results of your surgery? Please mark the appropriate box.

| Left Ft | Excellent | Good | Fair | Poor | Right Ft | Excellent | Good | Fair | Poor |
|---------|-----------|------|------|------|----------|-----------|------|------|------|
| 2nd toe | | | | | 2nd toe | | | | |
| 3rd toe | | | | | 3rd toe | | | | |
| 4th toe | | | | | 4th toe | | | | |
| 5th toe | | | | | 5th toe | | | | |

Comments: _____

Would you recommend this surgery to others? Yes _____ No _____
 Comments: _____

In the healing phase, did you have: (Please circle the appropriate number: 1=minimal 5=maximum)

| | | | | | |
|---------------|---|---|---|---|---|
| Pain: | 1 | 2 | 3 | 4 | 5 |
| Swelling: | 1 | 2 | 3 | 4 | 5 |
| Malalignment: | 1 | 2 | 3 | 4 | 5 |
| Shortening: | 1 | 2 | 3 | 4 | 5 |

Please center your answers regarding procedures performed on toes 2-5.
 Also, please indicate any change of address or phone number in the space below.

SUMMARY OF RESULTS

Subjective Results

Postoperatively, 91.5% of the patients noted either good or excellent relief of preoperative symptoms. With regard to overall results of the surgery, 87% (93/107) ranked the procedures as either good or excellent, 8% were ranked fair, and 5% were ranked poor. Overall, 50 of the 55 patients would have the surgery again or recommend the surgery to others. Of the five patients who did not recommend the surgery, two experienced excessive pain and one developed a nerve entrapment that necessitated surgical release.

Subjective results regarding evaluation of pain, swelling, malalignment, and shortening in the immediate healing period were recorded on a 1-5 scale (1 equaling minimal pain or symptoms and 5 equaling maximum pain or symptoms) (Table 1).

Objective Results

Sagittal Plane. The majority of the digits (101/107, 94%) were noted to be severely or moderately contracted in the sagittal plane per preoperative evaluation. Postoperatively, the majority of the digits (92%) were noted to be mildly contracted, or straight in the sagittal plane.

Transverse Plane. Correction in the transverse plane, per clinical evaluation was noted initially postoperative at the metatarsophalangeal level in both arthroplasty and arthrodesis procedures, but was not maintained over the long term. Considerable attention was focused on the radiographic evaluation of the toes in the transverse plane. This focus was an effort to

identify a pattern of deviation of individual phalanges, as well as the whole digit, that may aid in predicting the postoperative position of the toe, short and long term. Toes two through four were evaluated together, and the fifth toe procedures evaluated separately.

It was hypothesized that toes undergoing an arthroplasty procedure would have greater deviation occurring at the intermediate phalanx and distal part of the digit, with relative stability at the metatarsophalangeal joint. It was further hypothesized that toes undergoing an arthrodesis procedure would have relative stability at the proximal interphalangeal joint but increased chance of deviation at the metatarsophalangeal joint because no force would be dissipated at the level of the proximal interphalangeal joint. These hypotheses were moderately substantiated. Toes two through four undergoing arthroplasty procedures had less deviation at the metatarsophalangeal (both short term and long term) and more deviation at the PIPJ than did toes undergoing an arthrodesis procedure. It was also noted that toes two through four which started with a positive preoperative deviation at the MPJ, tended to stay positively (laterally) deviated but in a slightly corrected position long term. Medially deviated or negatively deviated toes preoperatively at the MPJ tended to become slightly more medially or negatively deviated long term. No obvious reason for this increased medial deviation at the MPJ was apparent. No associations with concomitant bunion procedures or other associates were noted from the study patients.

Table 1

SUBJECTIVE RESULTS IMMEDIATE HEALING PERIOD

| Symptom Level (1-5) | Postop Pain | Swelling | Shortening | Malalignment |
|------------------------|----------------|----------|------------|--------------|
| 1 | 16 pts | 9 pts | 21 pts | 21 pts |
| 2 | 9 pts | 14 pts | 17 pts | 15 pts |
| 3 | 15 pts | 15 pts | 16 pts | 16 pts |
| 4 | 7 pts | 9 pts | 1 pt | 2 pts |
| 5 | 8 pts | 8 pts | 0 pts | 1 pt |

1 = minimal 5 = maximal

Other Results

Ninety-six of the 107 (89.72%) digits had complete resolution of the preoperative hyperkeratotic lesions. The remaining 11 digits (10.28%) had residual lesions but all were decreased in severity.

Arthrodesis procedures were more stable at the PIPJ postoperatively. Ninety-three percent of arthrodesis procedures were classified as rigid in stability at the PIPJ postoperatively. Seventy-two percent of arthroplasties procedures were moderately stable, 20% were minimally stable, and 8% were floppy. Arthrodesis procedures were superior to arthroplasty procedures in postoperative purchase power evaluations. Eighty-six percent of arthrodesis procedures were excellent or good compared to 58% of the arthroplasty procedures. Twenty-four percent of the arthrodesis procedures were fair or poor compared to 42% of the arthroplasty procedures.

Long-term evaluation of the net respected toe length revealed very little change preoperatively to postoperatively as the lost length from resections was offset via length gained in correcting the sagittal plane.

All 42 arthrodesis procedures appear to have bony fusion per radiograph even though three digits had a minimal amount of clinical motion available at the PIPJ. Five of the 65 digits which received arthroplasty procedures showed evidence of small bony spicules or regrowth of bone at the resected proximal phalanx margin. All resected proximal phalanx margins in the remaining arthroplasty procedures showed some evidence of remodeling via rounding of the resected margins, or slight bony resorption distally. Complications included one mild pin tract infection treated with pin removal and oral antibiotics. No deep infections were noted.

SUMMARY

Retrospectively, 107 digital procedures including 42 PIPJ arthrodesis procedures, and 65 arthroplasty procedures were reviewed in 55 patients. Detailed evaluations were performed on each digit preoperatively and postoperatively via clinical and radiographic means.

Arthrodesis procedures were noted to provide better stability, toe purchase and sagittal plane corrections compared to the arthroplasty procedures. Both procedures were more effective in reducing and maintaining sagittal plane correction compared to transverse plane correction. A high patient satisfaction rate for both procedures was noted.

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