Extensor Indicis Proprius Tenodesis to Correct Finger Ulnar Drift Deformity in Rheumatoid Arthritis

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Abstract

Background: The most frequent deformity of the hand occurring in patients with RA affects the metacarpophalangeal (MCP) joint and it is characterized by a volar subluxation of the proximal phalanges and ulnar drift of the fingers. **Methods:** The Extensor Indicis Proprius (EIP) tenodesis for correction of ulnar deviation of fingers (II to V) was performed in 10 hands (40 fingers and 5 patients). **Results:** There was complete correction of the subluxation or dislocation and almost complete correction of the ulnar drift of the metacarpophalangeal joints at the initial postoperative evaluation (three to four months after surgery). However, at final evaluation (eight to twelve months after the operation), all of the digits had some recurrence of ulnar deviation. **Conclusion:** The EIP tenodesis provides a correct forces vector to maintain the fingers in proper alignment following correction of ulnar deviation.

Keywords: tenodesis, rheumatoid arthritis, finger ulnar drift, surgical correction

Introduction

Rheumatoid arthritis (RA) is a chronic systemic autoimmune inflammatory disease that may affect all parts of the body but predominantly afflicts the limb joints.

Ulnar deviation of fingers is a frequent problem occurring in patients with RA that compromises grasp and affects the aesthetic appearance of the hand and it is characterized by volar subluxation of the proximal phalanges and ulnar drift of the fingers.^{1,5}

The deformities are secondary to chronic synovitis of the metacarpophalangeal (MCP) joints, which causes a progressive attenuation of the radial collateral ligaments and the sagittal fibers of the extensor tendon apparatus.

The finger drift in ulnar direction is also influenced by forces at the wrist, namely, ulnar translocation of the carpus,^{12,16} which often results in radial deviation of the metacarpals.¹⁵

Despite progress in medical therapy, there are many patients with hand deformities that require surgery.^{9,10,17} Deformity, poor function, pain, and cosmesis are all indications for surgery.

The objective of this report is to show the results of the extensor indicis proprius (EIP) tenodesis technique previously described by De Santolo et al⁴ as effective methods to maintain alignment of the extensor tendons over the MCP joints following correction of ulnar deviation.

Table 1. Preoperative/Final Postoperative Ulnar Drift Deformity by Hand Involved.

	Right hand average (°)	Left hand average (°)
Ulnar drift deformity		
Preoperative	30	21
Final postoperative	16	11

Patients and Methods

We report the results of EIP transfer in selected patients with ulnar deviation of finger MCP joints in rheumatoid arthritis (without pain or neurological disturbance) that require correction while the deformity is passively correctable with good active MCP joint motion. The radiographs should reveal good preservation of the joint space without volar subluxation.

The EIP tenodesis for correction of ulnar deviation of fingers has been performed in 5 patients. Both hands were involved in all patients (10 hands, 40 fingers). The procedures were done separately. Preoperative ulnar drift of the digits was more severe on the right hand (all patients were right handed; Table 1).

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Figure 1. A dorsal transverse incision is made across the metacarpal heads.

Surgical outcomes were assessed by comparing preoperative and postoperative ulnar deformity of the digits. For purposes of this study, the initial postoperative evaluation was performed 3 to 4 months after surgery, and the final postoperative evaluation was done 8 to 12 months after the operation. All of the patients were women between the ages of 41 and 72. In all of them, the deformities were corrected by soft tissue repair only.

Surgical Technique

Under general anesthesia, a dorsal transverse incision is made across the metacarpal heads beginning on the radial side of the head of the second metacarpal and ending on the ulnar side of the head of the fifth metacarpal (Figure 1). A longitudinal incision is made in the radial sagittal fibers of the extensor tendon mechanism, leaving a rim of tissue on the tendon to facilitate later closure. The radial sagittal fibers are retracted further radially, the extensor tendon is retracted ulnarly, and a synovectomy of the joint is performed. The ulnar intrinsic tendon to the finger is frequently divided, to facilitate centralization of the extensor tendon over the midline of the MCP joint.

The EIP is identified through a 3- to 4-cm incision over the distal forearm. The musculotendinous junction is divided at that level, and the tendon is withdrawn through the incision over the metacarpal heads (Figure 2). The insertion of the EIP is maintained, and it is attached to the adjacent extensor digitorum communis tendon using 2 sutures of a 4-0 grade nonabsorbable material. The free end of the EIP is passed volarly to the neck of the second metacarpal and then through a small incision dorsal to the first dorsal interosseous muscle. Passing the tendon through the muscle and the metacarpal is facilitated using a mosquito clamp. The free end of the EIP tendon is now on the radial side of the index metacarpal head. The

Figure 2. The EIP is sectioned at the musculotendinous union at the wrist and is withdrawn distally to cover the tops of the 4 MCP joints.

Note. EIP, extensor indicis proprius; MCP, metacarpophalangeal.

surgical technique to stabilize the extensor tendons in their normal midline positions is the same for every joint.

Two small (1 cm) parallel incisions are made in the radial and ulnar sagittal bands on either side of the extensor tendon or tendons. The EIP is passed transversely through all those incisions beginning in the index finger and ending in the small finger (Figure 3). The EIP is passed transversely in the sagittal bands at the level of the metacarpal necks. Passing the tendon at a more distal level should be avoided, because it has the potential of compromising MCP flexion. After the EIP is passed through the final incision in the ulnar sagittal fibers of the little finger; tension is adjusted to ensure that ulnar deviation has been corrected and that all the fingers are in proper alignment with the long axis of the metacarpal. The EIP is then sutured at each incision in the sagittal fibers with 1 or 2 simple interrupted sutures of a 5-0 grade nonabsorbable material (Figure 4). After stabilization of the EIP tendon over the dorsum of the MCP joint of the little finger, the remaining length of the tendon is passed through itself to the radial side of the extensor tendons and is sutured to the radial collateral ligament. The skin is closed with interrupted sutures over a subcutaneous drain. A bulky dressing is applied and the hand is splinted with the MCP joints in extension to protect the soft tissue reconstruction.

Rehabilitation

The patients are placed in a hand-based cast (palmar) with the MP joints in extension and 10° to 15° of radial deviation. The wrist and distal joints are left free. The cast is removed after 6 weeks and patients begin a therapy program of active and passive motion with a static nighttime splint for an additional 6 weeks.¹³

Figure 3. The EIP is passed palmar from radial to ulnar at the neck of the second metacarpal bone, and brings back into the first space and places the transfer at the top of the MCP.

Note. The EIP is introduced through 2 small incisions in the middle of the extensor hood at the sagittal band. After stabilization of the EIP tendon over the dorsum of the MCP joint of the little finger, the remaining length of the tendon is passed through itself to the radial side of the extensor tendons and is sutured to the radial collateral ligament. EIP, extensor indicis proprius; MCP, metacarpophalangeal.

Figure 4. After passive correction of ulnar deviation of the fingers by the surgeon, the EIP is sutured with 5-0 monofilament at the sagittal bands.

Note. EIP, extensor indicis proprius.

Results

Preoperative ulnar drift of the digits ranged from 15° to 47° (average, 26°). There was complete correction of the subluxation or dislocation and almost complete correction of the ulnar drift of the MCP joints (average, 6°) at the initial postoperative evaluation. However, at final evaluation,

Table 2. Changes in Average Ulnar Drift.

	Average (°)	Range (°)	Average by digit (°)			
Ulnar drift			II	III	IV	V
Preoperative	26	15-37	22	24	24	31
Initial postoperative	6	0-7	2	1	4	6
Final postoperative	12	6-15	8	11	13	16

all of the digits had some recurrence of ulnar deviation (average, 12°; Table 2; Figures 5 and 6).

Preoperative ulnar drift of the digits was more severe on the right hand (all patients were right handed). There was better correction of the ulnar drift of the left hand (all patients were right handed) at the final postoperative evaluation (Table 1).

All patients showed independent extension of the index MCP joint without any extension lag or tendon subluxation. No patient reported any discomfort with the use of the index finger in her activities of daily living. There were no wound complications or tendon ruptures.

Discussion

Management of the rheumatoid hand requires an integrated approach involving both rheumatologist and orthopedic surgeons. The first line of treatment should be conservative,

Figure 5. Preoperative ulnar deviation of the fingers in a 47-year-old woman.

Figure 6. Nine months after surgery, ulnar deviation has been reduced.

including medical and injective therapy. However, when patients develop severe deformities with no passive range of motion of the joint affected, surgery is necessary. Furthermore, tenosynovitis unresponsive to medical treatment, as well as tendon ruptures, needs surgical intervention.

Ulnar deviation of fingers is a frequent problem that affects approximately one-third of patients with RA¹⁸ and compromises grasp and the aesthetic appearance of the hand and it is characterized by volar subluxation of the proximal phalanges and ulnar drift of the fingers.¹

The deformities are secondary to chronic synovitis of the MCP joints, which causes a progressive attenuation of the radial collateral ligaments and the sagittal fibers of the extensor tendon apparatus.

The extensor tendons then displace ulnarly from their normal midline positions over the joints, often into the grooves between the metacarpal heads; in the small finger, the extensor tendons can displace to the ulnar side of the fifth metacarpal head. The changes cause a progressive imbalance between extrinsic and intrinsic tendon forces on the MCP joints.

Patients presenting with this deformity often report inability to extend the fingers. Moreover, the deformity limits the ability to cup the fingers around larger objects, and fine pinch is obstructed because the index and middle fingers can no longer oppose the thumb in a tip-to-tip pinch.

The deformities of the MCP joint in patients with RA represent one of the most challenging situations to treat in hand surgery. MCP joint activity is crucial for the arc of motion of the finger, which is initiated at the MCP joint. For this reason, fusion of the finger at the MCP joint is rarely performed.¹⁴ Despite the aesthetic advantage reached after the fusion of the MCP, the loss of motion can be too much disabling, impairing patient's activities of daily living.

A variety of surgical procedures have been recommended to correct the ulnar deviation at the MCP joints.^{2,3,6}

Synovectomy of the MCP joints associated with a crossed intrinsic transfer has been advocated as a good solution in the early stages of RA.¹⁴ This procedure restores the ulnar deviation deformity of the MCP joint if the subluxed fingers can be easily reduced to the anatomical position and there is no damage of the articular surface and there is no volar subluxation. Soft tissues procedures are less invasive and associated with shortened recovery. However, in the case of MCP destruction or when a chronic MCP subluxation is present, arthroplasty procedure is necessary to relieve pain and restore function.

The stabilization of finger ulnar deviation using the EIP as a tenodesis across the dorsum of the MCP joints of the fingers, a surgical technique previously described by De Santolo et al,⁴ augments the soft tissues over the dorsum of the MCP joint and also provides a correct forces vector to maintain the fingers in proper alignment following correction of ulnar deviation.

Preoperative ulnar drift of the digits was more severe on the right hand (all patients were right handed). The greater use of the right hand will explain the deformity. In cases

where ulnar deviation is more marked on the left hand, a similar explanation will hold.

When ulnar deviation is greater in the left hand or limited to the left in right-handed persons, either the patient has for some reason used the left hand more than the right, or the conditions necessary for development of the deformity are not present in the right hand, either because the arthritic process is asymmetrical or there has been a priority ankylosis of the MCP joints in extension, or the proximal interphalangeal joints are free to flex.

There was better correction of the ulnar drift of the left hand (all patients were right handed) at the final postoperative evaluation (Table 2). The difference due to the individual patient's dominance in regard to the results is related to the preoperative deformity.

The technique can also be used in conjunction with other surgical procedures, including prosthetic replacement arthroplasties of the MCP joints.⁴

The disadvantage of this procedure is the sacrifice of the EIP muscle-tendon unit and the potential for index finger dysfunction. The previous literature indicates that index finger extension strength is reduced to half or two-thirds of the normal finger after the EIP transfers.^{7,8,11} Although generally no functional deficits are noted after EIP transfer, the preservation of the EIP may be preferable in some patients who require a strong extension of the index finger in their profession.¹⁰ There is also a 0.5% possibility that EIP may be absent, which would make its use impossible.¹⁹

Our study limitation included a small study population and no comparative groups. Despite these limitations, this study supports the use of EIP transfer as a reliable procedure to correct ulnar deviation in rheumatic hands.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

Statement of Informed Consent

Informed consent was obtained from all patients for being included in the study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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