INTRODUCTION

- Surgical repair is the best option for regaining strength, power, and function of the muscle-tendon-bone complex when the Achilles tendon is injured.
- Zimmer Collagen Repair Patch (cross-linked acellular porcine dermal patch; APD) holds promise as a means to augment healing and regeneration of such lesions.
- The primary goal is to evaluate ultimate potential of APD for Achilles tendon repair in a sheep model.
- A secondary goal is to assess the ability of platelet rich plasma fibrin matrix (PRPFM) to augment healing process and final repair strength.

METHODS

- 18 skeletally mature ewes assigned to 3 groups (n=6). The animal acted as own control.
  - Group 1: tendon sutures only
  - Group 2: tendon sutures + APD patch
  - Group 3: APD patch + PRPFM + 1.5cm gap
- Under general anesthesia, the larger branch of gastrocnemius tendon transected (Fig 1: a, b). Two ends anastamosed using Kessler locking loop pattern (Group 1 or 2), or gap left (Group 3).
- APD patch applied for reinforcement (Group 2) or bridging (Group 3, Fig 1: c). Remnant gap filled with autogenously harvested PRPFM (Fig 1: d).
- Sheep housed in pens until humanely euthanized at 24 w. post-op.
- Biomechanical testing evaluated tensile strength in a longitudinal direction.
- All sections examined under transmitted and polarized light microscopy.
- Statistical analysis performed using one-way ANOVA with paired analysis with significance reported at p < 0.05.

RESULTS

- All operated tendons appeared healed with no apparent fibrosis.
- Group 1 (Fig 2a): all specimens had identifiable surgical separation sites. Healing occurred by increasing tendon width and bridging the defect.
- Group 2 (Fig 2b): healing occurred with new tendon fiber bundles directly across the separation, without increasing total tendon width.
- Group 3 (Fig 2c): complete bridging of gap in all specimens.
- In Groups 2 and 3, integration of the patch to new and existing tendons was found in peripheral zones with ingrowth of vasculature.
- Surgical sites of two animals in Groups 2, 3 were indiscernible with polarization microscopy.
- Group 3 also demonstrated occasional blend-in of new fibers within peripheral portions of patch.
- No significant difference among groups undergoing biomechanical testing.
- Group 2 had values in extension closest to that of normal limb with mean % difference of 4.69% from contralateral limb (Fig 3).

DISCUSSION

- These findings support use of both PRPFM and APD in combination, to augment healing of a severed Achilles tendon in sheep model.
- Based on histological data, healing was best achieved in Group 3, despite a 1.5cm gap.
- Group 2 showed closer extension value to that of the contralateral control than the other two groups (Fig 3).
- There were noticeable differences between healing in Groups 1 and 2, with increased healing correlated to APD application.
- The combination of APD patch and PRPFM could serve as a therapeutic regimen for clinical condition when resection of torn tendon is necessary to aid with quality and strength of healing.
- The benefits of an augmentation matrix may be more evident in chronic injury model and need to be investigated.

REFERENCES


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