LONG-TERM EFFECTIVENESS OF PROGRESSIVE RESISTIVE EXERCISE ON POSTERIOR TIBIALIS TENDON DYSFUNCTION: A RANDOMIZED CLINICAL TRIAL

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Introduction

Posterior tibialis tendon dysfunction (PTTD) is a common cause of foot pain and dysfunction in adults. Despite its high prevalence, there are no intervention guidelines for Stage 1 or 2 PTTD, and surgical repair is the only definitive treatment for Stage 3.

Purpose

To assess the long-term effectiveness of a 3-month progressive resistive posterior (TP) exercise program in subjects with Stage 1 or 2 PTTD.

Methods

Subject Demographics
- 7 males, 20 females
- Age = 50.6 ± 16.4, Range = 21-76 years old
- Symptom duration = 3.5-240 months

Evaluation
- Pre-intervention evaluations were performed by an investigator blinded to group assignment (PRE).
- Six months after completion of the program evaluations were self-administered (6-MONTH FOLLOW UP)

Variables Measured
- Foot Functional Index (FFI); a self-reported measure of pain, function, and activity level associated with foot dysfunction, range 0 to 100, where 0 = no disability and 100 = complete disability
- Physical Activity Scale (PAS); a self-reported measure of physical activity encompassing work, leisure time, and sports activity on a 24-hour scale

Tibialis Posterior Exercise Intervention
- Previous research demonstrated that selective activation of the TP muscle occurs with plantar flexion and adduction
- Donning shoes with foot orthoses increases intensity and selectivity of TP in persons with flat feet
- Exercise performed using a unit designed to isolate concentric or eccentric TP activity

Data Analysis
- A 3x2 ANOVA with repeated measures identified differences in the FFI across groups (ORTH, ECC, CONC) and between testing sessions (PRE, 6-MONTH FOLLOW UP).

Results

Figure 1. Exercise unit for isolated TP exercise. (1) LED displaying static plantar flexion from pressure sensors under forefoot; (2) Constant force extension spring for dynamic adduction; (3) Lever to allow passive adduction or abduction of forefoot.

Figure 3. A) Standing gastrocnemius stretch. B) Standing soleus stretch.

Figure 2. Custom fitted orthoses.

Figure 4. FFI Data. When averaged across subject groups there was a significant reduction from PRE to 6-MONTH FOLLOW UP in FFI scores (Total, Pain, Function, and Activity). There was a trend towards a significant interaction between group and testing session in the Pain, Function, and Total categories, with a greater change from 6-MONTH FOLLOW UP occurring for the ECC group compared to either the CONC or ORTH groups.

Figure 5. PAS Scores. The PAS value was significantly higher at 6-MONTH FOLLOW UP compared to PRE intervention when averaged across all subjects for whom data were available (p<0.012).

Conclusions

Participation in a 3-month program of either orthoses intervention or selective TP strengthening and orthoses intervention resulted in a significant improvement in overall foot function (FFI) and physical function (PAS) with gains maintained six months after intervention. The current data set suggests that eccentric loading with orthoses may provide an added benefit compared to either concentric exercise with orthoses or the use of orthoses alone, however, additional subjects are required to substantiate the trend in the data.

Clinical Relevance

The long-term effectiveness of a treatment regime for the non-operative management of Stage 1 or 2 PTTD was demonstrated. Theraband can be used in place of the exercise unit, with care to maintain plantar flexion with adduction, in treating patients with PTTD. Coupled use of custom orthoses with isolated loading of the TP tendon will result in improvements of both foot function and physical activity.

References


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