

Repair of Peroneus brevis tendon with or without use of Human Pericardium graft: A Retrospective

Comparative Study. Does the graft improve patient outcome?

Devin D. Wahlen, DPM; John J. Anderson, DPM, FACFAS; Zflan Swayzee, BS



Statement of Purpose

The surgical repair of a split tear of the peroneus brevis tendon (STPBT) is performed when conservative treatment has failed. The accepted surgical technique is the use of debridement of tendon when necessary and tubularization.(1-4) The authors present a retrospective analysis of the use of a Human Pericardium Graft for repair of STPBT and simple tubularization.

Methodology and Hypothesis

Retrospective chart review of 85 charts, totaling 91 surgical procedures (3 bilateral, 3 revisions), for the repair of peroneus brevis longitudinal split tendon tear. Charts reviewed are ranging from July 2008-December of 2012, (mean 19 months, range 10-34). Inclusion criteria were partial tear of the peroneus brevis diagnosed clinically or intraoperative finding. All patients with diabetes, peripheral neuropathy or complete tear of peroneus brevis tendon were excluded, reducing the total number of procedure to 69, 32 with a pericardium graft and 37 without the graft. Pre-op and post-op ACFAS and VAS scores, healing times, demographics, comorbidities and complications were recorded.

Procedures

All of the ankles reviewed in this study had an adjunct procedure of either ankle arthroscopy or lateral ankle stabilization via modified brostrom or both. Repair of the peroneus brevis tendon consisted of simple tubularization with or without augmentation of a human pericardium graft. The decision to affix a graft was made if the tear was >3cm and <6cm. Excision of any low lying muscle belly (LLMB) of the peroneus brevis tendon was surgically excised to decompress the peroneal groove and retinaculum. Figs. 1-4.

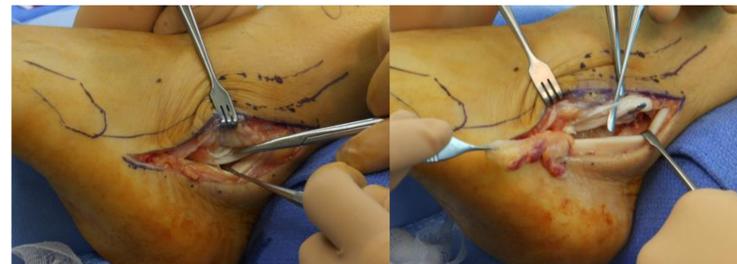


Fig. 1-Split tear of the peroneus brevis tendon.

Fig. 2-Split tear of peroneus brevis tendon along with LLMB.



Fig. 3- Human Pericardium Graft once hydrated is very malleable and strong.

Fig. 4- Peroneus brevis tendon repaired then wrapped and over sown with the pericardium graft.

Literature Review

Use of allograft in Orthopedic surgery has been well studied. Valentin et al reported on five different scaffolds used in the market today. They implanted these five different allograft extracellular matrix into an abdominal incision in rats. After 112 days the histology was analyzed. The final analysis proved that the preparation of each graft was significant for cellular incorporation as well as bifrous-tissue deposition. It was concluded that those extracellular matrix-derived materials that are processed to minimize degradation through chemical crosslinking methodologies are more likely to be associated with fibrous encapsulation and chronic inflammation.(5)

Barber and Aziz-Jacobo et al. tested the physical properties and physical dimensions of 7 commercially available soft-tissue augmentation devices. Each product was hydrated according to the manufactures' specifications and then tested in cyclic loading including cyclic displacement and permanent displacement, tensile modulus, stiffness, and ultimate load-to-failure was tested on 2x5 cm strips of each individual material. In conclusion, the human collagen matrix had the highest retention strength for suture and the greatest elongation. However, the pericardium material tested had the highest tensile modulus (resistance of the material to stretching and deformation).(6)

Surgical repair of the peroneus brevis has been studied. Dombek and Lamm et al. performed a retrospective study regarding peroneal tendon tears in general. The purpose of their study was to identify the patient profile and mechanism or nature of the injury, to analyze the treatment course, and to determine the prevalence of surgical complications following repair. Peroneal tendon repair was completed on 40 patients, average age 42(range 13 to 64 years). Twenty-three (58%) recalled a history of trauma, while the other 17(42%) could not recollect any traumatic event. Twenty-one patients (53%) presented with isolated lateral ankle pain. Other complaints included difficulty while walking or during exertion (45%), recent ankle sprain (20%), swelling (15%), lateral ankle instability/history of multiple ankle sprains (8%), chronic pain (5%), and clicking near the region of the peroneal tendons (5%). Thirty-five (88%) patients had repair of the peroneus brevis tendon. Thirteen had debridement of the tendon, and 18 had debridement and tubularization. Fifteen (37%) patients with peroneus brevis tear also had peroneus longus damage. Outcomes were reported as either major or minor clinically. Eight (20%) patients had minor complications, of the which the most common was transient sural neuritis (5 patients). Four (10%) patients had clinically relevant (major) complications. (4)

Demetracopoulos reported on 34 patients with tear of one or both peroneal tendons treated operatively. The patients had visual analog scales (VAS) for pain, the SF-12 Health Survey, and the Lower Extremity Functional Scale (LEFS) questionnaire. Eighteen patients participated in the full follow up surveys with the mean follow-up time of 6.5 years (range, 2-14 years). There was a significant improvement in VAS scores at the time of final follow-up (p<.001) from a mean of 39 (range, 0-80) pre-operatively to a mean of 10 (range, 0-52) postoperatively. The increase in the LEFS was also significant (p<.001) from a mean of 45 (range, 23-70) preoperatively to a mean of 71 (range, 24-80) postoperatively. Conclusions to the study support long-term functional outcomes for patients with tears of the peroneal tendons treated surgically with debridement and primary operative repair, with the majority of patients returning to previous level of activity.(7)

Results

Of the 69 patients, 3 needed a revision (1 from graft) (p=.065). The average times to weight bearing were 6.5 weeks for graft and 7.1 for control (p=.004). The comorbidity obesity had a significant negative effect on time to full weight bearing (p=.005). The other comorbidities recorded were not significant in affecting weight bearing times. (p=.007 for smoking, p=.008 contralateral PB tendon tear, p=.018 for rearfoot cavus). The post-op ACFAS scores were about 97 for the graft group and about 91 for the control (p=.003). The pain scores using the VAS at the time of weight bearing were also significant reduced for the patients for both groups (p= .003). Graft patients were not significantly different from the patients without a pericardium graft in pain scores either in pre or post-op (p=.014, and .017, respectively).

Variable	With Graft		Without Graft	
	Average	Range	Average	Range
Age	47.34	19-81	48.42	18-76
Weeks to Weight Bearing	6.52	4.5-8.4	7.07	5.3-9.2
Pre-op ACFAS	51.19	36-71	49.68	27-73
Post-op ACFAS	96.75	82-100	90.84	78-99
Pre-op VAS	7.47	4-10	7.16	4-10
Post-op VAS	2.41	0-6	2.84	0-7

Table 1. Patient Demographics

Analysis and Discussion

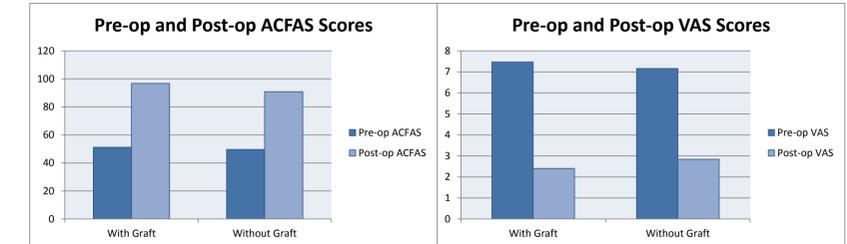
The use of extracellular matrix and its use in the aid of repair of the peroneal brevis tendon are not new.(1,5,6,8,9). This article is the the first to report the use or non use of an extracellular matrix graft in the repair of the peroneus brevis tendon with measurement of the outcomes. There are many types of grafts that perform

as augmentation to tendon repair. The Human Pericardium graft used in this study was chosen for it's strength, preparation methods and malleable nature.(10) Fig. 5&6.

<http://evansmed.com/wp-content/uploads/2012/06/LT-GRAFT-Brochure.pdf>

Fig. 5-Scanning electron micrograph of collagen fiber structure inside healthy human pericardium.

Fig. 6-Scanning electron micrograph of collagen and elastin structure of human dermis.



Graphs 1 and 2. Pre-op and Post-op ACFAS and VAS Scores for patients with and without a pericardium graft

The need for graft is reviewed in this study by the outcomes measured by the ACFAS scores and the VAS scores. (Table 1 and Graphs 1&2.) The authors conclude that the use of graft is beneficial with statistically significant ACFAS scores with the graft patients compared to the non-graft patients.

It is recognized that the limitations to this study is that it is a retrospective study. Further need for a prospective study in the use of graft in the repair of peroneal tendons is needed.

As surgical outcomes become more and more important as healthcare is evolving. The evidence in this paper is felt to be very important in the fact that cost effectiveness in this case does not equal better outcomes. It is important for us as the leading foot and ankle surgeons to lead in this effort to improve patient outcomes. Despite the overwhelming cry to cut costs.

References

- Saxena A, Cassidy A. Peroneal Tendon Injuries: An Evaluation of 49 Tears in 41 Patients. J Foot Ankle Surg. Jul/Aug 2003;42(4):215-220.
- Squires N, Myerson M, Gamba C. Surgical Treatment of Peroneal Tendon Tears. Foot Ankle Clin N Am. Dec 2007;12:675-695.
- Selmani E, Gjamta V, Gijka E. Current Concepts Review: Peroneal Tendon Disorders. Foot Ankle Int. 2006;27(3):221-228.
- Dombek MF, Lamm BM, Saltrick K, Mendicino RW, Catanzariti AR. Peroneal Tendon Tears: A Retrospective Review. J Foot Ankle Surg. Sep/Oct 2003;42(5):250-258.
- Valentin JE, Badylak JS, McCabe GP, Badylak SF. Extracellular Matrix Bioscaffolds for Orthopaedic Applications. JBJS (Am). 2006;88:2673-2686.
- Barber FA, Aziz-Jacobo J. Biomechanical Testing of Commercially Available Soft-tissue Augmentation Materials. Athroscopy. Nov 2009;25(11):1233-1239.
- Demetracopoulos CA, Vineyard JC, Kiesau CD, Nunley JA 2nd. Long-Term Results of Debridement and Primary Repair of Peroneal Tendon Tears. Foot Ankle Int. Dec. 6, 2013.
- Rapley JH, Crates J, Barber A. Mid-Substance Peroneal Tendon Defects Augmented With an Acellular Dermal Matrix Allograft. Foot Ankle Int. 2010;31(2):136-140.
- Philbin TM, Hollawell SM, Weil LJ, Mangone PG, Barrett SL, Lee DK. Bioimplant Augmentation of Soft Tissue in the Foot and Ankle: A Multi-center Retrospective Study. Paper presented at: AOFAS annual meeting, 2009; Vancouver.
- Balsly CR, Cotter AT, Williams LA, Gaskins BD, Moore MA, Wolfenbarger L Jr. Effect of low dose and Moderate dose gamma irradiation on the mechanical properties of bone and soft tissue allografts. Cell Tissue Bank. Dec 2008; 9(4):289-298.