Long Term Functional Outcomes of Surgical Treatment of Insertional Achilles Tendinopathy Augmented with Human Acellular Dermal Matrix, Without the Use of Suture Anchors

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ABSTRACT

PURPOSE

The aim of this study was to evaluate the long-term outcomes of patients who underwent surgical treatment for Insertional Achilles Tendinopathy (IAT) in which an acellular dermal allograft matrix (ADM) was utilized to augment the surgical procedure, and no suture anchors were utilized.

METHODOLOGY

A retrospective review was performed with an initial total of 42 patients with IAT who underwent surgical treatment consisting of partial detachment (50-75%) of the Achilles tendon, excision of retrocalcaneal exostosis, debridement and repair of Achilles tendon with augmentation of the repair with ADM. A final total of 20 patients were available for follow up by phone beyond 12 months and were included in this series. Mean follow up period of 36 months.

Primary outcomes assessed included:

- Time to weight bearing.
- Visual analog scale scores at baseline and final follow-up.
- Major and minor complications.

The effect of comorbidities including diabetes mellitus, hypertension and tobacco usage were reviewed.

PROCEDURE

All 20 patients underwent surgical treatment consisting of partial detachment (50-75%) of the Achilles tendon, excision of retrocalcaneal exostosis, debridement and repair of Achilles tendon with augmentation using human acellular dermal matrix allograft.

A lateral linear incision approach was utilized. All procedures were performed by a single surgeon (VR*). Once identified and exposed, approximately 50-75% of the Achilles was detached from the posterior calcaneus.

PROCEDURE

Any intratendinous calcifications and degenerative tissues were debrided. Any longitudinal tears were repaired with 0 braided absorbable suture. A 2 cm x 3 cm ADM allograft was then interposed between the Achilles tendon and the calcaneus and sutured in place with 0 braided absorbable suture.

The lateral investment of the Achilles was then sutured to the medial aspect of the raised full thickness flap with 0 braided absorbable suture. Closure of the subcutaneous tissue and skin was then performed. A negative Thompson test was noted at the completion of all procedures.

Patients were placed in a posterior splint in gravity equinus for 2 weeks of non-weightbearing followed by 2 additional weeks of non-weightbearing in a short leg cast.

At an average of 4.25 weeks post-operative, they were then transitioned to a removable cast boot with a heel wedge and allowed full weightbearing as tolerated. The patients then began a physical therapy regimen and transitioned to regular shoe gear at 6 weeks as tolerated.

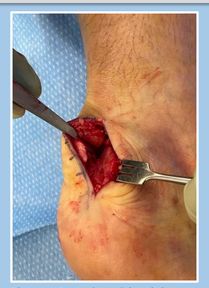

Figure 1. Lateral incision placement and reflection of the lateral Achilles tendon attachment.

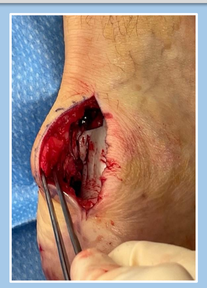

Figure 2. Interposition of the ADM anterior to the Achilles tendon.

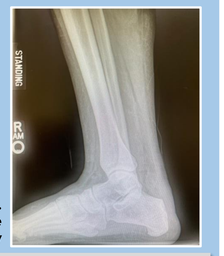

Figure 3. Postoperative Weightbearing X-Ray

LITERATURE REVIEW

Insertional Achilles Tendinopathy (IAT) presents as tendon pain and swelling at the distal aspect of the Achilles tendon at its insertion to the calcaneus[1]. This pathology commonly affects runners and athletes as well as patients with hypertension, diabetes mellitus, and obesity[2,3]. These comorbidities are associated with acute ruptures and decreased healing potential[3].

IAT is marked by the presence of degenerative changes within the tendon at the calcaneal insertion.[1] This degenerative process is associated with a loss of parallel collagen fiber orientation.
Historically, surgical treatment consists of partial or total detachments of the Achilles tendon, debridement and repair of the Achilles tendon, excision of the retrocalcaneal exostosis and reattachment of the tendon with use of suture anchors.

RESULTS

- Mean time to weight bearing was 4.25 weeks.
- The VAS scores for these 20 patients improved from a mean of 5.1 to a mean of 1.75
- No patients had postoperative infection.
- Two (10%) patients had delayed wound healing with one patient (5%) requiring surgical wound debridement.
- No postoperative Achilles tendon ruptures occurred.

Patient Demographics & Comorbidities	
Number of patients	20 with follow-up > than one year
Mean age (year)	51.6
Sex (male:female)	8:12
Comorbidities, n (%)	
Hypertension	9 (45)
Diabetes Mellitus	3 (15)
Tobacco Use	1 (5)

VAS, Time to Weight Bearing & Complications	
Mean Initial VAS	5.1
Mean Final VAS	1.75
Mean Time to Weightbearing (weeks)	4.25
Mean Follow-up Interval (months)	36
Complications, n (%)	
Delayed wound healing	2 (10)
Surgical wound debridement	1 (5)

ANALYSIS & DISCUSSION

Generally, a detachment greater than 50% has required single or double row suture anchor repair[5]. Various graft materials have been used to augment the repair of the Achilles tendon. ADM allografts avoid the complexity and morbidity associated with autograft and provide mechanical support to the tendon in the healing process[6]. Additionally, ADM allografts promote angiogenesis in vivo[7].

The results demonstrate that the use of ADM in the surgical treatment of IAT appears to allow a time to weightbearing that is comparable to and in some cases sooner than surgical treatments that utilize suture anchors to reattach the Achilles tendon with no observed increase in postoperative complications. The reason for this is likely multifactorial and could include the ADM's role in stimulating angiogenesis and decreasing fibrous deposition at the Achilles tendon and calcaneus interface.

There were no postoperative infections or reactions to the graft tissue observed. There were two instances of delayed wound healing with one patient requiring surgical wound debridement. There were no postoperative Achilles tendon ruptures. The average time to weight bearing was 4.25 weeks and the average VAS score improved from 5.1 to 1.75 at final follow up. In conclusion, this protocol for surgical treatment of Insertional Achilles Tendinopathy with the use of ADM resulted in promising outcomes with earlier time to weightbearing while eliminating the need for supplemental fixation products.

REFERENCES

1. Chimenti RL, Cychosz CC, Hall MM, Phisitkul P. Current Concepts Review Update: Insertional Achilles Tendinopathy. Foot Ankle Int. 2017 Oct;38(10):1160-1169.
2. Clement DB, Taunton JE, Smart GW. Achilles tendinitis and peritendinitis: etiology and treatment. Am J Sports Med. 1984 May-Jun;12(3):179-84.
3. Mokdad, A; Ford, ES; Bowman, BA: Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. J. Am. Med. Assoc. 289:76–79, 2003.
4. Movin T, Gad A, Reinholt FP, Rolf C. Tendon pathology in long-standing achillodynia. Biopsy findings in 40 patients. Acta Orthop Scand. 1997;68(2):170-175
5. Beitzel K, Mazzocca AD, Obopilwe E, et al. Biomechanical properties of double- and single-row suture anchor repair for surgical treatment of insertional Achilles Tendinopathy. *Am J Sports Med*. 2013;41(7):1642-1648.
6. Aurora A, McCarron J, Iannotti JP, Derwin K. Commercially available extracellular matrix materials for rotator cuff repairs: state of the art and future trends. J Shoulder Elbow Surg. 2007 Sep-Oct;16(5 Suppl):S171-8.
7. Greaves NS, Lqbal SA, Morris J, Benatar B, Alonso-Rasgado T, Baguneid M, Bayat A. Acute cutaneous wounds treated with human decellularised dermis show enhanced angiogenesis during healing. *PLoS One*. 2015 Jan 20;10(1):e0113209.

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Disclosures: Vytautas Ringus, MD and Bryce Corlee, DPM are paid consultants for TRX BioSurgery.