

# Combined Opponens Replacement of Thumb and Little Finger A Preliminary Report<sup>1</sup>

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In the case of combined ulnar and low median paralysis in leprosy, restoration of function of the metacarpal arch is necessary, as was noted by Bunnell (2), Ranney (8), and Fritschi (4). Bunnell mentioned two methods to restore the metacarpal arch together with adduction of the thumb (2). As, according to Fritschi, "surgical reconstruction of deformities of leprosy is now well and firmly established" (3), a new procedure to restore the metacarpal arch in instances of ulnar and low median paralysis must be a method easily combined with the remaining program of surgical reconstruction. The method described in this paper meets these expectations.

## MATERIALS AND METHODS

**Functional anatomy considerations.** Knowledge of systematic anatomy of the hand and pathologic anatomy of the claw hand (2,7) are presupposed. Extensor many-tailed graft and other procedures, which increase the reversal of the metacarpal arch, are no longer preferred (3,9). The procedures "extensor to flexor many-tailed graft" (Brand), "sublimis transfer" (Stiles), "palmaris longus many-tailed graft" (Lennox), performed in cases of claw hand due to ulnar and low median paralysis do not seem to improve the active increase of concavity of the metacarpal arch. When the ring finger sublimis is used for opponens replacement of the thumb, the thumb function gains at the cost of a part of ring finger flexion and at cost of strength in active increase of the concavity of the metacarpal arch during grasp (6).

**Prerequisite conditions.** There should be no subcutaneous scars at the hypothenar. Passive opposition of thumb and metacarpal of the little finger must be normal. In this position, pulp to pulp pinch of thumb to lit-

tle finger should be easy. The physiotherapist has to check the range of movement before the combined opponens replacement of thumb and little finger is performed. The remaining prerequisites are practically the same as for opponens replacement of the thumb.

**Surgical procedure.** Opponens replacement of the little finger is carried out as a procedure combined with opponens replacement of the thumb. For the latter, we follow the procedure described by Fritschi (3) which differs somewhat from Brand's description (1). When moving into opposition the range of movement of the metacarpal bone of the thumb is about double the range of movement of the metacarpal of the little finger. The arrangement of the transferred tendon portion running through a pulley attached to the capsule of the metacarpophalangeal joint of the little finger (Fig. 1) permits the pulley and metacarpal of the little finger to move half as much as the thumb when the motor tendon is acting.

The combined opponens replacement of thumb and little finger differs from Fritschi's description (3) of opponens replacement of the thumb as follows: after tunneling to an incision one centimeter distal to the pisiform, the motor tendon (usually the ring finger sublimis) is split, properly. A quarter of it is covered with a wet compress. The opponens replacement of the thumb is carried out as usual with the remaining three quarters of the motor tendon, except that we preserve the surplus tendon piece cut away from the so-called "rotation slip," for which usually half strength of ring finger sublimis is used.

After the tendon sutures at the thumb are completed (including one wire tension relief suture for the rotation slip), the radial aspect of the hand is placed onto the oblique part of the extensor to flexor many-tailed splint, keeping the hand joint flexed and the thumb opposed. The prepared motor tendon slip for the opponens replacement of the little

<sup>1</sup>Received for publication 28 September 1973.

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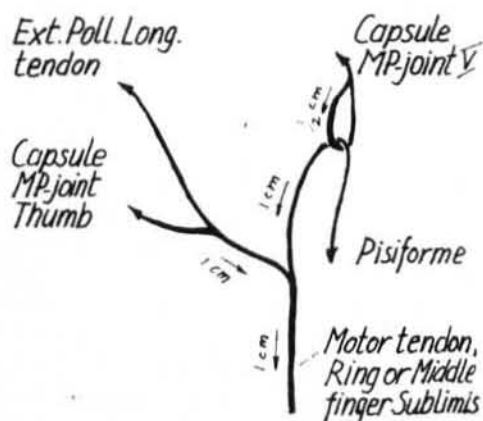


FIG. 1. The four reinsertions of combined opponens replacement. The pulley follows with MCV 0.5 cm when the motor tendon pulls the thumb 1 cm into opposition.

finger is guided through a pulley formed with the preserved surplus tendon piece. The pulley carrying the slip, or so-called "rope," is then tunneled from the incision lying one centimeter distal to the pisiform to an incision at the dorso-ulnar side of the metacarpo-phalangeal joint of the little finger (Fig. 2). The ends of the pulley are stitched to the joint capsule of this joint. Thereafter, the end of the "rope" is stitched to the pisiform near the origin of the abductor of the little finger, keeping thumb and



FIG. 2. Course of the tendon using pulley and rope to combine opponens replacement of thumb and little finger.

metacarpals of ring and little fingers in opposition. So-called "O-tension" is given. Plaster of Paris is applied as for opponens replacement of the thumb, but in addition, the metacarpal of the little finger is kept opposed rounding the metacarpal arch. The hand is elevated for four days after the operation. Plaster of Paris is removed after three weeks, the stitches are taken out and physiotherapy is begun.

**Postoperative physiotherapy.** Physiotherapy after combined opponens replacement of the thumb and little finger consists of almost the same routine of reeducation followed after opponens replacement of the thumb (5). Some additional points need to be mentioned. More care must be taken to avoid overstretching of the transferred tendon. The patient, therefore, gives support with his other hand, keeping thumb and little finger metacarpal in opposition during exercises. The spica of plaster of Paris applied includes, at the dorsum of the hand, the metacarpal of the little finger, thus, fully keeping the ulnar half of the hand rounded so that thumb and little finger are kept in opposition. To ensure that this position is maintained, the plaster of Paris of the spica must be made sufficiently strong at the volar side to give good modeling in the proper position. If this is neglected, the power of the extensors of the fingers may damage the spica. Hard work is best avoided for an additional four weeks after completing postoperative physiotherapy.

## RESULTS

To standardize the results, angle measurement of the metacarpal arch is used. We mark the complement angle of the angle, which is formed by the two tangents touching a) the metacarpal head of the index and middle fingers, and b) the metacarpal head of the ring and little fingers. In different positions of the hand this complement angle is taken by applying the protractor at the neck of the metacarpal bones. Guttering of extensor tendons of the fingers, edema, and other abnormal conditions must be taken into consideration. In the "slip through a ring" position of the normal hand, this angle indicates the strongest concavity of the metacarpal arch. Grasping small round objects with all finger tips comes near to this position and is easier to perform.

The angle for strongest concavity of the metacarpal arch was found to be:

20 normal hands—40° to 62° average 52°

6 hands after finger correction and opponens replacement of thumb and little finger—30° to 48° average 33°

6 hands after extensor flexor many-tailed graft and opponens replacement of the thumb—7° to 22° average 16°

Restoration of thumb function in six cases where combined opponens replacement of thumb and little finger was performed was as easily obtained as in cases where only opponens replacement of the thumb was done. The pinch of thumb to pulp of ring finger and little finger was found comparatively improved. When doing active rounding of the metacarpal arch (volar aspect of the hand upside, index and middle finger metacarpal fixed), the patients were able to lift up to 250 g attached to the base of the little finger. Cases with only finger correction and opponens replacement of the thumb were not able to round the metacarpal arch under the same conditions.

### DISCUSSION

It has been suspected that the transferred tendon portion, the so-called "rope," might form adhesions with itself resulting in a tenodesis. If so the "rope" would form tight, firm adhesions with itself, resulting in a direct tendinous connection of the motor tendon to the little finger metacarpal. Pull of the motor tendon would therefore cause equal range of movement at thumb and little finger. At full opposition of the little finger, further pull of the motor tendon would result only in more isometric tension but not in further movement. The thumb, therefore, would remain in a half-opposed position and not receive further impulse. This sequence has not been seen so far. Different tension given to Y-insertion and rope-insertion may alter this aspect to some degree.

Good results with combined opponens replacement of thumb and little finger in suitable cases are nearly as easily obtained as good results in cases of opponens replace-

ment of the thumb. The suture for the "rope" should be prepared at least before suturing at the thumb is done. This is advisable as in the flexed position of the hand joint the pisiform is much more difficult to expose than in extended position. We use an additional small incision over the pisiform.

This method should not be used for hypothenar replacement or for replacement of opponens and abductor of little finger as this results in unpleasant abduction of the little finger and less effective correction of the metacarpal arch. Alteration of the method by stitching one end of the pulley as usual and the other end to the insertion of the abductor of the little finger might seem attractive, however, the result of doing so is more disabling than improving the little finger function with respect to the five finger pinch.

### SUMMARY

This report is presented after six cases have been operated on according to the above described method. The evaluation of the results is based on the status after completing reconstructive surgery and post-operative physiotherapy, which extended over a six month period from March to August 1972.

A further follow-up of these cases is presently under study.

The results obtained using the described procedure, show that it is possible to restore the metacarpal arch more to normal along with the usual reconstruction of the function of the thumb.

This method has become a routine procedure in our operation program as it so far has given cosmetically and functionally better results in comparison with similar cases where other methods were used.

### RESUMEN

Este informe se presenta después de haber operado seis casos con el método descrito. La evaluación de los resultados esta basada en el estado después de haberse completado la cirugía reconstructiva y la fisioterapia post-operatoria, que se extendió durante un período de seis meses, desde Marzo hasta Agosto de 1972.

Actualmente estos casos están siendo sometidos a nuevas evaluaciones. Los resultados obtenidos utilizando el procedimiento descrito demuestran que es posible restaurar el arco metacarpiano más cerca de lo normal, junto con la

reconstrucción acostumbrada de la función del pulgar.

Este método se ha convertido en un procedimiento de rutina en nuestro programa quirúrgico que hasta ahora ha dado mejores resultados cosméticos y funcionales en comparación con casos similares en los cuales se han usado otros métodos.

### RÉSUMÉ

Ce rapport est présenté après que six cas aient été opérés par le méthode du remplacement combiné de l'opposant du pouce et de l'auriculaire. L'évaluation des résultats est basé sur l'état du malade à l'issue de la chirurgie réparatrice et de la physiothérapie post-opératoire, au cours d'une période qui s'est étendue sur six mois de mars à août 1972.

On présente ici un suivi ultérieur des cas étudiés.

Les résultats obtenus en utilisant cette méthode montre qu'il est possible de restaurer l'arche du métacarpe en même temps que l'on obtient le rétablissement habituel de la fonction du pouce.

Cette méthode est devenue une procédure de routine dans notre programme opératoire, car elle a jusqu'ici donné des résultats esthétiques et fonctionnels meilleurs que ceux que permettent d'obtenir d'autres méthodes dans des cas similaires.

**Acknowledgment.** I am grateful to Dr. Fritschi, who favored this work by giving me the necessary encouragement to complete this study. My thanks also to Dr. Vomstein, Medical Superin-

tendent, Leprosy Relief Rural Centre Chettipatty, Salem, and to Msgr. Chittilapilly, Director, Damien Institute, Trichur, S. India, and to German Leprosy Relief Assoc., Wurzburg, who made it possible to complete this work.

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