

Applied Musculoskeletal

[Name of the Writer]

[Name of the Institution]

[Date]

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Discuss what is currently understood regarding the etiology of PTTD
and its clinical recognition.

Literature Review

Introduction

The posterior tibial tendon dysfunction (PTTD) is considered to be the primary and one of the most significant causes of acquired flatfoot deformity in the adults since last two decades. PTTD is the major stabilizer for the longitudinal medial arch in the course of the normal gait of the human being. It is a very commonly occurring disorder that is seen among the majority of the adults these days and is known as the acquired flatfoot deformity in adults (Abousayed, 2016).

The literature review will discuss the etiology of PTTD and its clinical recognition. It will be supported through one example of a conservative treatment intervention that will be adopted to heal this condition. The etiological factors linked with the selected cause of heel pain will be identified and discussed in detail, which will later be recognized clinically. The rationale behind the chosen treatment intervention will be considered along with the evidence that supports its clinical efficacy.

Body

Posterior Tibial Tendon Dysfunction (PTTD)

The Posterior tibial tendon dysfunction (PTTD) refers to a commonly existing disorder which is observed in the adults. It is also called as the adult acquired flatfoot deformity (Richie, 2007). The disease, PTTD, is usually defined as the degenerative,

and progressive musculoskeletal process which extends from the localized tenosynovitis up to ankle deformity, rigid foot, or even both occurring at the same time. Such a condition results in the elongated posterior tibialis tendon, and this is the preliminary dynamic stabilizer which exists in the medial longitudinal arch (MLA) of the foot. The tendons are attached to the posterior tibialis muscle, and they function as invertors to subtler joint and ankle plantar flexor (Melissa, 2011). Therefore, it can be said that PTTD involves a musculoskeletal condition which is featured by the tendon dysfunction related to the tibialis posterior (TP) muscle.

The various PTTD etiologies comprises the previous injury caused to the tendon, worsening or aggravation occurring in the congenital pes planus along with the degenerative tendinosis, or any past trauma with relation to the similar problem. The posterior tibial tendon in the human feet functions as the primary structures that support the foot and helps it function properly during walking. Posterior tibial tendon dysfunction (PTTD) may be caused by the alterations in the tendon while impairing the ability of the tendon to provide support to the arch resulting in flattening the foot (William, Geideman, 2000).

PTTD has usually known as the adult acquired flatfoot for the fact that it serves as the most significant type of the flatfoot that has been developed in the adulthood. Through, this condition usually occurs only in one foot, yet some individuals may suffer from PTTD in both feet. The disorder is often progressive and keeps getting worse if it is not given proper treatment.

Etiological Factors

PTTD was once assumed to be the tendonitis and is considered as the tendon degeneration process or tendinopathy now. The factors responsible for causing this situation are identified as the poor supply of blood along with the mechanical factors which may include pes planus foot or peroneal brevis over activity (Semple, 2009). The pes planus foot is usually held responsible for gradually placing the increased amount of stress on the posterior tibial tendon which causes it to degenerate early. Moreover, various traumas such as fracture or ankle sprain may also be the reason of the initiation of this process. It usually occurs in the middle-aged and elderly women in particular along with young athletes.

The risk factors that result in getting PTTD condition include:

- Obesity
- Hypertension
- Diabetes mellitus
- Accessory navicular bone
- Pes planus (flatfeet)
- Seronegative arthropathies (Kong, Van der Vliet, 2008)
- Steroid therapy
- Ligamentous laxity
- Accessory navicular which is most likely to interfere with the functioning of the posterior tibial tendon
- Any previous traumas such as ankle fracture
- Overuse (Edwards, Jack, 2008)

- Steroid injections
- Psoriatic Arthritis / Rheumatoid arthritis

Other risk factors which may be responsible for the condition, PTTD, to occur in the individuals may include the sedentary lifestyles, pre-existing flatfoot, female gender, and any inflammatory diseases. The above mentioned etiological factors result in the occurrence of PTTD and cause heel pain to the sufferer. They may limit the walking ability and cause swelling along the medial longitudinal arch and behind medial malleolus, ultimately impairing the balance. The dysfunction of the posterior tibial tendon (PTT) allows the hindfoot to stay in aversion and enables the midfoot more flexibility all through the posture (Kornelia , Stephen, 2008). This flexibility of the midfoot is later subject to mechanical overloading, which arises from both weight and body along with force exerted by the triceps surae which acts about the rotational axis to the subtler joint laterally and, in turn, causes the strong probation moment.

Due to the exertion of such abnormal stress, the soft and Ligamentous tissue structures present in the feet may deform and stretch with the passage of time. Notably, the plantar and calcanea navicular ligaments which are used to provide the static support to the posterior tibial tendon may attenuate and increase the unconventional load that is exerted on the PTT (Hintermann, Gachter, 1998). The processing features of the PTTD foot deformities comprises of hindfoot aversion, MLA, Achilles tendon contracture, and usually forefoot abduction.

PTTD Diagnosis

The PTTD is diagnosed through examining the patient's history, conducting a physical examination of the feet, and later considering the patient for a radiographic evaluation. The clinical diagnosis is also undertaken, but the radiographic evaluation is also used by the doctors to assess the deformity and examine for the possible existence of degenerative arthritis or other causes of the pes planus (Trnka, 2004). Besides this, MRI possesses the highest level of sensitivity with accuracy and specificity, however, the ultrasound proves to be less expensive along with being almost of the same specificity and sensitivity as the MRI.

PTTD is clinically assessed and diagnosed through the clinical tests. These include testing for the excessive toes sign, first metatarsal rise sign, single leg heel raise, inversion of the foot against resistance and plantar flexion. While some additional tests may also be conducted to classify the different stages of AAFD which would include assessing the mobility and flexibility of the CC and TN joints, weightbearing X-Rays and others (Wacker, 2008).

Stages of PTTD

According to Johnson and Strom (1989), the stages of PTTD include the following:

Stage I: Intact and inflamed posterior tibial tendon, with mild swelling and no deformity

Stage II: Dysfunctional posterior tibial tendon, with the passively correctable, acquired pes planus which is usually not able to perform heel raise

Stage III: Fixing the deformity and degenerative changes in subtler joint

Stage IV (Myerson): Valgus talus tilt that leads to the lateral tibiotalar degeneration

Stage I

- Deformity: tenosynovitis
- physical exam: the test of single-leg to raise (+)
- radiography: normal

Stage IIA

- Deformity: Flexible hindfoot, flatfoot deformity, and normal forefoot
- Physical exam: mild sinus tarsi pain, and single-leg heel raise (-),
- radiography: deformity of arch collapse

Stage IIB

- Deformity: forefoot abduction, flexible hindfoot/rear foot, and flatfoot deformity,
- physical exam: Same stage IIA
- radiography: same stage IIA

Stage III

- Fixed, inflexible, or rigid deformity occurring in stage II
- Deformity: rigid forefoot abduction, flatfoot deformity, rear foot valgus/rigid hindfoot
- physical exam: single-leg heel raise test (-), and severe sinus tarsi pain
- radiography: arch collapse deformity (subtler arthritis)

Stage IV

- deformity: rigid forefoot abductin, flatfoot deformity, rear foot valgus/rigid hindfoot deltoid ligament compromise
- physical exam: arch collapse deformity, ankle pain,
- severe sinus tarsi pain, single-leg heel raise test (-), talar tilt ankle mortise, radiography, and subtalar arthritis

Medical Management

This study undertakes orthosis as the conservative treatment to be applied to managing PTTD. An orthosis, which includes foot orthosis and ankle orthosis, refers to the device which is eternally applied and is developed and fitted with the body for accommodating deformity, controlling biomechanical alignment, reducing pain, increasing mobility, or achieving other purposes.

The basic goal of the tendinopathy and medical management of PTTD is to provide the patient a nonsurgical and non-operative treatment, and in order to do so, many different variables will have to be considered by the attending physician.

According to Alvarez et al. (2006), the non-invasive therapy may be considered which would include physical therapy and orthosis; the basic goal of the treatment is to ensure that the healthy surrounding tissue is not damaged. However, in the case of the failure and unsuitability of the non-operative treatment, there is a dire need for the surgical treatment (Durrant, 2011). The other goal of the conservative intervention treatment being considered here is to improve the quality of patient's life significantly with regards to pain, function, and disability.

Prior to considering the surgical management, conservative treatment is prescribed and recommended for almost all the patients initially. Conservative treatment comprises of rest, anti-inflammatory non-steroidal drugs, and the immobility of the acute inflammation along with the orthosis that is utilized for controlling the worsening chronic symptoms. The primary elements in the determination of the appropriate method of treatment include if the foot flexibility and acute inflammation are fixed or flexible. However, patients usually determine the ultimate treatment themselves. Though compliance issues may occur during the first two stages of the treatment, yet it stresses upon the patients that the PTTD or dysfunction of tibialis posterior is normally a chronic and progressive condition.

Stages I and II: the flexible foot

During the conservative treatment and management of the PTTD, any occurrence of acute inflammation which surrounds the covering of the tibialis posterior tendon needs to be catered to before treating the chronic part of the existing painful condition. This takes a time period ranging 4 to 8 weeks of the immobility due to the that

is caused by the plaster which has been under the removable boot or knee which possesses the capability of controlling the accompanying inflammation. The anti-inflammatory and RICE (rest, ice, compression, and elevation) may be used in conjunction with the treatment, however, there is a contraindication of the steroid injection.

Footwear performs a significant part in the treatment, and it is necessary that the patients are encouraged for wearing the type of shoes that are flat lace-up, or the boots which are lace-up boots and easily accommodate orthosis. The patients at Stage I are capable of managing the orthosis which includes Formthotics or Orthaheel . The different semi-rigid, cast orthosis encourage and help the medial longitudinal arch in the feet and either corrects the outward bent of the heel to take it to the neutral ligament or fix the heel towards the neutral ligament. Such an approach serves different functions: it eradicates stress which is exerted on the tibialis posterior, and makes it in an efficient manner by holding fixed the hindfoot; and finally, it prevents the progression of the deformity from occurring.

Stage III and IV: the rigid flatfoot

The inflammation during the entire process is a less commonly occurring feature while presenting the unbending acquired flatfoot. The conservative treatment also revolves around the accommodating of the deformity instead of making an attempt to for correcting it. This could be done through customizing the rigidly modeled orthosis which is utilized in combination with the suitable footwear, as the deformity of feet may worsen.

Conclusion

PTTD is the dysfunctioning that occurs in the tibialis posterior tendon and has been proven to be the common condition which leads to the common cause that results in the acquired deformity of flatfoot in adults. The functional limitations and impairments that are linked with the PTTD begins from the involvement of mild soft tissues and ranges up to engaging the extreme foot deformity. Factors such as hypertension, diabetes mellitus, accessory navicular bone, pes planus, seronegative arthropathies, and steroid therapy. However, it can be treated and cured through both, surgical and non-surgical interventions.

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