THE TREATMENT OF CLAW TOES BY MULTIPLE TRANSFERS OF FLEXOR INTO EXTIONOR TENDONS

R. G. TAYLOR, OXFORD, ENGLAND

From the Wingfield-Morris Orthopaedic Hospital, Oxford

This paper is an attempt to assess the value of transfer of the flexor into the extensor tendons of the toes in the treatment of claw toes. In the fully developed condition, with hyperextension of the metatarso-phalangeal joints and flexion of the interphalangeal joints, the long flexor tendons can no longer act as slings under the metatarsal heads, which become depressed. Painful callosities develop in relation to the new pressure areas, namely under the heads of the metatarsals and the tips of the toes, and over the dorsum of the proximal interphalangeal joints, from pressure against the shoe. The claw deformity deprives the interossei and the lumbricals of any function of flexing the toes at the metacarpo-phalangeal joints and all the strain of the push-off in walking now falls on the metatarsal heads. Indeed, once the deformity is established, the intrinsic muscles become adaptively shortened, and because the line of their action is now dorsal to the transverse axis of movement at the metatarso-phalangeal joints they act as extensors and perpetuate the deformity. For this reason the power of plantar-flexion of the metatarso-phalangeal joints, which is so essential for efficient function of the forefoot, is lost.

Etiology—A common explanation for claw toes is paralysis of the intrinsic muscles of the foot; but in this series of sixty-eight patients, observations during operation showed that the intrinsic muscles appeared normal and reacted normally to physical stimulation, and biopsy showed no evidence of degeneration. If the cause in these cases was intrinsic paralysis, it must have been transient; no evidence of such temporary paralysis was obtained.

Development of the operation—In 1922 Stiles advocated transfer of the flexor sublimis tendons into the extensor tendons of the fingers to counteract intrinsic paralysis. In 1928 Forrester-Brown applied the same principle for clawing of the great toe. Transfer of the long flexor tendons of the toes into the dorsal expansions of the extensor tendons—the operation now under review—was first carried out by the late Professor G. R. Girdlestone. The object of the operation is to enable the long flexor muscles to take over the function of the intrinsics, giving plantar-flexion of the toes at the metatarso-phalangeal joints and extension at the interphalangeal joints. In addition, division of the contracted long flexor tendons facilitates active extension of the toes.

CLINICAL MATERIAL

This series consists of sixty-eight consecutive patients with clawing either of all five toes or of the lateral four toes treated by flexor-extensor tendon transfers. Forty-four patients had bilateral deformity, making a total of 112 feet operated upon. Thirty-eight patients had associated pes cavus, twenty-three had plano-valgus deformity and seven had no other apparent abnormality. Clawing of the great toe was present only in those patients with pes cavus. Thirty-eight patients were female and thirty male. The youngest patient was aged eight years and the oldest fifty-four; most were between ten and twenty years of age. Operation was not undertaken unless conservative measures such as passive stretching, faradic stimulation of the intrinsic muscles, active exercises and metatarsal bars had been tried and failed to give relief.
Muscle testing—Careful examination of the leg muscles in all three groups failed to reveal any evidence of paralysis, and no evidence of abnormality of the intrinsic muscles was found at operation. There were no cases of spina bifida. These findings in three different structural types of foot make it difficult to account for the deformity, except by ineffective use of the intrinsic muscles.
TECHNIQUE OF OPERATION

The first step is to correct the fixed deformity as fully as possible by manual stretching. Subcutaneous tenotomy of the extensor tendons may be required to allow reduction of dorsal subluxation of the metatarso-phalangeal joint. In this series it was often necessary not only to elongate the extensor tendons but also to divide the dorsal capsules of the metatarso-phalangeal joints, and occasionally plantar capsulotomy of the interphalangeal joints was performed when these were exposed during operation.

Two-inch dorso-lateral incisions are made extending from the neck of each metatarsal to the distal interphalangeal joint. The extensor expansion is defined and the long and short flexors are caught up with a small blunt hook, cut at their insertions, brought round the lateral aspect of the proximal phalanx and sutured to the extensor expansion by the buttonhole method (Figs. 1 and 2). While being sutured, the flexor tendons are maintained in tension sufficient to ensure that the deformity remains fully corrected. It is also most important to maintain upward pressure on the heads of the metatarsals during the suturing and until plaster-of-Paris fixation has been secured.

When the great toe is clawed, simple excision of the interphalangeal joint and transplant of the extensor hallucis longus into the neck of the first metatarsal is performed so as to form a supporting sling for the head of the first metatarsal (Figs. 3 and 4). In some cases it may be necessary to amputate the little toe because of failure to obtain adequate correction of the fixed deformity; the amputation is done through the metatarso-phalangeal joint, and the extensor tendon is transplanted into the neck of the fifth metatarsal.

In both the operations on the toes and on the hallux, the next step follows Lambrinudi’s (1938) technique for arthrodesis of the interphalangeal joints; a stay suture threaded on a needle at each end is passed close round each proximal phalanx and out through the plantar surface of each toe, ready for fixation to a modified form of Lambrinudi’s splint (Fig. 5). These sutures must lie against the bone lest the digital vessels and nerves be included.

A carefully padded below-knee plaster is applied extending down to the base of the toes, the foot being held dorsiflexed by pressure applied beneath the metatarsal necks. The shortened Lambrinudi splint is fixed on the plantar surface of the plaster, and each stay suture is fixed to a wire of the splint while gentle pressure is applied over the dorsum of the toe. A felt pad is placed over the gauze dressing on the dorsal surface of the toes and the plaster is extended down to include this pad and the end of the Lambrinudi splint. Finally the plaster is carefully moulded down over the toes.

Post-operative treatment—Walking irons are applied after the first week and the patient is allowed up. The irons must be long enough to allow the patient’s toes to clear the ground, as the sole of the plaster extends farther forwards than usual. The plaster and sutures are removed after six weeks and foot exercises are begun. It has not been found necessary to use metatarsal bars or insoles.
RESULTS

Sixty-eight patients have been followed up for periods varying from one to twelve years. Of the thirty-eight patients with cavus deformity, twenty-seven have obtained a good result, with satisfactory correction of deformity, relief of symptoms and good gait; in two patients the little toes were amputated. In five cases the results were fair, slight residual clawing of one or more of the toes having caused some persistent disability; one of these patients had a pressure sore under the fourth metatarsal head which healed uneventfully. In six patients the results were poor. In one of these cases, good correction was obtained but the patient still complained of pain under the metatarsal heads; another patient had tarsal osteoarthritis.

Of the twenty-three patients with valgus deformity, twenty-one gained good results, one fair and one bad (this patient suffered from endarteritis obliterans).

Of the seven patients without tarsal deformity, two gained good results, four fair and one bad.

DISCUSSION

In general it may be stated that the best results were obtained in the younger patients; there was no evidence that the sex of the patient was a factor. Most of the bad results were caused by persistent dorsiflexion of the toes at the metatarso-phalangeal joints from failure to correct all fixed deformity. This is a most important point, and in our opinion elongation of the extensor tendons, dorsal capsulotomy of the metatarso-phalangeal joints and plantar capsulotomy of the interphalangeal joints should be done without hesitation. If satisfactory correction cannot be obtained, the operation should be abandoned. It is also of the utmost importance to keep the metatarsal heads elevated in the post-operative plaster.

It is true that the prehensile action of the toes is lost by this operation, but this is of no account. Lambrinudi (1942) noted that cavus feet submitted to his operation of multiple interphalangeal arthrodesis later showed a lessening of the cavus deformity. The same improvement has been observed after this operation, and is attributed to a restoration of the sling action of the flexor tendons as they pass beneath the metatarsal heads.

SUMMARY

1. The principles and technique of flexor-extensor tendon transfers for claw toes are described. The operation is tedious, but it is effective in selected cases.
2. Sixty-eight patients have been operated upon and followed up; good results were obtained in fifty, fair results in eleven, and poor in seven. More careful selection and better operative technique might have avoided some of the failures.
3. The operation restores useful function to the toes at the cost of their prehensile action, diminishes any cavus deformity of the foot, and, by lessening the prominence of the metatarsal heads in the sole, avoids callosities and discomfort.

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REFERENCES