

Chronic Achilles Tendon Rupture Treated with Two Turndown Flaps and Flexor Hallucis Longus Augmentation – Two-year Clinical Outcome

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Abstract

Introduction: Both conservative and operative management have been described in the literature for the management of chronic Achilles tendon ruptures with surgical management generally having more favourable results. In our institution, the favoured reconstructive technique was the use of 2 turndown tendon flaps fashioned from the proximal Achilles tendon augmented by a teno-myodesis of the flexor hallucis longus. The purpose of this study was to assess the clinical outcome of all patients who underwent this procedure. **Materials and Methods:** From the records, a total of 9 patients underwent the above-mentioned procedure of whom 6 patients had complete data collection sets [including SF-36, Visual Analogue Scale (VAS), American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot scores, ankle range of motion (ROM), presence of residual symptoms and complications] at 2 years of follow-up. **Results:** Our results showed an average AOFAS Ankle-Hindfoot score of 94.2, VAS of 0 in all but 1 patient, and generally high scores (75-96) in all 8 domains of the SF-36 questionnaire. Patient satisfaction was also rated to be high from the surgical procedure. **Conclusion:** We submit that the procedure adopted at our institution is able to reproduce satisfactory results with low morbidity in patients with this challenging condition.

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Introduction

Chronic Achilles tendon rupture is a disabling condition resulting in ankle pain, weakened ankle plantarflexion and abnormal gait.^{1,2} Management of chronic ruptures is technically challenging with generally poorer outcomes and higher complication rates than that of acute repair. Current literature suggests this problem is still better tackled surgically although no single technique has been shown to be clearly superior.³

The purpose of this study was to assess the clinical outcome of all patients who had undergone Achilles tendon reconstruction at our institution.

Materials and Methods

We assessed our results for the reconstruction of chronic Achilles tendon rupture performed at our Foot and Ankle Service, Department of Orthopaedic Surgery, Singapore General Hospital, from 1998 to 2005. All surgeries were performed by a single surgeon. In all there were 9 patients who underwent reconstruction (7 male and 2 female). The mean age was 59.5 years with a range of 54 to 75 years.

The mean time of injury to surgical intervention was 6.3 months with a range of 1 to 12 months. One patient had a concomitant arthrodesis for hallux rigidus. Clinical data on range of motion, return to normal gait and postoperative complications were collected. Additionally, the patients were assessed using the 36-Item Short Form (SF-36), Visual Analogue Scale (VAS), American Orthopaedic Foot and Ankle Society (AOFAS) Ankle and Hindfoot Score, and Satisfaction Level questionnaires at 2 years postoperation.

Surgical Technique

Reconstruction in all cases utilised 2 tendon-aponeurotic turndown flaps sutured onto the remnant distal tendon stump and augmented by teno-myodesis of the flexor hallucis longus tendon (FHL).

With the patient prone, a midline incision is made over the posterior aspect of the heel cord to expose the rupture site, extending from the musculo-tendinous junction of the gastrocnemius to the superior aspect of the calcaneum. The sural nerve is identified and protected. Scar tissue excision from the tendon gap along with adhesiolysis is performed.

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The final gap is measured with the ankle in plantigrade to determine the length of the flaps required. Two 1-cm wide turndown flaps of appropriate length are developed from the proximal tendon and detached proximally leaving 2 cm intact distally. A second incision made over the medial aspect of the foot is used to expose the FHL tendon that is subsequently divided as far distally as possible. The distal FHL stump is then tenodesed to the flexor digitorum longus (FDL) tendons while the proximal FHL tendon is rerouted into the first incision (Fig. 1).

The 2 tendon-aponeurotic flaps are turned down and tenodesed to the distal Achilles tendon stump with the ankle in plantigrade and further stitched together side-to-side. The FHL tendon is then passed medial to lateral through the distal Achilles tendon. Slack from the FHL tendon is removed and tenodesed to the lateral turndown flap. The FHL muscle belly is then myodesed to the medial turndown flap (Fig. 2).

The paratenon is opposed with vicryl 2-0 followed by irrigation, haemostasis and layered wound closure. A back slab with the ankle plantigrade is then applied. Postoperatively, the patient is converted to a full cast early and kept on non-weight bearing crutch ambulation. The cast is discontinued in the 6th week. Thereafter, the patient is progressed from stretching to strengthening exercises and permitted to bear weight and ambulate as tolerated.

Results

The mean length of the 9 tendon rupture gaps post-debridement was 5.6 cm (4 to 7 cm).

One case of sural neuropraxia and 2 cases of heel numbness were observed both of which resolved subsequently. No complication of wound breakdown or tendon rupture was detected on follow-up. There were no cases of ankle stiffness, heel cord tightness and all patients were assessed to have a normal gait by a mean of 6 months (3 to 24 months).

Of note, FHL to FDL tenodesis was not performed in our first patient who subsequently complained of weakness of

big toe plantarflexion. This tenodesis was subsequently performed in the remaining 8 cases with no recurrence of this complaint.

Six of the 9 patients consented to return at 2 years for clinical assessment, 2 refused participation and 1 remained uncontactable.

The mean VAS Pain Score was 0.8 with a pain score of 0 in 5 patients and a pain score of 5 in 1 patient who had an additional arthrodesis of his first metatarsophalangeal joint (MTPJ). The AOFAS Ankle-Hindfoot score for the 6 patients were good-excellent with a mean of 94.2 ranging from 78 to 100 (maximum = 100 points).

The mean scores for the 8 elements of the SF-36 were as follows: (i) physical functioning – 88.3, (ii) role functioning, physical – 95.8, (iii) bodily pain – 82.2, (iv) general health – 75.0, (v) vitality – 86.7, (vi) social functioning – 87.5, (vii) role functioning, emotional – 94.5, and (viii) mental health – 90.7.

To gauge patient satisfaction, the patients were asked the following 2 questions:

1) Has the surgery met your expectation so far?

(1=Yes, totally, 2=Yes, almost totally, 3=Yes, quite a bit, 4=More or less, 5=Not quite, 6=Far from it, 7=Not at all)

Response	No of patients
1 (Yes, totally)	4
2 (Yes, almost totally)	1
3 (Yes, quite a bit)	1

2) How would you rate the overall results of the treatment for your foot and ankle pain? (1=Excellent, 2=Very good, 3=Good, 4=Fair, 5=Poor, 6=Terrible)

Response	No of patients
1 (Excellent)	4
2 (Very Good)	1
3 (Good)	1



Fig. 1. Two proximal turndown flaps with FHL tendon at distal end of wound.



Fig. 2. Completed reconstruction of Achilles tendon.

Discussion

The pathophysiology of chronic Achilles tendon rupture differentiates it from an acute rupture resulting in a greater need for more complex reconstruction and augmentation. Successful outcomes require that the bridging scar in the tendon gap be excised to allow for adequate healing. Often, primary end-to-end anastomosis is not achievable and V-Y tendon lengthening,⁴ tendon flaps and augmentation are required to bridge the defect.

Turndown flaps to bridge the tendon gap have become the workhorse operation for many surgeons due to the ease of harvesting, availability of tissue and generally good, consistent results. Christensen first described the use of a central turndown flap in 1953 followed by Arner and Lindholm who described the use of 2 peripheral turndown flaps in 1959.⁵

Tendon grafts are used either as the principle procedure to bridge the gap or for augmentation. These include the use of peroneus brevis first described by Perez-Teuffer in 1974, the FDL by Mann et al in 1991⁶ and the FHL by both Hansen⁷ and Wapner et al⁸ in 1991. In addition, several authors have reported the use of tendon allografts and synthetic grafts in order to overcome donor site morbidity and reduce operative times.

The use of the FHL tendon is well reported in the literature and was first described by Hansen⁷ where the tendon was harvested through the same incision that was used to repair the Achilles tendon. Wapner et al⁸ subsequently described using a separate incision along the medial border of the midfoot. Recently, Panchbhavi² has described a minimally-invasive plantar approach for FHL harvest.

The benefits of using the FHL over other dynamic tendon transfers include:

- i) being the second strongest plantarflexor of the ankle (after the posterior tibialis),
- ii) having an axis of pull resembling that of the Achilles tendon,
- iii) maintaining normal ankle muscle balance via phasic contraction with the gastrocnemius-soleus complex,
- iv) limiting iatrogenic neurovascular bundle injury due to close proximity of the FHL to the Achilles tendon,
- v) increasing the vascularity of reconstruction with myodesis of low-lying FHL muscle belly.²

Concerns over great toe plantarflexion weakness with FHL harvest have been addressed by several authors. Hansen reported that most patients over 30 years did not miss the loss of strength in the great toe. Wapner et al reported that 6 of 7 patients who underwent FHL harvesting returned to the same level of athletic activities postoperatively. Hahn et al⁹ reported that though the active range of motion of the great toe in all 16 patients were impaired, and demonstrated gait asymmetry on pedobarography, none of these patients had

any clinically observable gait disturbances or encountered problems with walking or climbing stairs. Other reports, however, have been less favourable with Mulier et al¹⁰ reporting that FHL division diminished plantar flexion strength of the first toe significantly in 6 of 9 patients. In our series, except for our first patient, we included FHL to FDL tenodesis in our reconstruction.

Meticulous attention needs to be paid to soft tissue handling to minimise wound breakdown and infection especially in patients with diabetes, peripheral vascular disease or who smoke. Closure of the calf wound over turndown flaps in addition to tendon augmentation may result in excess tension along the suture line. Ensuring that the reconstruction is not too bulky or bulbous in its dimensions can minimise the risk of dehiscence.

Although we acknowledge this case series is small and retrospective, we found that we were able to achieve consistently good clinical results with a high level of patient satisfaction at 2 years. In addition, no wound complications, tendon re-rupture or deep vein thrombosis were noted.

Conclusion

Achilles tendon rupture is best managed acutely by it conservatively or surgically. When dealing with a chronic rupture, one must appreciate the increased complexity of this problem or run the risk of having a poor outcome. Numerous surgical techniques have been described each with their own strengths and caveats. The technique described here has been found to be reliable and able to achieve good clinical outcomes although one must always be aware of the potential complications and take the appropriate steps to mitigate these risks.

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