

## BACKGROUND

- Up to 70% of clinic visits for shoulder pain are due to rotator cuff injury.
- Arthroscopic rotator cuff repair (RCR) is the gold standard for surgical fixation of these injuries and is one of the most common ambulatory surgeries in the field of orthopedics.
- Candidacy for and recovery potential after arthroscopic RCR involves considerations of patient specific factors, tear pathology, and repair and rehab techniques.
- While literature outlining these considerations individually is abundant, very few studies aggregate this information for easy reference.
- Most literature is written at levels above the average reading level of most patients.
- Low patient expectations lead to worse outcomes following arthroscopic RCR.

## PURPOSE

- Highlight current concepts on operative considerations of arthroscopic RCR
- Create reference to help shape expectations for patients receiving arthroscopic RCR

## METHODS

Two independent PubMed database searches identified 1964 articles. 128 met all criteria.

### SEARCH TERMS

- Arthroscopic rotator cuff repair
- Suture technique rotator cuff
- Acromioplasty
- Rotator cuff repair physical therapy
- Rotator cuff tear revision
- Reverse shoulder arthroplasty

### INCLUSION CRITERIA

- Peer reviewed
- Adult population

### EXCLUSION CRITERIA

- Case studies
- Non-arthroscopic techniques

## REFERENCES

1. Björnsson HC, Norlin R, Johansson K, Adolphsson LE. The influence of age, delay of repair, and tendon involvement in acute rotator cuff tears: structural and clinical outcomes after repair of 42 shoulders. *Acta Orthop* 82: 187-192, 2011. 2. Cole BJ, Cotter EJ, Wang KC, Davey A. Patient Understanding, Expectations, and Satisfaction Regarding Rotator Cuff Injuries and Surgical Management. *Arthroscopy* 33: 1603-1606, 2017. 3. Eltorai AE, Sharma P, Wang J, Daniels AH. Most American Academy of Orthopaedic Surgeons' online patient education material exceeds average patient reading level. *Clin Orthop Relat Res* 473: 1181-1186, 2015. 4. Gwark JY, Sung CM, Na JB, Park HB. Outcomes of Arthroscopic Rotator Cuff Repair in Patients Who Are 70 Years of Age or Older Versus Under 70 Years of Age: A Sex- and Tear Size-Matched Case-Control Study. *Arthroscopy* 34: 2045-2053, 2018. 5. Pihl K, Roos EM, Nissen N, Jørgensen U, Schjerring J, Thorlund JB. Over-optimistic patient expectations of recovery and leisure activities after arthroscopic meniscus surgery. *Acta Orthop* 87: 615-621, 2016. 6. Piper CC, Hughes AJ, Ma Y, Wang H, Neviaser AS. Operative versus nonoperative treatment for the management of full-thickness rotator cuff tears: a systematic review and meta-analysis. *J Shoulder Elbow Surg* 27: 572-576, 2018.

# DOCTOR, WHAT HAPPENS AFTER MY ARTHROSCOPIC ROTATOR CUFF REPAIR?

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## RESULTS

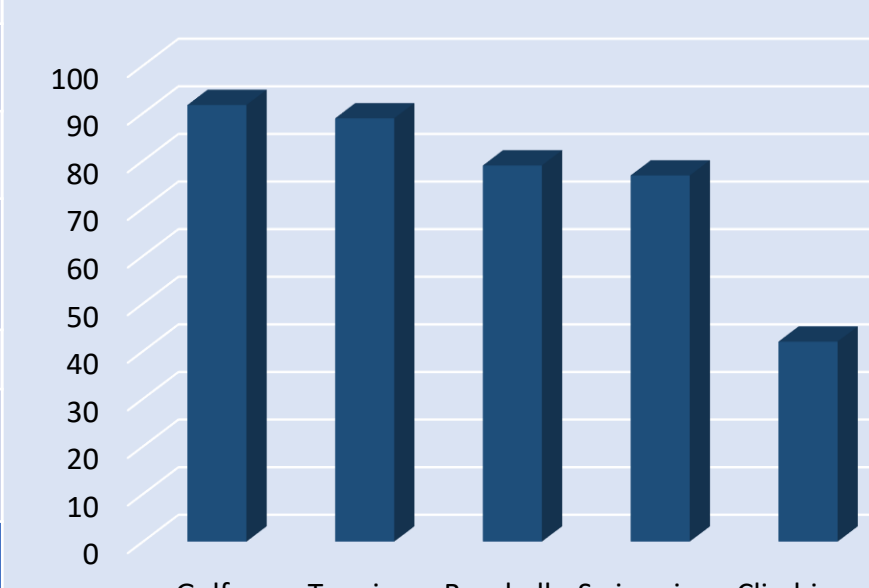
Non-Modifiable Patient-Specific Factors Affecting Outcomes			Modifiable Patient-Specific Factors Affecting Outcomes		
Patient Factor	Outcomes Assessed	Comments	Patient Factor	Outcomes Assessed	Comments
Age	Repair Integrity (MRI, US), ROM assessment, VAS pain score	<ul style="list-style-type: none"><li>Increasing age leads to higher incidence of rotator cuff tears and decreased healing rates.</li><li>Clinical and functional outcomes may not differ with age.</li><li>Few Data compare young adult and senior populations.</li></ul>	Post-operative management	CMS, PSQI, ROM assessment, WORC	<ul style="list-style-type: none"><li>Short terms functional outcomes do not differ between the use of immobilization and early ROM,</li><li>Early ROM may lead to improved long-term ROM with a higher risk of retear.</li><li>Early functional improvement leads to higher sleep quality.</li></ul>
Sex	CMS, ROM assessment, SST, VAS pain score	<ul style="list-style-type: none"><li>Women have higher short-term pain and worse function while men are more likely to experience short-term complications.</li></ul>	Obesity	DASH score, SST, VAS pain score	<ul style="list-style-type: none"><li>Obese patients do not have significantly different patient reported outcomes despite having longer operative times (108 vs. 87 minutes) and longer hospital stay times (18 vs. 9 hours).</li></ul>
Tear Pathology	CMS, Repair integrity (MRI, US)	<ul style="list-style-type: none"><li>Increasing tear size leads to decreased healing at 1 year postoperatively.</li><li>Number of torn tendons negatively correlates with short-term but not long-term outcomes.</li></ul>	Smoking	ASES score, Repair integrity (MRI), SST, VAS pain score, WORC	<ul style="list-style-type: none"><li>Smokers present with larger mean tear sizes, have worse initial outcome scores, earlier plateaus in improvement, and higher rates of failed RCR than non-smokers.</li></ul>
Preinjury Tendon Health	CMS, Repair Integrity (MRI, CTA)	<ul style="list-style-type: none"><li>Pre-injury tendinosis is correlated with worse functional outcomes and risk of failure to heal.</li><li>Fatty degeneration leads to worse outcomes and risk of postoperative progression of fatty degeneration.</li></ul>	Timing of repair	OSS	<ul style="list-style-type: none"><li>Delaying traumatic tear repair up to 3 months has no difference on outcomes, however, improved function following arthroscopic RCR is seen if performed within 6 months of the injury.</li></ul>
Diabetes	ASES score, CMS, Comorbidity HR, Outcome HR, ROM assessment, SST, VAS,	<ul style="list-style-type: none"><li>Diabetic patients have a higher incidence of rotator cuff tears (41 vs 26 per 100,000) and less improvement in pain and functional scores than non-diabetic patients.</li><li>It is important to note that type 2 diabetes can be considered both a modifiable and non-modifiable risk factor due to known genetic and environmental etiologic components.</li></ul>	Chronic peri-operative opioid use	ASES score, ROM assessment, SSV, VAS pain score	<ul style="list-style-type: none"><li>Chronic opioid use prior to RCR still leads to significant improvement following surgery but not to the same extent as in opioid-naïve patients.</li></ul>

ASES = American Shoulder and Elbow Surgeons Score, CMS = Constant Murley Score, CTA = Commuted tomography Angiography, MRI = Magnetic resonance imaging, ROM = Range of Motion, SST = Simple Shoulder Test, VAS = Visual Analog Scale, US = Ultrasound.

Factors Predictive of Re-Tear Following Arthroscopic RCR	
Factor	Comments
AHI	Smaller AHI indicates higher retear rates (MRI) (AHI: 6.8mm vs. 8.7mm [P < 0.01])
Age	Increased intact rotator cuffs seen postoperatively in younger patients
CSA	Higher CSA correlates to higher retear rates (CSA: 34.2 vs 38.6 degrees [P < 0.01])
Diabetes	Animal models suggest delayed tendon-to-bone healing in Diabetic patients.
Fatty degeneration	Higher mean GFDI correlates with higher risk of retear (1.2 vs 0.6; [P < 0.01])
Mean tear size	Larger mean tear area was found in patients experiencing retear as compared to those who did not following primary RCR (7.5cm <sup>2</sup> vs 2.7 cm <sup>2</sup> ; [P < 0.01])
Osteoporosis	Lower BMD leads to higher failure rates (%) graded by osteopenia (30.2%; [OR = 4.38]) and osteoporosis (41.7%; [OR = 7.25])
Postoperative stiffness	No statistically predictive relationship, postoperative stiffness and retear risk.
Preoperative ROM	Preoperative external rotation < 25 degrees [P < 0.01] is predictive of retear
Primary repair techniques	Specific primary repair techniques have been shown to influence retear rates. Details are beyond the scope of this review.
Smoking	Nicotine increases tendon-to-bone healing time
Supraspinatus tendon lengthening	Increased Tendon lengthening following surgery predictive of lower retear in patients with higher grades of fatty degeneration.
AHI = Acromiohumeral Interval, CSA = Critical shoulder angle, GFDI = Global fatty degeneration Index, ROM = Range of motion, BMD = Bone mineral density	

Postoperative Considerations	
Use of Nerve Blockade vs. General Anesthesia	<ul style="list-style-type: none"><li>Short term: decreased pain and increased patient satisfaction.</li><li>Long term: no difference in outcomes.</li></ul>
Early Physical Therapy	<ul style="list-style-type: none"><li>Lead to faster recovery and improved final ROM.</li><li>No difference in long term patient reported outcomes.</li></ul>

Intraoperative considerations	
Single row (SR) vs. double row (DR)	<ul style="list-style-type: none"><li>Tendon-bone healing: DR &gt; SR</li><li>Patient reported outcomes: DR = SR</li></ul>
Partial vs. Complete Repair	<ul style="list-style-type: none"><li>Consider partial repair if &gt;25-75% torn</li><li>Outcomes do not differ in partial repair vs. conversion to full repair</li></ul>
Use of Acromioplasty	<ul style="list-style-type: none"><li>No differences in clinical outcomes, retear rates with vs. without</li></ul>

Significant Mean Rates of Return to Sport	Returning to work and ADLs
<p>Mean Rate of Return to Sport (%)</p> 	<ul style="list-style-type: none"><li>For senior citizen population compete return to ADLs occurs in average of 14 months.<ul style="list-style-type: none"><li>This can be prolonged with increasing age, higher pre-injury level of function.</li></ul></li><li>Up to 97% of people return to work following arthroscopic RCR.<ul style="list-style-type: none"><li>Average time is ~5 months.</li><li>Factors prolonging this include:<ul style="list-style-type: none"><li>Increasing age, high shoulder function, requirement, workers comp claims.</li></ul></li></ul></li><li>Hand dominance: no effect on time to return to ADLs, negative influence on time and rates of return to work.</li></ul>

## CONCLUSIONS

- Properly shaping expectations for recovery potential following arthroscopic RCR can improve patient satisfaction.
- Though many risk factors for delayed improvement following arthroscopic RCR are inherent, many are modifiable.
- Understanding risks of reinjury can help guide the postoperative process.
- The majority of patients will return to ADLs, work and sport, though the extent and timing varies based on patient risk factors.