Arthroscopic Double-Row Rotator Cuff Repair: A Comparison of Fixation Methods

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Objectives

Arthroscopic double-row rotator cuff repair is a time consuming and technically challenging procedure. The aim of the study was to compare two different configurations of arthroscopic double-row rotator cuff repair, one using a new parachute tissue anchor and the other using only threaded double-loaded suture anchors. Comparisons between the repair techniques will focus on time of repair, strength of repair, and restoration of tendon footprint.

Methods

Twelve 2.5 cm (in length) full-thickness supraspinatus rotator cuff tears were created in six pairs of fresh frozen cadaver shoulders with intact rotator cuffs. Alternating left and right shoulders, one of two different arthroscopic rotator cuff configurations were performed. Repair configurations consisted of two medial parachute tissue anchors with a single lateral suture anchor and two medial corkscrew anchors with one lateral suture anchor. With the parachute double row repair, the lateral anchor is inserted centrally in the AP plane then both sutures passed in single interrupted fashion to reduce the tendon. The parachute anchors are placed medially, one anterior and one posterior to the lateral anchor (Figure 1A &B).

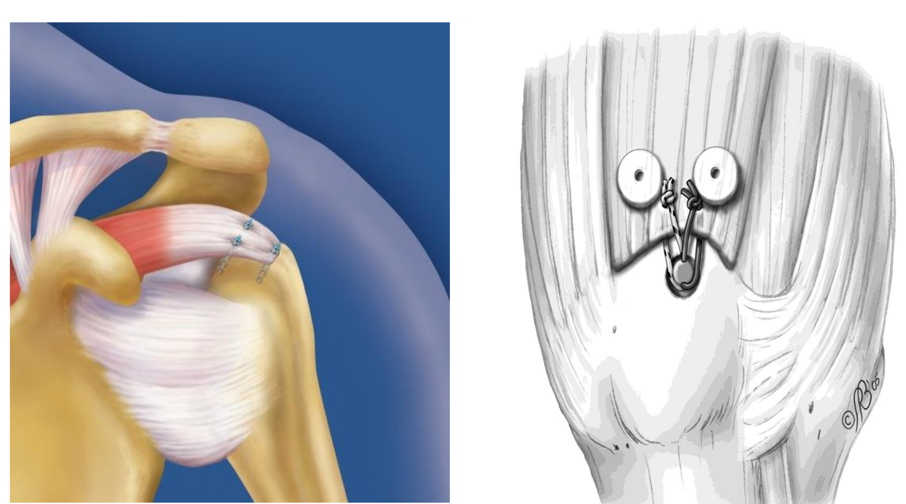


Figure 1A & B

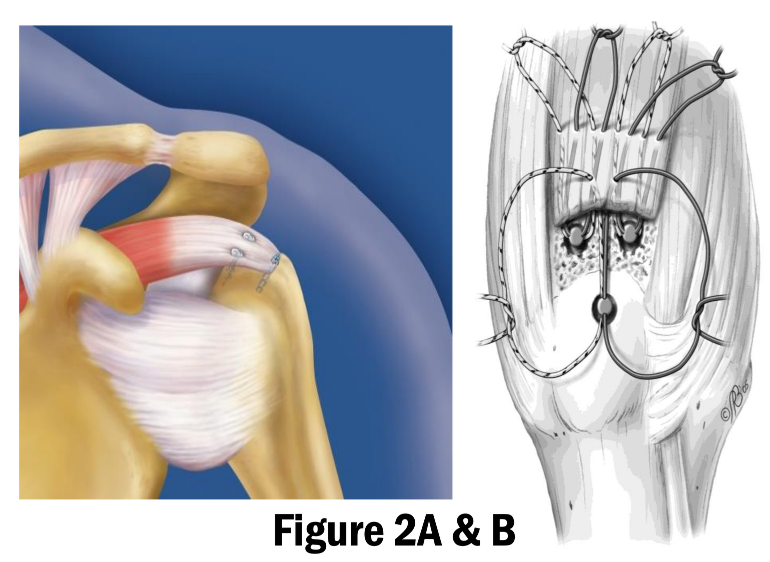


Figure 2A & B

With the double anchor row repair medial anchors are inserted anterior and posterior followed by a central lateral anchor. Sutures are passed after each individual anchor is inserted and parked. The medial anchor sutures are passed in mattress fashion and the lateral in interrupted fashion. The posteromedial anchor is tied first followed by the anteromedial and last the lateral anchor (Figure 2A & B). Repairs were evaluated by surgical time, area of supraspinatus footprint restoration, cyclic displacement, load to failure, and mode of failure. Area of footprint restoration (area of repaired tendon to bone) was measured using a calibrated Microscribe three-dimensional digitizer (immersion San Jose, CA). Displacement across the tendon-bone repair was recorded using a differential variable resistance transducer (DVRT) after 10 to 100N of force was applied by a Materials Testing System (MTS) to the supraspinatus tendon at a rate of 1Hz for 1 and 3000 consecutive cycles. Following 3000 cycles, the supraspinatus tendon was loaded at a rate of 30mm/min to determine load to failure and mode of failure. Photographs of anchors compare side by side the loaded parachute anchor to the loaded corkscrew anchor (Figure 3).

Figure 3

Results

The parachute anchor repair required significantly less time than the suture anchor repair (25.3 ± 6.4, parachute vs. 65.5 ± 15.3 min, suture anchor, p=0.001) (Figure 4). Inserting the two parachute anchors alone without the lateral anchor required only 7.3 ± 2.2 min. No statistical differences can be demonstrated for area of footprint restoration (242.75 ± 41.05 vs. 200.88 ± 54.23 min, p=0.162) (Figure 5), bone mineral density (0.494 ± 0.077 vs. 0.465 ± 0.062 g/cm², p=0.496), 1 cycle displacement (1.51 ± 0.86 vs. 1.23 ± 0.77 mm, p=0.567), 3000 cycle displacement (2.36 ± 1.11 vs. 2.22 ± 0.85 mm, p=0.828) (Figure 6), and load to failure (349.67 ± 105.17 vs. 449.90 ± 221.73 N, p=0.341) (Figure 7).

Figure 4: Anchor Placement Time

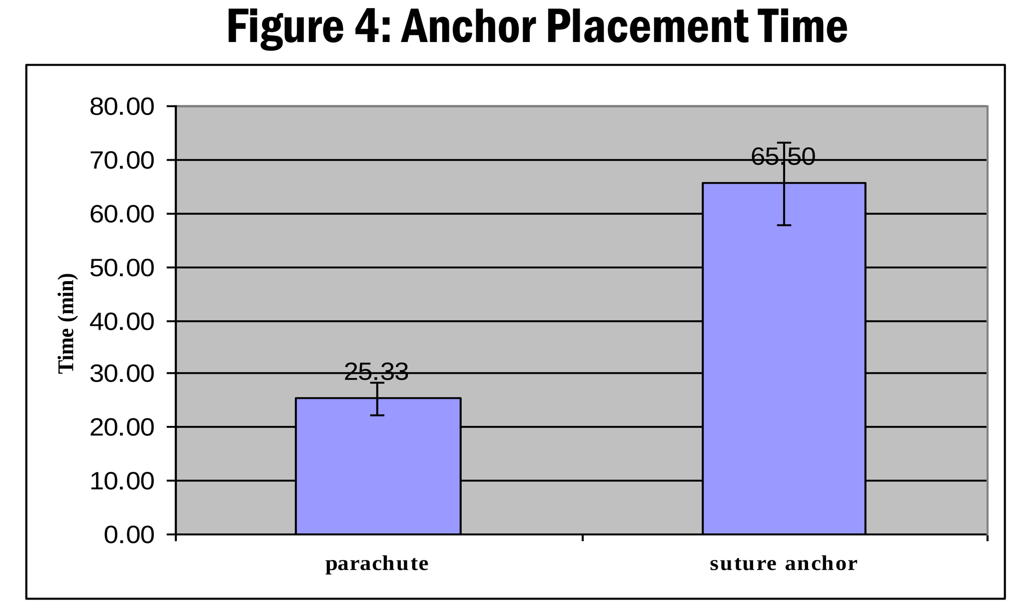


Figure 5: Footprint Restoration

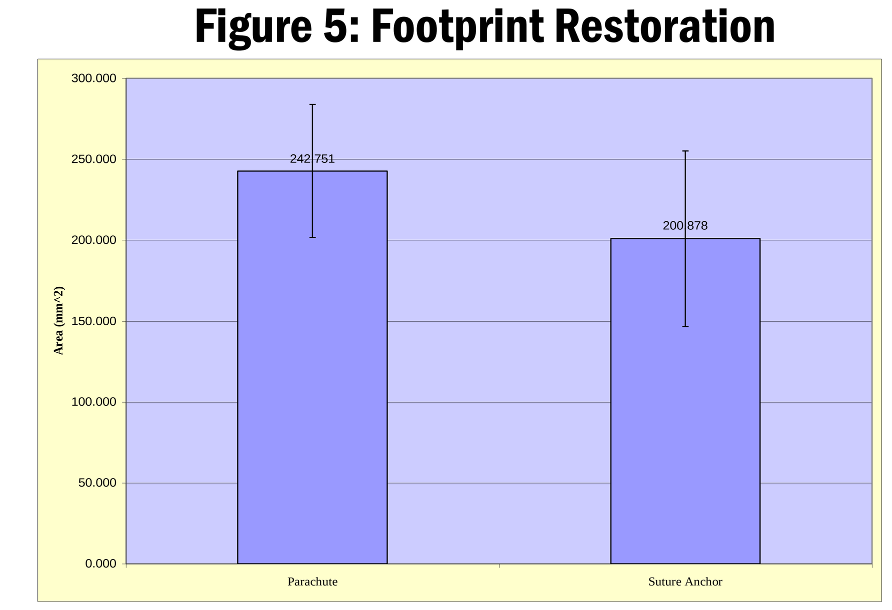


Figure 6: Cyclic Displacement to 3000 Cycles at 1Hz

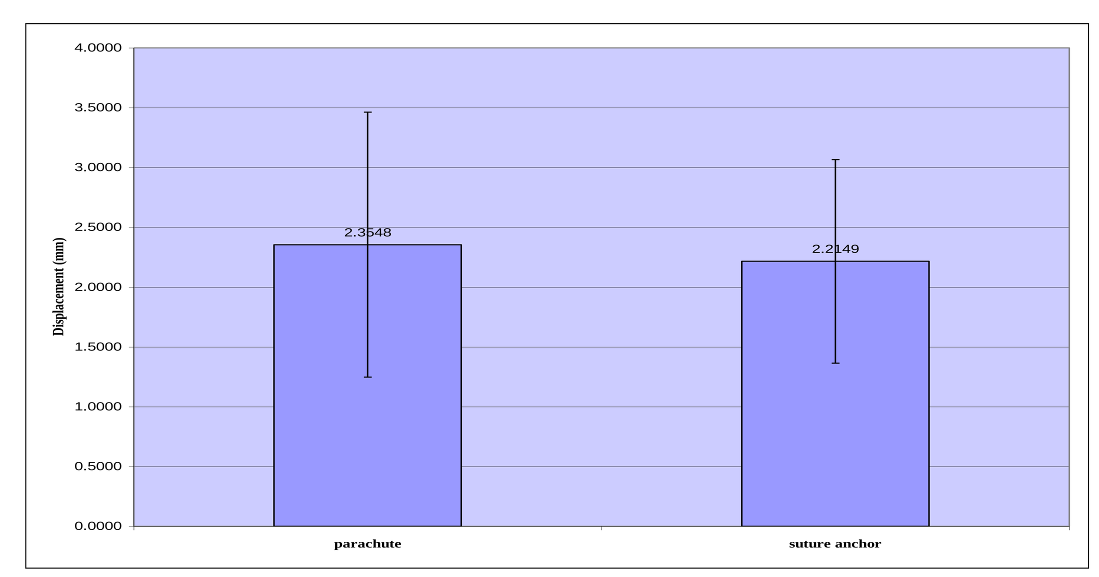
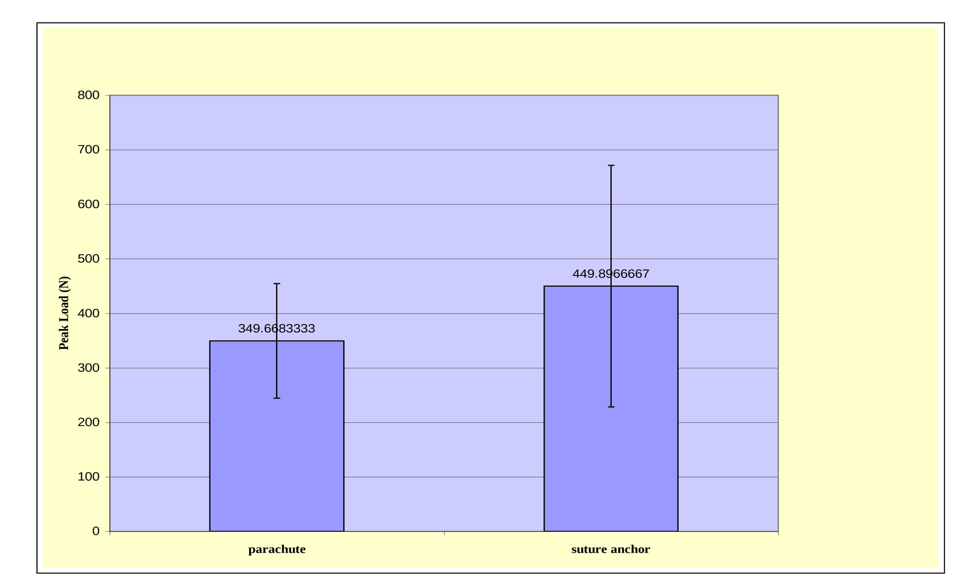


Figure 7: Load to Failure



Conclusion

Arthroscopic double-row rotator cuff repair performed with parachute tissue anchors decreases surgical time and costs without demonstrating statistical differences in footprint restoration and biomechanical parameters. This data provides an opportunity to decrease operative time and costs without sacrificing a good repair.

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