



Standard of Care: Arthroscopic repair of a rotator cuff tear.

Case Type / Diagnosis:

It is widely known and understood that the rotator cuff provides dynamic stability of the glenohumeral joint. This is achieved through co-contraction of numerous muscles that approximate the humeral head within the glenoid fossa and guide humeral head movement. Early recognition of rotator cuff disease began in the mid 1930's from the work of Codman where he described the critical zone of the supraspinatus near its insertion, where most tears occur. ¹

Rotator cuff tears (RCT) are frequent and increase with age, yet the varying functional implications of a tear can have a unique and dramatic impact on a patient's daily life. The presence of a RCT can cause a vast array of impairments and associated dysfunctions. This can be the result of many variables including: age of the individual, activity level of an individual, size of the tear, location of tear, number of tendons involved, overall rotator cuff tissue quality, as well as the presence or absence of other pathology within the shoulder complex.

In the mid 1940's Moseley felt that there was a significant age-related decline in vascularity, which contributed to the tendon becoming vulnerable to compression and attrition especially with excessive use. ² In the 1970's it was thought that there was a higher level of avascularity in the cuff when the arm was adducted and that it seemed to go away as the arm was abducted. ³ This led to the conception that recurrent injury to the rotator cuff is the result of compression between the acromion and humeral head. Complete and lateral acromionectomy was the initial surgical procedure attempting to alleviate this area of compression. ⁴ This procedure leads to the weakening of the deltoid and the creation of very deep scars.

Neer attempted to decompress this region, in those patients without tears, by performing an anterior acromioplasty, which removed the under surface of the anterior third of the acromion. ⁵ Neer also devised a staging system for rotator cuff disease. ⁶ (Table 1)

| Stage | Age | Clinical Course | Treatment |
|--------------------------------------|------------|------------------------------|---|
| I – Edema and Hemorrhage | <25 | Reversible | Conservative |
| II – Fibrosis and tendinitis | 25-40 | Recurrent Pain with activity | Consider subacromial decompression |
| III – Bone spurs and tendon ruptures | >40 | Progressive Disability | Subacromial decompression and rotator cuff tear |

Table 1. *Neer classification of rotator cuff disease.*

Standard of Care: Arthroscopic repair of a rotator cuff tear.

This staging system is widely recognized and an appropriate guideline for most rotator cuff management. However, it has been thought to be less appropriate for the throwing athlete since the degenerative process is usually accelerated secondary to the repetitive stresses applied to the shoulder.⁷ In addition, it is very broad and lacks the specificity needed to truly describe the vast array of rotator cuff tears. The type and severity of presentation of rotator cuff tears varies considerably between patients. This is thought to be the case since there are so many factors that influence the rotator cuff.⁸ It has been suggested that a classification system should take into account the extent of the lesion and its topography based on an anatomic-pathologic system. Some classification systems of rotator cuff tears only report the greatest diameter of the tear after excision of the necrotic edges.⁹

Patte devised a classification system of rotator cuff tears during the 1980's from the findings of 256 cuff repairs. The classification is based on the: (1) extent of the tear, (2) topography of the tear in the sagittal plane, (3) topography of the tear in the frontal plane, (4) trophic quality of the muscle of the torn tendon, and (5) state of the long head of the biceps.¹⁰ (Table 2)

| |
|--|
| <p>Extent of Tear Group I: Partial tears or full-substance tears measuring less than 1 cm in sagittal diameter at bony attachment (enthesis) a. Partial thickness tear bursal surface b. Partial thickness tear articular surface c. Full thickness tear subcentimeter Group II: Full thickness tear of entire supraspinatus Group III: Full thickness tear involving more than one tendon Group IV: Massive tear with secondary OA</p> <p>Topography of Tear in Sagittal Plane Segment 1: Subscapularis Tear Segment 2: Coracohumeral ligament tear Segment 3: Isolated supraspinatus tear Segment 4: Tear of entire supraspinatus and one-half of infraspinatus Segment 5: Tear of supraspinatus and infraspinatus Segment 6: Tear of subscapularis, supraspinatus and infraspinatus</p> <p>Topography of Tear in Frontal (Coronal Oblique) Plane Stage 1: Proximal stump close to enthesis (bony insertion) Stage 2: Proximal stump at head of humeral head Stage 3: Proximal stump at level of glenoid</p> <p>Quality of Muscle</p> <p>State of the LHB (long head of biceps)</p> |
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Table 2. Patte Classification System of Rotator Cuff Tears

Possible ICD.9:

Standard of Care: Arthroscopic repair of a rotator cuff tear.

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| | |
|-----------------------------------|--------|
| Rotator Cuff Syndrome | 726.10 |
| Shoulder Pain | 719.41 |
| Rotator Cuff Tear, Full Thickness | 727.61 |
| Shoulder Region Disorder | 726.2 |

Indications for Treatment:

Status post arthroscopic rotator cuff repair.

Examination:

Medical History: Review patient’s self reported medical history questionnaire (on an ambulatory evaluation), patient’s medical record (during the inpatient stay-if the patient is admitted post-op) and medical history reported in the Hospital’s Computerized Medical Record. Review any diagnostic imaging, tests, work up and operative report listed under LMR.

History of Present Illness: Interview patient at the time of examination to review patient’s history and any relevant information that would pertain. If the patient is unable to give a full history, then interview the patient’s legal guardian or custodian. Determine any past injuries that have taken place. Some examples of previous injury could be history of trauma, history of OA, history of shoulder joint related problems. Thoroughly review the attending Surgeon’s notes to determine underlying tissue quality of the rotator cuff and tendon tear to the surgical repair.

Social History: Review patient’s home, work, recreational and social situation. Areas to focus on would be any upper extremity weight-bearing activity, excessive reaching, lifting or carrying loads with upper extremities.

Medications: The surgeon typically prescribes Postoperative Pain Medication and then transitions patients to Anti-Inflammatory Medication.

Examination (Physical / Cognitive / applicable tests and measures / other)

This section is intended to capture the most commonly used assessment tools for this case type/diagnosis. It is not intended to be either inclusive or exclusive of assessment tools.

Pain: As measured on the NRS, activities that increase symptoms, decrease symptoms, location of symptoms.

Visual Inspection: Attention to the healing of the incision, ensuring there are no signs of infection.

Palpation: Palpate entire shoulder. Focus on presence and extent of musculature atrophy and swelling.

Standard of Care: Arthroscopic repair of a rotator cuff tear.

ROM: Initial ROM assessment is contingent upon post-operative day tissue quality ROM restrictions. See attached protocols for progression.

Strength: Early post-op, only motor control will be assessed. MMT will be deferred until post-operative healing has occurred. See time frames on protocol.

Sensation: If abnormal as found via dermatomal screen or if diabetic, further assessment would be indicated.

Posture/alignment: Primary focus on sitting and standing upper quadrant and upper back posture. Patients tend to be at extremes of rounded shoulders and forward head.

Gait & Balance: Gross assessment to determine patient's safety to ensure Independence with transfers, gait, and stairs. Further in depth assessment to be conducted if impairments noted in screening.

Differential Diagnosis: None secondary to post-op condition. Unless patient has any co-morbid issues and/or post-op complications that need to be considered.

Functional Assessment:

Use of a shoulder specific functional capacity questionnaire is recommended to establish early post-op status and track progress.

Possible tools:

- Shoulder Pain and Disability Index (SPADI)
- Simple Shoulder Test (SST)
- American Shoulder and Elbow Surgeon's Shoulder Evaluation Short Form (ASES-SF)

Functional performance as reported by the subject can be measured using the Simple Shoulder Test (SST). Pain, range of motion, strength, and functional performance can be standardized and measured by the American Shoulder and Elbow Surgeon's Shoulder Evaluation Short Form (ASES-SF). Psychometric standards that are not specific to age, disease, or treatment group can be assessed using the MOS 36-item short form health survey (SF-36). The SST and SF-36 are both self-report questionnaires; the examiner can be available for assistance with these self-administered questionnaires.

The SST¹¹ and the ASES-SF¹², which are both standardized self-assessments of shoulder function have been found to have fairly high responsiveness as well as high test-retest reliability as compared to other shoulder outcome tools.¹³ They both are very simple and quick for the subject and investigator to fill out. The SST has been proven to be sensitive for various shoulder conditions as well as sensitive to detect changes in shoulder function over time.¹⁴

Standard of Care: Arthroscopic repair of a rotator cuff tear.

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The SF-36^{15, 16} is a standardized self-assessment of generic health status that looks at 8 major categories including: physical function, social function, physical role function, emotional role function, mental health, vitality, comfort, and general health perception. It has been used in conjunction with the SST in assessing shoulder function in previously published studies.^{64, 17, 18} Since the SF-36 is a generic health status tool it is not as sensitive to change as joint specific outcome tools.⁶⁶ Despite this low sensitivity, Beaton et al. states that outcome assessments that look at the overall quality of life and full impact of a condition for an individual require the use of both disease-specific and generic measures.⁶⁶ The SPADI is another subjective questionnaire that has a pain and disability/function components. This scale uses a visual analog scale to measure pain while subjective questions are used to assess function of the shoulder. The pain and function components are weighted accordingly since there are 5 pain scales and 8 functional questions, then the total score is computed by averaging the pain and functional score. With the SPADI, unlike the other outcome measures a higher value indicates greater pain and disability.

In 1998 Gartsman et al. looked at the functional outcome of 50 consecutive patients that underwent an arthroscopic repair of a full-thickness RCT. Comparison of the preoperative and postoperative responses to three (SF-36, ASES-SF, The University of California at Los Angeles (UCLA) Shoulder Score) different health questionnaires were evaluated. All three questionnaires demonstrated significant improvement in the postoperative pain and functional scores.¹⁹

Evaluation / Assessment:

Establish underlying reason for Surgery and Need for Skilled Services

Potential Initial Problem List (Identify Impairment(s) and/ or dysfunction(s))

1. Pain
2. Decreased ROM
3. Decreased Strength
4. Decreased Function as compared to baseline
5. Decreased Knowledge of Activity Modification
6. Decreased Knowledge of Rehabilitation Progression

Prognosis/Expected Outcomes: Literature Review:

Rotator cuff tears are a common and prevalent injury.^{20, 21} The conventional management for a painful RCT that has failed conservative treatment is operative repair with a subacromial decompression.^{5, 22, 23, 24} Post surgical outcomes for rotator cuff repairs are quite good.^{25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35} General health status has been shown to significantly improve in individuals that have undergone surgery for chronic rotator cuff disease.³⁶ In 1993, Ellman et al. reported on their findings from a two to seven year follow-up study of arthroscopically repaired full-thickness RCT. Forty full-thickness RCT were treated arthroscopically with a subacromial decompression and debridement. Those individuals having a small tear (0-2 cm) did well. Those with a larger tear (2-4 cm) did poorly as compared to their previous study of similar tears treated with an open procedure. Strength and range of motion was not restored in those individuals that

5

Standard of Care: Arthroscopic repair of a rotator cuff tear.

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had a massive irreparable tear treated by arthroscopic means, yet patient satisfaction was 86%. Hence, they felt that the role of arthroscopic repair of full-thickness RCT was valuable but limited.³⁷

Now more is known about the repair of RCT and results continue to improve. In 1998, Gartsman et al. published his findings of the outcomes of seventy-three patients who had undergone arthroscopic repair of full-thickness tears. They had four groups of patients: small tears (< 1cm, n = 11), medium (1-3 cm, n = 45), large (> 3-5 cm, n = 11), and massive (> 5 cm, n = 6). Comparison of the preoperative and postoperative responses to four different health questionnaires were evaluated both pre and postoperatively. Active range of motion, passive range of motion, and strength improved significantly. Seventy-eight percent of the subjects rated their pain relief as good or excellent on the visual-analog scale. Ninety percent of patients rated their satisfaction in surgical results as good or excellent.³⁸ Based on these results the authors feel that arthroscopic surgical repair of the full-thickness RCT offered several advantages; smaller incisions, no need for deltoid detachment, and overall less soft-tissue disruption.

Rotator cuff repair continues to advance and repairs that were traditionally open repairs are now nearly all arthroscopic with less morbidity to the patient with equivalent success. Arthroscopic surgical rotator cuff repairs have shown to have a more rapid recovery of function.^{39, 40, 41} Seventy-five individuals who underwent subacromial decompression and mini-open arthroscopic repair were evaluated and reported on in 2002. Thirty subjects had a large tear, 35 had moderate sized tears, and 10 had small tears. They all had a mini-open repair using a 2-row fixation technique. There were no statistical differences between the three groups at a two-year follow-up point; mean time from surgery to full recovery was 7 months, satisfaction was shown to be 92.6%, and 83% returned to pre-injury activities.⁴²

With all the literature that demonstrates that arthroscopic rotator cuff repair leads to good functional results it is still not well known which if any of the soft tissue variables of the rotator cuff have a greater impact on predicting functional outcome. Younger individuals have shown to have done better.⁴³ Increased strength and decreased pain has been correlated with early surgical repair.^{44, 45, 46} Smaller tears have had better outcomes.^{47, 48, 49} Given the many variables that classify a RCT, it is understandable that it is difficult for a surgeon to predict a postoperative functional outcome for a patient. As far as rehabilitation, the postoperative course for patients who have undergone a rotator cuff repair should take into consideration the underlying tissue quality and structural integrity of the repair.

Most rotator cuff repair studies have reported correlation's between size of the tear and/or type of tear and functional outcome.^{50, 51, 52, 53} Gazielly et al. found a significant statistical correlation between type of tear and the postoperative Constant's and Murley's Functional Score ($p = 0.0012$, standard error, 1.5). Constant's and Murley's Functional Score, used by the European Society for Shoulder and Elbow Surgery, is a standardized shoulder assessment tool that examines both subjective and objective aspects of shoulder function.

However, Pai et al. reported that with the exception of massive tears there was not a correlation between the size of the cuff tear and functional outcome.²² Other studies support this as well.^{54, 55} In addition, Gazielly et al. reported there was a significant correlation between postoperative

Standard of Care: Arthroscopic repair of a rotator cuff tear.

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strength, as assessed by using Constant's method and type of tear ($p = 0.0001$, standard error, 1.5). A slightly weaker correlation was found between the type of tear, determined intraoperatively, and the ability to perform activities of daily living ($p = 0.03$). There was no correlation found between type of tear and postoperative pain, active range of motion, and patient satisfaction.⁴¹

Few studies have described the presence of atrophy and its effect on postoperative functional outcomes; yet supraspinatus atrophy is a strong predictive factor of postoperative retearing of rotator cuff repairs.^{56,57} However, besides the incidence of retearing there is no reported correlation between the presence of atrophy and functional outcome.

Kiebler et al. does an excellent job of discussing shoulder rehabilitation strategies and guidelines based on a practice pattern that focuses on movement patterns rather than isolated muscle exercises. This is quite a different framework than the previously cited protocols that are entirely isolated motion and muscle specific. His guidelines are strongly founded on the principles of motor control and closed chain exercises. According to Kiebler et al., shoulder protocols in general can be effective if they comply with some basic concepts of:

1. Muscle activation and motion follow a proximal to distal recruitment pattern.
2. Shoulder musculature functions in an integrated pattern and should be rehabilitated accordingly.
3. Rotator cuff activation and scapular control are essential to proper shoulder function.
4. The primary means of early shoulder rehabilitation is closed chain axial loading exercises.⁵⁸

Hence, the BWH Standard of Care for Arthroscopic repair of rotator cuff repairs includes a Protocol that is not just merely time based, but based on meeting healing sensitive criteria and takes into consideration the above 4 components of an effective shoulder protocol.

Goals

1. Decrease Pain
2. Increase ROM
3. Increase Strength
4. Increase Function

Treatment Planning / Interventions

Established Pathway ___ Yes, see attached. X No

Established Protocol X Yes, see attached. ___ No
(Small tear, medium tear, and large/massive tear)

Interventions most commonly used for this case type/diagnosis.

Standard of Care: Arthroscopic repair of a rotator cuff tear.

This section is intended to capture the most commonly used interventions for this case type/diagnosis. It is not intended to be either inclusive or exclusive of appropriate interventions.

Please see attached Protocols.

Frequency & Duration

Inpatient Stay: N/A, most all arthroscopic repairs are day surgery cases.

Outpatient Care: 2-3x/week for 2-3 months as indicated by patient's status and progression.

Patient / family education

1. Instruction in HEP (home exercise program)
2. Instruction in pain control and ways to minimize inflammation
3. Instruction in activity level modification / joint protection

Recommendations and referrals to other providers.

None, except back to Attending Surgeon if issues arise.

Re-evaluation / assessment

Standard Time Frame- 30 days or less if appropriate

Other Possible Triggers- A significant change in signs and symptoms, significant decline in post-operative progression

Discharge Planning

Commonly expected outcomes at discharge – Please see previous literature review.

Transfer of Care (if applicable) – N/A

Patient's discharge instructions – Continue with individualized home program indefinitely to ensure maintenance of ROM, strength, and function.

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Standard of Care: Arthroscopic repair of a rotator cuff tear.

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Standard of Care: Arthroscopic repair of a rotator cuff tear.

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Standard of Care: Arthroscopic repair of a rotator cuff tear.

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Standard of Care: Arthroscopic repair of a rotator cuff tear.

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Standard of Care: Arthroscopic repair of a rotator cuff tear.

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