Palmaris longus tendon transfer for augmentation of the thenar musculature in low median palsy

The palmaris tendon may be lengthened by a distal strip of palmar fascia and transferred subcutaneously to the tendon of insertion of the abductor pollicis brevis for augmentation of thumb elevation from the palm. The transfer attempts to duplicate abductor brevis function in the complex act of opposition. The palmaris has appropriate strength, excursion, and direction for this purpose. It is properly phased for pinch activity and requires minimal retraining. Twenty-eight cases of transfer have been performed successfully and without difficulty. The uses of the transfer have included cases of carpal tunnel syndrome with thenar atrophy, injury to thenar muscles, and direct trauma to the median nerve in the forearm.

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The palmaris longus was used initially for tendon transfer to the thumb by Camitz1 and has been described more recently by Littler and Li2 for augmentation of weakened thenar muscles in cases of low median palsy. The procedure described in this report is essentially that of Camitz; however, the function of the transferred palmaris longus appears to be that of elevation of the thumb metacarpal in a plane that is perpendicular to the palm. This procedure does not completely replace the complex function of true opposition. All cases reported in this study possessed adductor and flexor power for convergence of the thumb toward the palm, as well as abductor and extensor power for thumb divergence. Palmaris longus transfer was used only as an assistive transfer for elevation of the metacarpal directly away from the flattened surface of the palm.

Surgical rationale

Palmaris longus tendon transfer for replacement of the function of the abductor pollicis brevis fulfills all established criteria for tendon transfer operations. It possesses adequate strength to replace the short thenar muscle. Amplitude of the palmaris longus, which crosses the wrist, is approximately 3 cm, which allows for adequate excursion. The tendon, prolonged by a strip of palmar fascia, may be redirected over the short abductor musculature in such fashion that pulley formation is not required (Fig. 1). The tendon of the abductor brevis is available for insertion of the transfer to ensure that an appropriate junction into the hood will occur. Therefore this procedure allows for appropriate strength, direction, and amplitude to restore thumb elevation. Its vectors for rotation of the thumb metacarpal

Fig. 1. In the Camitz transfer the palmaris longus tendon has been prolonged with a strip of palmar fascia and inserted into the tendon of the short abductor.

Fig. 2. Chronic compression of the median nerve has resulted in weakening of the thenar muscles and limited elevation of the thumb. The patient has shifted to a modified key grip because of the weakness in the abductor brevis.

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Fig. 3. Intraneural scarring of the median nerve with a guarded prognosis for thenar return was noted. The palmaris tendon has been lengthened with a strip of contiguous palmar fascia and will be redirected for transfer.

Fig. 4. The transfer has been passed subcutaneously from the forearm, directly over the fibers of the abductor brevis, and sutured into the tendon of the short abductor. Adduction of the metacarpal is weak. A single transfer cannot fully replace the six muscles which perform the functions of normal opposition.

There is no functional loss in the hand with transfer of the palmaris longus, which frequently is sacrificed as a tendon graft or excised in major reconstructive surgery to the forearm and hand.

Surgical technique

A curved incision is made at the base of the thenar musculature and extended proximally for a short distance into the forearm. The palmaris longus tendon is isolated in the distal forearm and its attachment to the deep fascia of the forearm is severed. The dissection plane continues distally into the palmar fascia, which is incised along two parallel lines extending from the borders of the palmaris tendon into the fascia of the palm. Two parallel incisions into the palmar fascia allow for a strip of fascia to be elevated to the level of the midpalm. The deep surface of the fascia then is freed from the volar carpal ligament and the muscle-tendon-fascia is tested for appropriate amplitude. At least 2 cm of amplitude is available. A subcutaneous tunnel is developed from the forearm to the level of the metacarpophalangeal joint of the thumb. This subcutaneous area lies directly superficial to the abductor pollicis

Fig. 5. An improved pinch pattern results from function of the transfer and partial return of the thenar muscles. One year following operation.
brevis muscle. The tendon transfer is passed through the tunnel and is withdrawn through a small incision in the region of the thumb metacarpophalangeal joint, where it is sutured to the tendon of insertion of the abductor pollicis brevis under appropriate tension. At this position a trial suture may be placed at the junction of the tendon transfer and the abductor brevis insertion into the hood. A trial balance should allow the thumb to stand moderately elevated from the palm at a position directly over the index finger. The junction is completed at the metacarpophalangeal level of the thumb, using small, interrupted, nonabsorbable sutures. A bulky, padded, plaster-reinforced dressing, which holds the thumb in an elevated position from the palm and maintains the wrist in neutral attitude, is applied for 3 weeks. The patient then begins an active exercise program with appropriate protective splinting to prevent stretching of the transfer.

Case reports

Three cases are described briefly to illustrate the use of the Camitz transfer. The initial case describes the most common use of this transfer in carpal tunnel syndrome.

Case 1. E. B., a 56-year-old Caucasian woman, had a history of numbness and tingling in the median distribution of her hand for several years. Although she was aware of the diagnosis of carpal tunnel syndrome, she continued to work until atrophy in the thenar musculature and loss of dexterity in the hand forced her to follow initial recommendations for decompression of the median nerve (Fig. 2). Exposure of the median nerve showed marked narrowing and intraneural fibrosis requiring endoneural neurolysis (Fig. 3). The prognosis for return of full function in the thenar musculature was guarded, and therefore the palmaris longus, prolonged by a distal strip of palmar fascia, was transferred to the tendon of insertion of the abductor pollicis brevis (Fig. 4). The patient's symptoms improved. Some thenar muscle bulk was restored, but complete return did not occur even after 5 years. The Camitz transfer functioned well after 3 weeks of initial splinting and has continued to serve as an effective augmentation to thenar function (Fig. 5).

The second case illustrates the use of a Camitz transfer as a temporary active splint in direct trauma to the median nerve.
Case 2. W. F., a 26-year-old computer operator, sustained a puncture wound injury to his forearm from the blade of a cutting tool. The wound of entry was over the flexor carpi ulnaris, but the direction of the perforation was toward the median nerve and the patient had numbness in the median nerve distribution and paralysis of the thenar muscles. At operation it was noted that the palmaris longus tendon was intact. It was prolonged with a strip of palmar fascia for Camitz transfer, and a neurorrhaphy was performed (Fig. 6). The patient's prognosis for eventual return of thenar function was good, but the laceration of the nerve was located about 3 inches above the wrist and a delay in return of the thenar function was anticipated. The palmaris longus tendon, which might have been sacrificed for exposure of the nerve, was used as an active splint in the Camitz transfer procedure. The patient was allowed to function normally after 4 weeks of splinting. Within 1 year he had regained the function of his thenar musculature. The Camitz transfer served effectively as an active motor unit from the period immediately following operation to the eventual return of thenar function (Figs. 7 and 8). The transfer also has been used in cases involving direct injury to the thenar musculature.

The third case illustrates the use of the Camitz transfer as part of a complex reconstructive procedure.

Case 3. D. W., a 65-year-old woman, had destructive osteoarthritis at the base of her thumb and virtual complete dislocation of the trapezium. An adduction contracture of the thumb metacarpal was present, and the patient's pinch power was diminished markedly because of the structural deformities and the long-standing carpal tunnel syndrome, which resulted in numbness in the median distribution and atrophy in the thenar muscles. A complex reconstructive procedure was designed to decompress the median nerve in the carpal tunnel, to release the adductor muscles from the third metacarpal, to perform and stabilize an arthroplasty at the base of the thumb, and to transfer the palmaris longus, which might have been sacrificed, to replace the thenar musculature. She acquired improved asymptomatic pinch and grasp.

Results

Twenty-eight cases of Camitz transfer have been performed in the past 10 years. There have been no complications and all transfers appear to have re-established elevation of the thumb from the plane of the palmar surface.

Summary

Transfer of the palmaris longus tendon, prolonged by a strip of palmar fascia, into the tendon of insertion of the abductor pollicis brevis is a safe, simple, and effective method for augmentation of weakened thenar muscles in low median palsy.

REFERENCES