

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

Janes LE, Mioton LM, Fracol ME, Ko JH

Northwestern University, Feinberg School of Medicine
Division of Plastic Surgery



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.

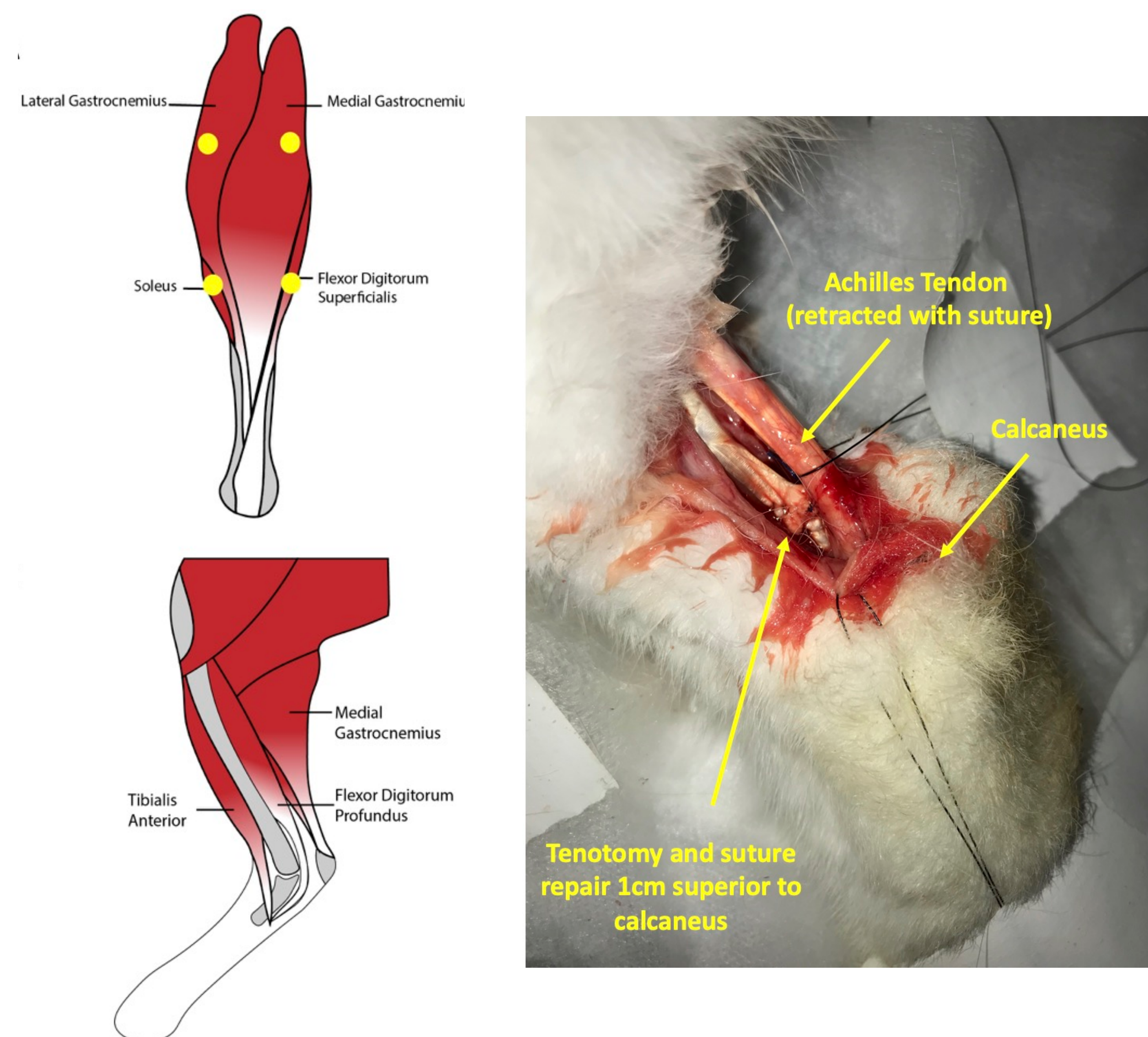


Figure 1. Top cartoon demonstrate a posterior view of the rabbit hindlimb, demonstrating the approximate location of the 4 injection sites (yellow circles). Bottom cartoon illustrates the location of the FDP tendon in relation to the Achilles tendon which helps to splint the repair. Right photograph demonstrates an example of the tenotomy and repair.

After 1 week, animals underwent surgical tenotomy of the flexor digitorum tendon and were randomized into repair with either 2-0 Duramesh™ 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 ≥ 5 mm of gapping. The tendon was then harvested and subjected to biomechanical testing utilizing custom manufactured cryoclamps and Instron Test System, Model 5942.

Results:

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

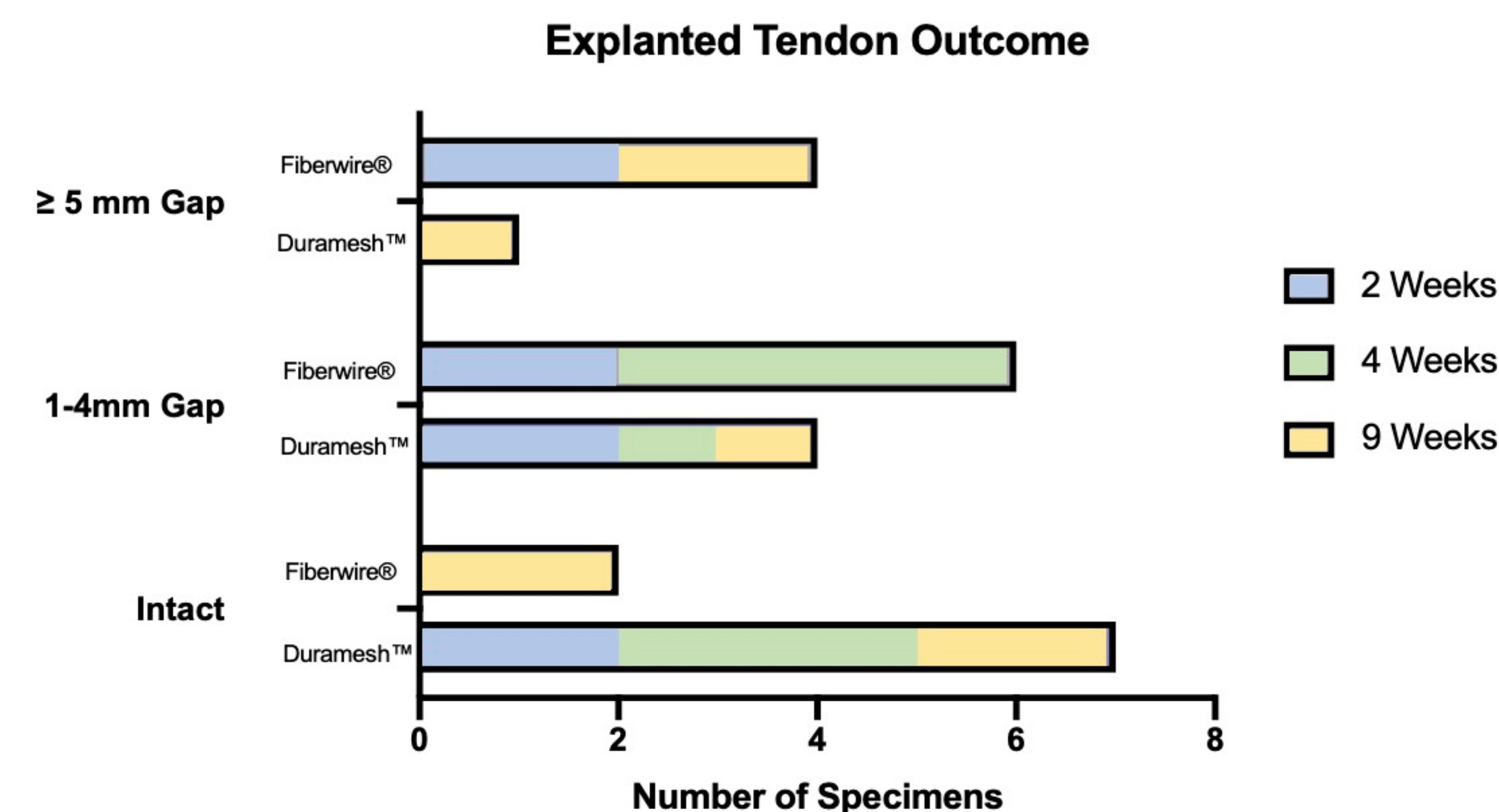


Figure 4. In vivo grade of tendon repair at explant

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

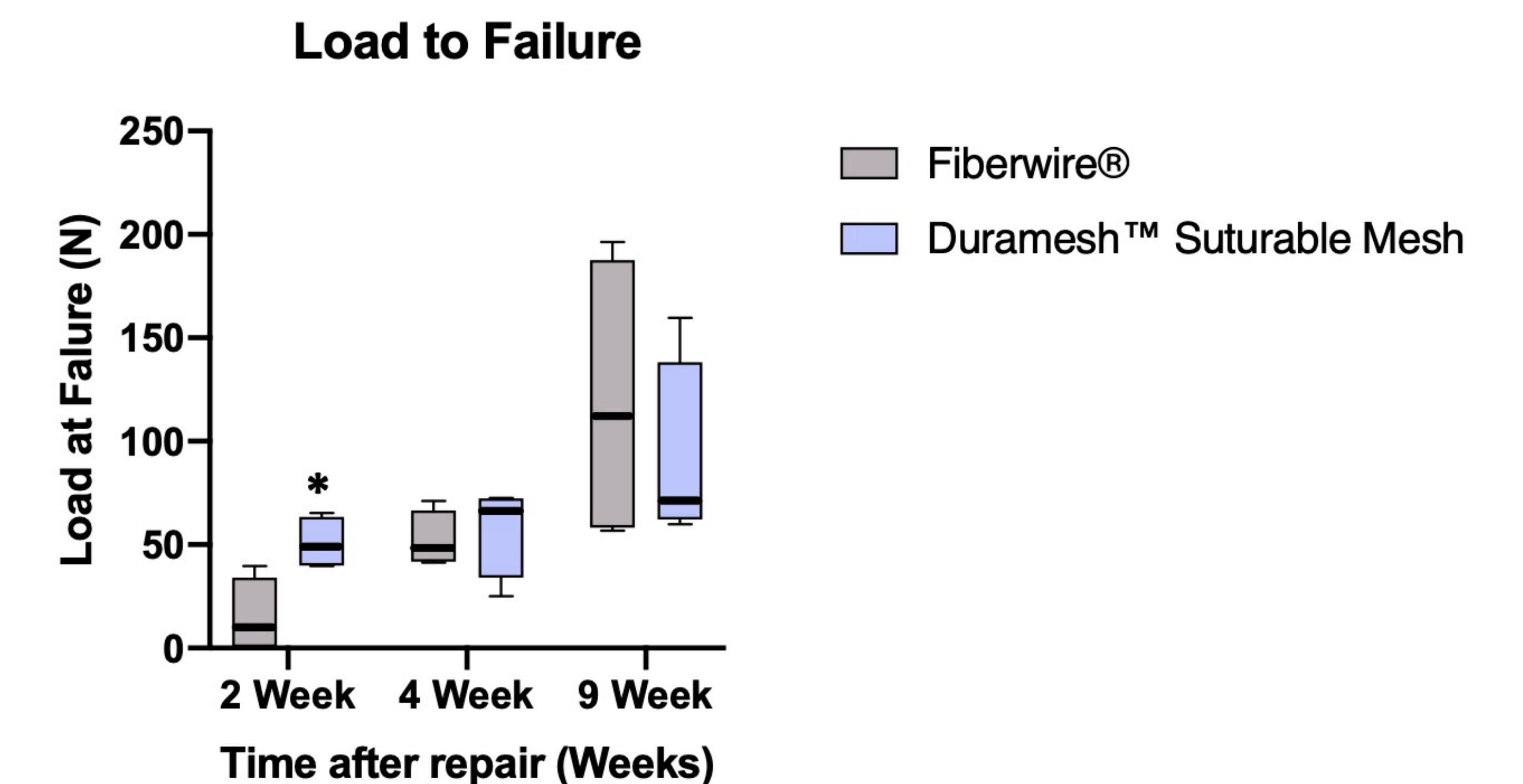


Figure 3. Tendons were pre-cycled with 5 cycles of 25N at 1N/s, followed by load to failure at 1N/s. * denotes statistical significance, p value $< .05$.

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.