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Combined flexor hallucis longus tendon transfer and gastrocnemius recession for reconstruction of gapped chronic achilles tendon ruptures

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ABSTRACT

Objective: The aim of this study was to assess the functional outcomes after a combined FHL transfer and a gastrocnemius recession for treatment of chronic ruptures of Achilles tendon with a gap and to investigate the patient's satisfaction about the great toe function after transfer.
Material and methods: 19 patients with chronic rupture of the Achilles tendon with a gap were treated with a flexor halluces longus tendon transfer combined with a gastrocnemius recession, Clinical diagnosis depends on the presence of gap in the tendon on examination, inability of tip toe walking on the affected side and positive calf-squeeze test, MRI was used to confirm the clinical diagnosis. American Orthopedic Foot & Ankle Society hind foot score was used for assessment of the results.
Results: The AOFAS score improved significantly from a mean of 65 preoperatively to 94 at the last follow up ($p < 0.001$), there was no significant difference in the final outcome between patients with FHL tendon weaved through the stump of the Achilles tendon and those with trans osseous tunnels, the mean AOFAS score at the last follow up was 94.2, 93.8 respectively, no patient complained of big toe dysfunction.
Conclusion: Management of chronic rupture of the Achilles tendon with a gap with flexor halluces longus tendon transfer combined with a gastrocnemius recession is a safe and reliable method with a significantly improved functional outcome, muscle advancement through gastrocnemius recession decreases the length of the gap without affecting the muscle function, flexor halluces longus tendon transfer doesn't harm the big toe function.

Introduction

The management of chronic rupture of the Achilles tendon with a gap is considered a great challenge due to causes related to the local blood supply of the area and the great force required for proper tendon function.

Chronic ruptures of the Achilles tendon (AT) are associated with functional disability. Rupture is considered chronic if it persisted without treatment for four weeks [1].

The condition has a great relation to sports activities mainly in people who return to their previous sport activity after a period of inactivity [2].

The chronicity of AT ruptures changes the protocol of management due to retraction and atrophy of the tendon ends with short fibrous distal stumps which has its worsening effect on the outcome as compared to management in acute states [3].

Many authors reported excellent results after reconstructions of chronic ruptures of Achilles tendons using the flexor halluces longus (FHL), the peroneus brevis (PB) or gracilis. The FHL has better mechanical properties than PB, but both of them had lower mechanical properties compared to AT. itself [4].

There is still a debate about the effect of FHL tendon transfer on the push-off during stance phase [5].

In this study authors used FHL tendon transfer combined with a gastrocnemius recession to bridge the gap aiming to assess the functional outcomes and to investigate the patient's satisfaction about the great toe function after transfer.

This study was approved by institutional review board of Mansoura University and informed consent was obtained from all patients.

Materials and methods

From February 2009 to October 2014, 19 patients with chronic rupture of the Achilles tendon with a gap after tendon debridement

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had FHL tendon transfers combined with a gastrocnemius recession in Mansoura university hospitals. Patients were diagnosed clinically and by Magnetic resonance imaging.

Clinical diagnosis depends on the presence of a gap in the tendon on examination, swelling of the tendon ends if present, inability of tip toe walking on the affected side and a positive calf-squeeze test (Thompson test) [6].

The mean age of the patients at surgery was 47 years (range, 24–62). There were 13 men patients and 6 women. 12 were affected on the right side and the remaining 7 on the left.

American Orthopedic Foot & Ankle Society (AOFAS) hind foot score was used for assessment of the results, this 100 points score includes 40 points for pain, 50 for function and 10 points for alignment, it was assessed preoperative, at 6 months, at 12 months and at the last follow up [7].

The calf muscle power was assessed using the MRC (Medical Research Council) scale which has 6 grades from 0 to 5, where 0 means no movement in the muscle while attempting to contract it, 1 means flickers in the muscle, 2 means movements only if gravity was eliminated, 3 means movements against gravity, 4 means movements against gravity with addition to some resistance exerted by the examiner, and 5 sits for normal power [8].

The average length of the defect in the tendon measured intraoperative after debridement with the foot in a 30° plantar flexion was 6.8 cm (range, 5cm–8 cm).

Tendon rupture was due to sports activity in 4 patients, falling down in 3 patients and due to traffic accident in 4 patients and in the remaining 8 patients due to chronic systemic steroid intake 3 patients out of these 8 patients had a previous failed primary repair with rerupture.

None of the patients in this study had a history of steroid local injection around the tendon.

The mean interval between injury and operation was about 16 weeks (range, 8–26) weeks.

Surgical technique

All patients were operated under spinal anesthesia while in a prone position, a tourniquet was applied to the thigh after the limb being exsanguinated, and a posteromedial longitudinal incision was used extending proximally exposing the gastrosoleus complex and distally exposing the distal stump or the superior part of the calcaneus when required. Meticulous resection with preservation of the tendon sheath as much as possible. Both stumps of the ruptured tendon were debrided of fibrotic and necrotic tissues. The length of the gap was measured with the foot in a 30° plantar flexion.

Gastrocnemius recession was done, the tendinous superficial aponeurosis was incised in an inverted V manner preserving the muscle fibers then the muscle carefully slided, and the aponeurosis was left without sutures. A great advantage of this technique is its simplicity and short operative time.

The FHL was exposed through a medial incision extending from the base of the proximal phalanx of the big toe towards the navicular bone. The FHL was then freed from the surrounding soft-tissue structures and the adjacent FDL tendons, to which it is attached, then it was divided distally leaving a segment of the tendon for tenodesis and retracted through the proximal incision, the distal segment of the tendon was sutured to the adjacent FDL tendon of the second toe with the big toe in a neutral position.

In cases with sufficient length of the distal tendon stump the FHL tendon was weaved through the stump (14 cases in this study), while; in cases with insufficient stump (5 cases) a transverse tunnel with a sufficient diameter to pass the FHL tendon was made in the calcaneus near the insertion of the Achilles tendon in a medial to a lateral direction, the FHL tendon after passing through the tunnel was weaved through the proximal stump and then tenodesed to itself and the ruptured ends of the Achilles tendon are sutured to the FHL tendon and muscle, the contralateral healthy side was used to assess the tension of the construct by comparing the degree of plantar flexion in both sides while the knees in 90° flexion. The paratenon was closed as possible to preserve the blood supply to the tendon.

The ankle was splinted in a below-knee cast with the ankle in a 45° plantar flexed position for 3 weeks, sutures were removed by 3 weeks and a new cast in a neutral position was applied for another 3 weeks. Partial weight bearing as tolerated was then allowed.

Physiotherapy started after cast removal.Patients were followed up after 3 weeks, 6 weeks then monthly for 6 months, then every 3 months till last follow up.

In the follow-up visits patients were assessed clinically for palantigrade foot, hind foot and fore foot alignment, skin condition, degree and frequency of pain if present, mobility as regard ankle dorsiflexion and plantar flexion, also eversion and inversion, mobility of the great toe, heel raise on the affected side, Thompson test, calf muscle atrophy.

Statistical methods

The data of patients were statistically assessed using the statistical package for social sciences (SPSS) version 19 for windows. Paired sample test was used to define relations between functional outcomes preoperative, at 6 months, at 12 months and at the last follow up, The Qui square test was used to assess the relation between the final outcome in patients with FHL tendon weaved through the stump of the Achilles tendon and in those with transosseous tunnels. Probability values of less than 0.05 were considered significant.

Results

In this study gastrocnemius recession allowed muscle advancement of about 3–5 cm. Patients were followed-up for a mean period of 29 months (range, 13–52 months) (Figs. 1–6).

All patients in this study had a degree of limitation of the range of motion of the ankle and big toe but this was functionally insignificant during sports or activity of daily living and without interphalangeal joint hyperextension.

There was a significant improvement in the mean AOFAS score over time till the last follow up ($p < 0.001$). AOFAS score was 65 (range, 52–72) preoperatively, 88.4 (range, 72–96) at 6 months,

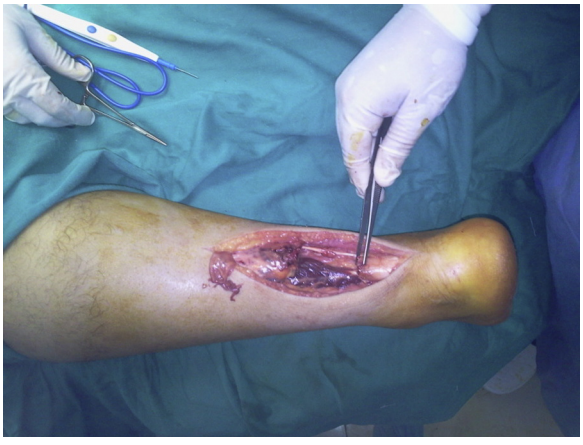

Fig 1. The defect in the Achilles tendon after debridement.

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