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Hypertrophy of the flexor hallucis longus muscle after tendon transfer in patients with chronic Achilles tendon rupture

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ABSTRACT

Background: Flexor hallucis longus tendon (FHLT) transfer has become a popular method for reconstructing a chronic Achilles tendon rupture (ATR). The purpose of this study was to evaluate the clinical outcomes and possible hypertrophy of the FHL muscle after FHLT transfer in patients with chronic ATR.

Methods: Seven patients with chronic ATR underwent an FHLT transfer to heel through single incision. The patients were clinically evaluated 27 (16–39) months after the surgery. The patient satisfaction was assessed with Achilles Tendon Total Rupture Scale (ATRS). Isokinetic strength was measured from both legs. The FHL muscle hypertrophy was evaluated from MRI of both legs. All subjects also performed a gait analysis with an instrumented walkway system (GAITRite®).

Results: The plantar flexion strength was 16.1% (-45, 7-2, 4%) weaker in the operated leg. ATRS scores averaged 70.3. Marked hypertrophy, +52% (9–104%) of the FHL muscle was seen in the operated leg compared to the non-operated leg. The gait analysis did not show any marked pathology in any of the patients.

Conclusions: A mean hypertrophy of 52% of the FHL muscle was found after FHLT transfer for the chronic ATR. This indicates strong adaptation capacity of this muscle after FLHT transfer in situation where the function of the gastro-soleus complex was severely impaired preoperatively. The reconstruction of chronic ATR with FHLT transfer provided a good functional outcome and excellent patient satisfaction.

1. Introduction

The main problem in managing chronic Achilles tendon rupture (ATR) is the lack of the tissue between the retracted stumps [1]. The repair usually requires some kind of tendon reinforcement (augmentation) with a turndown flap, tendon transfer, tendon graft, or synthetic materials [2,3]. If the gap between tendon stumps is large, or if there is marked degeneration of the gastro-soleus muscle complex, tendon transfers provide a viable option for reconstruction.

Flexor hallucis longus tendon (FHLT) transfer has become a popular method for reconstructing a chronic ATR [4–12]. This method has many advantages. Firstly, the FHLT transfer can be carried out through a single incision, which makes the transfer a quite simple procedure. Secondly, proximity to the Achilles tendon avoids the need to disturb the lateral compartment or the neurovascular bundle, and the distal musculature of the FHL may provide some vascularity to the degenerated Achilles tendon [3,4,13]. Thirdly, the FHL is a strong ankle plantar flexor, having similar contractile axis and phase with gastrosoleus.

Several small patient series have shown good results with FHLT transfer [4–12]. The previous results have shown that the plantar flexion strength of the operated side cannot be fully restored, but most of the patients have been able to re-enter their previous sports interests. These studies also show very low failure rates after the FHLT transfer [4–7,9–13]. Hypertrophy of the FHL muscle after FHLT transfer has been previously reported in a series where majority of the patients were treated due to Achilles tendinopathy [5]. To our knowledge, there are no previous reports of FHL muscle hypertrophy specifically after FHLT transfer for chronic ATR.

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The purpose of this retrospective study was to evaluate the clinical outcome and cross-sectional area of the FHL muscles after FHLT in patients who had presented with difficulties in walking due to chronic ATR.

2. Materials and methods

2.1. Patients

From 2008 to 2010, 10 patients with a chronic ATR had undergone an augmentation with FHLT transfer in our clinic. All patients were asked to participate to this retrospective study in 2012. Seven out of 10 patients signed an informed consent and were enrolled in the study.

Three patients had received corticosteroid injections due to Achilles tendon problems before primary ATR. The right limb was affected in four cases and the left in the three. Three patients smoked regularly. Five patients had been unable to continue in their regular sporting activity. Preoperatively all the patients reported difficulties and discomfort in daily living and normal walking.

Patients were operated 3–52 months (mean 16 months) after the ATR by a single surgeon (H.-J.L.). The follow-up evaluation was performed at 27 months (range, 16–39 months) after the surgery. The subject characteristics are listed in Table 1. Four men and three women with a mean age of 53 years (range, 37–69 years) participated. All patients had suffered a previous total ATR. In two patients the primary diagnosis of ATR was delayed. In three patients the primary rupture was treated conservatively. Two of them had a re-rupture, and in one patient the conservative treatment had failed. One patient had a marked deficiency in ankle plantar flexion strength after primary surgery. One patient had a residual AT defect following revision surgery for a deep wound infection following a primary AT repair.

2.2. Surgical technique

The operation was performed through a single incision placed posteromedially to the Achilles tendon [14] (Fig. 1). The Achilles tendon was exposed and the proximal and distal tendon stumps were prepared free from the surrounding tissue. The fibrous scar tissue, if present, was preserved. The deep fascia was divided and FHL muscle and tendon were indentified. The FHLT was tenotomized as distal as possible while keeping the foot maximally plantar flexed (Fig. 2). The FHLT was fixed to calcaneus just anterior to Achilles tendon insertion with one bone suture anchor (TwinfixTM 5.0 mm, Smith & Nephew) keeping the ankle in a plantar flexed position. The FHLT tension was considered optimal if the FHLT was maximally tight when the ankle was in a neutral position or only a few degrees in dorsiflexion. In practice this tension is usually achieved when the lowest portion of the FHL muscle comes in contact with the calcaneus. Postoperatively ankles were immobilized in non-weight bearing equinus (ankle 20–30° in plantar flexion) cast for 4 weeks. After 4 weeks a functional brace was applied and daily active motion exercises and partial weight-bearing were started. The brace was removed and full weight-bearing was allowed after 8 weeks (Fig. 3).

2.3. Follow-up evaluation

The patients were evaluated at the mean of 27 (16–39) months after the surgery. The clinical evaluation was not blinded and was

Table 1
Characteristics of the study subjects.

Patient	Sex	Age	Rupture-surgery (mo)	Follow-up (mo)	Defined diagnosis	Previous surgery	Cortison infiltrations	Smoking
1	M	37	3	39	Deep wound infection	Tendorraphy, revision, Lindholm'splastia	No	No
2	F	69	3	37	Neglected rupture	None	Yes	Yes
3	M	50	52	24	Rerupture, failed conservative treatment	Tendorraphy	No	No
4	M	37	18	24	Lack of strength, no rerupture	Tendorraphy	No	No
5	M	50	5	26	Rerupture, failed conservative treatment	Tendorraphy	No	Yes
6	F	67	18	19	Failed conservative treatment	None	Yes	No
7	F	61	12	16	Neglected rupture	Tendorraphy	Yes	Yes
Mean		53	16	27				

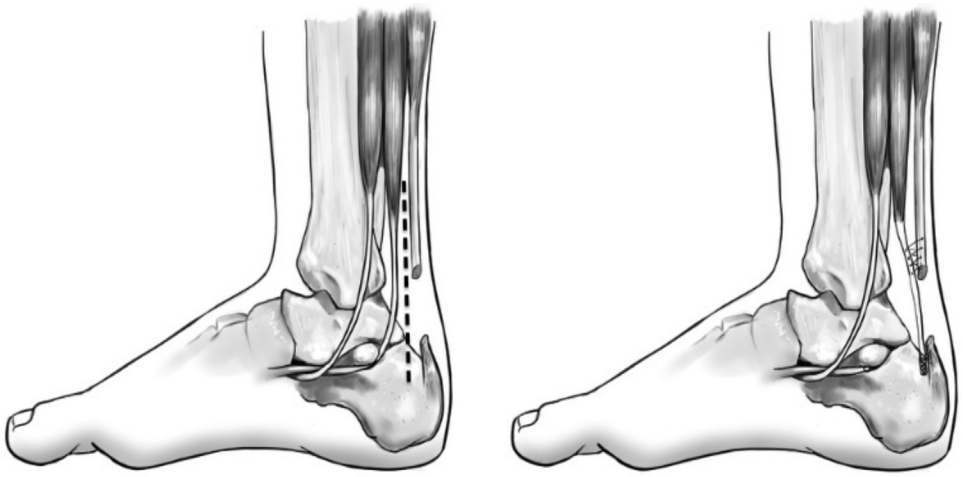

Fig. 1. Schematic presentation of the FHLT single incision technique.