Functional Results following Posterior Tibialis Tendon Transfer in Drop Foot Reconstructive Surgery

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Statement of Purpose:

The purpose of this study is to retrospectively assess the functional outcomes and patient satisfaction following a posterior tibialis (PT) tendon transfer for drop foot deformity.

Level of Clinical Evidence: 4

Literature Review:

Transfer of the PT tendon has been well described for the treatment of drop foot. In 1933, Ober was the first author to describe a surgical technique for the treatment of drop foot which transferred the PT tendon around the medial border of the tibia to the dorsum of the foot.[1] Watkins then modified the procedure by transferring the PT tendon through the interosseous membrane.[2]

Although the procedure and its modifications are well described in the literature, there is still a lack of consensus on whether tendon transfers affecting the ankle joint adequately restore functional status for daily activities. There is a paucity of studies which examine the transfer using the same technique we describe in our study. To our knowledge, the study we present using our surgical technique for the treatment of drop foot contains the second largest sample size in the literature with a total of 15 feet in 14 patients.

Patients and Methods:

Following institutional review board approval, consecutive patients from the primary author's (R.R.) surgical records who had undergone a PT tendon transfer for drop foot deformity over an 11 year period (4/2007 - 7/2018) were identified. Inclusion criteria included any patient with anterior leg muscle compartment manual muscle testing (MMT) grade < 2/5 who underwent a PT tendon transfer performed by the primary author for drop foot deformity. Exclusion criteria included patients who were not followed for a minimum of 1 year postoperatively. The primary indication for surgery was diminished ambulatory status due to drop foot deformity in patients who failed at least 6 months of conservative treatment that included bracing and physical therapy. All patients had PT muscle strength grade 4 or higher, which was determined by preoperative clinical evaluation and ancillary testing when necessary. Medical records were analyzed and data abstracted by the co-authors including age, gender, laterality of affected limb, etiology of drop foot deformity, and adjunctive procedures performed. Patients were examined postoperatively and followed for a minimum of 1 year.

Outcome measures included the American Orthopaedic Foot and Ankle Society (AOFAS) ankle and hindfoot scoring system, a patient satisfaction questionnaire asking if they would have the same procedure again, postoperative passive ankle range of motion, and postoperative ambulatory status. Postoperative assessment and questionnaires were performed by the primary author (R.R.). Passive ankle range of motion was measured using a handheld goniometer in 5 degree increments. Postoperative ambulatory status was categorized into three groups: ambulating without an assistive device, ambulating with an assistive device, or non-ambulating.

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Results:

Table 1: Patient and clinical characteristics (N = 15 feet in 14 patients)

Case	Age at surgery (years)	Gender	Affected limb	Etiology of drop foot	Adjunctive procedures performed
1	47	Male	Left	CMT*	Yes
2	17	Female	Right	CMT*	Yes
3	67	Female	Right	CVA†	Yes
4	47	Male	Left	Cerebral palsy	Yes
5	56	Female	Left	CVA†	Yes
6	48	Male	Right	Cerebral palsy	Yes
7	48	Male	Left	TBI‡	Yes
8	19	Female	Right	Tethered cord syndrome	Yes
9	56	Female	Left	Lumbar radiculopathy	Yes
10	38	Female	Right	CVA†	Yes
11	56	Male	Left	Peroneal nerve injury	Yes
12	44	Female	Left	CVA†	Yes
13	64	Male	Left	Lumbar radiculopathy	Yes
14	56	Male	Left	Lumbar radiculopathy	Yes
15	66	Male	Left	Peroneal nerve injury	Yes

*Charcot Marie Tooth, †cerebrovascular accident, ‡traumatic brain injury

Table 2: Outcome measures (N = 15 feet in 14 patients)

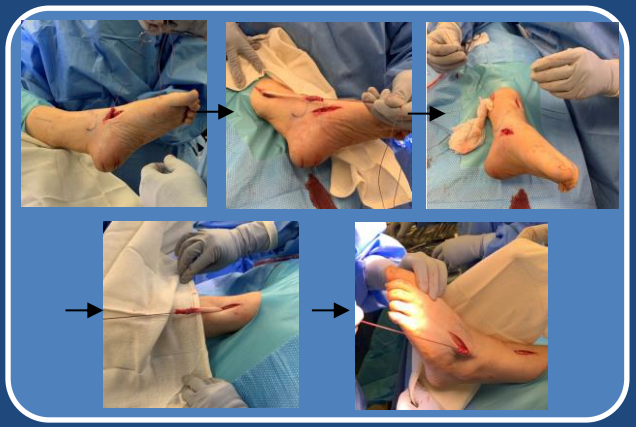
Case	Follow up (months)	AOFAS* score	Would have procedure again?	Ankle passive dorsiflexion (degrees)	Ankle passive plantarflexion (degrees)	Ambulatory status
1	140	83	Yes	5	30	No assistive device
2	138	95	Yes	5	30	No assistive device
3	137	43	No	0	10	Non-ambulating
4	89	89	Yes	10	20	No assistive device
5	64	58	Yes	5	30	No assistive device
6	56	86	Yes	5	30	No assistive device
7	52	82	Yes	0	25	Ambulating with AFO†
8	50	73	Yes	0	30	Ambulating with AFO†
9	38	72	Yes	5	30	No assistive device
10	37	95	Yes	5	30	No assistive device
11	29	92	Yes	5	35	No assistive device
12	15	72	Yes	10	15	No assistive device
13	12	90	Yes	5	30	No assistive device
14	12	95	Yes	10	30	No assistive device
15	12	85	Yes	10	20	Ambulating with AFO†

*American Orthopaedic Foot & Ankle Society ankle and hindfoot score, †Ankle foot orthosis

We evaluated 15 feet in 14 patients who underwent a PT tendon transfer to the lateral cuneiform utilizing a consistent 4-incision technique performed by the same surgeon.

The median age at the time of surgery was 48.0 years (44-56). Median length of follow-up was 50.0 months (15.0-75.0). Causes of drop foot included cerebrovascular accident (4 patients; 28.6%), lumbar radiculopathy (3 patients; 21.4%), Charcot-Marie-Tooth disease (2 patients; 14.3%), peroneal nerve injury (2 patients; 14.3%), tethered cord syndrome (1 patient; 7.1%), cerebral palsy (1 patient; 7.1%), and traumatic brain injury (1 patient; 7.1%). Patient demographics and clinical characteristics are summarized in Table 1. All 14 patients underwent additional adjunctive procedures in addition to the posterior tibialis tendon transfer.

The median post-procedure ankle and hindfoot AOFAS score recorded at the patient's last follow-up visit was 85.0 (72.0-92.0). The median postoperative passive ankle dorsiflexion was 5.0 degrees (5.0-10.0). The median postoperative passive ankle plantarflexion was 30.0 degrees (20.0-30.0). The median postoperative total passive ankle range of motion was 35.0 degrees (30.0-35.0). Thirteen (92.9%) patients maintained postoperative ambulation. Ten (71.4%) ambulated without the use of an assistive device, and 3 (21.4%) ambulated with the use of an AFO. When asked at their last follow up visit if they would undergo the procedure again, 13 (92.9%) patients reported that they would (Table 2).



Analysis and Discussion:

Our study shows that this procedure demonstrated good postoperative functional results and patient satisfaction. In our current study, the median postoperative AOFAS ankle and hindfoot score was 85.0. This is consistent with a recent study by Cho et al who found a mean postoperative AOFAS score of 86.2 following posterior tibialis tendon transfer for drop foot.[3]

With regards to patient satisfaction scores, our study found that 13 out of 14 patients would have this surgery again. The single patient who said "no" was able to ambulate postoperatively but then at the time of re-evaluation she became wheelchair bound due to stroke sequelae. In the study by Yeap et al, they reported patient satisfaction scores of 6 excellent, 4 good, 2 fair, and 0 poor outcomes. Pain was present and persisted in 1 patient.[4]

In our study, 10 out of 14 patients were able to walk without the use of an assistive device postoperatively. This is a significant improvement in functional status as all 14 patients were unable to walk without an assistive device preoperatively. Our results were similar to a study by Yeap et al who reported 10 out of 12 patients no longer required the use of an orthosis following PT tendon transfer for drop foot.[4] We did not observe any postoperative development of flatfoot at a median follow-up of 4.16 years.

We conclude that the posterior tibialis tendon transfer for treatment of drop foot is a useful, predictable procedure which can improve the patient's ability to ambulate and may even negate the need to wear an ankle-foot orthosis.

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