

Fibrin Glue Does Not Improve Rotator Cuff Healing in a Rat Model

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Summary:

The retear rate of massive rotator cuff (RC) tears remains high. The purpose of this study is to determine if fibrin sealant can improve healing of the tendon-to-bone insertion site after RC repair in a rat model. In this study, adding fibrin sealant to the healing RC repair did neither improve the structure nor the biomechanical properties of the tendon-bone junction in a rat model.

Abstract:

Introduction

Rotator cuff tears (RCTs) are common and their incidence is known to increase with advancing age. Even though surgical techniques have improved the clinical outcome in the last decade, the retear rate of massive RCTs remains high. For this reason, there has been much interest in the biological augmentation of the rotator cuff repair.

Fibrin sealant is made out of clotting factors, namely fibrinogen and Factor XIII and a fibrinolysis inhibitor and has shown not only to improve the healing of Achilles tendon ruptures, but also has accelerated soft tissue healing by promoting neovascularization and early influx of fibroblasts to the healing site. It furthermore has improved graft incorporation into a bone tunnel.

Although these studies are encouraging, it is unclear, if fibrin sealant improves tendon-bone healing in the rotator cuff tear model. In this study, we tested the following hypothesis: Fibrin sealant will improve the healing of the tendon-bone interface in a rat rotator cuff model.

Material and Methods

This study was approved by the Institutional Animal Care and Use Committee. A total of 30 mature Lewis rats underwent bilateral detachment and acute repair of the supraspinatus tendon by sutures. In each rat the rotator cuff repair in one randomly chosen shoulder was augmented with 50ul of fibrin sealant (Evicel Fibrin Sealant, Ethicon, USA) and in the other shoulder, a repair without fibrin sealant augmentation was performed (control group).

Half of the animals were sacrificed after 2 weeks, the other half after 5 weeks. Twelve rats per group and time-point were allocated for biomechanical testing and three rats for histological evaluation.

Results

There were no postoperative complications. All the rats had a normal gait after 4-6 days. Dissection of the shoulders after euthanizing the rats showed continuity between the bone and the tendon in all the 60 specimens. The gross inspection showed no detectable differences between the fibrin glue group and the control group for both time-

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points.

Even though the maximal load to failure as well as the stiffness within in the fibrin sealant group as well as the control group improved from 2 to 4 weeks, we did not find significant differences between the fibrin sealant group and the control group

At 2 weeks, the mean load to failure for the fibrin sealant group was 8.94+/-3.27N and for the control group 8.31+/-2.42N ($p>0.05$). At 5 weeks, the mean load to failure for the fibrin sealant group was 22.29+/-6.44N and for the control group 21.05+/-5.33N ($p>0.05$). Also no differences were found with respect to the stiffness of the repair construct between the groups.

Histologic analysis confirmed the biomechanical results: No significant differences were found between the groups at each time point with respect to the new cartilage formation and collagen organization.

Conclusion

Adding fibrin sealant to the healing rotator cuff repair did neither improve the structure nor the biomechanical properties of the tendon-bone junction in a rat model.