SPOTLIGHT ON upper extremity

The Multi-suture Technique for Rotator Cuff Repair: A Biomechanical Evaluation

James Bicos, MD; Augustus D. Mazzocca, MD; Nadim Hallab, PhD; Stephen Santangelo; Bernard R. Bach, Jr, MD

Multi-suture fixation of supraspinatus rotator cuff tears provides excellent fixation and biomechanical failure characteristics.

Rotator cuff tears are a common cause of upper extremity pain and dysfunction. Nonoperative versus operative management has been debated for many years. Open rotator cuff repair has yielded 85% to 95% success rates for long-term pain relief with a moderate improvement in function.[1-16] Mini-open rotator cuff repair has equally shown adequate pain relief but with improved functional results (93%) in medium-term follow-up studies.[17-21] Arthroscopic treatment of rotator cuff repairs has continued to show improvement in techniques and results,[22-26] but no technique has been shown to have better long-term results than the open rotator cuff repair model. It remains the basis for all other treatment comparisons.

Research has shown a 13% to 68% rate of fixation failure after primary rotator cuff repair.[5,27,28] In addition, rotator cuff outcomes significantly decrease after re-repair, with 83% fair or poor results.[29] Therefore, with large rotator cuff tears the importance of a stable primary repair construct cannot be overemphasized, with the theory that a stronger repair is more likely to yield an intact repair.

Rotator cuff fixation techniques have been based on 3 factors: strength of tendon-to-bone fixation, strength of the suture itself, and strength of suture-to-tendon fixation. Tendon-to-bone fixation typically is divided between transosseous sutures (ie, the McLaughlin technique[30,31]) and bone anchor techniques. Although literature has shown bone anchor techniques to be stronger than standard transosseous suture repairs,[32-34] studies have shown that proper placement of transosseous tunnels into adequate cortical bone can alleviate this problem.[35-37] In addition, by increasing the number of sutures crossing the repair site, fixation strength can exceed the maximal muscle contraction force across the rotator cuff crescent.[38,39]

The multi-suture technique for open rotator-cuff repair has been described in the literature and its efficacy has been proven.[14,40,41] However, no biomechanical study objectively compared the results of the multi-suture technique to the open technique[30,31] of rotator cuff repair. This article attempts to biomechanically evaluate the cyclic failure and pull-out strength of the multi-suture technique of rotator cuff repair in comparison to an open rotator cuff repair and a normal rotator cuff tendon model. Our hypothesis is that the greater number of sutures used in the multi-suture technique will disperse the force of the repair across a greater portion of the rotator cuff tendon and significantly increase the pull-out strength when compared to an open rotator cuff repair technique model (ie, the McLaughlin technique[30,31]).

Materials and Methods

Twenty-four fresh-frozen human cadaver shoulders were randomly divided among 3 experimental groups. A power analysis was performed with $\beta = .2$ to determine the number of specimens needed to determine a statistically significant difference. Group 1 consisted of the multi-suture technique

Dr Bicos is from JRSI Sports Medicine, St Vincent Medical Center, Indianapolis, Indiana; Dr Mazzocca and Mr Santangelo are from the Department of Orthopedics, University of Connecticut, Farmington, Connecticut; Dr Hallab is from the Research Department and Dr Bach is from the Sports Medicine Section, Department of Orthopedics, Rush University Medical Center, Chicago, Illinois.

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Reprint requests: Bernard R. Bach, Jr, MD, Dept of Orthopedic Surgery, Rush University Medical Center, 1725 W Harrison St, Ste 1063, Chicago, IL 60612.