ISAKOS

International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine

11th Biennial ISAKOS Congress • June 4-8, 2017 • Shanghai, China

Paper #234

An In Vitro Biomechanical Assessment of Biceps Femoris Repair

Adam William Anz, MD, UNITED STATES
Eric A. Branch, MS, UNITED STATES
Dustin Loveland, MD, UNITED STATES
Sohale Sadeghpour, MD, UNITED STATES

Andrews Research and Education Foundation
Gulf Breeze, Florida, UNITED STATES

Summary:
Transosseous biceps femoris repair is stronger than suture anchor repair upon the fibula but does not reestablish the native failure load.

Abstract:
Background: Knee injury encountered in clinical practice can involve avulsion of the biceps femoris from the fibula and proximal tibia. This injury pattern can be managed successfully with acute repair. Through advancements in tendon repair surgery, stronger options for approximating tendon to bone have been established. The objective of this controlled laboratory study was to determine the tensile properties of the native biceps femoris insertion and modern tendon repair techniques.

Hypothesis: Upon tensile testing, complex repair techniques and repairs involving both the tibia and fibula would perform better than simple repair constructs.

Study Design: Controlled laboratory study.

Methods: Dissections were performed on forty paired, fresh-frozen cadaveric specimens identifying the biceps femoris and its insertion upon the proximal tibia and fibula. For eight specimens, the biceps femoris was loaded to failure on an uniaxial material testing machine, evaluating tensile properties. For 32 specimens, the biceps femoris insertion was dissected free with a 15-blade, a repair performed, and the repair loaded to failure on an uniaxial material testing machine. Four repair constructs were evaluated, with 8 specimens allocated for each. The first repair construct involved a simple repair to the fibula with two suture anchors. The second repair construct involved a simple repair to the fibula and tibia with three suture anchors. The third repair construct was a transosseous equivalent repair involving the fibula and tibia and three suture anchors. The fourth repair group involved a transosseous repair through the fibula and one suture anchor on the tibia. Analysis of variance (ANOVA) was used to evaluate for significance of mean failure load and stiffness between groups.

Results: Data are presented as means with 95% CIs. The mean failure loads were: native biceps femoris 1280 ± 247 N, simple fibula repair 173 ± 84.6 N, simple tibia and fibula repair 176 ± 48.1 N, transosseous equivalent repair 191 ± 78.5 N, and transosseous repair 327 ± 66.3 N. The mean stiffness values were: control group 46 ± 13 N/mm, simple fibula repair 16 ± 5.1 N/mm, simple tibia and fibula repair 14 ± 5.4 N/mm, transosseous equivalent repair 13 ± 2.8 N/mm, and transosseous repair 15 ± 2.5 N/mm. Inter-construct comparison of failure load revealed no statistical difference between constructs utilizing anchors alone. The transosseous repair showed a significant difference for failure load when compared to each anchor repair construct ($p = 0.02$, $p = 0.02$, $p = 0.04$). Inter-construct comparison of stiffness revealed no statistical difference between all constructs ($p > 0.86$). None of the repair techniques recreated the failure load or stiffness of the native biceps femoris tendon ($p = 0.02$).

Conclusion: In this biomechanical study, no difference was found between the mean failure load of different biceps femoris repairs involving suture anchors alone. A technique involving transosseous fibular tunnels illustrated a higher mean failure load than repairs relying on suture anchors for fixation.

Paper #234

Clinical Relevance: Current biceps femoris repair techniques do not approximate the native strength of the tendon. A transosseous style of repair offers the highest failure load.