Sublimis loop reconstruction of the transverse metacarpal ligament following central ray amputation

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GA Robertson, MM Al-Qattan. Sublimis loop reconstruction of the transverse metacarpal ligament following central ray amputation. Can J Plast Surg 1993;1(3):128-130. A new procedure to restore the integrity of the deep transverse metacarpal ligament after central ray amputation using a flexor sublimis loop is described. This technique can be used both for primary or secondary reconstruction where the remaining ligamentous tissues are insufficient for direct repair.

Key Words: *Central ray amputation, Flexor sublimis loop, Transverse metacarpal ligament*

Reconstruction de l'anse superficielle du ligament métacarpien transverse suite à une amputation du rayon central

RÉSUMÉ : Une nouvelle technique en vue de restaurer l'intégrité du ligament métacarpien profond transverse après amputation du rayon central au moyen d'une anse superficielle du fléchisseur est décrite ici. Cette technique peut être utilisée pour une reconstruction primaire ou secondaire, lorsque les tissus ligamenteux restants ne permettent pas une réparation directe.

The anatomy of the deep transverse metacarpal ligament has been well described (1,2). It acts as a strong link between the rigid radial two metacarpals and the mobile ulnar two metacarpals. It allows the ulnar metacarpals to rotate in a stable fashion around the radial, producing the cupped palm that is necessary for grip strength.

Central ray amputation of either the middle or ring finger disrupts this link between the rigid and the mobile, resulting in a major loss of grip strength down to as much as 20% of normal. Additional causes of morbidity include gap formation between adjoining digits allowing for loss of small objects, together with these digits developing rotational deformities and scissoring.

A technique is described where the two slips of the resected sublimis tendon are passed through button-holes in the transected edges of the transverse metacarpal ligament and are then sutured to each other (Figure 1). This restores the integrity of the ligament, and during strong grip the contraction of the sublimis augments this new link between radial and ulnar metacarpals. The sublimis of the affected digit is used where feasible.

If not, the sublimis of an adjacent digit can be transferred without appreciable donor morbidity.

CASE REPORTS

Case 1: A 44-year-old right handed manual worker presented with a crush injury to the left middle finger and had central ray amputation without bony transposition. The osteotomy of the third metacarpal was done through the proximal base using subperiosteal dissection. The digital arteries were ligated and digital nerves were transected just distal to the bifurcation of the common digital neurovascular bundles. The flexor profundus and extensor tendons were resected proximally under stretch. The preserved sublimis tendon was split proximal to the chiasma into two slips. Each slip was brought through a button hole in the corresponding identified edge of the deep transverse metacarpal ligament. The two tendon slips were then sutured together with 4-0 prolene under tension with the wrist in neutral position (Figure 1). The hand was immobilized in an occlusive dressing for three weeks. The patient resumed heavy manual work three months after surgery. At follow-up one year later, he remained satisfied with no scissoring and a grasp strength of 36 kg or 80% of his dominant right hand.

Case 2: A 50-year-old right handed manual worker sustained a paint gun injury to the left middle finger and had central ray resection without bony transposition done elsewhere. He presented six months later complaining of a painful neuroma at the distal part of the palmar incision and weak grip strength. Examination revealed a full range of movement and normal sensation in the remaining digits.

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There was extreme tenderness over the distal part of the volar incision to the extent that he was unable to use the dynamometer to measure grip strength. His power grip was 0% compared to his normal hand, but this gross loss was an attribute more of pain limitation than mechanical inefficiency. In effect, the contribution of the latter to his loss of grip strength was impossible to gauge objectively.

Using the previous volar longitudinal incision, the neuroma was excised and the nerve end buried into muscle more proximally. The sublimis tendon of the index finger was cut at the distal palmar crease, split into two more proximally, and used to reconstruct the deep transverse metacarpal ligament (Figure 2). The patient resumed work three months after surgery. At follow-up one year later, he remained satisfied with no recurrence of the neuroma and a grip strength of 25 kg or 63% of that of his dominant right hand.

Case 3: A 32-year-old man had previously sustained a zone II laceration to both flexor tendons to the left ring finger. An unsuccessful primary repair led to a two-stage flexor tendon graft that was equally unsuccessful. The affected digit had virtually no active movement and was seriously impeding the

Figure 1) Reconstruction of the deep transverse metacarpal ligament using the split sublimis tendon of the amputated central ray. The cut edges of the ligament are firmly approximated (arrows) to close the gap before suturing together the two slips of the sublimis tendon

Figure 2) (Left) A 50-year-old male with previous central ray resection. Because the sublimis tendon of the amputated digit was not available for reconstruction of the metacarpal ligament, the sublimis to the index was cut at the distal palmar crease and transferred. (Right) Each slip was brought through a button hole in the corresponding identified edge of the deep transverse metacarpal ligament. The two hemostats pulled the two tendon slips together before suturing them to each other

function of the hand as a whole. The patient himself requested amputation. His preoperative grip strength was 34 kg or 71% of the normal dominant right hand. A ray amputation of the ring finger was performed and a sublimis loop reconstruction was carried out transferring the sublimis tendon from the middle finger. His postoperative recovery was uneventful and one year later his grip strength was 39 kg or 81% of his normal dominant right hand.

DISCUSSION

Two other techniques have been reported that have attempted to restore the integrity of the transverse metacarpal arch. Bony transposition of an adjoining digit was first described by Carroll (3) and reaffirmed with objective measurements by Colen and coworkers (4). Restoration of grip strength averaged 74%, but the range was not recorded. This technique requires eight weeks of immobilization, and its

complications include malunion, non-union and tendon adherence at the osteotomy site (5).

The second technique is the direct suturing of the cut edges of the transverse metacarpal ligament. Steichen and Idler (6) reported a 70% restoration of grip strength with a range from 24% to 97%. This procedure is not always possible technically as the nature of injury can result in an insufficiency of ligamentous tissue particularly in secondary cases where there is an inevitable retraction and shortening.

The sublimis loop technique described here is a simple method of dynamic reconstruction of the transverse metacarpal ligament. It has conferred benefit without significant morbidity on the three patients on whom it was used. Power grip averaged 75% of the opposite dominant hand, but greater numbers are needed before any definitive statement can be made regarding restoration of grip strength.

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