THE EFFECT OF ABDUCTION ON FOOTPRINT CONTACT FOR SINGLE-ROW, DOUBLE-ROW, AND TRANSOSSEOUS-EQUIVALENT ROTATOR CUFF REPAIR TECHNIQUES

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Introduction: A “transosseous-equivalent” rotator cuff repair using tendon-bridging sutures improves pressurized contact between tendon and tuberosity when compared to a double-row technique at 0° abduction. However, an abduction pillow is commonly used after rotator cuff repair, as are passive range of motion exercises. The effect of abduction on footprint contact for different rotator cuff repairs has not been elucidated.

Materials and Methods: In six fresh-frozen human shoulders, a “transosseous-equivalent” supraspinatus tendon repair was performed: a suture limb from each of two medial anchors was bridged over the tendon, and fixed laterally with a suture-interference implant (Figure 1A). In the same specimens, after releasing the suture laterally, a double-row repair was performed. Finally, the medial-row was released, creating a single-row pair. The tendon was loaded with 30 N. The shoulders were tested at 0°, 30°, and 60° abduction with neutral humeral rotation using a custom supraspinatus loading device. For all repairs, a Tekscan pressure sensor was secured on the greater tuberosity at the tendon-footprint interface (Figure 1B). The area of interest was defined at 160 mm².

Results: The greatest contact areas were achieved at 0° abduction for the “transosseous-equivalent”, double-row, and single-row repairs (151.33±10.69 mm², 81.00±29.96 mm², 61.31±26.12 mm², respectively), with values decreasing as abduction increased (Figure 2). Each repair was significantly different from one another at each abduction angle with respect to area (p<0.05), except between single- and double-row repairs at 0° abduction. The mean interface pressure exerted over the footprint by the tendon was also greater for the “transosseous-equivalent” technique compared to both other techniques at each abduction angle (p<0.05) (Figure 3). For a given repair, there were significant decreases in contact area comparing 0° versus 60° of abduction, and significant decreases for the single- and double-row comparing 30° versus 60° of abduction. At 0° abduction with respect to contact area, the coefficient of variation for the “transosseous-equivalent” technique was at least 30% less than the other two repairs.

Discussion: For a given repair, increasing abduction from 0° to 60° reduces contact area. However, at each abduction angle, the “transosseous-equivalent” rotator cuff repair technique improved pressurized contact area and overall pressure between tendon and footprint when compared to both single- and double-row techniques. A “transosseous-equivalent” technique, employing tendon-bridging sutures, may optimize the potential for healing at a repaired rotator cuff insertion.

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Figure 1. A: “Transosseous-equivalent” rotator cuff repair using four tendon-bridging sutures. B: Tekscan sensor secured to greater tuberosity footprint prior to repair.

Figure 2. Bar graph depicting footprint area with increasing abduction by repair. TOSE = “Transosseous-equivalent”, DR = Double-row, SR = Single-row

Figure 3. Bar graph depicting footprint pressure with increasing abduction by repair. TOSE = “Transosseous-equivalent”, DR = Double-row, SR = Single-row