OVERVIEW

This guideline describes indications for arthroscopic and open, non-arthroplasty shoulder surgeries. Arthroscopy introduces a fiber-optic camera into the shoulder joint through a small incision for diagnostic visualization purposes. Other instruments may then be introduced to remove, repair, or reconstruct joint pathology. Surgical indications are based on relevant subjective clinical symptoms, objective physical exam and radiologic findings, and response to previous non-operative treatments when medically appropriate. Open, non-arthroplasty surgeries are performed instead of an arthroscopy as dictated by the type and severity of injury and/or disease.

Initial Clinical Reviewers (ICRs) and Physician Clinical Reviewers (PCRs) must be able to apply criteria based on individual needs and based on an assessment of the local delivery system.

This guideline is structured with clinical indications outlined for each of the following applications:

I. Rotator Cuff Repair
II. Distal Clavicle Excision (DCE)
III. Labral Repairs
   1) SLAP
   2) Anterior-Inferior Labral Tear (Bankart)
   3) Posterior Labral Repair
   4) Combined Tears
   5) Open Capsulorrhaphy for Multidirectional Instability
IV. Long Head Biceps (LHB) Tenotomy or Tenodesis
V. Synovectomy
VI. Lysis of adhesions; Capsulotomy
VII. Subacromial Decompression (SAD)
VIII. Elective surgery of the shoulder should only be considered if the following general criteria are met:

1) There is clinical correlation of patient subjective complaints with objective exam findings and/or imaging (if applicable)
2) Patient has limited function (ADLs, occupation, or sports)
3) Patient is medically stable with no uncontrolled medical problems such as diabetes
4) Patient does not have active local or systemic infection
5) Patient does not have active, untreated drug dependency (drug dependency increases likelihood of poor surgical outcome)
6) Patient is not an active smoker. Smoking increases rotator cuff degeneration, increases the prevalence of larger rotator cuff tears, and inhibits healing in many cases (especially primary rotator cuff repair) and is a relative contra-indication across surgeries. A smoking cessation program should be instituted pre-operatively and continued post-operatively.

CLINICAL INDICATIONS

I. ROTATOR CUFF REPAIR (RCR)

Surgical treatment of rotator cuff tear (RCT) should only be performed when there is a clinical correlation of patient symptoms, clinical exam findings, imaging, and failed non-operative management (where required). Although many surgeons perform mini-open rotator cuff repair, traditional open rotator cuff repair (RCR) with deltidoid take-down should be rare given increased morbidity compared to arthroscopic or mini-open surgery. Nonetheless, in certain situations traditional open repair remains an acceptable (albeit not preferred) technique.

NOTE: If Subacromial Decompression (SAD) is to be performed in conjunction with this surgery, see SAD-specific criteria in guidelines to confirm clinical necessity AND SAD must be noted within preoperative notes.

NOTE: RCR Surgery may be required as first line therapy in the following situations:

a) Surgery is appropriate as first line treatment when MRI shows significant progression of a full thickness tear, at least 50% increase in tear size, on serial imaging performed at least 3 months apart, even with minimal or no patient symptoms.

b) If MRI shows medium size or greater (must be a complete single tendon or greater) full thickness tear with minimal or no patient symptoms, surgery may be appropriate as first line treatment.

1) Surgical repair of a partially torn rotator cuff may be necessary when ALL of the following criteria are met:

a) Reproducible rotator cuff pain patterns as evidenced by:
i) Lateral arm, deltoid pain not radiating past the elbow, night pain, or pain with overhead motions; **AND**
ii) Positive impingement signs and/or tests on exam (reproducible pain when arm is positioned overhead (above plane of shoulder) with relief of pain when arm is repositioned below the plane of the shoulder); **AND**
iii) Functional loss (inability to do normal and/or recreational activities); **AND**
b) MRI showing >50% partial thickness tear (articular-sided, concealed, or bursal-sided); **AND**
c) Failure of at least 12 weeks non-surgical treatment*.

d) *Nonsurgical treatment must include **ALL** of the following:
i) Physical therapy or properly instructed home exercise program (physical therapy protocol should include treatment for scapular dyskinesis when present)
ii) Rest or activity modification
iii) Minimum of 4 weeks of oral NSAIDs (if not medically contraindicated)
iv) Single injection of corticosteroid and local anesthetic into subacromial or intra-articular space.

2) **Surgical repair of a small (<1cm), full thickness rotator cuff tear may be necessary when ALL of the following criteria are met:**
a) Reproducible “rotator cuff pain patterns” as evidence by:
   i) Lateral arm, deltoid pain not radiating past the elbow, night pain, or pain with overhead motions; **AND**
   ii) Positive impingement signs and/or tests on exam (reproducible pain when arm is positioned overhead (above plane of shoulder) with relief of pain when arm is repositioned below the plane of the shoulder); **AND/OR**
   iii) Rotator cuff weakness on physical exam; **AND**
   iv) Functional loss (inability to do normal activities); **AND**
b) MRI showing small, full thickness tear (<1cm); **AND**
c) Failure of at least 6 weeks non-surgical treatment*

d) *Nonsurgical treatment must include physical therapy or properly instructed home exercise program (physical therapy protocol should include treatment for scapular dyskinesis when present); **AND**
i) Rest or activity modification; **OR**
ii) Minimum of 4 weeks of oral NSAIDs (if not medically contraindicated); **OR**
iii) Single injection of corticosteroid and local anesthetic into subacromial or intra-articular space.

3) **Surgical repair of a medium (1-3cm) or large (3-5cm), full-thickness torn rotator cuff may be necessary when ALL of the following criteria are met:**
a) Reproducible “rotator cuff pain patterns” as evidence by:
   i) Lateral arm, deltoid pain not radiating past the elbow, night pain, or pain with overhead motions; **AND**
ii) Positive impingement signs and/or tests on exam (reproducible pain when arm is positioned overhead (above plane of shoulder) with relief of pain when arm is repositioned below the plane of the shoulder); AND/OR
iii) Rotator cuff weakness on physical exam; AND
iv) Functional loss (inability to do normal activities); AND
b) MRI showing medium (1-3cm) or large (3-5cm), full-thickness tear; OR
c) Serial MRI demonstrates progression in size, even if asymptomatic; OR
d) MRI demonstrates presence of atrophy and/or fatty degeneration and/or Goutallier stage 2.

4) Surgical repair of a massive (>5 cm with at least 2 tendons involved) torn rotator cuff may be necessary when ALL of the following criteria are met:
   a) MRI demonstrates Goutallier stage 0 (normal muscle), 1 (some fatty streaks), or 2 (less than 50% fatty degeneration or infiltration); AND
   b) Warner classification of atrophy "none" or "mild"; AND
   c) No x-ray evidence of chronic subacromial articulation of humeral head (e.g. acromiohumeral distance less than 7 millimeters, acetabularization or femoralization, no remodeling of greater tuberosity, lack of sclerotic lateral acromion, lack of extensive CA (coracoacromial) ligament calcification; AND
   d) MRI showing massive (>5cm), full-thickness tear.

5) Surgical revision of a previously repaired small, medium, large or massive torn rotator cuff may be necessary when ALL of the following criteria are met:
   a) All RCR revision cases within 1 year of original RCR will be reviewed on a case-by-case basis.
   b) MRI (with or without arthrogram) or CT arthrogram results showing failure of healing (Sugayas type 4-5) or recurrent tear > 3 months after index surgery.

II. DISTAL CLAVICLE EXCISION (DCE)

The AC joint (acromio-clavicular joint) commonly develops degenerative disease in those over 30 years of age, those with a history with grade 1 or 2 AC sprain/separation, those with a history of heavy lifting (labor occupation or strength training), or those with evidence of remote trauma. It can occur in isolated form in younger patients (distal clavicle osteolysis) but is more commonly observed concomitantly with rotator cuff disease in those over age 40 years of age.

NOTE: If Subacromial Decompression is to be performed in conjunction with this surgery, see SAD-specific criteria in guidelines to confirm clinical necessity AND SAD must be noted within preoperative notes.

1) Distal Clavicle Excision may be necessary when ALL of the following criteria are met:
   a) Positive clinical exam findings as evidenced by pain upon palpation over AC joint and pain with cross-body adduction test; AND
   b) Positive radiographic findings:
i) Radiographic (x-ray) demonstrates narrowed joint space, distal clavicle or medial acromial sclerosis, and/or osteophytes or cystic degeneration of distal clavicle or medial acromion correlating with the clinical findings, patient symptoms and diagnosis; OR

ii) MRI (not required) findings with edema in the distal clavicle and/or inflammatory change within the joint space correlating with the clinical findings, patient symptoms and diagnosis; AND

iii) Failed 12 weeks of non-surgical treatment*.

c) *Nonsurgical treatment must include a single injection of corticosteroid and local anesthetic into the AC joint (with at least 50% pain relief from injection). Note: if injection fails, patient may be at higher risk for surgical infection if performed within 3-6 months of injection; AND

i) Physical therapy or properly instructed home exercise program; OR

ii) Rest or activity modification; OR

iii) Minimum of 4 weeks of oral or topical NSAIDs (if not medically contraindicated).

### III. LABRAL REPAIRS

There is a tendency to misinterpret normal degenerative labral changes and variations as “tears” which may lead to over-utilization of surgery if decisions are made upon imaging reports alone. In addition, the anterior-superior labrum (from 12 to 3 o’clock for a right shoulder) has many normal variations that can be misinterpreted as a tear, including sublabral hole/foramen, Buford complex, and a labral overhang with an intact biceps anchor. In general, true labral tears lead to pain, catching, popping, functional limitations (including ADLs, occupational and sports), micro-instability, and gross instability. Labral repairs are most-frequently associated with a specific traumatic event.

**NOTE:** If subacromial decompression is to be performed in conjunction with this surgery, see SAD-specific criteria in guidelines to confirm clinical necessity AND SAD must be noted within preoperative notes.

**SLAP**

A SLAP tear describes a labral tear that extends from 10 to 2 o’clock. There are many types of SLAP tears, and treatment options are dependent upon the type of tear. For all SLAP tears, non-operative management should always be used as the initial treatment approach. Surgical indications should be focused on clinical symptoms and failure to respond to non-operative treatments, rather than imaging (due to a higher percentage of tears being missed on images AND significant over-diagnosing of tears based on imaging-alone).

1) **SLAP repair of a labral tear may be necessary when ALL of the following criteria are met:**

   a) Minimum of 12 weeks of non-operative treatment;

      i) Activity modification by avoiding painful activity; AND

      ii) NSAIDs; OR
iii) Oral steroids; OR
iv) Failed intra-articular injection (Corticosteroid injection is not included in non-operative management for SLAP tear); OR
v) PT or self directed home exercise program; AND
b) MRI demonstrating superior labral tear; AND
c) History compatible with tear (acute onset in thrower or overhead athlete, fall, traction injury, shear injury (MVA), lifting injury); AND
d) Pain localized to the glenohumeral joint (often only associated with certain reaching or lifting activities and at night); OR
e) Painful catching/popping/locking sensations; AND
f) Inability to perform desired tasks without pain (ADLs, sports, occupation); AND
g) Age < 40*; AND
h) Type 2 or 4 SLAP tear (not type 1 or 3)
   i) I Labral and biceps fraying, anchor intact
   ii) II Labral fraying with detached biceps tendon anchor
   iii) III Bucket handle tear, intact biceps tendon anchor (biceps separates from bucket handle tear)
   iv) IV Bucket handle tear with detached biceps tendon anchor (remains attached to bucket handle tear)
i) *All requests for SLAP repair in patients age >40 will be reviewed on a case-by-case basis.

j. CONTRAINDICATIONS:
   i) ANY evidence of degenerative disease upon imaging
   ii) Smoker and age >40
   iii) Diabetics with poor control HgBA1c > 7
   iv) MRI findings not attributable to normal common variants (for example, labral overhang)

   v) In cases where a true SLAP tear exists, but the patient has one or more contraindications, a SLAP debridement (limited, extensive debridement), biceps tenotomy or tenodesis may be an alternative. See Tenotomy and Tenodesis Indications.

2) ANTERIOR-INFERIOR LABRAL TEAR (Bankart):
   This is defined as a “Bankart” tear after the physician who first described it. It is located in the 3-6 o’clock region of a right shoulder, “clock face”. It is typically caused by a traumatic instability event (dislocation or subluxation). It can involve the labrum, the capsular ligaments (IGHL [inferior glenohumeral ligamentous complex]) and/or the bone (bony Bankart fracture). If symptomatic, bankart tears typically require surgical repair (indications below).
a) Bankart repair of a labral tear may be necessary when ALL of the following criteria are met:

i) ACUTE
   1. History of an acute event of instability (subluxation or dislocation) or acute onset of pain following activity; AND
   2. Acute Labral Tear on MRI or CT imaging; AND
   3. Age < 30 (high recurrence rate without repair); AND
   4. Range of motion is not limited by stiffness upon physical exam; AND
   5. Clinical exam findings demonstrate positive apprehension test, positive relocation test, positive labral grind test, or objective laxity with pain.

ii) RECURRENT (two or more dislocations)
   1. Recurrent instability (subluxation or dislocation) with history of repeat events; AND
   2. Evidence of labral tear with or without bony Bankart fracture of glenoid width upon imaging; AND
   3. Range of motion is not limited by stiffness upon physical exam; AND
   4. Clinical exam findings demonstrate positive apprehension test, positive relocation test, positive labral grind test, or objective laxity with pain.

iii) CONTRAINDICATIONS
   1. Pain only (no documented recurrent instability events) in patients over 40.
   2. Evidence of degenerative glenohumeral disease upon imaging
   3. Evidence of Engaging Hill Sachs humeral head defect upon imaging if surgery is for stand alone Bankart repair
   4. Cases demonstrating greater than 20% glenoid bone loss (should indicate Latarjet reconstruction or bone graft [autograft or allograft] repair) will be reviewed on a case by case basis.

3) POSTERIOR LABRAL REPAIR:
   Identical to Bankart tears with the exception of the posterior aspect of the shoulder. Posterior labral tears are often associated with a paralabral cyst that grows large enough to compress the suprascapular nerve (isolated to infraspinatus). Posterior labral tears are frequently associated with contact sports or a patient history of a traumatic fall/posterior loading of the joint. They are often observed in athletes performing repetitive posterior loading of the joint (offensive linemen in football, weight-lifting: push-ups, bench press). These tears are more likely to result in pain and weakness rather than recurrent dislocations/instability.

   a) Surgical repair of a posterior labral tear may be necessary when ALL of the following criteria are met:
      i) Symptoms of pain OR painful catching/popping OR instability (shoulder pops out of joint); AND
ii) MRI findings of posterior labral tear: AND

iii) Exam findings demonstrate positive load-shift test, OR jerk test, OR glenohumeral grind test OR objective laxity with pain or profound weakness; AND

iv) Failure of 12 weeks or more of non-surgical treatment (exception is traumatic tear in competitive athlete at any level): NSAIDs and home exercise OR physical therapy and activity modifications (i.e. avoidance of painful activity); AND

v) Age < 40*; AND

vi) No radiographic evidence of degenerative disease (e.g. posterior glenoid cartilage loss, subchondral glenoid cysts, mucoid degeneration of labrum, narrowing of joint space with posterior humeral head subluxation on axillary x-ray or axial MRI images).

*NOTE: Posterior labral changes are often misinterpreted on MRI as a “tear” in age >40 years old when early glenohumeral degeneration manifests with posterior glenohumeral degeneration.

4) COMBINED TEARS (e.g Anterior/Posterior, SLAP/Anterior, SLAP/Posterior, SLAP/Ant/Post)

Combined tears that require repair are almost always associated with significant recurrent instability. Often tears begin within one area and overtime the failure to repair the original injury causes the tear to extend.

a) Surgical repair of a combination tear may be necessary when ALL of the following criteria are met:

i) Acute Tears

   (1) History of an acute event of instability (subluxation or dislocation); AND
   (2) Acute labral tear on MRI/CT imaging with/without bony bankart fracture not > 25% of glenoid width upon imaging; AND
   (3) Age < 30 (high recurrence rate without repair); AND
   (4) Range of motion not limited by stiffness upon physical exam; AND
   (5) Clinical exam findings demonstrate positive apprehension test and positive relocation test, OR positive labral grind test OR objective laxity with pain; AND
   (6) Minimal to no evidence of degenerative changes on imaging.

ii) Recurrent Tears

   (1) Recurrent instability (subluxation or dislocation) with at least 2 instability events: AND
   (2) Labral tear on MRI AND CT, with/without Bony Bankart fracture not > 25% of glenoid width upon imaging; AND
   (3) Range of motion not limited by stiffness upon physical exam; AND
(4) Clinical exam findings demonstrate positive apprehension test and positive relocation test, or positive labral grind test, or objective laxity with pain; AND
(5) Minimal to no evidence of degenerative changes on imaging.

NOTE: Thermal capsulorrhaphy was previously used to augment unstable shoulders, with and without labral tears. It is no longer considered an accepted procedure for unstable shoulders.

5) Open or Arthroscopic Capsulorrhaphy for Multidirectional Instability of the Shoulder (MDI)
   a) Patient has pain and limited function (ADLs, occupation, or sports); AND
   b) Patient has recurrent instability due to hyperlaxity or mobility and no traumatic dislocation; AND
   c) Physical exam supports repeatable increased glenohumeral joint translation (greater than 2cm of movement during the sulcus test); AND
   d) Imaging (x-ray and MRI) rules out fracture and/or other soft-tissue injury; AND
   e) Failure of 6 months or more of formal physical therapy and activity modifications (i.e. avoidance of painful activity).

IV. LONG HEAD BICEPS (LHB) TENOTOMY/TENODESIS
This is a common source of pain, especially in overhead sports and in the presence of rotator cuff tears (especially subscapularis). It can be an isolated source of pain in chronic tenosynovitis, SLAP tears, or small tears of the biceps sling, resulting in dynamic or static subluxation or dislocation. LHB problems are frequently missed on MRI (especially using contrast which can mask the pathology). The choice of tenodesis versus tenotomy is controversial. Typically, tenodesis is better for more active, muscular individuals performing higher demand activity (labor, sports). Tenotomy is generally a better option for older, less active patients with poor muscle definition, as it generally leaves the patient with a "popeye" deformity and the possibility of biceps cramping or anterior shoulder pain with activity. The choice of tenotomy vs. tenodesis is generally left up to the surgeon/patient.

NOTE: If Subacromial Decompression is to be performed in conjunction with this surgery, see SAD-specific criteria in guidelines to confirm clinical necessity AND SAD must be noted within preoperative notes.

1) Tenotomy or Tenodesis may be necessary when the following criteria are met:
   a) Diagnosis of chronic LHB groove pain from tenosynovitis refractory to conservative treatment OR
   b) Age > 50 with SLAP tear OR
   c) Smoker with SLAP labral tear (regardless of age, more significant with increasing age) OR
   d) Failed SLAP repair OR
   e) SLAP tear in diabetic or patient with loss of motion or predisposition to stiff shoulder OR
f) LHB hypertrophy/tearing/subluxation in association with RCR AND

g) Failed 12 weeks of non-surgical treatment including:

i) Activity modification (eliminating or decreasing pain producing movements) or rest; AND

ii) Oral OR topical anti-inflammatory medicine AND

iii) Intra-articular OR bicipital groove (anesthetic and corticosteroid) injection; AND

iv) Home exercise program OR formal physical therapy for >12 weeks.

2) CONTRAINDICATIONS

a) Less than 12 weeks of non-surgical treatment for isolated LHB tenosynovitis.

b) (Relative Contraindication) Failed bicipital groove injection

c) The indications for tenodesis and tenotomy are the same with the exception that tenodesis is typically better for more active, muscular individuals that are performing higher-demand activities for work or sport. Tenotomy is often preferred in patients that smoke (this is a relative indication of tenotomy over tenodesis) due to healing problems in tenodesis.

V. SYNOVECTOMY

Synovitis is common in many shoulder conditions and typically resolves when the primary pathology is treated. Most commonly, this includes loose bodies, inflammatory arthritis or degenerative arthritis, labral tears and adhesive capsulitis. Primary synovial diseases include pigmented villonodular synovitis, synovial chondromatosis, rheumatoid arthritis, other inflammatory arthritides, traumatic synovial hypertrophy or metaplasia.

Synovecetomy as an isolated procedure is usually reserved for primary synovial disease or in cases where secondary hypertrophic synovitis is documented during arthroscopy (these include adhesive capsulitis, osteoarthritis, chronic rotator cuff tear). These should be evident on arthroscopic photographs taken at surgery but may be missed on preoperative images.

NOTE: If Subacromial Decompression is to be performed in conjunction with this surgery, see SAD-specific criteria in guidelines to confirm clinical necessity AND SAD must be noted within preoperative notes.

VI. LYSIS OF ADHESIONS; CAPSULOTOMY

Adhesive capsulitis is a thickening and tightening of the soft tissue capsule that surrounds the glenohumeral joint. Adhesive capsulitis begins with a gradual onset of pain and limitation of shoulder motion, patient discomfort and loss of movement progress to interfere with activities of daily living. Primary adhesive capsulitis is the subject of much debate as the specific causes of this condition are not fully understood. Patients with uncontrolled diabetes have a significantly higher risk of developing adhesive capsulitis than the general population. Secondary (acquired) adhesive capsulitis develops from a known cause, such as stiffness following a
shoulder injury, surgery, or a prolonged period of immobilization. Adhesive capsulitis may last from one to three years if untreated.

a) Patient has pain, loss of motion, and limited function (ADLs, occupation, or sports); AND
b) Physical exam evaluating range of motion and patient comorbidities (diabetes); AND
c) Failure of 12 weeks of non-operative treatment*; AND
d) Imaging (x-ray and/or MRI) may be used to identify other underlying problems.

e) *Nonsurgical treatment must include physical therapy or properly instructed home exercise program; AND
   i) Rest or activity modification; OR
   ii) Oral or topical NSAIDs (if not medically contraindicated)

VII. SUBACROMIAL DECOMPRESSION (SAD)
Acromioplasty involves removing bone from the undersurface of the acromion to change a type 3 acromion to a type 1 acromion. Although debated for decades, current evidence concludes that there is no role for isolated acromioplasty (subacromial decompression), which prompted conversion of CPT code 29826 (acromioplasty, subacromial decompression) from an index, primary, "stand-alone" code to an "add-on" code only.

1) **Subacromial decompression may be necessary in conjunction with other shoulder procedures when ALL of the following criteria are met:**
   a) Radiographic (x-ray) evidence of mechanical outlet impingement as evidenced by a Bigliani type 3 morphology*; AND
   b) Must be performed at the same time as capsulorrhaphy, repair of SLAP lesion, removal of loose body, synovectomy (partial or complete), debridement (limited or excessive), distal claviclecurectomy, lysis and resection of adhesions, rotator cuff repair, or biceps tenodesis.

   c) *There are 3 types of acromion anatomy according to Bigliani classification:
      i) Type 1, flat, 20%
      ii) Type 2, curved, 40%
      iii) Type 3, hooked, 40%

   NOTE: If decompression is requested and performed as part of rotator cuff repair patient must have documented type 3 acromial morphology on supraspinatus outlet or scapular-Y x-ray. Please see rotator cuff repair indications.

2) **CONTRAINDICATIONS:**
a) Type 1 or Type 2 or a thinned acromion. Subacromial bursectomy may be a reasonable option.
b) If patient has received an injection in the subacromial space and there is failure to adequately respond—significant relief (>50%) for minimum of 1 week—to injection in the subacromial space (pain should respond temporarily if impingement).
c) Prior subacromial decompression with either a Type 1 or a thinned acromion or no evidence of overhang on x-ray (unnecessary revision can thin the acromion and lead to deltoid avulsion and/or acromial fracture)
d) Open SAD procedures should rarely be performed given the increased morbidity due to deltoid disruption.
VIII. ADDITIONAL INFORMATION

1) ARTHROSCOPIC vs. OPEN
Most shoulder procedures can be performed open or arthroscopic. The method is simply the “tool” used to perform a given surgical procedure. However, arthroscopic surgery often leads to more rapid recovery with less pain, fewer complications (e.g. loss of motion, infection) and more rapid restoration of function. This is only true if the user of the “tool” (surgeon) is skilled in this discipline. Arthroscopic surgery is technically more difficult, requiring more complex 3-D spatial skills, hand-eye coordination, 3-D interpretation of 2-D imaging and advanced training and higher volume to become proficient. Thus, in unskilled hands, arthroscopic surgery can lead to INCREASED morbidity relative to the open form of the same procedure. Studies have demonstrated that higher volume, specialty trained surgeons have better outcomes, shorter operative times, faster patient recovery and decreased costs.

The indications for most shoulder surgery is identical for open and arthroscopic techniques and the preferred method of surgery should be left to the surgeon, given their comfort with the specific procedure.

2) IMAGING
Nearly all shoulder problems can be diagnosed with adequate history/physical exam AND proper plain radiographic series (typically 3 views - AP, scapular Y, axillary).

Advanced imaging should only be considered when evaluating for a SUSPECTED surgical problem determined from the above. It should not be used to “search” for pathology as MRI and CT (with or without arthrogram) scans often demonstrate asymptomatic abnormalities that are present with increasing frequency with advancing age.

MRI may over-estimate clinically important pathology in many cases yet can miss other treatable conditions and is very dependent on the imaging center and the physician reading the study. Highly trained, high volume Orthopedic shoulder surgeons may interpret studies more accurately than radiologists given their ability to correlate history and physical exam findings with prior experience in surgery when pathology can be confirmed and compared to imaging.

3) ROTATOR CUFF REPAIR
The rotator cuff (RC) is a highly complex 5 layered structure that envelops the humerus. It is made up of the inter-woven fibers of 4 muscle-tendon units and serves to maintain proper humeral head positioning on the glenoid during shoulder motion. Tears (RCT) can occur within the tendon substance, on the bursal side, articular side, or a combination of these.
Most tears begin within the tendon substance at the attachment of the supraspinatus in the critical zone behind the biceps tendon. It can then extend anteriorly, posteriorly and/or medially. It can include the fibers of the biceps sling, which maintains stability of the long head of the biceps. The latter is often missed on MRI. If left untreated, RCT tend to progress over time as the intrinsic healing ability is low. Most RCTs are degenerative and the chance of having a full thickness ASYMPTOMATIC RCT on MRI is approximately 10% per decade of life (e.g. 50% at age 50). They are the result of normal shoulder use with micro-tearing that ultimately leads to a larger tear. They can also occur in younger patients involved with repetitive overhead activity and tension overload sports (e.g. throwing, tennis). The latter tears are pathologically different and usually start on the articular side and often in conjunction with labral tears. They are also more complex to treat.

4) **LABRAL TEARS**:
The labrum is a circumferential (or nearly) fibrocartilage surrounding the glenoid. It is a complex structure but simplistically serves to provide stability to the shoulder through a variety of methods (e.g. deepens the glenoid fossa, acts as a bumper, attachment point for stabilizing capsular ligaments and long head biceps tendon). Fibers blend with the articular cartilage of the glenoid rim so that there is a smooth transition to the joint surface.

With age and degeneration, the articular cartilage thins and the labrum hypertrophies giving the appearance on MRI of a “tear”. These can be misinterpreted by some and lead to repairs of normal labral tissue and subsequently, a stiff painful shoulder. In addition, the anterior-superior labrum (from 1 to 3 o’clock for a right shoulder) has a many normal variations that can be misinterpreted as a tear including sublabral hole, Buford complex and a loose attachment.

To understand which findings on MRI (or other advanced imaging) are pathologic versus normal “variants” or age-appropriate changes, one needs to understand the function of the labrum, normal ranges and clinical importance of each region. This is critical to determine which tears require repair.

There are 3 clinically important regions to the labrum which can tear: superior labrum (superior labrum anterior posterior) or SLAP tear (10-2 o’clock for right shoulder), anterior-inferior labrum (Bankart tear, 3-6 o’clock) and posterior labrum (Posterior Bankart, Kim Lesion, 6 to 10 o’clock). Both anterior and posterior tears can connect via an inferior tear. In addition, any combination of tears can occur. A complete circumferential tear is typically called a triple labral tear.

Advanced imaging is very sensitive to labral abnormalities but is center dependent. In addition, interpretation of the clinical significance of labral abnormalities has been shown to be more accurate when determined by highly trained Orthopedic shoulder specialists when compared to radiologists. The latter tend to There is a tendency to over read over-read normal degenerative
changes and variations as “tears” which may lead to over-utilization of surgery by those surgeons who rely on imaging reports alone or do not have expertise in MRI interpretation.

Clinically relevant triple labral tears (i.e. circumferential 360° tears) may be associated with gross recurrent instability. Circumferential tears without instability are more often degenerative and should be debrided if painful but not repaired.

- Note that all degenerative shoulders will have thinning of the articular cartilage on the periphery of the glenoid and hypertrophy of the labrum, which is typically interpreted on MRI by the radiologist as a “tear”. This can lead to inappropriate repair and worsening clinical symptoms of pain and loss of motion. The posterior aspect of the joint is affected earliest and most severely.
- Injections are usually not indicated for labral tears but maybe indicated for degenerative shoulders.
IX. REFERENCES


10) Harris JD, Frank JM, Jordan MA, Bush-Joseph CA, Romeo AA, Gupta AK. Et al. Return to sport following shoulder surgery in the elite pitcher: a systematic


