

# Abstracts Presented at the 29th Annual Meeting of the Arthroscopy Association of North America

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## **Restoration of the Rotator Cuff Footprint After Arthroscopic Single Row Repair (SS-01)** *Don A. Buford, M.D.*

**Introduction:** The purpose of this study was to evaluate whether or not the rotator cuff footprint is restored after single row, triple loaded suture anchor repair. The hypothesis was that the rotator cuff footprint is restored when the tendon heals, even with a single row of suture anchors placed medially in the footprint. A secondary purpose was to evaluate when the rotator cuff footprint is restored after surgery.

**Methods:** This was a prospective study of 100 consecutive arthroscopic rotator cuff repairs done by a single surgeon. The rotator cuff tears were of varying sizes. All tears were repaired arthroscopically with the same triple loaded suture anchor. Tears were repaired with 1 to 3 anchors and margin convergence sutures as deemed necessary by the surgeon. Patients were evaluated by shoulder ultrasound at 6 weeks, 3 months, and 6 months after surgery. UCLA scores were obtained preoperatively and at the same postoperative intervals as the shoulder ultrasound examinations. For statistical analysis, patients were separated into 3 groups based on the anterior to posterior size of the cuff tear determined arthroscopically (<2cm, 2-4 cm, >4cm).

**Results:** There were 48 rotator cuff tears measuring less than 2 cm and the healing rate, as determined by restoration of the footprint on ultrasound evaluation, was 92%. Footprint restoration was visible at the 3 month ultrasound examination in 80% of the patients. There were 41 rotator cuff tears measuring 2cm to 4cm and 88% of them had footprint restoration by 6 months postoperatively. Of the patients with footprint restoration, only 51% had footprint restoration at 3 months. There were 11 rotator cuff tears greater than 4cm and 70% of them had footprint restoration by 6 months postoperatively. Of the patients with footprint restoration, only 18% had footprint restoration at 3 months.

**Conclusion:** Arthroscopic single row rotator cuff repair with triple loaded suture anchors can lead to a high

rate of tendon healing. The lateral aspect of the rotator cuff footprint does appear to be restored by the end of the healing process, as visualized dynamically by shoulder ultrasound.

## **Early Structural and Functional Outcomes for Arthroscopic Double Row Transosseous Equivalent Rotator Cuff Repair (SS-02)** *Erik A. Schnaser, M.D., Jacob Bosley, M.D., Bruno Toussaint, M.D., Reuben Gobezie, M.D.*

**Introduction:** Several investigators have studied the clinical outcomes after arthroscopic repair and have reported that the short-term clinical outcomes are comparable. However, the influence of the repair technique on the failure rates and functional outcomes after open or arthroscopic rotator cuff repair remains controversial. Several studies have evaluated biomechanical strength, contact area, and failure modes of single-row suture anchor, double-row suture anchor, as well as transosseous repairs and their ability to restore native the native rotator cuff. We present here our data from 155 consecutive patients who underwent double-row transosseous equivalent (suture bridge technique) rotator cuff repairs.

**Methods:** Between June 2006 and October 2007, 225 patients underwent the arthroscopic double-row transosseous equivalent repair of a torn rotator cuff at two surgical centers. One hundred and fifty-five of these patients were available for follow up at an average of 15 months postoperatively. At this evaluation, patients had either an MRI or CT arthrogram of the operative shoulder. The Constant scores, pain ranking (0-15 scale), forward flexion and strength were also collected at the follow up examination. Failure rates were determined based on analysis of the radiographic outcomes.

**Results:** During this period 155 patients were clinically and radiologically evaluated at a mean of 15 months (5.5-26.1). 54% male 46% female at an average age of 57.73 years (18-80). 47, 89, 19 patients had Patte type I, II, III lesions (respectively). Mean preoperative Constant Score improved from 44.21 (23-66) to 80.41

(40-96)  $p < 0.001$  at follow up. Mean preoperative pain score improved from 3.83 (0-10) to 12.83 (5-15)  $p < 0.001$  at follow up. Mean preoperative forward flexion improved from 122.22 (60-170) to 162.44 (15-170)  $p < 0.001$ . 35% (54 patients) had an arthrogram, 65% (100 patients) had an MRI and 0.7% (1 patient) during or after their follow up evaluation. Imaging demonstrated that 92%, 80%, 58% of the Type I, II, III lesions respectively were intact at follow up.

**Conclusion:** The results of this study indicate that the transosseous equivalent double-row rotator cuff repair (the suture bridge technique) has excellent results at greater than 1 year follow up.

**A New Technique to Achieve Arthroscopic Rotator Cuff Repair Using Trans-osseous Fixation Instead of Suture Anchors (SS-03)** *Marc Beauchamp, M.D., F.R.C.S.C.*

**Introduction:** We demonstrate a technique and the preliminary results of arthroscopic rotator cuff repairs performed by means of trans-osseous (bone tunnels) fixation, using newly designed instruments.

**Methods:** We have designed a curved awl and a curved hollowed hook enabling the making of bone tunnel under arthroscopy, and the visual retrograde passage of sutures through it. After testing it on arthroscopic training lab models, we have proceeded to forty (40) consecutive cases of arthroscopic rotator cuff repair (small and medium size tears). We have assessed the patients at 2,4 and 6 months post-operatively.

**Results:** We have achieved full repair in 38 of the 40 cases. In the two cases we did not succeed, it was due to bone bridge failure during the tying of the knots related to inappropriate distal entry in the humerus (i.e. less than 10 mm distal to the apex of the greater tuberosity). Both were converted to standard repair using suture anchors. Mean operative time was increased for the first 25 cases as compared with our "normal suture anchor time" (+ 11 minutes), but became normal for the last 15. Clinical results at 6 months were comparable to our regular suture anchor experience. Apart from the two cases mentioned above, we report no complications.

**Conclusion:** Trans-osseous rotator cuff repair can be safely achieved by arthroscopy. The use of reusable specially designed awl and hollowed curved hook facilitate the passage of the sutures under direct visualization. The bone tunnel should include a minimum of 10 mm of lateral humeral cortex for solidity. This technique provides excellent per operative fixation and clinical results that are comparable to those obtained with suture anchors, but at a substantially reduced cost.

**Measurement of Rotator Cuff Tension In Vivo: Single-row vs Double-row Repair (SS-04)** *David W. Wang, M.D., Joseph P. Burns, M.D., Mark H. Getelman, M.D.*

**Introduction:** The merits of single-row vs. double-row rotator cuff repair constructs have been debated in recent years. Some authors suggest that double-row constructs are biomechanically superior and provide restoration of the footprint of the rotator cuff. Others have suggested that the laterally based double row repair places significantly higher tension on the construct compared to a medially based single-row repair. The purpose of this research was to report the difference in rotator cuff tension between medially based articular margin single-row repairs compared to laterally based double-row repairs in vivo.

**Methods:** Patients with rotator cuff tears undergoing arthroscopic rotator cuff repair at a single institution were identified. After diagnostic arthroscopy, the rotator cuff tear is debrided back to normal, healthy tissue, and adhesions to the bursa or labrum are removed. The tear size is measured in the anterior-posterior and medial-lateral planes using a pre-measured marked suture. A tissue grasper is then placed onto the apex of the tear through the lateral portal. A calibrated digital weigh scale is then attached. The tendon edge is then pulled just lateral to the articular margin, simulating the location of a medially based single row repair, and the tension is recorded. Next, the tendon edge is pulled laterally to the edge of the greater tuberosity, simulating its final location after a double row repair, and the tension is recorded. All measurements are made with the arm abducted 20 degrees, simulating the position of post-operative sling immobilization.

**Results:** Twenty-one rotator cuff tears were available for measurement. 16 were crescent tears. 3 were L-shaped and 2 were bursal sided partial tears that required completion of the tear. The average AP tear size was 18.1 mm. The average ML tear size was 19.7 mm. The mean cuff tension when the tendon edge was approximated to the articular margin was 0.41 lb. The mean cuff tension when approximated to the lateral greater tuberosity was 2.16 lb. This is a 5.2 fold difference ( $p < 0.000001$ ). Sub-group analysis was done for small ( $\leq 20$  mm ML) vs. large tears ( $> 20$  mm ML) tears. For the smaller tears, the average tension to the articular margin was 0.28 lb. The average tension to the lateral tuberosity was 1.73 lb for a 6.3 fold difference ( $p < 0.0005$ ). For the larger tears, the average tension to the articular margin was 0.63 lb. The average tension to the lateral tuberosity was 2.84 lb. This was a 4.5 fold difference ( $p < 0.0005$ ). When com-