Described by Daniel J. Cuttica, DO. *(Falls Church, VA)*

POST-OPERATIVE CARE

At 1-week post-op, the patient is placed into an Achilles boot with a 20° heel wedge.

Protected weightbearing and active range of motion exercises are initiated at 2-weeks postoperatively.

6-weeks postoperatively, the heel wedges are gradually removed, and the ankle brought to neutral and formal rehabilitation begins.

The patient is then transitioned into normal shoe gear with a supportive ankle brace at an average of 10-weeks and resumes regular activities. Return to full activity is estimated at 6 months postoperatively.

CONCLUSION

These two patients with difficult Achilles tendon injuries underwent successful Achilles reconstruction utilizing the “Box Weave” technique with the Artleon FlexBand matrix.

This procedure provides a strong, reliable, and kinematically permissive augmentation to Achilles tendon repair. Capable of enhanced resistance to reconstruction laxity as well as augmenting the mechanical properties of insufficient tissue throughout healing, Artelon’s FlexBand technology is safe, effective, and versatile even in difficult clinical situations.

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4000055 Rev. A

SURGICAL TECHNIQUE
DYNAMIC "BOX WEAVE" ACHILLES REPAIR TECHNIQUE
UTILIZING ARTELON® FLEXBAND™ TECHNOLOGY
Described by Daniel J. Cuttica, DO. *(Falls Church, VA)*

Tenocytes, the primary cell type regulating tendon homeostasis, respond to kinematic loading through a process termed mechanotransduction[1,2]. Stated simply, appropriate physiologic loads are necessary for tendon development and maintenance following injury – and conversely, abnormal loading compromises connective tissue healing. Therefore, re-establishing these mechanically driven processes early in healing is critical to optimize repair outcomes following tendon injury.[3]

Clinically, early loading of repair has been shown to improve overall mechanical properties of the Achilles tendon[4]. However, the promise of enhanced tendinous tissue from early tissue loading must be weighed against the risk of gapping or tearing the surgical repair. The management of this risk/benefit ratio has highlighted (1) static mechanical solutions that protect the primary repair but result in abnormal kinematic loads, or (2) biological options closer to native tissue that expose the primary repair to failure as biological graft necrosis quickly degrades the mechanical structure. Understanding the shortcomings of current connective tissue repair, Artelon's Dynamic Matrix™ was specifically designed to provide mechanical and biological support.

Artelon's matrix is a synthetic bio-textile that functions as a provisional connective tissue scar. Composed of a polycaprolactone/poly (urethane-urea) co-polymer, the hyper-resilient material stabilizes the primary repair and mechanically activates tenocyte protein activation and remodeling throughout the entire tissue healing phase (12-18 months). Furthermore, it slowly transfers the kinematic loading to the native connective tissue over 4 to 6 years while undergoing a simple, non-necrotic dissolution process. This ensures proper kinematics as well as a strong repair.

The technique described below has previously been shown to significantly improve the mechanical strength of a primary repair,[5] and offers a novel approach to utilizing Artelon's Matrix Technology in a mid-substance Achilles tendon repair.

Two clinical scenarios are included to demonstrate its use and clinical effectiveness.

REQUIRED IMPLANTS AND INSTRUMENTATION:

- 1 Artelon FlexBand (0.5 x 16cm if ends can be re-approximated or 0.7 x 32cm if they cannot)
- Hemostat

SURGICAL PROCEDURE

The surgical technique is similar to that described by Berlet et al.[5]

STEP 1: A primary repair of the Achilles tendon is performed in standard fashion utilizing a locking suture technique and circumferential epitenon suture (Figure 3). Next, augmentation of the repair is performed with the Artelon FlexBand.

STEP 2: Initially, a small, 1 cm, trans-Achilles tunnel is created approximately 2 cm superior and 2 cm distal to the tendon repair.

STEP 3: A FlexBand is passed from medial to lateral through the proximal tunnel utilizing a hemostat (Figure 4).

STEP 4: Next, the 2 ends of the FlexBand are brought distally, and are passed through the distal tunnel. One end is passed medial to lateral, and the other end from lateral to medial (Figure 5, 6).

STEP 5: The 2 distal ends are then placed under tension, drawn back proximally along each side of the Achilles tendon, and are secured to the tendon under tension (Figure 7).

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ACHILLES BOX-WEAVE: Case 1

DYNAMIC ACHILLES RECONSTRUCTION UTILIZING ARTELON® FLEXBAND™ TECHNOLOGY

Described by Daniel J. Cuttica, DO. *(Falls Church, VA)*

CLINICAL HISTORY:

A 68 year-old male presented for evaluation of his Right Achilles tendon. Eight weeks prior, he felt a sudden sharp pain in the posterior aspect of the ankle while playing tennis. Physical examine revealed mild swelling in the Achilles region. There was a palpable defect in the watershed region of the Achilles region. A Thompson test was absent, and there was no resting plantarfexion.

Weightbearing radiographs of the ankle were without pathologic bone lesions, fractures, or other degenerative changes. MRI evaluation revealed a complete Achilles tendon rupture in the watershed region of the Achilles with 3 cm of retraction of the proximal stump.

Surgical treatment was recommended due to the nature of the tendon rupture with retraction and the patient's high level of function.

INTRA-OPERATIVE FINDINGS:

A complete rupture of the Achilles tendon was noted in the watershed region (Figure 1). There was a large amount of fibrosis present at the rupture site, which was excised. After excision of the fibrotic tissue, there was a 3 cm defect present (Figure 2). After freeing up any adhesions proximally, the tendon ends could be reapproximated and an end-to-end repair was performed with a running, locking suture and epitenon suture (Figure 3).

A 0.5 x 16cm Artelon FlexBand was utilized to augment the repair utilizing a "Box Weave" technique to improve the mechanical strength of the primary repair, due to the more chronic nature of the tendon injury (Figure 4-7).

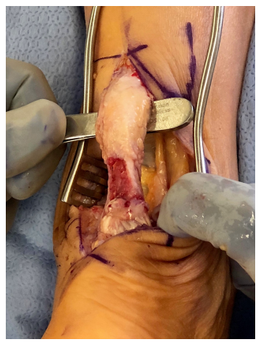

Figure 1. A complete rupture of the Achilles tendon was noted in the watershed region, with fibrosis present at the rupture site.

Figure 2. After excision of fibrotic tissue, a 3 cm defect was present.

Figure 3. Primary repair of the Achilles tendon utilizing a locking suture technique and circumferential epitenon suture.

Figure 4. The FlexBand is passed medial to lateral through the proximal tunnel utilizing a hemostat and then is brought distally.

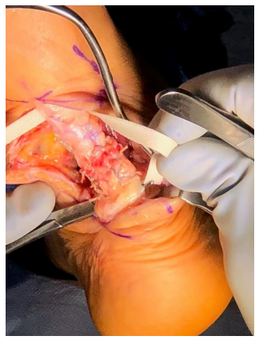

Figure 5. The FlexBand is passed through the distal tunnel using a hemostat.

Figure 6. The distal ends are passed through the distal tunnel, one from medial to lateral and the other from lateral to medial.

Figure 7. The 2 distal ends are then drawn back proximally along each side of the Achilles tendon and secured to the tendon under proper tension.

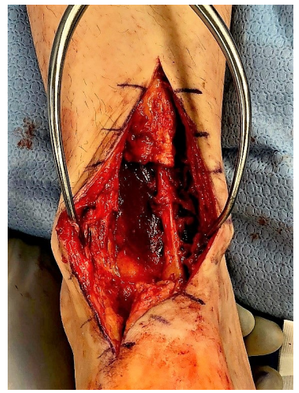

Figure 8. . There was approximately 7 cm of segmental defect, too-large for an end-to-end repair. Therefore, an FHL transfer was utilized for biological re-approximation.

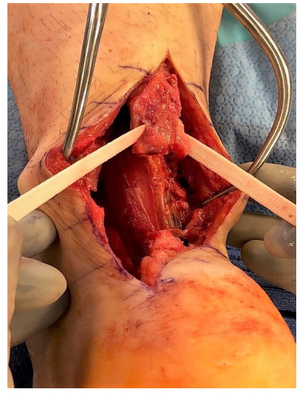

Figure 9: Artelon FlexBand being passed through the surgically created tunnel in the proximal stump.

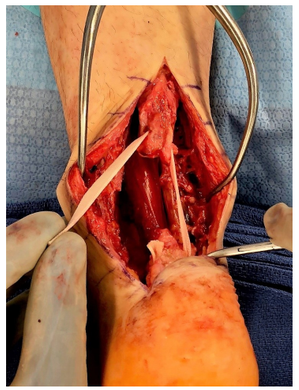

Figure 10: The Flexband is passed through the distal tunnel, then prepared for tensioning and final attachment.

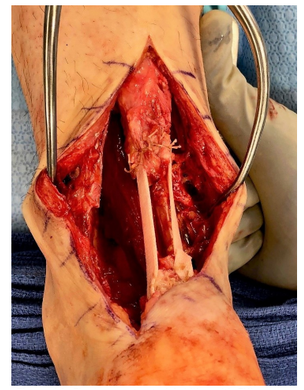

Figure 11: Final reconstructed Achilles with FHL transfer reinforced by an Artelon FlexBand in a "Box-Weave" fashion.

ACHILLES BOX WEAVE: Case 2

DYNAMIC ACHILLES RECONSTRUCTION UTILIZING ARTELON® FLEXBAND™ TECHNOLOGY

Described by Daniel J. Cuttica, DO. *(Falls Church, VA)*

CLINICAL HISTORY:

A 27 year-old male suffered a traumatic Achilles tendon rupture and underwent underwent primary repair. Postoperatively, the patient developed a deep infection, which required surgical debridement and excision of the infected portion of the tendon.

After 6 weeks of IV antibiotics and resolution of the infection, the patient underwent reconstruction of the Achilles tendon.

INTRA-OPERATIVE FINDINGS:

At the definitive procedure, there was no evidence of residual infection and tissues appeared clean. There was an approximately 7 cm defect. This was too large for an end-to-end repair. (Figure 8)

As a result, an FHL tendon transfer was performed in standard fashion and secured at approximately 20° of plantarflexion to the calcaneus just anterior to the Achilles insertion with a biotenodesis screw.

Attention was then turned to reconstructing the Achilles tendon. Due to the significance of the segmental defect, a 0.7 x 32 cm FlexBand matrix was utilized in a "Box-Weave" fashion to reinforce the FHL transfer and bridge the tendinous defect. (Figures 9-11).