

# Postoperative Functional Results of Posterior Tibial Tendon Transfer for Foot Drop as a Consequence of Nerve Palsy in Leprosy.

Indrajeet Kumar<sup>1</sup>, Alok Ranjan<sup>2</sup>, Laljee Choudhary<sup>3</sup>

<sup>1</sup>Assistant professor, Dept of Ortho, Darbhanga Medical College and Hospital, Laheriasarai.

<sup>2</sup>Assistant professor, Dept of General surgery, Rohilkhand medical College and hospital, Bareilly.

<sup>3</sup>Professor and Head, Dept of Ortho, Darbhanga Medical College and Hospital, Laheriasarai.

## ABSTRACT

**Background:** The aim of this study was to access the postoperative functional results of posterior tibial tendon transfer for foot drop as a consequence of nerve palsy in leprosy. **Methods:** sixteen patients (13 Male and 3 females) with ages ranging from 14 to 47 years (mean=27.56 ± 8.41 years) were submitted to posterior tibial tendon transfer by the circumtibial route to correct foot drop in leprosy cured patients. The operated patients were followed up on the end of 6<sup>th</sup>, 12<sup>th</sup>, 18<sup>th</sup> and 24<sup>th</sup> weeks. The Stanmore system was used as a method for evaluating the functional results of postoperative tibialis posterior tendon transfer. This system is made up of 7 different categories and the total score is 100. **Results:** According to the Stanmore system, the results of 62.5% of patients i.e., 10 patients out of 16 had very good result. More so 12.5% of them (two out of sixteen) had shown good results, whereas other patients i.e., 12.5% of them had fair results. Rest 12.5% of them had poor results. All the patients were satisfied with their near normal gait pattern. **Conclusion:** The posterior tibial tendon transfer for foot drop in leprosy cured patients is efficient in restoring normal function of the foot and achieving "heel to toe" gait pattern without changing foot posture. In the absence of a standardized method for assessing the results of posterior tibial tendon transfer, the Stanmore system seems to be a good tool for an objective evaluation.

**Keywords:** Tendon transfer, Leprosy cured patients, Stanmore Scoring System.

## INTRODUCTION

Foot drop is the second most common deformity seen in Leprosy after claw hand. The standard procedure for correction is to transfer the tibialis posterior tendon routing it to dorsum of the foot passing anterior to the ankle joint either by circumtibial or by interosseous route.<sup>[1]</sup> The transfer is inserted either to the tarsal bones<sup>[2]</sup>, or split into two slips for insertion to the tendon of Extensor hallucis longus and Extensor digitorum longus [Figure 1]. These muscles help the body clear the foot during swing phase and control plantar flexion of the foot on heel strike [Figure 2]. Weakness results in an equinovarus deformity, Steppage Gait, and tends to walk with an exaggerated flexion of the hip and knee to prevent the toes from catching on the ground during swing phase.

Foot-drop is often associated with compromised plantar sensation. Ankle foot orthosis (AFO) has limited use for foot-drop in Hansen's disease as majority of patients in endemic countries are manual or agriculture workers habituated to bare-feet walking.

### Name & Address of Corresponding Author

Dr Indrajeet Kumar  
Assistant professor,  
Dept of Ortho,  
Darbhanga Medical College and Hospital,  
Laheriasarai, India.  
E mail: indrajeet98ortho@gmail.com

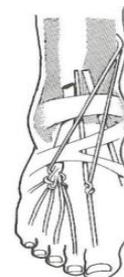


Figure 1: Two tailed tendon transfer



Figure 2: Action of tibialis posterior.



Figure 3: Post-operative Rt foot.

Patient education for care of the anaesthetic foot along with tendon transfer provides appropriate care and rehabilitation for irreversible common peroneal nerve neuritis in Hansen's disease.



**Figure 4:** Dorsiflexion Rt great toe

For postoperative pain relief in the mobilisation group, the foot was supported by a above-knee posterior splint in dorsiflexion. Then a below-knee cast was applied in full dorsiflexion for 4 weeks. Patients were allowed non-weight-bearing crutch walking from the second postoperative day. The operated patients with their transferred tendon were subjected to 4 weeks of tendon re-education program.

## **MATERIALS AND METHODS**

This study was conducted in a time span of 8 years in a tertiary care hospital of eastern India. Sixteen patients of post-Hansen foot drop, fulfilling the inclusion criteria were included in this study. The criteria were irreversible common peroneal nerve paralysis of more than 1 year and completion of multi-drug therapy for treatment of Hansen's disease. The exclusion criteria were clawed toes requiring additional surgery, neuropathic changes, bone fracture, bone absorption in the foot and active plantar ulcers. Clinical data e.g. age, sex, side, religion were recorded. After the completion of tendon re-education program the patients were instructed to adhere heel to toe gait pattern. All patients were subjected to follow up study at the end of 6<sup>th</sup>, 12<sup>th</sup>, 18<sup>th</sup> and 24<sup>th</sup> weeks. Pre and post operative data were collected according to the Stanmore system questionnaire<sup>[8,9]</sup>, which was preferred over the American Orthopaedic Foot / Ankle Society scale because it is specifically conceived for outcome evaluation after tendon transfer technique. Results for the Stanmore grading system were classified as excellent, good, fair and poor depending upon the scoring points.

Patients were operated under spinal anaesthesia and with use of esmarch bandage. Surgical techniques were similar to that described by Srinivasan et al.,<sup>[3]</sup> except for the technique of insertion. The tibialis posterior tendon was detached from its insertion, retrieved in the lower leg and split in the middle up to musculotendinous junction into an anterior and posterior part. Each slip was then transferred separately along the circumtibial route passing anterior to the ankle and superficial to the extensor retinaculum. Closed tendo achilles lengthening was performed if passive ankle dorsiflexion was less than 20 degree with extended knee. The limb was put in splint that maintained the knee in 60 degree flexion

and the ankle in 20 degree dorsiflexion to ensure standardization of tendon-transfer tension [Figure 3 & 4]. One slip of the transferred tendon was inserted into the tendons of extensor digitorum longus with maximum tension, and the second slip was inserted into extensor hallucis longus tendon in neutral tension.<sup>[4-7]</sup> Limb was kept elevated over a splint during the post-operative period [Figure 5 & 6].

## **Surgical Procedure**

The patients, selected for operation, were given vigorous tibialis posterior tendon strengthening exercises continuously for 3 weeks. As such, the strength of this tendon was assessed.

## **Statistical Analysis**

Descriptive statistics including mean and standard deviation (SD) were found for each quantitative variable. Comparison of the Stanmore system data obtained from preoperative and postoperative phases were carried out with the use of the paired-sample test, which is significant ( $t=12.73$ ,  $p < 0.001$ ).



**Figure 5:** Post-operative infected incision



**Figure 6:** Walking with pair of crutches

## **RESULTS**

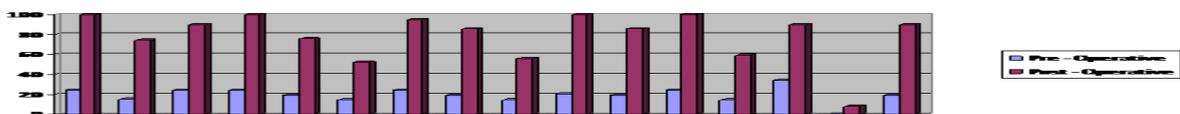
18 patients participated in the current study. Two patients did not come for follow-up. Thus a total number of 16 patients [13 male (81.3%), 3 female (18.7%)], satisfying the inclusion criteria were enrolled in the study. The Age of the patients ranged from 14 to 47 years (mean=27.56 ± 8.41 years). All patients were assessed pre-operatively and post-operatively, at 8 weeks, 16 weeks and 24 weeks. 7 (44%) patients had deformity in right foot and 9(56%) in the left [Table 1, Figure 7]. All patients completed 6-month follow-up. Results were assessed using Stanmore scoring system consisting of 7 parts

and was graded as very good, good, fair and poor. The results of the Stanmore system were the following: 10 of 16 (62.5%) had very good result, 2 (12.5%) had good results, 2 (12.5%) had fair results,

and 2 (12.5%) had poor results. The average score was  $78.87 \pm 24.78$  and the median 86 points [Table 2].

**Table 1:** Preoperative evaluation.

Name	Modified Stanmore System Questionnaire	Points	Patient Number																	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
<b>Pain (15 Points)</b>	No pain at any time	15	15		15	15				15				15		15		15		
	Mild Pain	10		10				10			10			10						10
	Moderate pain	05							05					05				05		
	Severe pain	00																		00
<b>Need for orthoses (15 points)</b>	No	15																		
	Occasionally (once a week)	10																10		
	Frequently (twice a week)	05		05																
	Regularly (greater than twice a week)	00	00		00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
<b>Normal shoes (5 points)</b>	Yes	05																		
	Yes, but prefers certain types	03	03		03	03	03	03	03	03	03	03		03	03	03	03		03	
	No	00		00									00	00					00	
<b>Functional outcome (10 points)</b>	Normal daily activity and normal recreation	10																		
	Normal daily activity and limited recreation	06																		
	Limited daily activity and recreation	03	03		03	03	03	03	03	03	03	03	03	03	03	03	03	03		03
	Severe limitation on daily activity and recreation	00		00																00
<b>Muscle power (25 points)</b>	Grade 4+ or 5	25																		
	Grade 4	20																		
	Grade 3	10																		
	Grade 2 or less	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
<b>Degree of active dorsiflexion (Degrees)</b>	Greater than 6	25																		
	0_ -5	20																		
	-5_ to -1	10																		
	-10_ to -6	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
<b>Foot posture (5 points)</b>	Less than -11																			
	Plantigrade, balanced, no deformity	05																		
	Plantigrade, mild deformity	03	03		03	03	03	03	03	03	03	03	03	03	03	03	03	03		03
	Obvious deformity or malalignment	00		00																00
<b>Total score of SS</b>			24	15	24	24	19	14	24	19	14	21	19	24	14	34	00		19	



**Figure 7:** Pre-operative and post-operative data.

**Grading:** Very good -100-85 points, Good- 84-70 points, Fair-69-55 points, Poor - < 55 points

**Table 2:** Postoperative evaluation

Name	Modified Stanmore System Questionnaire	Points	Patient Number															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>Pain (15 Points)</b>	No pain at any time	<b>15</b>	15	15	15	15	15		15	15		15	15	15		15		15
	Mild Pain	<b>10</b>									10				10			
	Moderate pain	<b>05</b>						05										05
	Severe pain	<b>00</b>																
<b>Need for orthoses (15 points)</b>	No	<b>15</b>	15		15	15	15	15	15	15	15	15	15	15		15		15
	Occasionally (once a week)	<b>10</b>													10			
	Frequently (twice a week)	<b>05</b>		05														
	Regularly (greater than twice a week)	<b>00</b>																00
<b>Normal shoes (5 points)</b>	Yes	<b>05</b>	05		05	05	05		05	05		05	05	05		05		05
	Yes, but prefers certain types	<b>03</b>		03				03			03				03		03	
	No	<b>00</b>																
<b>Functional outcome (10 points)</b>	Normal daily activity and normal recreation	<b>10</b>	10		10	10			10			10		10		10		10
	Normal daily activity and limited recreation	<b>06</b>		06			06	06		06			06					
	Limited daily activity and recreation	<b>03</b>									03				03			
	Severe limitation on daily activity and recreation	<b>00</b>																00
<b>Muscle power (25 points)</b>	Grade 4+ or 5	<b>25</b>	25			25			25			25		25				
	Grade 4	<b>20</b>		20	20					20			20			20		20
	Grade 3	<b>10</b>					10	10			10				10			
	Grade 2 or less	<b>00</b>																00
<b>Degree of active dorsiflexion (Degrees)</b>	Greater than 6	<b>25</b>	25			25						25		25				
	0_ -5	<b>20</b>		20	20		20		20	20			20		20	20		20
	-5_ to -1	<b>10</b>						10			10							
	-10_ to -6	<b>00</b>																00
	Less than -11																	
<b>Foot posture (5 points)</b>	Plantigrade, balanced, no deformity	<b>05</b>	05	05	05	05	05		05	05	05	05	05	05		05		05
	Plantigrade, mild deformity	<b>03</b>						03							03			
	Obvious deformity or malalignment	<b>00</b>																00
<b>Total score of SS</b>		<b>100</b>	<b>74</b>	<b>90</b>	<b>100</b>	<b>76</b>	<b>52</b>	<b>95</b>	<b>86</b>	<b>56</b>	<b>100</b>	<b>86</b>	<b>100</b>	<b>59</b>	<b>90</b>	<b>08</b>	<b>90</b>	

<b>Total score of SS (Pre - Operative)</b>	24	15	24	24	19	14	24	19	14	21	19	24	14	34	00	19
<b>Total score of SS (Post - Operative)</b>	100	74	90	100	76	52	95	86	56	100	86	100	59	90	08	90

## DISCUSSION

The tibial posterior tendon transfer through the circumtibial route was shown to be efficient in the restoration of near normal functions of foot with greatly improved gait, thus enhancing the life quality of patient. The transfer of tibial posterior tendon to EHL and EDL, is an efficient and low-risk method that permits easy fixation in the recovery of the dorsiflexion. The Stanmore system was shown to be useful in the assessment of the preoperative and postoperative outcomes of tibial posterior tendon transfer.<sup>[8,9]</sup>

Andersen,<sup>[10]</sup> in a study with 108 patients had following results: 72 had excellent or good results (66%), 30 had fair results, and 6 had poor results. Srinivasan et al<sup>[3]</sup> performed 39 tibial posterior tendon transfers in 33 patients and reported excellent results in 34 cases (87%) and poor results in 3 cases. The results found in the original study of Yeap et al,<sup>[8]</sup> using the Stanmore System, showed that 11 of 18 (61%) patients had excellent or good results, and the average score was 67.2. Felipe JJ. Reis et al in their study of 13 patients, the functional results using the Stanmore system were the following: 5 (38.4%) patients had excellent results, 5 (38.4%) had good results, 2 (15.3%) had fair results, and 1 (7.6%) had a poor result.<sup>[11]</sup>

The transfer through the interosseous membrane provides a stronger foot dorsiflexion compared with the circumtibial. However, the risk of vascular injuries and adhesions in the interosseous membrane are key problems.<sup>[5]</sup> While the subcutaneous transfer of the tibial posterior tendon to the dorsum of the foot by taking it around the tibia medial fascia is technically easier and is a less risky method, it provides a lesser degree of range of motion in the joint.

## CONCLUSION

The posterior tibial tendon transfer for foot drop in leprosy cured patients is efficient in restoring normal function of the foot and achieving “heel to toe” gait pattern without changing foot posture. In the absence of a standardized method for assessing the results of posterior tibial tendon transfer, the Stanmore system seems to be a good tool for an objective evaluation.

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