An In-Vivo Comparison: Novel Mesh Suture Versus Traditional Suture-Based Repair in a Rabbit Tendon Model

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Purpose:
Despite advancements in surgical technique, suture pull-through and rupture continue to limit early range of motion and functional rehabilitation after flexor tendon repairs. The aim of this study was to evaluate a mesh suture compared to a commonly used braided suture in an in-vivo rabbit intrasynovial tendon model.

Methods:
Twenty-four 3.0-4.0 kg New Zealand Female Rabbits were injected with 2u/kg botulinum toxin evenly distributed into 4 sites in the left calf. After 1 week, animals underwent surgical tenotomy of the flexor digitorum tendon and were randomized into repair with either 2-0 DurameshTM suturable mesh or 2-0 Fiberwire® utilizing a 2-strand modified Kessler and 6-0 polypropylene running epitendinous suture. Rabbits were sacrificed at 2, 4, and 9 weeks postoperatively. Each tendon was evaluated in-situ and measured to determine if the tendon was 1) intact 2) had 1-4mm of gapping or 3) had ≥5mm of gapping. The tendon was then harvested and subjected to biomechanical testing utilizing custom manufactured cryoclam in and Intron Test System, Model 5942.

Results:
Grouping time points, 58.33% (7 of 12) of DurameshTM repairs were noted to be intact at explant compared to 16.67% (2 of 12) Fiberwire® repairs (p = 0.0894).

At 2 weeks, the mean DurameshTM repairs were significantly stronger than the Fiberwire® repairs with a mean failure load of 50.69N ± 12.72N compared to 14.84N ± 18.26N (p = 0.0212). The load supported by the DurameshTM repairs at 2 weeks (mean 50.69 ± 12.72) was similar to the load supported by both Fiberwire® (52.19 ± 13.62) and DurameshTM (57.59 ± 22.30) at 4 weeks. The strength of repair between Fiberwire® and DurameshTM at 4 weeks and 9 weeks was not significantly different.

Conclusions:
Tendon repair with mesh suture achieves significantly greater strength at two weeks compared to conventional suture techniques. Future studies should evaluate strength of repair prior to two weeks to determine a strength curve for this novel suture material.

Disclosures:
Dr. Ko is on the Scientific Advisory Board of Mesh Suture, Inc. and Checkpoint Surgical, Inc. and a consultant for Integra LifeSciences Corporation. Drs. Janes, Mioton, and Fracol have no disclosures.