Tibialis posterior transfer by interosseous route for the correction of foot drop in leprosy

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Abstract This article summarises a prospective study to evaluate the long-term results produced by interosseous transfer of the tibialis posterior tendon for the correction of foot drop due to leprosy neuritis. The study was carried out in 120 feet in 69 patients. All patients had closed elongation of the tendo Achillis (ETA) before transfer of the bifurcated tibialis posterior tendon through the interosseous route to the tendons of tibialis anterior and peroneus tertius or brevis over the dorsum of feet. At final follow-up of average 24 months, all the patients with ETA had a significantly greater range of active dorsiflexion of more than 10° above 90°, which was not merely from the tenodesing effect. The results, in terms of improvement in gait and prevention of trophic changes, remained satisfactory. An interosseous route is preferred with split attachment to the tibialis anterior and to the peroneus brevis or tertius tendons.

Résumé Une étude prospective de façon à évaluer les résultats à longs termes du transfert du tendon du jambier postérieur dans la correction des lésions du tendon d'achille secondaires à la lèpre. cette étude a permis d'évaluer 120 pieds chez patients. Tous les patients présentaient une élongation du tendon d'Achille avant transfert avec le jambier postérieur à travers la membrane inter-osseuse. au suivi final à 24 mois pour les patients ont été améliorés avec une flexion dorsale active de 100 à 90° sous effets de ténodèse. cette intervention améliore la marche et prévient des troubles trophiques. Il s'agit d'une intervention satisfaisante. Le transfert inter-osseux est préférable au simple agrafage du tendon tibial antérieur à l'utilisation du court peronier latéral ou du troisième fibulaire.

Introduction

Foot drop due to paralysis of the anterior tibial and peroneal muscles is found in 2–5% of newly-diagnosed leprosy patients [11, 17]. About 30% of patients have established nerve damage by the time of diagnosis of leprosy [8].

Leprosy neuritis affects nerves where they are close to the skin and pass through a narrow fibro-osseous canal. In the leg this involves the lateral popliteal nerve at the neck of the fibula which leads to foot drop, and the posterior tibial nerve in the tarsal tunnel which produces anaesthesia of the sole. When both nerves are damaged the main impact of walking falls on the anaesthetic forefoot rather than on the heel and causes trophic ulceration.

Tendon transfer in leprosy is not a new operation, but it was first brought to light by Brand [3, 4] in 1952 and 1956, and the possibility of using tibialis posterior as a dorsiflexor was further stimulated by the report of Watkins et al. [18] in 1954 who had used this muscle in poliomyelitis by bringing it through the interosseous membrane. Later, Gunn and Molesworth [6] in 1957 reported satisfactory results in 49 of 56 cases though the interosseous (IO) route.

Tibialis posterior transfer through the IO route with elongation of tendo Achilles can obtain excellent results in treating foot drop due to leprosy [2, 5, 9, 10].

The IO route gave a much lower incidence of recurrent inversion deformity of the foot. The results, in terms of improvement in gait and prevention of trophic changes, have been reported to be satisfactory [10, 14, 16]. But the circumtibial (CT) route is associated with an unacceptably high rate of recurrent inversion leading to ulceration of the lateral border of the foot [1].

The aim of this study was to assess the long-term outcome of tibialis posterior transfer for the correction of foot drop due to leprosy through the IO route.

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Patients and methods

Between 2001 and 2007 at the Lalgadh Leprosy Hospital, Dhanusha, Nepal, 150 corrections for foot drop were performed in 89 adult patients (73 men and 16 women). Forty-six patients had bilateral corrections and 58 had unilateral corrections.

Follow-up data of all patients on inversion, measurements of active dorsiflexion and plantar flexion, and records of recurrent ulceration and bone loss as well as other problems were recorded regularly at six-month intervals, and final results were derived after a mean follow-up of four years. Twenty patients were lost to follow-up and were excluded from the study. The follow-up study was confined to 120 operated feet in 69 patients.

The average age of the patients was 34 years (range 13–75), and the average duration of foot drop before operation was three years. Of the 120 feet reviewed, 93 had had complete foot drop whereas in 27 only the dorsiflexors were affected and the evertors were normal. The IO route was used in all 120 feet; 68 operations were on the left foot and 52 on the right.

Operative & postoperative techniques

The main details of the technique for the IO route have been described elsewhere [7, 12, 13, 15]. Elongation of tendo Achillis (ETA) was routinely done by closed percutaneous lengthening so that the foot could be passively dorsiflexed to at least 60°. A metallic positioning frame was used to maintain the position of dorsiflexion while suturing the bifurcated tendon of the tibialis posterior tendon at optimal tension with the tibialis anterior and peroneus tertius or brevis. The leg was placed in a plaster

Table 2 Details of the study

Characteristic	Value
Number of cases operated	89
Number of feet operated	150
Number of feet reviewed in detail	120
Number of cases lost for follow-up	20
Mean follow-up (y)	4
Recurrent inversion	2
Mean active dorsiflexion (degrees)	10
Mean active plantar flexion (degrees)	12
Clawing of toes	30

cast for three weeks with the foot well dorsiflexed to relieve tension on the tendon sutures.

The medial slip of the transferred tendon was attached to the tibialis anterior in 120 feet. The lateral slip was attached to the extensor digitorum longus in 25 feet and to the peronei in 95 feet.

After three weeks the cast was split for intensive re-education and coordination exercises (alternate dorsiflexion and relaxation but not plantar flexion) and relearning of “swing-phase walking” with crutches. In the third week out of plaster the patient was allowed partial weight-bearing in parallel bars or with crutches and continued to practise swing-phase walking on parallel bars. Active plantar flexion was allowed six weeks after operation, and the patient was given a sandbag (500–1000 g) to use for exercises to build muscle strength. Patients gradually increased weight-bearing until by the ninth or tenth week after operation when they could walk without crutches and could practise walking up and down stairs. Usually at the end of that week they were ready for discharge from intensive physiotherapy.

Table 1 Number of operations and follow-up

Table 3 Functional results

Results

The average duration of immobilisation in plaster was 28 days (range 21–42) and the average time to discharge from hospital from the date of operation was ten weeks (range 6–30). The average final follow-up was 48 months (range 6–85). The yearly follow-up numbers of patients are shown in Table 1.

Of the 120 feet for whom preoperative and final follow-up data on further bone loss were available, 115 had no further bone loss and only five had more than two ‘points’ of bone loss after the operation. Each toe and each metatarsal head count as one ‘point’. Clawing of toes was observed in 30 feet. The medial arch collapsed following the tendon transfer but gait pattern changed from high stepping toe to heel gait to normal heel to toe gait. Thus the body weight was also equally and evenly distributed on the plantigrade foot after the operation.

Long-term follow-up for functional data regarding inversion were available for 120 feet in 69 patients. Only two had recurrent inversion. At final follow-up all the patients with ETA had a significantly greater range of active dorsiflexion of more than 10° above 90° (Table 2), which was not merely from the tenodesing effect. Anaesthetic mapping of the operated feet did not show any change following the surgery but the power of the tibialis posterior muscle after transfer lost one degree on average on the Medical Research Council (MRC) grade (from 5 to 4). The functional results of tibialis posterior transfer are depicted in Table 3.

Discussion

Tibialis posterior transfer done by the IO route, plus elongation of tendo Achillis, produced active dorsiflexion in 80% of patients, with the restoration of near-normal gait in 94% [10, 16]. The CT transfer should be reserved for patients with a calcified and unyielding interosseous membrane; these are usually elderly with recurrent inflammation and infection in the foot. The CT route is associated with an unacceptably high rate of recurrent inversion as observed in a small subgroup of patients by Hall [7]. If this type of transfer is performed, the tendon bifurcation must be at least 3 cm above the ankle so that the line of pull is as close to the vertical as possible. Wherever possible an interosseous route should be used. Failure to lengthen the tendo Achillis can lead to a poor result [9, 16].

There was no evidence in this series of the ‘crippling adhesions’ said to be associated with the IO route, and at final follow-up the IO route produced better active dorsiflexion [9, 18], although less active plantar flexion than the CT route [16]. In our series there was clawing of toes in 30

feet—in 16 of 25 feet where the tendon was sutured to the extensor digitorum tendon and 14 from the other group where the tendon was sutured to the peronei. It is generally believed that attachment to the extensor digitorum longus leads to a higher incidence of clawing in mobile toes and this transfer is not commonly used [16].

Although there was no change in the anaesthetic pattern of the foot, the change in gait pattern, even transmission of body weight and active dorsiflexion, significantly improved the overall functional outcome of the operated feet and reduced the chances of deformity and ulcerations.

Conclusions

Tibialis posterior transfer with closed elongation of the tendo Achillis gives excellent results in foot drop due to leprosy neuritis. An interosseous route is preferred with split attachment to the tibialis anterior and to the peroneus brevis or tertius tendons. Immobilisation for three weeks in a plaster cast in maximum dorsiflexion is sufficient, with full weight-bearing and active plantar flexion starting six weeks after operation.

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