Biomechanical Comparison of Three Methods to Repair Pectoralis Major Ruptures

1Northwestern University Department of Orthopaedic Surgery, Chicago, IL, USA. 2Hebei University of Technology, Tianjin, China

1 Stephen J. Rabuck, MD; 1 Jamie L. Lynch; 1, 2 Xin Guo, PhD; 1 Li-Qun Zhang, PhD; 1 Sara L. Edwards, 1 Gordon W. Nuber, MD; and 1 Matthew D. Saltzman, MD

Introduction

Stephen J. Rabuck, M.D.
Orthopaedic Sports Medicine Fellow
Department of Orthopaedic Surgery
University of Pittsburgh
E-Mail: rabucksj@upmc.edu
Corresponding Author

Methods

Results

Conclusion

Objective

Disclosures


Pectoralis major ruptures most commonly occur in young, athletic individuals during the bench press exercise. Operative repair has been shown to have superior outcomes when compared to non-operative management1-5.

To compare the biomechanical strength of bone trough, cortical button, and suture anchor repairs of the pectoralis major tendon.

The mean ultimate load to failure was 383 N (+/- 168) for suture anchor repair, 494 N (+/- 116) for cortical button repair, and 597 N (+/- 126) for the bone trough repair (Figure 3). Bone trough repair was stronger than suture anchor repair (p=0.006). Bone mineral density showed no correlation with ultimate load to failure.

The mode of failure most commonly was suture breakage in the bone trough (9/10) and cortical button (10/10) repairs. Suture anchor repairs failed via suture anchor failure (5/9) and suture breakage (4/9). One fracture occurred in the bone trough repair group.

Bone trough repair was stronger than suture anchor repair of pectoralis major rupture. There is a higher risk of fracture with bone trough repair than cortical button or suture anchor repair.

References

Support for completion of this study was provided by Arthrex, Inc (Naples, Fla.)

The senior author (MS) receives a research grant from Arthrex, Inc.

Thirty fresh-frozen cadaver shoulders were randomized to bone trough, suture anchor, or cortical button repair. All repairs were performed with No. 2 Fiberwire (Arthrex Inc, Naples Fla) in a Krackow fashion for a total of six limbs crossing each repair site (Figure 1).

Load to failure testing was performed with the repaired pectoralis major tendon securely clamped and attached to a custom materials testing system (MTS). The humerus was positioned in 30o of extension and 40o of abduction relative to the direction of pull of the MTS to simulate the position in which the tendon most often fails during the bench press exercise (Figure 2). Ultimate load to failure was recorded and compared for repair technique and bone mineral density.

Fig. 3
Load to failure of Suture Anchor, Cortical Button, and Bone Trough Repairs.

Fig. 2.
Biomechanical Testing System. HH = Humeral Head, Clamp, Tendon Repair Site, and Direction of pull of Materials Testing System (MTS)