

Barefoot Rehabilitation of Type II Posterior Tibialis Tendon Dysfunction in a Veteran: A Case Report

Background

Posterior Tibialis Tendon Dysfunction (PTTD)

- Effects ~10% of the population¹
- Stage I: medial arch pain, possible pain with heel elevation, and mild ankle/foot swelling²
- Stage II: Stage I + flexible flatfoot deformity²
- Stage III: Stage I + fixed flatfoot deformity²
- Stage IV: tibiotalar degeneration stemming from valgus tilt of talus in ankle mortise²

Barefoot Training

- Increased plantar surface proprioception³
- Increased activation of foot intrinsic musculature⁴
- Decreased running injuries⁵

Foot Intrinsic Musculature Strengthening with Short-foot Exercise (Fig. 1)

- Showed highest EMG for intrinsic musculature⁶
- Improved balance scores in patients with chronic ankle instability⁷
- Decreased navicular drop in patients with pes planus and hyper-pronation⁸
- Increased support of the medial longitudinal arch⁹

Research

- 3 randomized controlled trials showed positive outcomes with comprehensive plan of care.^{10,11,12}
- Studies have yet to include barefoot training or intrinsic foot musculature strengthening in conservative management of PTTD.



Fig. 1: Foot Intrinsic Musculature <https://bjsm.bmj.com/content/49/5/290.full>

Purpose

To examine barefoot training and foot intrinsic musculature strengthening within a comprehensive PT plan of care for type II PTTD.

Patient Description

- 39-year-old male veteran with complaints of dull pain along the left, medial longitudinal arch
- Presence of flexible flatfoot deformity
- Patient stopped consistent exercise regimen after discharge from the military resulting in weight gain
- Pain began 3 months prior to seeking care and was worse with rising onto toes and weight bearing activities
- Unable to run any distance without pain
 - Goal for PT: return to running several miles daily without pain

Methods

Barefoot training:

- All exercises performed in barefoot

Intrinsic foot musculature strengthening:

- Short-foot exercise: 3 sets x 10 reps once per day (Fig. 2)

Comprehensive Plan of Care:

- Posterior tibialis strengthening: resisted inversion 150-600x once per day
 - Increased in increments of 50 reps/week or based upon patient response. (Fig. 3)
- Manual therapy: Mulligan mobilization with movement for increase in dorsiflexion range of motion.
 - 3 sets x 60 seconds (Fig. 4)
- Gastrocnemius and soleus strengthening: double heel raise with unilateral controlled descent.
 - 3 sets x 10 reps 1-2x/day (Fig. 5)
- Gastrocnemius and soleus stretching: 3 sets x 30 second hold 5-7x/week.
- Orthoses: Orthotist prescribed over-the-counter orthotic prior to physical therapy initial evaluation.



Fig. 2 Foot Intrinsic Musculature Strengthening

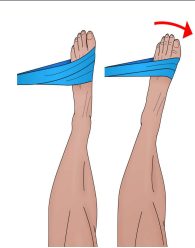


Fig. 3 Posterior Tibialis Strengthening

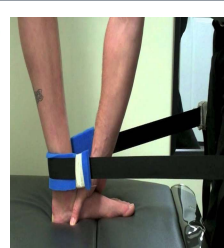


Fig. 4 Manual Therapy: Mobilization with Movement



Fig. 5 Gastrocnemius & Soleus Strengthening

Results

Tests & Measures	Initial Evaluation Results		Discharge Results	
	Right	Left	Right	Left
Lower Extremity Functional Scale	49/80		71/80	
Single Leg Heel Rise Test	10 reps	0 reps	20 reps	18 reps
Ankle ROM (degrees)	Right	Left	Right	Left
Dorsiflexion at 0° knee flexion	10	2	10	10
Dorsiflexion at 90° knee flexion	15	5	15	15
Manual Muscle Testing	Right	Left	Right	Left
Ankle Plantarflexion	5/5	3+/5 with pain	5/5	5/5
Great Toe Extension	5/5	5/5	5/5	5/5
Posterior Tibialis	5/5	3+/5 with pain	5/5	5/5

Conclusion

- Barefoot training and intrinsic foot musculature strengthening within a comprehensive PT management plan of care revealed excellent outcomes for a 39-year-old veteran with type II PTTD.
- Future research may consider investigating the use of barefoot training and intrinsic foot musculature strengthening in a larger sample of subjects with PTTD.

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Figure 1: <http://forsterturncurrysportspodiatry.com/wp-content/uploads/2017/12/short-foot-10244415.jpg>
 Figure 2: <https://www.sportsinjurybulletin.com/ankle-sprains-a-balanced-approach-to-treatment/>
 Figure 3: <https://www.youtube.com/watch?v=uh8vHid6w>
 Figure 4: https://www.researchgate.net/figure/Two-legged-or-one-legged-heel-rise-Going-up-onto-the-toes-is-a-concentric-call-muscle_fig2_258337529