Percutaneous Desmotomy of Digits for Stiffness from Fixed Edema

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A simple technique, not previously described, has been successful in achieving increased motion of contracted metacarpophalangeal and proximal interphalangeal joints of the hand. The procedure involves percutaneous sectioning of collateral ligaments followed by joint manipulation. Experience with 65 stiff joints treated by this minimally invasive technique followed by physical therapy revealed an average final gain of 28 degrees for metacarpophalangeal joints and 19 degrees for proximal interphalangeal joints. Mean follow-up was 13 months. This compares favorably to the more aggressive technique of open arthrolysis, thus offering a simple and effective treatment alternative.

Pain and stiffness are the two major causes of disability of the hand. Despite improved methods of fixation, observance of important principles in the early care of the injured hand, and aggressive physical therapy, stiffness of the finger joints continues to be a major problem in the rehabilitation of the hand following injury.[1]

Percutaneous desmotomy of radiographically normal metacarpophalangeal and proximal interphalangeal joints is a simple technique not previously described in the literature, and it has been successful in achieving increased flexion of joints stiffened in extension by virtue of untreated edema causing swelling and foreshortening of the collateral ligaments. The method involves percutaneous sectioning of the collateral ligaments followed by joint manipulation. The minuteness of the stab puncture wound minimizes concern over wound healing and allows for a more aggressive immediate mobilization.

A careful evaluation of the contracted finger joint must be carried out in an attempt to clarify the etiology of stiffness. Scar contractures in the skin, Dupuytren's disease, "intrinsic plus" states, extensor mechanism contractures due to muscle shortening or tendon adhesions, flexor tendon sheath contractures from injuries or infections, capsular contractures, and joint surface disruption are not uncommon causes of joint stiffness and must be tested for in evaluating joint contractures.

The most common cause of joint stiffness in extension is swelling and contracture of the collateral ligaments of the metacarpophalangeal and proximal interphalangeal joints after any mechanism that causes swelling of the whole hand or one of its digits. A frequent causative factor is failure to exercise an edematous hand or prolonged immobilization with the joints in an extended position.

Open release of such stiff joints has become the standard operation method of treatment when stiffness of the metacarpophalangeal and proximal interphalangeal joints has become intractable. Curtis,[2] Sprague,[3] Young et al.,[4] Gould and Nicholson, [5] and Rhode and Jennings[6] have reported their experiences with the operative management of stiffness of finger joints. Procedures done were relatively uniform, differing only in the approach to the joint[5,7] and manner of releasing the contracted tissues.[1,3–5,7] Gould and Nicholson[5] noted an average final gain of 21 degrees of active range of motion for metacarpophalangeal joints (100 dorsal capsulectomies and 5 volar capsulectomies), 14 degrees of average final gain in active range of motion for proximal interphalangeal joint dorsal capsulectomies, and 13 degrees of average final gain in active range of motion for proximal interphalan-

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geal joint volar capsulectomies. Commonly, much of the initial gain is subsequently lost as the contracture recurs.

Technique

Percutaneous desmotomy may be performed as an outpatient procedure under general, regional, or local anesthesia, although the latter permits intraoperative evaluation of gains made in active range of motion. The anatomic positions of the extensor tendons and collateral ligaments are marked out on the skin. The joint is positioned in the direction of desired motion, so as to have tension on the collateral ligaments. A stab wound approximately 2 mm long is made through the skin, using a no. 11 blade directed transversely across the ligament. The blade is pushed vertically into the ligament, rather than slicing the ligament. For precision control of the knife blade, it is held with the shortest lever arm possible. The dorsal half of the tight ligament is sectioned first by pushing in the blade with the cutting edge facing volarly to avoid injury to the extensor tendon. If the more volar component of the ligament needs sectioning, the blade is removed and turned 180 degrees so that the cutting edge faces dorsally before reinsertion into the same puncture wound, so as to preclude injury to the neurovascular mechanism. Between progressive jabs of the ligament, the joint is manipulated into flexion. When adequate motion is not obtained, further sectioning of the collateral ligament is done. A tendency of the joint to spring back into extension is interpreted as inadequate release and indication for further sectioning. The small skin wounds require no suturing. A well-padded dressing and, in most instances, a short-arm cast or a splint are applied with the digit or digits held in flexion over a roll of gauze.

The postoperative management of these patients is critical. The extremity is kept elevated for 24 to 48 hours. The wounds are inspected, and active range of motion is commenced at that time. The full cast is discarded 1 to 3 days postoperatively, depending on the presence of local swelling and pain. The patients are generally seen at least three times a week for the first 2 weeks and less frequently thereafter if they have a satisfactory postoperative course. During the office visits, the joints are mobilized actively and passively with the assistance of local Xylocaine and Marcaine to overcome pain. The patients are instructed to perform active and passive range-of-motion exercises at home as often as is tolerated.

Materials and Methods

Percutaneous desmotomy was performed in a total of 65 joints, including 39 metacarpophalangeal joints and 26 proximal interphalangeal joints, in 26 patients. Age range was 23 to 82 years, with a median of 48 years. Etiology of joint stiffness included crush injuries and hand and wrist fractures. The procedure was variably performed under general, regional, or local anesthesia. Follow-up ranged from 1 month to 7 years, with a mean of 13 months, a time at which the majority of patients had plateaued in their recovery.

Results

The mean final gain in motion for metacarpophalangeal joints was 28 degrees and for proximal interphalangeal joints 18 degrees. Improvement was obtained in 36 of 39 metacarpophalangeal joints with a mean follow-up of 15 months and 17 of 26 proximal interphalangeal joints with a mean follow-up of 11 months.

One patient developed a minor beta streptococcal infection of a stab wound, which was promptly controlled with appropriate treatment. There were no cases of instability, ulnar drift, neurovascular injury, or tendon injury.

Case Reports

Case 1

A 43-year-old anesthesiologist developed progressive stiffness of her left (nondominant) fourth metacarpophalangeal joint several years following a closed crush injury to the finger. Preoperative active range of motion was 50 degrees

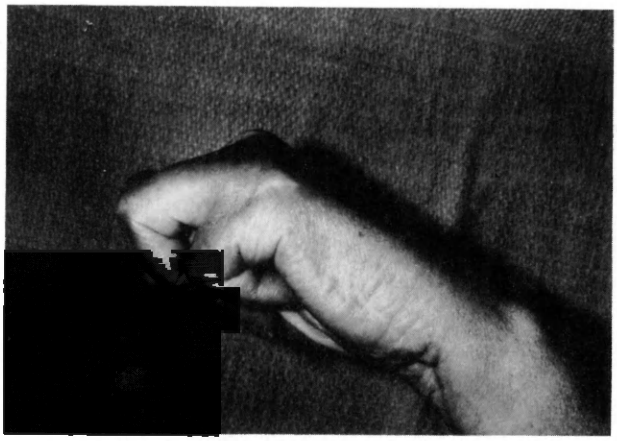

FIG. 1. *Case 1.* A 43-year-old woman with fourth metacarpophalangeal joint stiffness several years following a closed crush injury.

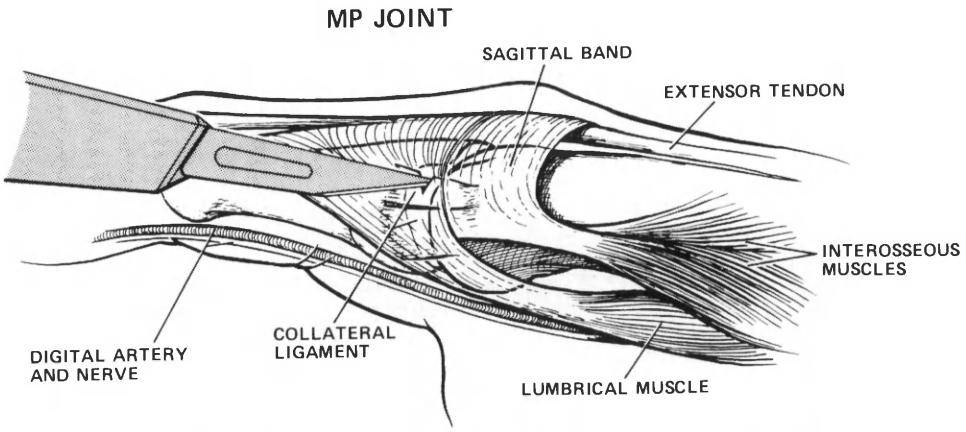

FIG. 2. *Case 1.* Percutaneous arthrolysis of the metacarpophalangeal joint.

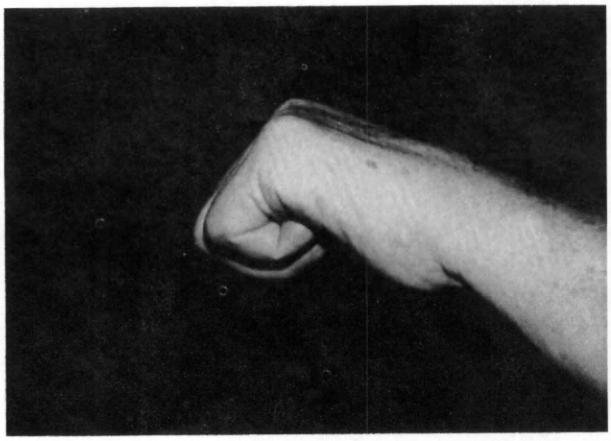

FIG. 3. *Case 1.* Seven years following percutaneous arthrolysis of the fourth metacarpophalangeal joint.

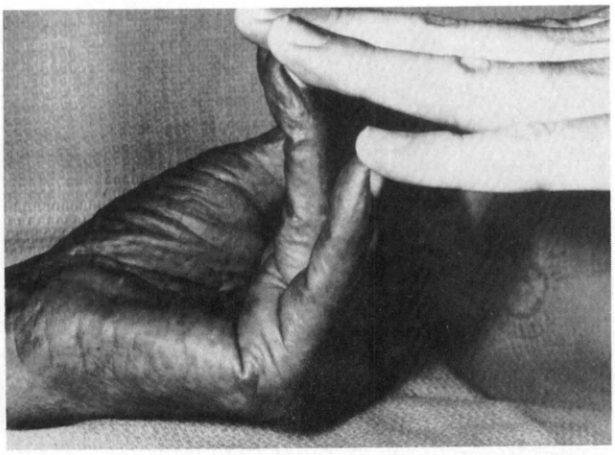

FIG. 4. *Case 2.* A 55-year-old painter with extension contractures of the index, long, ring, and small finger proximal interphalangeal joints.

(Fig. 1). Percutaneous arthrolysis of the metacarpophalangeal joint was performed (Fig. 2). Postoperative active range of motion was 90 degrees, and this was maintained 7 years postoperatively (Fig. 3).

Case 2

A 55-year-old painter developed extension contractures of his left (nondominant) index, long, ring, and small finger proximal interphalangeal joints 4 months following a Colles' fracture. Preoperatively, passive proximal interphalangeal joint flexion was markedly limited (Fig. 4). Following percutaneous arthrolysis (Fig. 5), active flexion demonstrated a gain of 60, 55, 60, and 30 degrees in the proximal interphalangeal joints of the index, long, ring, and small fingers, respectively, at 7½ months of follow-up (Fig. 6).

DISCUSSION

Percutaneous desmotomy for postedema intractable stiffness in extension of metacarpophalangeal and proximal interphalangeal joints is a simple, safe, and minimally invasive technique which has proven to be an effective alternative to the management of the stiff hand. Results appear to be more dramatic in the metacarpophalangeal joint, with less theoretical risk of injury to the neurovascular bundle or the extensor mechanism, than in the proximal interphalangeal joint. No such complications occurred in our series.

The results of this procedure in our patient population compares favorably with those reported in open capsulectomies. The minimization of surgical trauma inherent in this procedure permits the more aggressive mobilization required for an improved result. Close postoperative follow-up is imperative.

This technique is not applicable to stiffness caused by problems other than fixed edema of the digit or hand.

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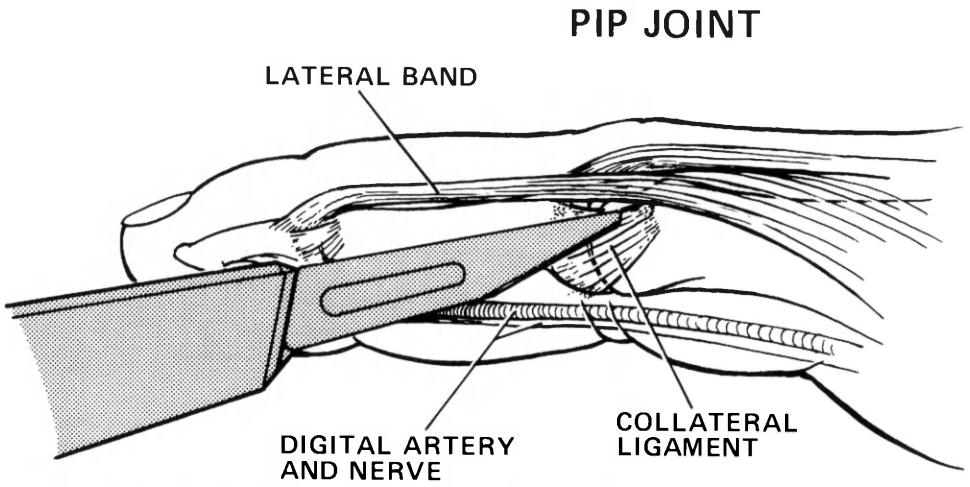

FIG. 5. *Case 2.* Percutaneous arthrolysis of the proximal interphalangeal joint.

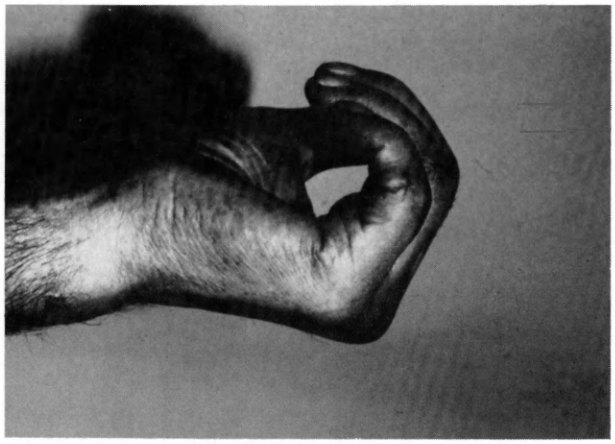

FIG. 6. *Case 2.* Marked improvement of active proximal interphalangeal joint motion 1 week postoperatively.

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