

Long term results of tibialis posterior tendon transfer for foot drop in leprosy

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Received : 17.05.2010 Revised : 02.05.2012 Accepted : 02.05.2012

Seventy four patients, who underwent tibialis posterior transfer between 1960 and 1970 at the Schieffelin Leprosy Research & Training Centre, were reviewed more than 10 years follow up. Sixty four patients (86.5%) improved from a high stepping gait to a heel toe gait. The foot at rest position and the range of movement which were seen after surgery were retained. Postoperative complications were minimal. Interosseous method was better than the circumtibial. Tibialis posterior tendon transfer has served the gait and foot function in the long term.

Introduction

Lateral popliteal nerve damage at the neck of the fibula is common in leprosy. This results in paralysis of the dorsiflexors of the ankle and the toes with or without paralysis of the evertors of the foot. This impairment results in inability of the patient to walk properly due to incomplete clearance of the foot during the swing phase resulting in a high stepping gait which is unsightly (Hastings 1995a).

When foot drop is associated with loss of sensation over the plantar surface (due to a posterior tibial nerve paralysis), high stepping gait could result in high pressures over the forefoot and heel areas when the foot is slapped onto the ground while walking, predisposing the foot to ulceration in these areas (Hastings 1995b).

Tibialis posterior tendon transfer has served as a useful method in correcting foot drop and improving the gait pattern. Tibialis posterior acts well as a dorsiflexor when anteriorly transposed and its removal as an inverter of the foot in the presence of paralysis of the evertors does not cause any deficit (Fritschi 1984).

This paper studies whether the benefits of tibialis posterior transfer are retained in the long term.

Study population and Methodology

Patients who underwent tibialis posterior transfer at the Schieffelin Leprosy Research and Training Centre, Karigiri between 1960 and 1970 were taken into the study group. The specific period was chosen in order to study the long term results of both ligament and bone insertion. The case records of all these patients were analyzed

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and basic information was detailed in a proforma. Recent follow up was possible only in 40 patients which was completed in 2005. For patients who could not be followed up information was gathered from the hospital records.

The initial information gathered from the case records included age, sex, route of tibialis posterior transfer and method of fixation of the tendon. At the time of follow up the gait was analyzed to see if it was near normal, high stepping, or stiff ankle gait. The following angles were measured at the ankle a) foot at rest b) foot in active dorsiflexion and c) foot in active plantar flexion. Complications such as tarsal disintegration, inversion or eversion and flat foot were noted.

The pattern of gait, range of active movement in dorsiflexion range, foot at rest and post surgical long term complications, were used as criteria to assess and compare the efficacy of the two main methods of performing a tibialis posterior tendon transfer.

All patients who underwent surgery had contracture of tendoachilles for which lengthening was done. There were no other deformities of the

foot prior to surgery. The bone or ligamentous insertions were done in with a single slip and the tendon insertions were done with two slips.

Results

Seventy four patients who underwent tibialis posterior transfer between 1960 and 1970 were followed up. 70 were males and four females. The age of the patients ranged from 12-60 years (Mean 34.62, SD 11.65). The duration of follow up ranged between ten years to more than thirty years. More than half had a follow up duration above 15 years. Average duration of follow up was 16.4 years (Table 1).

Gait

The gait patterns are shown in Table 2. At follow up the gait was normal in 64 (86.5%) patients and high stepping in 10 patients.

In the circumtibial group there were 32 patients (82.1%) with normal gait and 7 (17.9) patients with high stepping gait. In the interosseous group 32 patients (91.0%) had normal gait and 3 (8.6 %) patients had high stepping gait (Table 3). The difference between both the groups was not statistically significant.

Table 1 : Duration Follow up

Number of years	Circumtibial	Interosseous	Total
10	6	–	6
11 - 15	9	19	28
16 - 30	17	12	29
> 30	7	4	11
Total	39	35	74

Table 2 : Gait Patterns

Type of gait	Circumtibial	Interosseous	Total
Normal	32 (82.1%)	32 (91.4%)	64 (86.5%)
High stepping	7 (17.9%)	3 (08.6%)	10 (13.5%)
Total	39 (100.0%)	35 (100.0%)	74 (100.0%)

Table 3 : Position of foot at rest

Position of ankle	Circumtibial Postop	Circumtibial Follow up	Interosseous Postop	Interosseous Follow up
Dorsiflexion/Neutral/ 5 degree plantar flexion	30(76.9%)	26(66.6%)	31(88.6%)	30(85.7%)
More than 5 degree plantar flexion	9(23.1%)	13(33.4%)	4(11.4%)	5(14.3%)
Total	39	39	35	35

Table 4 : Range of movement

Range of movement (active) in degrees	Circumtibial Postop	Circumtibial Follow up	Interossoeus Postop	Interossoeus Follow up	Total Postop	Total Follow up
Dorsiflexion						
0-5	13 (33.3%)	15 (38.4%)	1 (2.9%)	4 (11.4%)	14 (19.0%)	19 (25.7%)
6-10	12 (30.8%)	12 (30.8%)	18 (51.4%)	8 (22.9%)	30 (40.5%)	20 (27.0%)
>10	14 (35.9%)	12 (30.8%)	16 (45.7%)	23 (65.7%)	30 (40.5%)	35 (47.3%)
Plantar flexion						
0-5	17 (43.6%)	15 (38.4%)	18 (51.4%)	12 (34.3%)	35 (47.3%)	27 (36.5%)
6-10	15 (38.5%)	14 (36.0%)	16 (45.7%)	7 (20.0%)	31 (41.9%)	21 (28.3%)
>10	7 (17.9%)	10 (25.6%)	1 (2.9%)	16 (45.7%)	8 (10.8%)	26 (35.1%)

Foot at rest

56 patients (75.7%) in both the groups had a favourable foot at rest position at follow up. In the circumtibial group there were 26 (66.6%) patients with the foot at rest in neutral or slight plantar/dorsiflexion position, and 13 (33.4%) patients with foot at rest in more than 5 degrees of plantar flexion. (Table 3)

In the interossoeus group there were 30 (85.7%) patients with foot at rest in neutral or slight plantar/dorsiflexion position, and 5 (14.3%) patients with foot at rest in more than five degrees of plantar flexion. There was loss of foot at rest position at follow up, when compared to the postoperative values, in 4 patients of circumtibial route and in one patient of inter-

osseous route. In patients who had a high stepping gait the foot at rest position was 10 degrees or more of plantar flexion. The number of feet at a favourable foot at rest position in the interosseous group as compared to the circumtibial group was statistically significant ($p < 0.05$).

Range of movement of the transfer

As presented in Table 4, it was seen that the range of motion postoperatively is maintained at follow up as well in both the groups except 2 patients in the circumtibial group and three patients in interosseous group who showed decrease in range of movement. However, 7 patients of the interosseous group showed increase in range of movement.

Table 5 : Complications

Complication	Circumtibial Route	Interosseous route	Total
NIL	22 (56.4%)	31 (88.6%)	53 (71.6%)
Tarsal Disintegration	5 (12.8%)	2 (05.7%)	7 (09.5%)
Inversion	9 (23.0%)	–	9 (12.2%)
Combined deformity	2 (5.1%)	–	2 (02.7%)
Eversion	1 (2.7%)	2 (05.7%)	3 (04.0%)
Total	39 (100%)	35 (100%)	74 (100%)

Table 6 : Results

Series	Number	Route	Insertion	Follow up Average	Results Good/Excellent
Ozkan 2007	41	Circumtibial	Tendon	8.99 years	70.7%
Kilic 2008	15	Circumtibial	Bone- 4 Tendon-11	2.1 years	66.7%
Shah 2009	120	Interosseous	Tendon	2 years	–
Present study	74	Circumtibial-39/ Interosseous-35	Bone/Lig -44 Tendon-30	16.4 years	75.7%

The distribution of range of movement of dorsiflexion postoperatively between circumtibial and interosseous groups is statistically significant ($p < 0.001$) in favour of interosseous route. Similarly, the distribution of range of movement of dorsiflexion, at follow up, between the circumtibial and interosseous groups is statistically significant ($p < 0.05$) in favour of interosseous route.

Complications

Twenty three patients in the circumtibial route and 31 patients in the interosseous route did not develop any complications (Table 5). The difference between the groups was statistically significant ($p < 0.0001$).

In the circumtibial group nine patients had inversion deformity. The tendency of the foot to be in inversion in circumtibial route has been a known complication. This probably is due to the

routing of one slip of the transferred tendon from the medial side of the leg into the foot. Five patients, in the circumtibial group developed tarsal disintegration. Out of these five patients, in three the transfer was fixed to the bone or ligament and in two to the tendon.

In the interosseous group two patients had tarsal disintegration where the transfer was fixed to the tendon. Two patients had mild eversion because of more tension on the lateral slip.

Discussion

Ozkar reported excellent and good results in 70.7% of patients at an average follow up of 51.5 months. (Ozkar et al 2007) Kilic et al (2008) reported good and very good results in 46.7% of patients who underwent tibialis posterior transfer at an average follow up of 25.3 months. Shah (2009) reported satisfactory results in 69 patients who underwent tibialis posterior

transfer at an average follow up of 24 months. Rath mobilized the tibialis posterior transfer immediately after surgery and reported good results at 22 months follow up (Rath et al 2010) Our results are similar with good results in 75.7% of patients at an average long term follow up of 16.4 years (Table 6).

The usefulness of tibialis posterior transfer as a method of correction of foot drop in leprosy is well known. Removal of tibialis posterior tendon, a deforming force (invertor) in the presence of paralysis of common peroneal nerve, does not cause any deficit.

In this study the gains of normal gait, favourable foot at rest position and active range of movement in the dorsiflexion range seen initially are sustained in the long term.

The interosseous group fared better because of a favourable foot at rest position and a good dorsiflexion range of movement in most of its patients. This probably was due to the mechanical advantage the transfer had working along a straight line with a direct pull as compared to the circuitous route and indirect pull of the circumtibial route. The tibialis posterior muscle belly also acts as a natural dorsiflexor having been mobilized into the anterior compartment through the interosseous membrane. The interosseous route is technically difficult and sometimes is associated with troublesome bleeding while making a window in the interosseous space while the circumtibial route is technically simpler.

The incidence of complications in the long term inversion deformity was high in the circumtibial

route group. Tarsal disintegration occurred both in the bone insertion group as well as the tendon insertion group.

In a long term evaluation of this procedure where the follow up ranged from 10 years to more than 30 years tibialis posterior transfer functioned well and did not develop major surgery related complications like neuropathic foot, loosening of tension by stretching of tendon or occurrence of new deformities.

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How to cite this article : Parthebarajan S, Soloman S and Ebenezer M (2012). Long term results of tibialis posterior tendon transfer for foot drop in leprosy. *Indian J Lepr.* **84** : 145-149.