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Case Report

Posterior Tibial Tendon Transfer with Combined Tendon-Tendon and Tendon-Bone Fixation using the Circum-Tibial Route and Superficial Retinacular Passage in the Foot Drop

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Introduction

Foot drop is a condition that makes walking difficult and interferes with active living [1,2]. Tendon transfers, such as the tibialis posterior tendon, are the most important adjunctive procedures in the treatment of foot drop [3,4]. It is important to apply the increasingly popular tendon transfer techniques and to understand the functional consequences of the type of surgical technique [5-7]. In particular, tendon transfer has been shown to improve patient satisfaction by increasing mobility and walking independence. In the treatment of foot drop, tendon transfer over the interosseous membrane and tendon fixation to bone have been the preferred techniques in recent years [8-10]. In our case, we used combined tendon-to-tendon and tendon-to-bone fixation, preferring the circumferential route and the superficial retinacular passage. The widespread use of these methods is important for the patient's participation in active life and satisfaction.

Case presentation

A 53-year-old male patient; with right foot drop following lumbar spinal surgery 7 years ago, was planned for tendon transfer. Passive dorsiflexion was 30-35 degrees, so Achilles lengthening procedure was not necessary. Neurological examination showed dorsiflexion 1/5, thumb extension 1/5, and foot inversion 2/5. No significant muscle atrophy was observed. In the surgical procedure, after finding the insertion point of the posterior tibial tendon through a small incision at the navicular bone, the tendon was released through a second vertical inci-

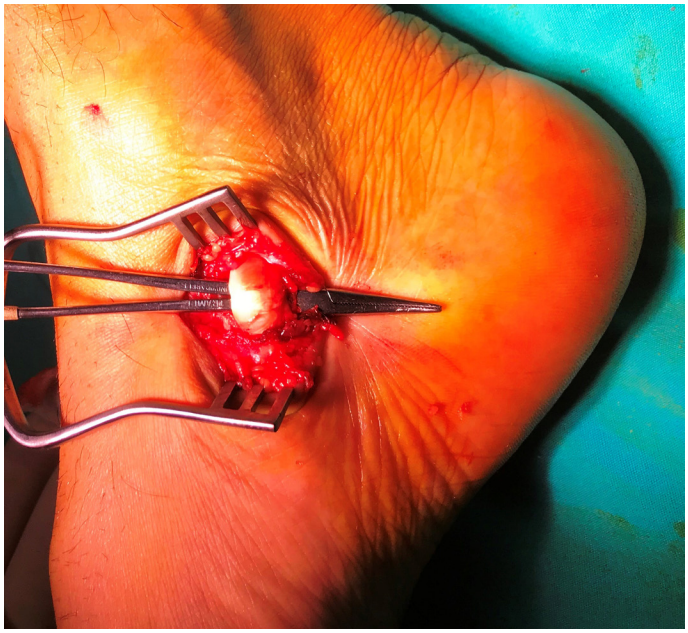

Figure 1: The insertion of the posterior tibial tendon is found through an incision at the navicular bone on the medial side of the foot.

sion 7 cm superior to the medial malleoli (Figures 1 and 2). A third incision was then made parallel to the 5 cm pili on the dorsal side of the foot, which will dominate the extensor tendons (Figure 3). Using Deschamp, the tendon was transferred dorsally over the extensor retinaculum via the circum-tibial route (Figure 4). The tendon was then bisected 3 cm distal to the tendon. The medial portion was ligated to the navicular bone and the lateral portion was ligated to the extensor tendons with the foot in 20 degrees of dorsiflexion. The patient was started on a physiotherapy programme after 6 weeks of splinting and at the 6 month follow-up, foot dorsiflexion was recorded as 3/5 and ROM angle as 45 degrees.

Figure 2: The tendon is released from the insertion site through an incision on the medial malleolus and removed.

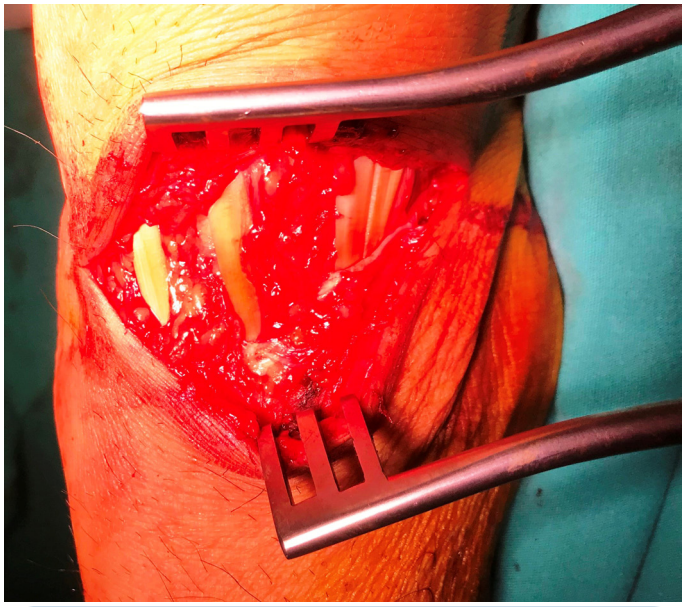

Figure 3: After a horizontal incision on the dorsum of the foot, the tendons of the anterior tibial, extensor hallucis, extensor digitorum and peroneus tertius muscles are observed from right to left.

Figure 4: The posterior tibial tendon is transferred to the dorsal aspect of the foot via the circumferential route and the extensor retinaculum.

Discussion

Foot drop may be of neurological origin related to central, spinal, and peripheral nerves or muscular origin such as muscle injury and compartment syndrome. It causes increased knee and thigh flexion on the affected side and hip elevation on the same side during the swing phase of gait, which impairs quality of life. Although gait can be improved to some extent with a foot-ankle orthosis that prevents further plantar flexion in the neutral position, surgical treatment should be performed early before spasticity and muscle atrophy develop. The most common cause of foot drop is injury to the peroneal nerve. In this case, early nerve repair is the first option. If this is not sufficient, a tendon transfer should be performed. Posterior tibial tendon transfer has been performed with remarkable success since 1933. Although tendon transfer is the gold standard, arthrodesis and tenodesis can also be performed [1,2]. Although postoperative dorsiflexion strength averages 33%, it improves function in activities of daily living and ambulation [1,2]. If the clubfoot is not treated, an equinovarus deformity will develop over time [3]. During surgery, a small incision is made on the navicular bone to locate the attachment of the posterior tibial tendon to the tuberosity. A second incision, 7.1 cm above the medial malleolus in males and 6.4 cm in females, allows us to obtain the longest mobile tendon without damaging its origin [4]. The tendon is transferred to the dorsum of the foot through the 3rd incision parallel to the ankle line. Intraosseous (transmembranous) and circumtibial routes may be preferred for transfer. Some argue that the transmembranous technique results in greater dorsiflexion and ROM angle [5]. However, the risk of vascular damage and adhesion formation is higher with this method [6]. As the circumferential tract is longer, the

torque for dorsiflexion will be greater. Data from cadaveric studies have shown that tendon length is insufficient for transmembrane transfer [7]. Another important consideration is the retinacular junction. Crossing the external retinaculum results in more effective motion [8].

Fixation can be tendon-tendon or tendon-bone. The recipient tendons are the anterior tibial or anterior tibial and extensor tendons [9]. Tendon-tendon fixation should be performed with the foot in 20 degrees of dorsiflexion, allowing for stretching over time [10]. Tarsal or metatarsal bones may be preferred for tendon-bone fixation. This is done by opening a bone tunnel. This causes neuropathic arthropathy. Bone fixation alone will not prevent the toes and fingers from falling off. After splinting for 4-6 weeks postoperatively, the physiotherapy programme is started early. In our case, we used combined tendon-tendon and tendon-bone fixation, preferring the circum-tibial route and the superficial retinacular passage. We suggest that combined fixation should be emphasised in terms of functional outcomes.

Conflict of interest: No potential conflict of interest relevant to this article was reported.

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