

DYNACORD™ Suture: Comparison of Tendon Cut Through Lengths in Ovine Infraspinatus

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OBJECTIVE:

The use of suture to approximate soft tissue is a common technique used during surgery. Suture is typically attached to an anchor, passed through tissue, and then a knotted or knotless technique is utilized to compress the tissue back down to the attachment site. However, failure of tendon healing after rotator cuff repair is common, and occurs in approximately 20% of cases, depending on tear size.¹ The weakest link of this repair is typically the suture/tendon interface. When the repair is loaded throughout the healing period, the suture can cut through the tendon therefore introducing a gap (Figure 1). This gap leads to the lack of tissue approximation to bone or other soft tissue and compromises the ability for healing to occur. The objective of this study is to compare the length of tendon cut through after cyclic loading of DYNACORD™ Suture (DePuy Synthes Mitek Sports Medicine, Massachusetts) and FiberWire® suture (Arthrex, Florida) through matched paired ovine (sheep) infraspinatus tendons.

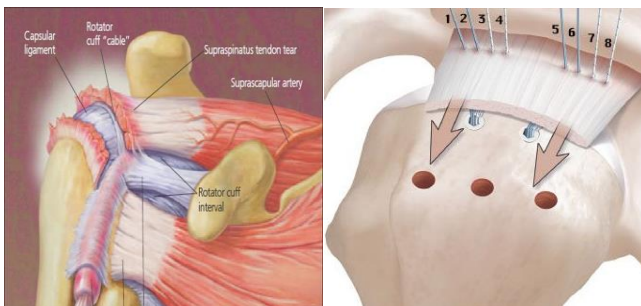


Figure 1: Rotator Cuff Failure and Loading of Suture/Tendon Interface.

DYNACORD™ SUTURE TECHNOLOGY:

DYNACORD #2 Suture is a high strength orthopedic suture that is composed primarily of an outer Ultra High Molecular Weight Polyethylene (UHMWPE) sheath, inner polyester (PET) sheath and a silicone/NaCl filled core. When DYNACORD Suture is placed in an aqueous environment, the salt

particles within the silicone core elute out, leaving behind a micro-porous structure within the silicone core. These small voids are consequently filled with fluid as the core hydrates, resulting in a radial expansion of the suture braid. This radial expansion of the braid causes an axial shortening of the total suture length (Figure 2).

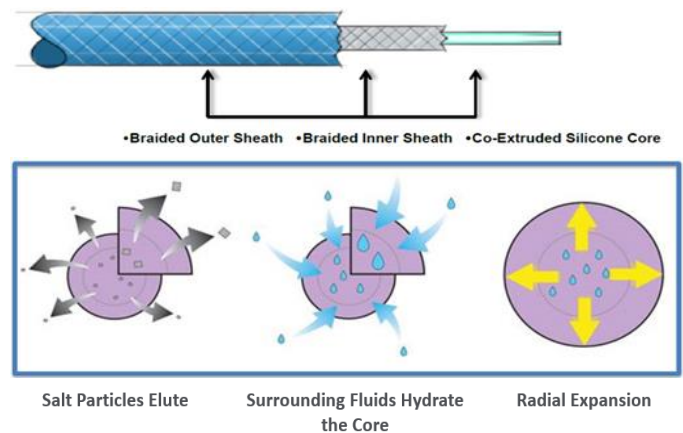


Figure 2: DYNACORD Suture Construct and Radial Expansion Mode of Action

METHODS:

Frozen Ovine infraspinatus tendons (matched pairs) still attached to the humerus were thawed 30 minutes prior to the preparation of each sample. The infraspinatus tendon was sharply transected off the bone and any connective tissue/muscle was cleared from the exposed tendon. Using calipers, the passing location of each suture was marked 15mm from the transected edge of the tendon and 1/3 the width of the tendon from the cranial side and 1/3 the width from the caudal side. DYNACORD and FiberWire Sutures (Size #2) that were pre-hydrated in 0.9% buffered saline for approximately 48 hours were passed through the marked location using the Mitek EXPRESSEW® III Flexible Suture Passer. For the matched pair analysis, the passing location of the sutures were swapped for each specimen.

DYNACORD Suture passed on the cranial side for the right infraspinatus tendon was then passed on the caudal side for the left infraspinatus tendon in the matched pair. Each sample was then brought over the mechanical test frame (MTS 810) and loaded into the clamping fixtures. The tendon was placed in the upper clamps such that 25mm of tendon was exposed. One suture was then clamped in the lower pneumatic clamps. The gage length between the two clamps was set to 35mm (Figure 3). A cyclic load control program was created in the MTS software to conduct 1000 sinusoidal cycles between 10N and 50N.² (*Supraspinatus Tendon: Tashjian; JARS 2007 Vol 23, Initial Fixation Strength on Rotator Cuff Tears*) After the 1000 cycles were completed, the amount of tendon cut through distance was measured using calipers and recorded.

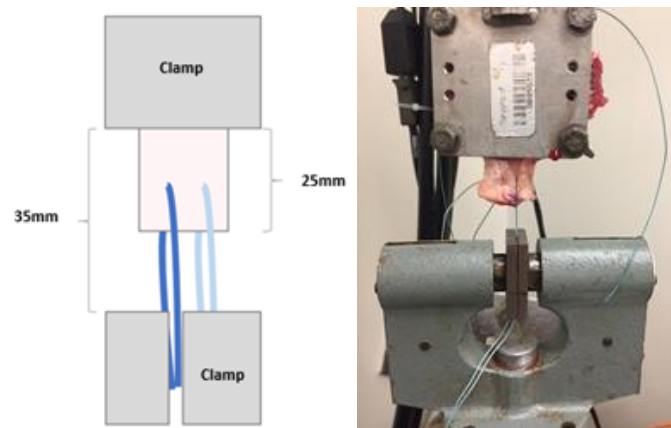


Figure 3: Sample Loaded in the MTS 810 Mechanical Test Frame.

RESULTS:

The average cut through distance was 2.69 mm \pm 1.02mm for DYNACORD Suture and 3.72mm \pm 1.14mm for FiberWire (Figure 4).³ The FiberWire group also had two samples where the cut through distance was greater than 5mm which is considered a clinical failure (Figure 5).^{3,4} A matched pair t-test showed a statistical difference with a confidence level greater than 95% (p -value < 0.05, $n = 14$ per suture) in favor of DYNACORD Suture.³

REFERENCES:

- (1) Lädermann A, et al J ISAKOS. 2016 Jan;1(1):32-37.
- (2) Tashjian R, Journal of Arthroscopic and Related Surgery, Vol 23 No7; Page 710-716.
- (3) DePuy Synthes. Study# Notebook 2017-14 page 23-25.
- (4) Barber FA, et al Arthroscopy: The Journal of Arthroscopic and Related Surgery, Vol 29, No 6 (June), 2013: pp 1012-1018.

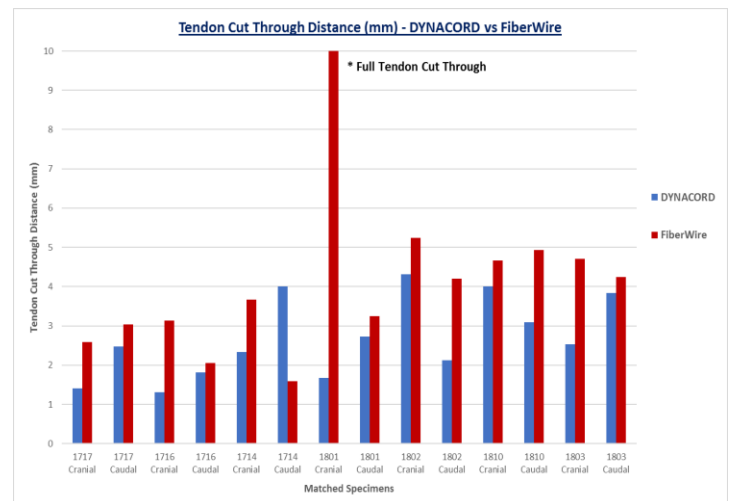


Figure 4: Comparison of the Cut Through Distance of DYNACORD and FiberWire Sutures.

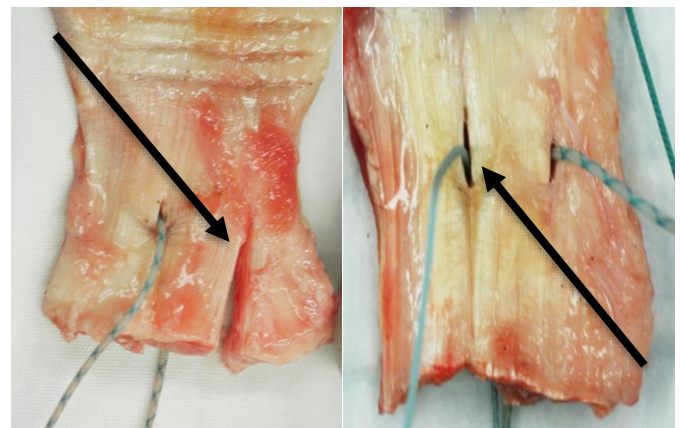


Figure 5: Two Samples of FiberWire Suture with Tendon Cut Through Distance Greater than 5mm.

CONCLUSION:

The results highlight DYNACORD Suture's innovative technology that limits the amount of tendon cut through distance within an ovine infraspinatus. As DYNACORD Suture hydrates, the diameter of the suture increases. This increases the contact area of the suture to tendon interface and therefore reduces the pressure applied locally. Additionally, the hydrated silicone core compresses and absorbs the force applied through the suture/tendon interface therefore decreasing the amount of tendon cut through. In summary, DYNACORD Suture showed less tendon damage as compared to FiberWire during cyclic loading which may lead to improved patient outcomes. Further research should aim to validate these findings in a clinical setting.