The abducted little finger in low ulnar nerve palsy

In 12 dissections the extensor digiti minimi tendons inserted into the abductor tubercle of the proximal phalanx. In eight of the 12, the tendons passed to the ulnar side of the abductor-adductor axis of the metacarpophalangeal joint. A separate tendon from the extensor digitorum communis to the little finger was found in only one dissection, with all others showing a connecting band which varies in its obliquity and thus in its abducting effect. To correct an abducted little finger, the ulnar portion of the extensor digiti minimi was transferred to the radial side of the little finger. Two methods were used: (1) the tendon was passed to the volar side of the metacarpophalangeal joint, if the joint could be hyperextended; if not, (2) a simple transfer to the radial collateral ligament was performed.

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Clawing of the ring and little fingers in low unlar nerve palsy (Fig. 1) results when the metacarpophalangeal joints hyperextend from the unopposed action of the extrinsic extensors, and the interphalangeal joints cannot be extended because of paralysis of the intrinsic muscles. Many operative procedures have been designed to provide active extension by tendon transfers into the lateral bands of the ring and little fingers.

Patients whose metacarpophalangeal joints will not hyperextend do not develop the claw deformity, having in effect an inherent capsulodesis. Since prevention of the hyperextension of the metacarpophalangeal joints allows the extrinsic extensors to extend the two distal joints, other surgical techniques have been designed to block the metacarpophalangeal hyperextension.

Some patients, however, with low ulnar motor paralysis and without clawing may have a much less obvious but annoying disability, a persistently abducted little finger (Fig. 2).

The abducted position of the extended little finger may be troublesome; the finger catches on attempting to reach into a pocket or to put a hand through a coat sleeve or during any maneuver requiring insertion of the adducted and extended fingers into a confined space. This deformity was described first by Wartenberg in 1930 and again in 1939 and has been discussed by Mannerfelt in his study of ulnar nerve paralysis in 1966. But not all patients with ulnar palsy and without clawing develop the abducted little finger. Why this should be has not been explained.

The purposes of this paper are to analyze the cause of the abducted little finger, to record our experience with eight patients whose primary complaint was of this impediment, and to describe in detail the results of the two corrective procedures employed.

Anatomy

Dissections were performed in 12 hands. In all specimens the extensor digiti minimi was composed of a single muscle mass proximal to the wrist, the tendon of which then divided into two discrete tendons over the dorsum of the hand. The separation occurred beneath or just distal to the extensor retinaculum (Fig. 3). Both tendons merged into the extensor apparatus of the little finger over the metacarpophalangeal joint. In three dissections the radialmost tendon passed over the center of the axis of abdution-adduction of that joint and in nine was radial to it. The ulnar tendon, which always was the thicker of the two, passed directly over the axis in three specimens, was radial to it in one, and was found to be ulnar to it in the remaining eight.

In all dissections the ulnar tendon of the extensor digiti minimi had a significant slip which passed around the ulnar border of the metacarpal head to gain a firm attachment to the tendon of the abductor digiti minimi (Fig. 4). By means of this slip the extensor digiti minimi acquired a bony attachment to the tubercle on the volar and ulnar aspects of the base of the proximal phalanx.
In all but one of the specimens, the contribution of the extensor digitorum communis to the little finger was made by a connecting band from the tendon of the ring finger into the radial tendon of the extensor digitii minimi just proximal to the metacarpophalangeal joint. In only one specimen was a separate tendon present from the extensor digitorum communis to the little finger.

The length and therefore the angle of approach of the connecting band varied greatly. In some it was short, broad, and approached the little finger in a transverse direction (Fig. 5). In others the tendon was long and narrow and almost parallel to the extensor digitii minimi (Fig. 6).

**Discussion**

From our dissections it was apparent that the extensor digitii minimi had the potential to abduct the little finger through its indirect insertion into the abductor tubercle on the proximal phalanx. The abduction effect will be increased if the primary line of pull of the extrinsic tendons lies ulnar to the abduction-adduction axis of the metacarpophalangeal joint, as was present in eight of the 12 dissections. However, in the living hand this alignment may be altered and we must consider what forces may cause it to do so.

Kaplan stated that the extensor digitorum communis rarely has a separate tendon to the little finger, its contribution being represented by the junctura tendinum. A separate tendon was found in only one of our dissections. The connexus intertendinosis varies considerably in its length and in its angle of approach to the metacarpophalangeal joint. The longer it is, the more acute will be the angle of approach to the joint. The more acute the angle of approach, the stronger will be the extensor effect and the weaker the adductor component (Fig. 6). The extreme situation would be that in which the extensor digitorum communis is represented by a separate third tendon to the little finger. It is reasonable to suppose therefore that if the connecting tendon is long and the extensor digitii minimi is ulnarward to the axis, then it will be more effective and more surely will abduct the little finger. A short transverse band would not only have a strong adducting component but also would serve to tether the extensor digitii minimi during active extension, diminishing its effect as an abductor (Fig. 5).

The balancing force to this abduction in extension, the third palmar interosseus, is inactive in ulnar paralysis. Thus the abduction of the little finger encountered in patients whose metacarpophalangeal joints do not hyperextend appears to be due to the unopposed action of the long, extrinsic, extensor tendon on the metacarpophalangeal joint. Surgical correction of this deformity should aim to restore the balance. We have employed two procedures.

**Fowler-Brooks transfer**

Through a longitudinal incision over the dorsal aspect of the metacarpophalangeal joint of the little finger, the tendons of the extensor digitii minimi are identified. The ulnar of the two tendons is detached from the extensor hood distally (Fig. 7, A) and is dissected from its companion proximally to the distal
edge of the extensor retinaculum. A 2.5 cm. palmar incision then is made obliquely from the distal palmar crease overlying the metacarpophalangeal joint of the little finger out to and just beyond the proximal digital crease. The neurovascular bundle to the fourth web space is identified and retracted radialward to expose the deep transverse metacarpal ligament (Fig. 7, B). A radially based flap of the flexor tendon sheath some 7 to 8 mm. wide is raised distal to the proximal pulley. The tendon transfer will be attached to this after the original method of Brooks (Fig. 7, C).

The previously prepared tendon of the extensor
digit minimi then is drawn from the dorsal to the palmar wounds between the fourth and fifth metacarpals proximal to the deep transverse metacarpal ligament, passed volar to the ligament, and held alongside the previously raised flap of flexor tendon sheath (Fig. 7, D). With the wrist joint at neutral and the metacarpophalangeal joint at 20° flexion, the tendon is sutured to the flap of sheath and to the adjacent periosteum of the proximal phalanx.

The original Brooks method of insertion of the tendon transfer was chosen for its simplicity. He has described a modification of his method in which the in-
Fig. 7. In correcting the abducted finger which can be hyperextended passively at the metacarpophalangeal joint, a modification of the Fowler-Brooks transfer was employed. A. The most ulnarly placed of the extensor digit minimi was freed from the extensor hood and through a palmar incision. B. The flexor sheath of the small finger was exposed and the transverse metacarpal ligament identified. C. A radially based flap of the flexor tendon sheath distal to the first pulley was reflected. D. The previously detached extensor tendon was then passed between the fourth and fifth metacarpals volar to the transverse metacarpal ligament and sutured into the flap of tendon sheath with the wrist joint at neutral and the metacarpophalangeal joint at 20° of flexion.

Insertion is made through a slit in the vaginal ligament, the tendon turned back on itself and sutured in place. Zancolli described a similar method of threading the tendon through the proximal part of the flexor tendon sheath, bringing it out through a slit in the sheath, turning it proximally, and suturing it to itself.

After operation the ring and little fingers are splinted for 4 weeks in the intrinsic-plus position with the wrist extended. The wrist and metacarpophalangeal joints are immobilized, but the interphalangeal joints are left free. Early interphalangeal motion is important in preventing adhesion of the flexor tendons. Protected active motion is commenced thereafter and full use is allowed 8 weeks after operation.

Extensor digit minimi-adductor transfer. Through a dorsal approach similar to that detailed above, the ulnar tendon of the extensor digit minimi is detached and mobilized as described previously. It then is passed under the connecting band from the ring finger and sutured into the phalangeal attachment of the radial collateral ligament of the metacarpophalangeal joint of the little finger, which is exposed by making a short longitudinal slit in the proximal edge of the transverse lamina of the extensor hood.

The procedure chosen depends upon whether there is any claw deformity in the little finger. If any clawing is evident, the Fowler-Brooks procedure is performed. If there is no clawing and the metacarpophalangeal joint cannot be passively extended beyond neutral, the simpler transfer is used. In the eight patients who were available for follow-up, each technique had been used four times.

The results achieved were satisfactory in seven of the eight patients, with the persistent abduction being elim-
Fig. 8. Result following a modified Fowler-Brooks transfer. A. The hand is relaxed. B. Active adduction of the little finger is present.

inated and active adduction restored (Fig. 8, A and B).

In the eighth patient, one in whom the modified Fowler-Brooks technique was employed, a flexion deformity resulted. Abduction was overcome satisfactorily, and extension of all fingers remained in balance to within 10° of neutral. However, with further extension, the index, middle, and ring fingers extended completely but the little finger remained flexed at 20°, producing an impediment as significant as that present prior to operation, but in a different plane. Clearly this resulted from too much tension on the insertion of the transfer and was corrected later.

Summary

The persistently abducted little finger, a troublesome deformity of the hand in some patients with ulnar nerve
palsy, is described. It occurs in patients in whom the metacarpophalangeal joints cannot hyperextend and who therefore do not develop the typical claw posture. The anatomical basis of the persistently abducted little finger was investigated in 12 dissections.

The diagnosis of abducted little finger was made in eight patients. Correction was achieved by two different operative techniques, a modification of the Fowler-Brooks transfer and a simpler transfer of a portion of the extensor digiti minimi to act as an adductor.

REFERENCES