



International Journal of Orthopaedics Sciences

E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2021; 7(4): 326-330
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www.orthopaper.com

Received: 17-08-2021

Accepted: 19-09-2021

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Outcome of acute degenerative Achilles tendon reconstruction using peroneus brevis tendon & its early mobilization

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DOI: <https://doi.org/10.22271/ortho.2021.v7.i4e.2902>

Abstract

Achilles Tendon (TA) rupture is not a rare condition nowadays. Mostly it is seen in athletic young age group population or accidental trauma in physically active group & degenerative rupture. TA rupture injury may present with acute (Traumatic) & chronic (Degenerative). Reconstruction of torn TA & its post operative rehabilitation is challenge. There are multiple technique for TA repair published in literature with their own results. But open surgery has a good results than conservative management. In present study, we report 11 patient who underwent augmented repair of acute degenerative Achilles Tendon reconstruction by peroneus brevis tendon by creating a dynamic loop technique as described by Turco & Spinella modification to Teuffer technique & with early mobilization. Patients were evaluated at 3 weeks, 3 & 6 months post surgery using Ankle Hindfoot scale by American Orthopaedic Foot and Ankle Society. At the last postoperative follow-up visit 10 out of 11 were able to do all physical activity with good functional outcome achievement. No patient had episode of re-rupture of Achilles tendon.

Keywords: Achilles tendon, peroneus brevis tendon, nowadays

Introduction

Acute degenerative ruptures of tendoachilles typically occur after the age of 30 years. The injury mechanism usually involves eccentric loading on a dorsiflexed ankle with the knee extended [4, 5]. The Achilles tendon has no true synovial sheath, unlike the flexor tendons of the hand; rather, it is covered only by a paratenon hence exogenous healing is not expected to occur. Secondary factor contributing to ruptures are gout, hyperparathyroidism, steroids and flouroquinolones may contribute to tendon rupture [6]. In the past, the injury was treated with end to end suturing and a plaster cast, but this was associated with high rates of re-ruptures and weakened push off. Hence, there is rationale to perform reconstruction using an expendable yet healthy tendon such as the peroneus brevis. Here, we are presenting a study of eleven patients treated with this technique.

Materials and Methods

Eleven patients with an acute degenerative tendoachilles tear were repaired using peroneus brevis tendon between May 2015 and May 2019. All the patients presented acutely or within a few days due to inability to walk normally post-injury. Clinical presentation was typical with pain and a snapping sensation behind the ankle following a sudden jerk while working on farm field or domestic trauma. The patients complained of difficulty in walking and inability to run. Clinical examination revealed local site tenderness, inability to actively plantarflex the ankle (passive plantarflexion was possible) and positive Thompsons' test [7], Matles test, O'Brien test. Ankle radiographs were obtained to rule out calcaneal fractures; patients with such fractures were excluded from the study. All patients underwent operative treatment after giving written informed consent by single surgeon & procedure. With the patient in prone position, a posterolateral longitudinal incision was made along the tendoachilles also exposing the calcaneal tuberosity. The sural nerve was identified and retracted proximally in the wound. Incision was made through the tendoachilles sheath to expose the ruptured ends (Figure 1). Scar tissue was resected and the tendon dissected proximally to free it if needed (Figure 2).

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The peroneus brevis was then detached from its insertion over the base of fifth metatarsal following a minimal incision. The aponeurotic septum was excised, separating the lateral and posterior compartments, and the tendon was delivered into the primary incision (Figure 3). Ruptured tendon ends of TA were approximated using the Turco & Spinella technique with No. 1 vicryl suture (Figure 5). We then made a midcoronal split enough for the peroneus brevis through distal stump of Achilles tendon. The peroneus brevis was passed through this distal tendon and then back proximally beside the site of rupture for reinforcement; finally, it was sutured to proximal stump by making dynamic loop technique



Fig 1: Posterolateral incised tendoachilles sheath



Fig 2: Degenerative torn Achilles tendon



Fig 3: Torn ends of Achilles tendon are freshened, sural nerve retracted & peroneus brevis tendon harvested from insertion via mini incision & brought through primary incision wound



Fig 4: Peroneus brevis tendon passed through mid coronal slit made in distal stump of Achilles tendon



Fig 5 & 6: Augmentation of repair using peroneus brevis with Turco & Spinella Technique. Peroneus brevis was passed through this midcoronal split & then back proximally beside the site of rupture for reinforcement, finally it was sutured to proximal stump to produce a dynamic loop similar to modified Teuffer Technique.

(Figure 6). Patients were put in a plaster slab with the ankle in 10-15° plantarflexion for 3 weeks. Suture removal done at 3 weeks & high heel shoe raise given with full weight bearing & strengthening exercise given. At the end of 3 months ankle range of movement, functional ability assessed & progressive strengthening rehabilitation programme followed given.

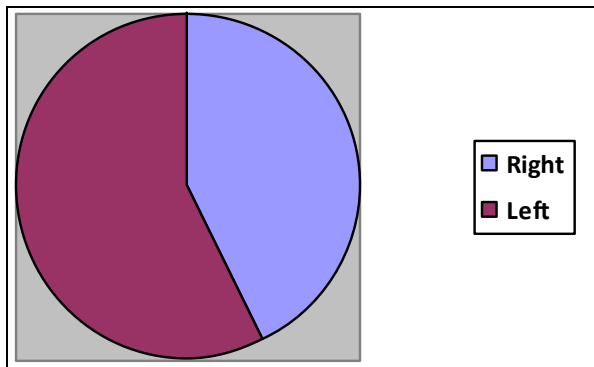


Fig 7: Demographic features

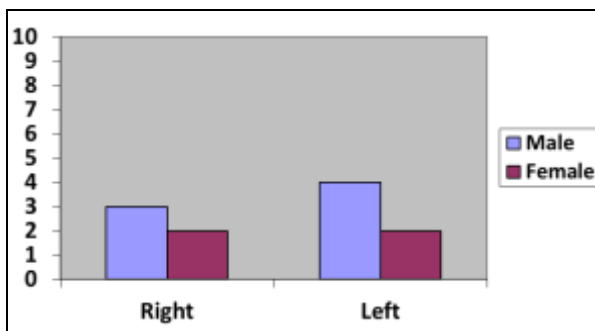


Table I: Complications following surgery

Complication	No. of Patients
Rerupture	0
Superficial infection	1
Hypertrophic Scar	0
Sural Nerve Injury	0

Table II: Objective & Subjective measures at follow up

Duration	Average Ankle Range of Motion		Ankle Hindfoot Scale
	Dorsiflexion	Plantar Flexion	
3 weeks	4°	12°	38
3 months	10°	22°	68
6 months	18°	28°	97

Results

Of the 11 patients, 4 were female and 7 male, and average age was 41 years (range, 31-56 yr) (Fig. 7). Three patients were on long term steroids for various diseases, one had gout, one had local steroids injections for retrocalcaneal pain and the remaining patients had no significant medical or surgical history. All patients were followed up for at least 6 months.

All patients were asked return for an evaluation under senior surgeon who was neither a part of preoperative diagnostic evaluation nor an operating team, and were examined using objective and subjective criterias. Objectively, ankle range of motion, ability to perform a toe raise, and neurological status of the foot were examined. Subjective criteria included the Ankle Hindfoot Scale, as given by American Orthopaedic Foot and Ankle Society (Table III).

At 2nd follow up, i.e. at 3 months end average dorsiflexion was 10° & average plantarflexion was 20°, with average Ankle Hindfoot scale was 71.

At the end of 6 months average dorsiflexion was 18° (compared to 24° on the non-injured side) and average plantarflexion was 28° (compared to 35° on the non-injured side). Patients were assessed by pain questionnaire, functional ability & alignment of foot. For Ankle Hindfoot scale, 90.9 % patients had excellent or good results. (Table II)

No patient suffered a re-rupture. One patient had a superficial postoperative infection, which was managed with debridement and regular dressing. After complete wound healing patient underwent the rehabilitation and strengthening exercise.

Discussion

Treatment of a degenerative tendoachilles tear is a tricky proposition. Results of Achilles tendon repair have been variable. As noted by Lagergren and Lindholm [8], the tendoachilles region 2 to 6 cm above the calcaneal insertion has the poorest blood supply. Carr and Norris [9] demonstrated that the midsection of the tendon is most prone to rupture, as this is the area of the tendon in which there is a reduced percentage and number of blood vessels. In addition, the tendo Achilles is devoid of a true synovial sheath and has only a paratenon which is more prone to inflammation & hence exogenous healing not occurred.

There are many treatment options for Achilles tendon rupture including nonsurgical [10, 11] (conservative), Primary surgical repair (percutaneous sutures [12], Krackow technique, V-Y lengthening of the gastrocnemius [13], augmented repair with central gastrosoleus aponeurosis [11]) and reconstruction using flexor hallucis longus [14, 15], plantaris, flexor digitorum longus, peroneus brevis. In Indian scenario most people use to walk bare foot on farm land (farmer) & uneven surfaces which need firm grip of foot. Many literature mention that flexor hallucis longus used for achilles tendon reconstruction have good tendon strength than other but more disadvantage in form of deformity (Table IV).

Table III: Ankle-Hindfoot Scale (100 points Total)

Ankle-Hindfoot Scale (100 Points Total)	
Pain (40 points)	
None	40
Mild, occasional	30
Moderate, daily	20
Severe, almost always present	0
Function (50 points)	
<i>Activity limitations, support requirement</i>	
No limitations, no support	10
No limitation of daily activities, limitation of recreational activities, no support	7
Limited daily and recreational activities, cane	4
Severe limitation of daily and recreational activities, walker, crutches, wheelchair, brace	0
<i>Maximum walking distance, blocks</i>	
Greater than 6	5
4-6	4
1-3	2
Less than 1	0
<i>Walking surfaces</i>	
No difficulty on any surface	5
Some difficulty on uneven terrain, stairs, inclines, ladders	3
Severe difficulty on uneven terrain, stairs, inclines, ladders	0
<i>Gait abnormality</i>	
None, slight	8
Obvious	4
Marked	0
<i>Sagittal motion (flexion plus extension)</i>	
Normal or mild restriction (30° or more)	8
Moderate restriction (15°-29°)	4
Severe restriction (less than 15°)	0
<i>Hindfoot motion (inversion plus eversion)</i>	
Normal or mild restriction (75%-100% normal)	6
Moderate restriction (25%-74% normal)	3
Marked restriction (less than 25% normal)	0
<i>Ankle-hindfoot stability (anteroposterior, varus-valgus)</i>	
Stable	8
Definitely unstable	0
Alignment (10 points)	
Good, plantigrade foot, midfoot well aligned	15
Fair, plantigrade foot, some degree of midfoot malalignment observed, no symptoms	8
Poor, nonplantigrade foot, severe malalignment, symptoms	0
Total=	100
American Orthopaedic Foot and Ankle Society	
From: http://www.aofas.org/4a/pages/index.cfm?pageid=3494	

Table IV: Comparison of Tendon for Tendon transfer in treatment of Achilles Tendon Rupture

TENDON	STRENGTH RELATIVE TO GSC	ADVANTAGES	CONCERNS
Peroneus brevis	18 times weaker	In phase with GSC during normal gait Shared role as plantar flexor of ankle Relatively close proximity to Achilles tendon but in separate muscle compartment	Loss of eversion strength Lateral-to-medial pull after transfer to calcaneus, which does not reproduce inversion normally created by Achilles tendon Sural nerve damage during harvest
Flexor digitorum longus	27 times weaker	In phase with GSC during normal gait Shared role as plantar flexor of ankle Relatively close proximity to Achilles tendon	Weakened flexion of toes Lesser toe deformities Nerve or artery injury during harvest
Flexor hallucis longus	13 times weaker	In phase with GSC during normal gait Shared role as plantar flexor of ankle Closest proximity to Achilles tendon	Loss of push-off strength during gait Clawed hallux deformity Transfer metatarsalgia Nerve or artery injury during harvest

We performed reconstruction using peroneus brevis based on the premise that the torn ends of the tendons are already unhealthy ^[4]. Further, the healing capacity of the injured tendon is further limited due to hypovascularity resulting in decreased tissue regeneration with a high probability of re-rupture. The use of peroneus brevis serves two advantages: 1)

it incorporates a healthy tendon with more reliable healing potential; 2) it is an expendable tendon and there is little disability in its absence. Overall, our results were satisfactory within 90.9 % good or excellent results as per Ankle Hindfoot Scale. Similarly, Teuffer ^[2] *et al.* reported that this is a dynamic loop repair technique which is bio-mechanically

more sound than static repair.

Nevertheless Achilles tendon reconstruction using peroneus brevis has certain disadvantages. For instance, this more extensive approach requires specialized surgical expertise. Infection, though rare is a possibility. Superficial infection occurred in one patient in the present study and was managed with debridement and multiple dressings.

Conclusion

Results of reconstruction of Achilles tendon ruptures using peroneus brevis tendon show a strong and stable repair that allows early weight bearing ambulation with favorable clinical results in most patients of.

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