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Original Research Article

The role of tibialis posterior tendon transfer in foot drop by circumtibial route and evaluation of the results according to criteria

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ABSTRACT

Background: The transfer of the tibialis posterior tendon to the anterior aspect of the ankle not only replaces the function of the paralyzed muscles, but also removes the deforming force on the medial aspect of the foot. This study was conducted to find the role of tibialis posterior tendon transfer in foot drop by circumtibial route and with evaluation of the results according to criteria.
Methods: This study was conducted in MLB Medical College and Hospital, Jhansi. Patients of paralytic foot drop due to leprosy with a moderately strong tibialis posterior muscle were selected from the outpatient department of Orthopaedics and Leprosy reconstructive surgery units. After taking informed consent, detailed history was taken. Data was analyzed using Microsoft Excel and the difference was considered to be significant if 'p' value was <0.05.
Results: Eleven patients were operated. Majority were males (82%). Eight patients (73%) had excellent and good results which were aged less than forty years. Two cases showed excellent results after corrective surgery that had deformities from 31 to 36 months before operation. Out of six patients who were taking antileprotic treatment, one (9.1%) showed excellent and three (27.3%) showed good results.
Conclusions: Method of anterior transfer of tibialis posterior for correction of foot drop has given encouraging results in a fairly large percentage of cases. The greatest utility of such a transfer is that of allowing the freedom of normal mobility in comparison to bony stabilization. After correction of deformity and disability the patient's mental health is improved.

Keywords: Tibialis posterior, Circumtibial, Carayon

INTRODUCTION

Foot drop is permanent lesion of the peroneal nerve or the dorsiflexors muscles of the foot and ankle result in loss of foot dorsiflexion and eversion.[1] As a result, the foot cannot be sufficiently lifted off the ground during swing phase of walking. An extra flexion of the hip and knee is thus necessary with ipsilateral elevation of the hip. Walking is facilitated with foot-ankle orthosis that prevents plantar flexion more than neutral.[2] In time, with the contribution of tibialis posterior tendon, equinovarus deformity develops.[3,4] The aim of treatment in foot drop is dorsiflexion of the foot and restoration of normal heel-toe gait.[5] Tenodesis, arthrodesis, and tendon transfer are among surgical treatment options for foot drop.[6] Anterior transfer of tibialis posterior tendon both serves to adequately restore lost tibialis anterior muscle function, and to eliminate a potent deforming force on the medial aspect of the foot.[4] The first tendon transfer for the treatment of foot drop was described in 1933 by Ober, who transferred the tibialis posterior tendon through the circumtibial route and inserts it on the third metatarsal bone. In 1954 Watkins made the same transfer via the interosseous route. Successful results with both

techniques are reported in the surgical treatment of foot drop.[5,7] The pathway of the transferred tendon (circumtibial versus interosseous), type of insertion (re-insertion of tendon to bone versus tendon to tendon suture), the recipient tendons (tibialis anterior per se versus tibialis anterior/toe extensors/peroneus longus and brevis tendons) and the tension of the transfer are important technical aspects still debated today.[8] The trauma is most common cause of foot drop now a day, peroneal neuropathy caused by compression at fibular head is the most common compressive neuropathy in the lower extremity; foot drop is its most notable symptom.[9] All age group are affected equally, but is more in males (male-to female ratio 2.8:1), and they can affect right or left side with equal frequency.[10] A foot drop of particular concern to orthopedic surgeons is a peroneal nerve palsy seen after total knee arthroplasty or proximal tibial osteotomy. Foot drop has an estimated prevalence of (0.3-4%) after total knee arthroplasty and a (3-13%) occurrence rate after proximal tibial osteotomy. Ischemia, mechanical irritation, traction, crush injury, and laceration can cause intra-operative injury to the peroneal nerve. Correction of valgus or flexion deformity also has been suggested to stretch the peroneal nerve and lead to palsy. Postoperative causes of peroneal nerve palsy include hematoma or constructive dressing as in tight plaster of paris cast.[11] The present study was conducted to find the role of tibialis posterior tendon transfer in foot drop by circumtibial route and with evaluation of the results according to criteria.

METHODS

The present one year study was conducted in the department of Orthopaedic Surgery, MLB Medical College and Hospital, Jhansi from July 2017 to June 2018. Patients of paralytic foot drop due to leprosy with a moderately strong tibialis posterior muscle were selected among patients attending the outpatient department of Orthopaedics and Leprosy reconstructive surgery units. Written informed consents were obtained from family members or legal guardians. All the patients who refused to cooperate or participate in the study were excluded. Detailed history was taken with reference to mode of onsets duration, clinical, manifestation, treatment received before admission to the hospital. A base line clinical examination along with routine and, relevant laboratory investigations were performed in each case.

Preoperative management

The presence of functioning tibialis posterior muscle was confirmed pre-operatively by noting the patients' ability to strongly invert the foot in plantar flexion. To facilitate postoperative re-education the patients were instructed to carry out exercises that would enabled them to distinguish the contraction of tibialis posterior and strengthen the muscle. The patients were instructed to sit in a chair or the edge of the bed with the sound leg hanging down and the affected one lying horizontally on the sound knee and lifting the foot in a vertical direction which brought the tibialis posterior strong play.

Postoperative management

After closing the wounds, a well padded below knee plaster of paris cast is applied with foot in calcane valgus and to a maximum degree of dorsiflexion. In the post-operative period, strict limb elevation with active tow movements, in order to avoid swelling and its complications, was observed. Thus plaster slitting to accommodate any post-operative swelling was avoided

Criteria of result

The result of tibialis posterior transfer for the correction of foot drop were analysed and graded on the criteria of position, power, and correction of deformity, gait, active dorsiflexion and total excursion.

The results were graded “Excellent” when position was normal, power grade four, correction of deformity to near normal, a normal gait active dorsiflexion above 10° and a total excursion of 30° to 40°.

The results were “good” when position was with minimal lateral deviation, power three plus to four, correction of deformity moderate, gait mildly high stepping, active dorsiflexion upto 10° with a total excursion of 20° to 30°.

Table 1: Outcomes were graded on the criteria of position, power, and correction of deformity, gait, active dorsiflexion.

Criteria	Excellent	Good	Fair	Poor
1. Position	Normal	Minimal lateral deviation	Slightly deviated	Plantar flexed
2. Power	Grade four	3+ to 4	3	1-0
3. Correction of deformity	Near Normal	Moderate	Moderate	Nil
4. Gait	Normal	Mildly high stepping	Mildly high stepping	High stepping
5. Active dorsiflexion	10°	Up to 10°	No active dorsiflexion but correction of foot drop	Only flicking of muscle
6. Total excursion	30°-40°	20°-30°	-	-

A "fair" grading was done when the foot remained.in slightly deviated position power grade three, moderate correction of deformity, mildly high stepping gait, no active dorsiflexion but correction of foot drop,

The results were "poor" when this foot was held in complete planta flexion and only a flicker of dorsiflexion was possible.

Data was analyzed using Microsoft excel. Results were presented in form of percentages and the difference was considered to be significant if 'p' value was <0.05.

RESULTS

All the eleven patients, who were included in this study, were operated for restoration of dorsiflexion to correct the foot drop.

Table 2: Gender wise distribution of study subjects.

Gender	Number of cases	Percentage (%)
Male	9	82
Female	2	18
Total	11	100

Gender wise distribution of study subjects in Table 2 illustrates that out of these, nine patients (82%) were males and two (18%) were females as shown in Table 2. Table clearly depicts the predominance of male study subjects. Difference in the percentage is about 64% (Table 2).

Table 3: Distribution of associated determinants of patients with foot drop.

Associated determinants	Number of cases	Percentage (%)
Side of foot involvement		
Right foot	6	55
Left foot	3	27
Bilateral	2	18
Treatment taken prior to surgery		
Chemotherapy for leprosy	6	55
No treatment	5	45
Associated deformities and complications		
Plantar ulcer	4	36
Lepra reaction	1	9

Table 3 represents the distribution of associated determinants of patients with foot drop. Above table shows that there were six (55%) patients having right foot involvement. Three (27%) left foot and the remaining two (18%) were having bilateral involvement. Out of eleven patients 6 (55%) were taking antileprotic treatment prior to surgery and remaining 5 (45%) were not taking any treatment as they were unaware of their disease and came hospital and came to hospital for their deformity. The other associated deformities and complications were found. It shows that 4 patients (36%) were having plantar ulcer and were treated for this and only when these ulcers were healed, the tendon transfer was done. In 1(9%) cases the operation was postponed for a while due to lepra reaction (Table 3).

Table 4: Effect of result with age.

Age group (years)	Excellent		Good		Fair		Poor	
	No.	%	No.	%	No.	%	No.	%
<20	1	9	1	9	-	-	-	-
20-40	2	18	4	37	-	-	-	-
>40	-	-	-	-	2	18	1	9

Table 4 illustrates that the effect of age on the results. It was observed that eight patients (73%) had excellent and good results which were of age less than forty years. All the cases who had fair or poor results were beyond this age group. Above table undoubtedly shows that excellent and good results were obtained when the correction was done before the age of 40 years. The most suitable age for the correction of deformity was found to be 20 to 40 years (Table 4).

Table 5: Duration of deformity and results.

Duration of deformity (months)	Excellent		Good		Fair		Poor	
	No.	%	No.	%	No.	%	No.	%
<6	1	9.1	2	18.2	-	-	-	-
7-12	-	-	2	18.2	-	-	-	-
19-24	-	-	1	9.1	2	-	-	-
31-36	2	18.2	-	-	-	-	-	-

Table 5 reveals the distribution of deformity and results of study subjects. The two patients out of three who showed excellent results after corrective surgery were having their deformities from 31 to 36 months before they were operated. Even in three patients who had their deformity of less than one year duration showed similar results as 9% showed excellent and 45% good result. Total five subjects showed good result in which 2 subjects were belongs to age group less than six months and 2 subjects were in between age group 7 months to 12 months while only one subject belongs to age group 19-24 months. Two subjects showed fair results after corrective surgery were having their deformities from 19 to 24 months before they were operated. There were no any subjects in poor category (Table 5).

Table 6 shows the effect of prior antileprotic treatment on the out cases the surgery. Out of six patients who were taking antileprotic treatment 1 (9.1%) showed excellent, 3 (27.3%) good results, and even the group who were not

taking any treatment showed similar results. Table showed almost equal results irrespective of whether the patient was receiving antileprotic treatment or not prior to surgery. Both showed 36.4% good and excellent results. This shows that chemotherapy had no influence on the surgical correction of the deformity. The surgery had been postponed for a while in one case because of lepra reaction. Five of the cases (45%) were neglected one's they had not taken any treatment for their disease prior to surgery (Table 6).

Table 6: Treatment received prior to surgery.

Duration of deformity (months)	Excellent		Good		Fair		Poor		Total
	No.	%	No.	%	No.	%	No.	%	No.
Received antileprotic treatment	1	9.1	3	27.3	1	9.1	1	9.1	6
Not taking treatment	2	18.2	2	18.2	1	9.1	-	-	5

DISCUSSION

A total of eleven patients were operated in our study. There were 9 (82%) males and 2 (18%) females patients. The percentage of male patients is more as the disease is more prevalent among males. An expert committee of WHO also observes that this sex difference of the disease is due to greater susceptibility of males. Pritchett et al suggested that All age group are affected equally, but is more in males (male -to female ratio 2.8:1), and they can affect right or left side with equal frequency.[10] The most controversial aspect of tibialis posterior transfer is the route by which the tendon be carried to the dorsum of the foot. Although the interosseous route is more physiologic from the viewpoint of direction, the greatest disadvantage of this method is the risk of adhesion, especially if the window is kept narrow.[5,11] This method also carries the risk of vascular injury. The circumtibial route has a longer movement arm, which increases the mechanical advantage with respect to power.[12]It was observed in present study that eight patients (73%) had excellent and good results which were of age less than forty years. Even in three patients who had their deformity of less than one year duration showed similar results as 9% showed excellent and 45% good results. In the present study it was found that 72.7% excellent and good results were obtained when the correction was done before the age of 40 years. The most suitable age for the correction of deformity was found to be 20 to 40 years. This also confirms the findings of the Straub et al who also observed better results of tibialis posterior tendon transfer, in children and young adults.[13] Out of six patients who were taking antileprotic treatment 1 (9.1%) showed excellent, 3 (27.3%) good results, and even the group who were not taking any treatment showed similar results. Furthermore, added by Majeed the degree of active dorsiflexion correlates with swing phase of gait.[14] 77.8% of patients get excellent to good result of active dorsiflexion. In addition, observed in present study that almost equal results irrespective of whether the patient was receiving antileprotic treatment or not prior to surgery. Both showed 36.4% good and excellent results. This shows that chemotherapy had no influence on the surgical correction of the deformity. Richard reported results of 15 patients (82%) achieving excellent to good active dorsiflexion[12], as well, Gunn and Moles worth reported a rate of success as 78% (11 patients).[15] The study of Yeap et al, involving 37 patients stated that 61% of the patients were improved in both gait and ankle dorsiflexion measures.[16] Moreover, some author mentions up to 90% success of this procedure.[17] This variation can partly be attributed to the different methods used to evaluate the results of tibialis posterior transfer. In this study, the evaluation was made with the criteria developed by Carayon et al. [6] Seventy five percent of our patients treated through interosseous membrane route have excellent or good results, and 80% of patients treated by anterior to tibial route attain excellent to good results.[14]

CONCLUSION

Method of anterior transfer of tibialis posterior for correction of foot drop has given encouraging results in a fairly large percentage of cases. In well selected cases with proper attention to the technique and an adequate and extensive rehabilitative therapy, this method offered very good results. The greatest utility of such a transfer is that of allowing the freedom of normal mobility in comparison to bony stabilization.After correction of deformity and disability the patient's mental health was improved.

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