Knee flexors tendons graft in posterior tibial tendon dysfunction: case report

Enxertia de tendões flexores do joelho na insuficiência do tendão tibial posterior: relato de caso

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ABSTRACT

Pes planus (flatfoot) valgus due to posterior tibial tendon dysfunction is a common condition and it is associated with great morbidity. A number of treatment options are described in the literature involving bone and soft tissue procedures. There is no consensus about what is the best donor area in relation to soft tissue procedures, more specifically for tendon transfers and use of grafts. We report a case of pes planus valgus by posterior tibial tendon dysfunction in which knee tendon grafts were used to reconstruct the posterior tibial tendon.

Keywords:

Posterior tibial tendon dysfunction/diagnosis; Flatfoot; Foot deformities; Tendons/transplantation; Case reports

RESUMO

O pé plano valgo por insuficiência do tendão tibial posterior é uma patologia comum e está associada à grande morbidade. Existem diversas opções de tratamento descritas na literatura envolvendo procedimentos ósseos e de partes moles. Em relação aos procedimentos de partes moles, mais especificamente nas transferências ou enxertos tendíneos, não existe um consenso sobre qual a melhor fonte doadora. Descreve-se um caso de pé plano valgo por insuficiência do tendão tibial posterior, no qual foi utilizado enxerto de tendões flexores do joelho para reconstruir o tendão tibial posterior.

Descritores:

Disfunção do tendão tibial posterior/diagnóstico; Pé chato; Deformidades do pé; Tendões/transplante; Relatos de casos

INTRODUCTION

Posterior tibial tendon dysfunction is an important cause of adult-acquired flat foot deformity – pes planovalgus. Its prevalence is higher in women over 40 years of age, affecting as many as around 4% of this group. Male subjects are also affected, but at a considerably lower rate. Its etiology is usually multifactorial, and the factors that contribute to its development, besides age-related degeneration, are local and systemic inflammatory processes, systemic arterial hypertension, diabetes mellitus, obesity, peritendinous corticosteroid injections, collagen diseases, presence of accessory navicular bone and, more rarely, traumatic injuries.[1-3]

The posterior tibial tendon (PTT) of the tibialis posterior is a primary dynamic stabilizer of the medial longitudinal arch, as well as the most important restrictor of foot over-pronation. Plantar flexion and inversion of the foot occur with the assistance of PTT contraction, so that the medial longitudinal arch of the foot becomes elevated,

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while the axes of the talonavicular and calcaneocuboid joints become non-parallel, thus locking the midtarsal joint and blocking the midfoot, forming a rigid lever arm and allowing adequate gait and lower energy expenditure to be achieved during the heel off with the contraction of the gastrocnemius-soleus complex. If the PTT does not function properly, the medial capsuloligamentous structures (plantar calcaneonavicular ligament and deltoid ligament) become progressively overburdened and weak, contributing to the deformity of the foot and leading to adult-acquired flat foot deformity.[4]

The aim of this article was to report the case of a patient with Johnson and Strom stage II PTT dysfunction (Table 1), of traumatic origin, who underwent surgical treatment with hamstring tendon grafting associated with calcaneal varization osteotomy, restoring hindfoot alignment and posterior tibial muscle function.[5]

Table 1 | Johnson and Storm classification modified by Myerson*

Stage	Characteristics
1	Pain and edema on the medial surface of the hindfoot and ankle in the trajectory of the posterior tibial tendon, without deformities
2	Pain and edema in the trajectory of the posterior tibial tendon associated with flexible valgus deformity and hindfoot
3	As stage 2 progresses, the hindfoot deformity becomes more pronounced and rigid
4	As stage 3 progresses, there is valgus inclination of the talus and consequent degenerative abnormality of the tibiotarsal joint

*Translated from: Myerson MS. Adult acquired flatfoot deformity: treatment of dysfunction of the posterior tibial tendon. Instr Course Lect. 1997;46:393-405. Review[5]

CASE REPORT

A 28-year-old male patient, initials J.A.R.A., farm worker with no comorbidities, who sustained a cut-contusion wound in the medial region of the right ankle at the age of 14, which was sutured superficially during emergency treatment. He complained of progressive pain in the medial region of the right ankle, associated with local edema. Physical examination showed asymmetrical planovalgus deformity of the right foot, mobility of the subtalar and tibiotalar joints present and painless, negative tiptoe test and negative for too many toes sign (Figures 1 and 2).

Following evaluation by the Foot and Ankle Surgery Group and request for imaging tests (magnetic nuclear resonance and radiographs, according to figures 3 to 5), the patient was diagnosed with Johnson and Strom stage II PTT dysfunction (Table 1).

Figure 1 | Posterior view of the ankles showing right hindfoot valgus deformity.

Figure 2 | Posterior view of the ankles showing right hindfoot varization in the tiptoe test.

Surgical technique

Since we are not certain about the integrity of the PTT and of the long flexor tendon of the toes (FDL – flexor digitorum longus, a habitual option of tendon transfer in pes

Figure 3 | Frontal and lateral radiographs with weight bearing on right foot demonstrating the pes planovalgus.

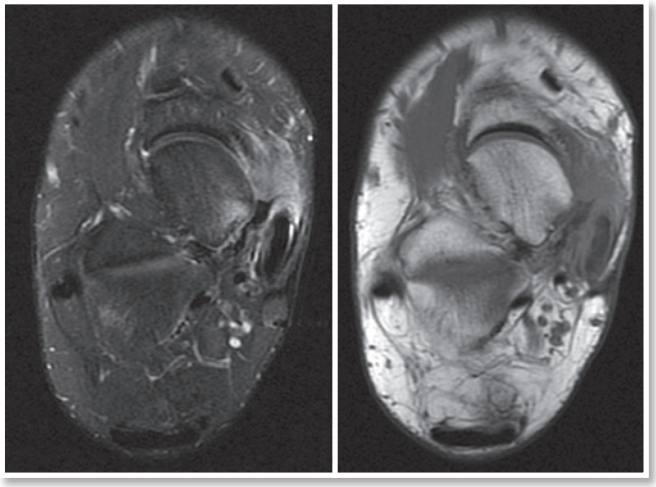

Figure 4 | T2 and T1-weighted axial cross-section of magnetic nuclear resonance image of the ankle showing tendinopathy of the posterior tibial tendon.

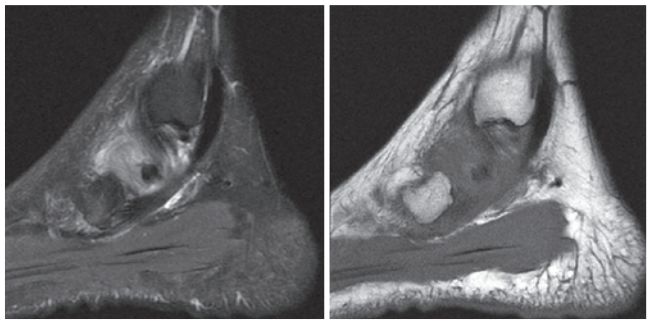

Figure 5 | T2 and T1-weighted sagittal cross-section of magnetic nuclear resonance image of the ankle showing tendinopathy of the posterior tibial tendon.

planovalgus due to PTT dysfunction) and because the patient's work is physically demanding, the surgical team chose to make use of the hamstring tendons (semitendinosus and/or gracilis) as an autologous graft to restore PTT function, if necessary.

The patient was placed in the horizontal dorsal decubitus position with a cushion under the contralateral buttock. A posteromedial approach was created in the right ankle, in which the surgeon identified an intense PTT lesion and a partial lesion of the FDL tendon (Figure 6). Structures such as the posterior tibial artery, posterior tibial vein, and tibial nerve were protected. The traction test of the injured PTT stump showed that its belly was retractable, and was therefore still elastic and functional. Thus, the surgical team chose to take advantage of this functionality of the posterior tibial muscle and to perform an unusual reconstruction technique that involves preserving the activity of this muscle belly. The entire affected portion of the PTT was resected.

Figure 6 | Degenerated posterior tibial tendon.

Ipsilateral hamstring tendon (semitendinosus and gracilis) graft measuring approximately 15cm was removed through an approach of approximately 3cm in the topography of the pes anserinus insertion, and its ends were prepared using double-row Vicryl® 1.0 Krakow sutures (Figure 7).

The hamstring graft (using only the semitendinosus tendon) was inserted distally into the navicular bone with transosseous sutures and proximally into the remaining PTT with termino-terminal sutures from the graft to the

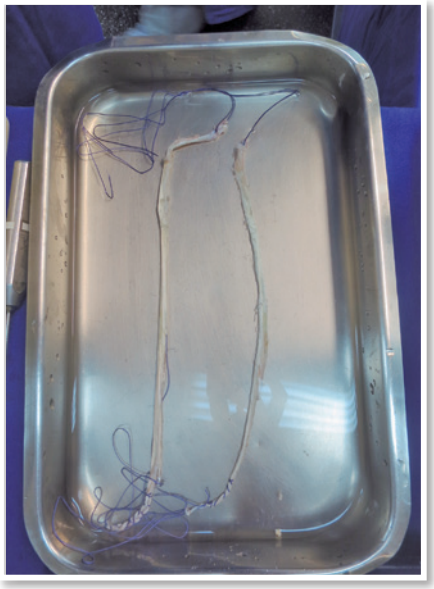

Figure 7 | Semitendinosus and gracilis tendon graft prepared for grafting.

proximal stump of the remaining PTT, both with Vicryl® 1.0 thread (Figures 8 to 10).

This step was followed by the calcaneal medial base wedge resection osteotomy and removal of medial base wedge with a base of approximately 2cm, culminating in calcaneal varization.

The definitive fixation of the calcaneus was performed with two cannulated screws (7.0mm), achieving adequate hindfoot correction. Closure was performed respecting the appropriate planes and reconstructing the flexor retinaculum.

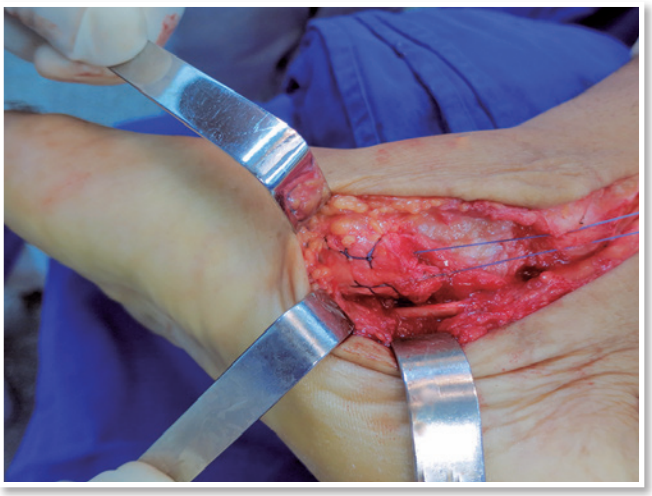

Figure 8 | Transosseous sutures in the navicular bone and remaining distal stump of the tibialis posterior tendon.

Figure 9 | Sutures in the proximal stump of the posterior tibial tendon.

Figure 10 | Final appearance of the semitendinosus tendon graft.

The patient had to use a long-leg plaster cast with no weight bearing for 2 weeks, with partial weight bearing wearing a walking boot authorized after this period for 2 weeks and full weight bearing wearing a walking boot for 4 weeks. All the procedural immobilization apparatus was removed 8 weeks after the procedure.

After 1 year of follow-up, the patient presented with painless, plantigrade foot with symmetrical medial arch and corrected hindfoot, strength for monopodal support in plantar flexion, having resumed full work/daily living activities without restrictions.

DISCUSSION

The surgical treatment of adult pes planovalgus due to PTT dysfunction has a wide variety of options. In the early stages, surgical treatment with soft tissue procedures, associated or not with bone procedures, is the most highly recommended.

In stage I, which rarely requires surgical treatment, PTT debridement, associated with a period of immobilization, can be performed and has shown good results.

In stage II, soft tissue procedures, associated with bone procedures, are indicated most often. A variety of soft tissue procedures (tendon transfers and reinforcement/reconstruction of medial capsuloligamentous structures) are described for the treatment of pes planovalgus due to PTT dysfunction.[6]

There are several tendon transfer options that can be used in PTT dysfunction, including transfer of the FDL, flexor hallucis longus (FHL) and fibularis brevis (FB) transfer.

Transfer of the FDL has routinely been used most often because its origin and trajectory are similar to those of the posterior tibial tendon, it contracts at the same time during gait, and can be transferred using the same incision as the PTT approach. However, its main disadvantage is that it is the weakest tendon of all potential donors.[7]

Compared with FDL transfer, FHL transfer can be considered stronger, since the tendon has a larger diameter and its muscle belly a greater mass.[8] However, we must take into consideration loss of flexion strength of the hallux interphalangeal joint, although its consequences are questionable,[9] and complications such as medial plantar nerve and lateral plantar nerve lesions during its distal dissection.[10]

Transfer of the fibularis brevis tendon, although used infrequently in the treatment of pes planovalgus due to PTT dysfunction, has the advantage of mobilizing the strongest of the three tendons in question. Factors that limit its use are: the need for an ancillary lateral approach, technical difficulties involved in transposing the tendon to the medial region of the ankle, loss of the main foot eversion force, and the possibility of generating functional ankle instability.

In the case reported here, the patient presented with a traumatic PTT lesion. Although the belly of the tibialis posterior was not analyzed radiologically to evaluate the degree of fatty infiltration along with a more accurate analysis of muscle viability (possible limitation of the study), in our opinion the tibialis posterior had a belly with intraoperative evidence of functionality.

As we considered the FHL tendon weak and the loss of the main foot eversion force detrimental to the occupational activities of the patient in question, we ruled out the use of the FHL tendon and of the fibularis brevis tendon as sources for transfers, having used the autologous hamstring graft (semitendinosus) to remedy removal of the PTT and performed calcaneal varization osteotomy.

Although this intraoperative finding is not that common in the classic degenerative condition, we imagine that it was found in this patient due to its atypical etiology, i.e., traumatic lesion of the PTT secondary to a cut-contusion wound.

After 1 year of postoperative follow-up, the patient maintained the correction performed in the hindfoot with grade 5 inversion force, no complaints of pain in the ankle and knee and having resumed previous activities in full.

The satisfactory result of the reported case suggests that transfer of the hamstring tendons may be a good alternative for the treatment of PTT dysfunction with intact and functioning belly, but comparative studies with a longer follow-up period need to be conducted to ratify this technique.

CONCLUSION

There are several options for foot and ankle tendon reconstructions. Use of hamstring tendon (semitendinosus and/or gracilis) presented satisfactory results in the treatment of the patient in question, but due to the atypical characteristics of the case (mainly the patient's sex and the traumatic nature of the lesion), comparative studies with adequate follow-up need to be conducted in order to compare the use of tendon grafts like those described above with traditional tendon transfers in the treatment of PTT dysfunction, especially in cases of degenerative origin.

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