Post-Operative Management of Rotator Cuff Repair

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Objectives:

- Differentiate between different types of rotator cuff repairs
- Explain post op precautions for rotator cuff repairs
- Describe current trends in the management of post operative rotator cuff repairs
- Identify a variety of practical interventions for post operative rotator cuff repairs
- Strengthen your clinical skills with treatment techniques designed for a range of patients with rotator cuff repairs

Types of Tear/Repair: Scope of presentation

This Presentation will cover:

- Arthroscopic repairs
- Small/Medium repairs
- Large/Massive Repairs
- Bicep tenotomy and tenodesis

Not Addressed in this presentation:

- Superior capsule Reconstruction
- Total shoulder arthroplasty with Rotator Cuff (RC) involvement
- RC tear involving the labrum

Classifying a RC Tear

- A clear global classification system does not currently exist
- Surgeons will identify RC Tears by depth of tear, length of tear, where it occurs in relationship to the humeral head, and what tendons were involved.

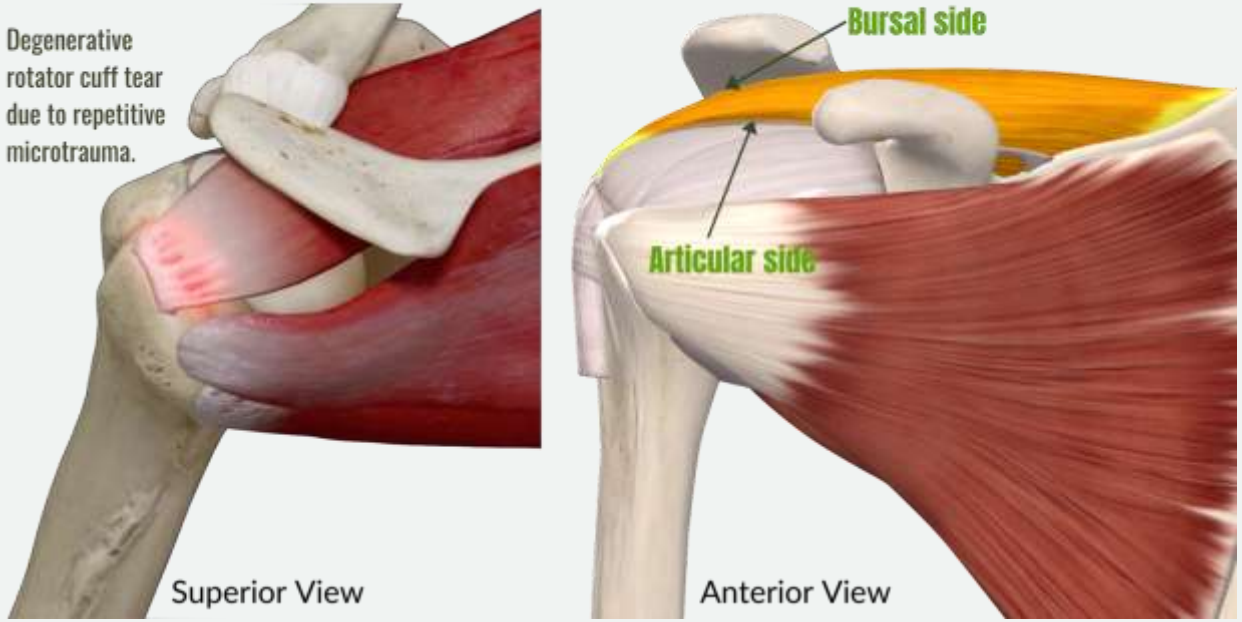
Partial-thickness Tear (Incomplete)

- Grade 1
  - <3mm in depth
- Grade 2
  - 3mm-6mm in depth
- Grade 3
  - >6 mm (affecting >50% of the tendon thickness

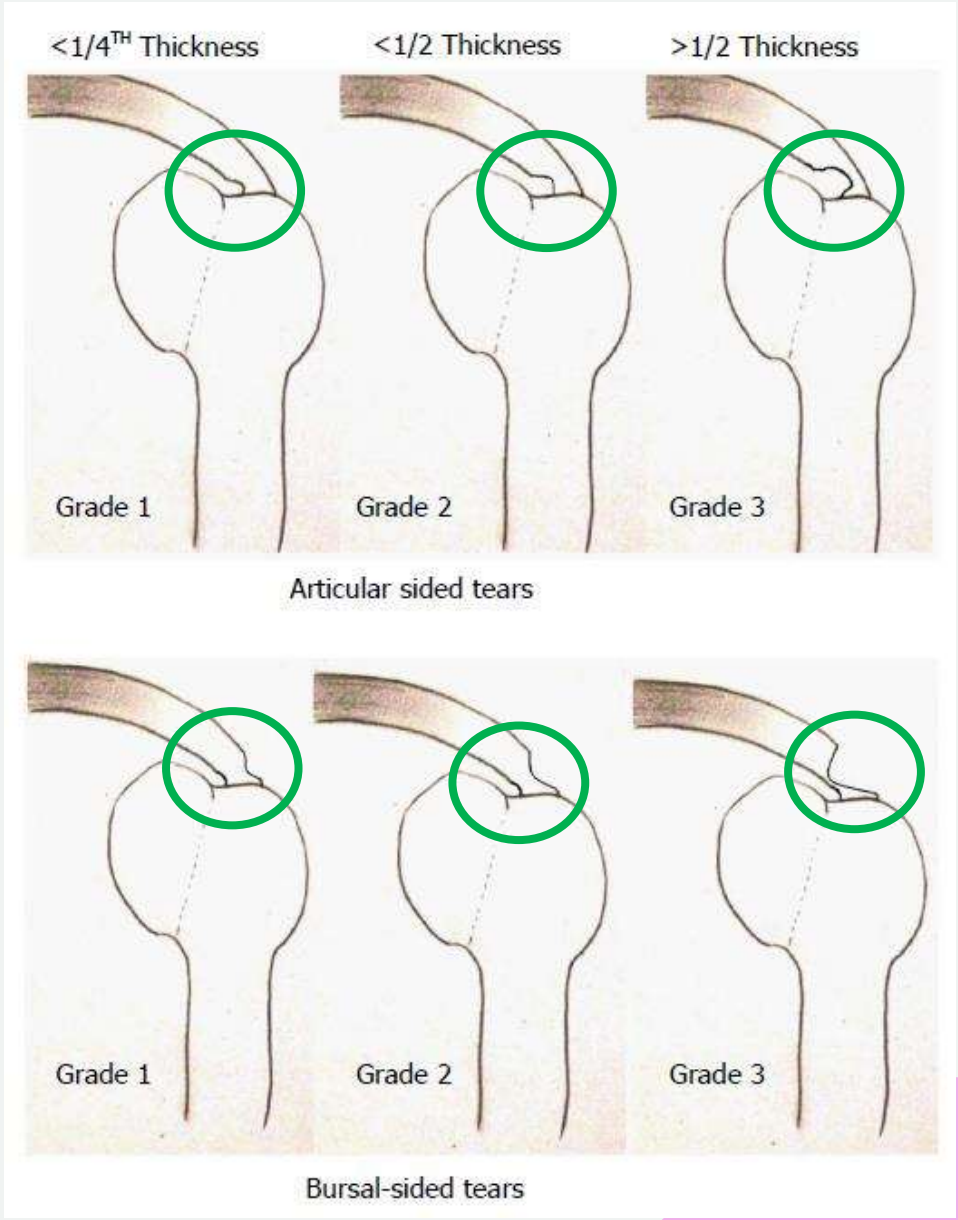
Snyder Classification for Partial Rotator Cuff Tears	
Location of Tear	
A	Articular Surface
B	Bursal Surface
Severity of Tear	
0	Normal cuff with smooth coverings of synovium and bursa
I	Minimal superficial irritation or slight capsular fraying in a small, localized area; typically <1 cm
II	Fraying and failure of some muscular fibers in addition to synovial, bursal, or capsular injury; typically 1-2 cm
III	More severe rotator cuff injury, with fraying and fragmentation of tendon fibers, often involving entire surface of cuff tendon; typically 2-3cm
IV	Significantly severe partial rotator cuff tear usually with the presence of a flap tear in addition to fraying and fragmentation of tendon tissue and often including more than a single tendon; usually >4cm

Parikh S. S., Delavaux L., Wolbert J. Rotator Cuff Shoulder Tendon and Muscle Injuries. Musculoskeletal Medicine. 2013, Sep.

Partial RC Tear



https://www.movebetterhp.com/rotator-cuff-tears/

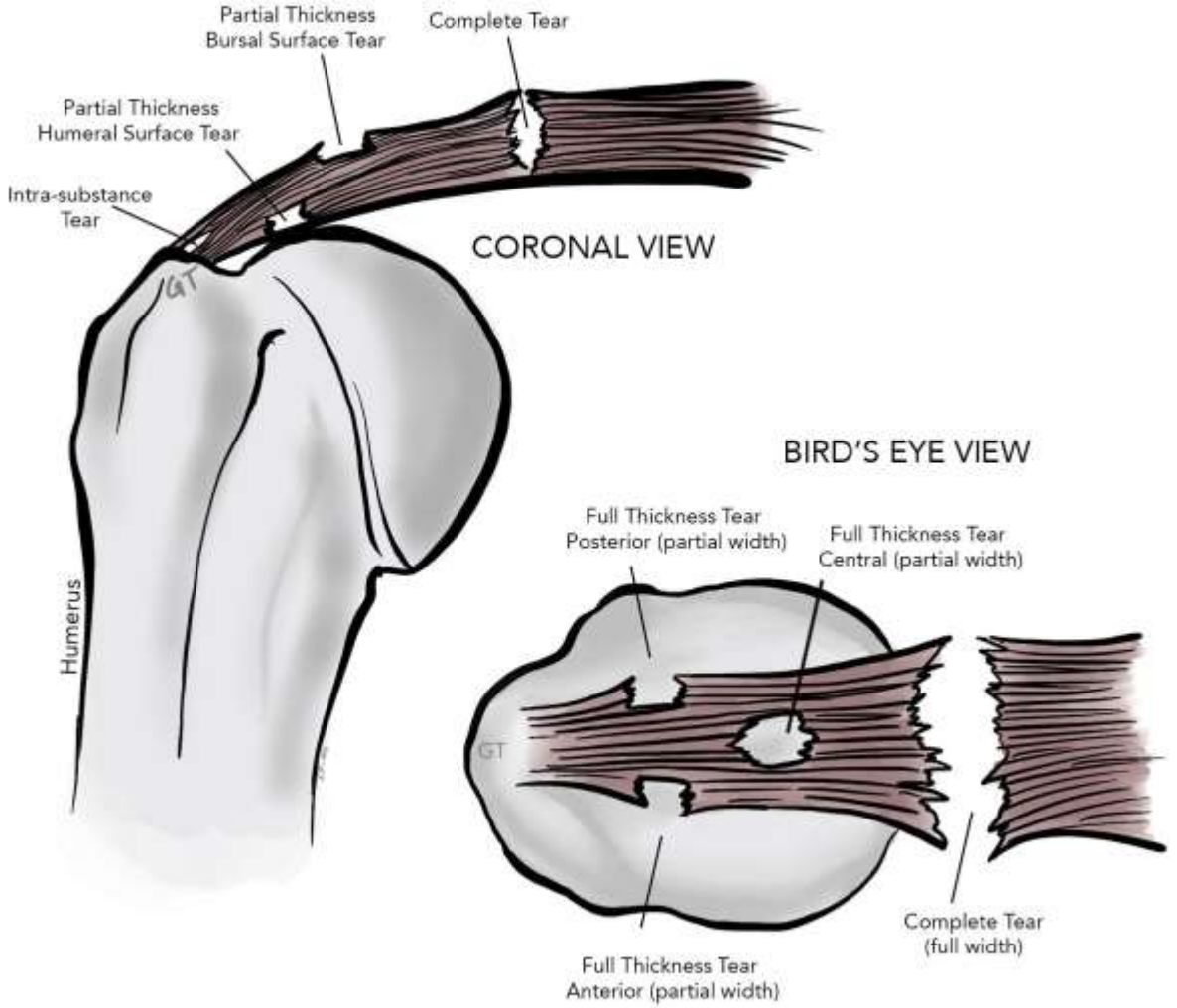


Sambandam SN, Khanna V, Gul A, et al. Rotator cuff tears: An evidence based approach. World Journal of Orthopeadics. 2015 Dec; 6(11):902-918.

Types of Rotator cuff tears cont.

Full-thickness Tear

- **Small**
  - **0 cm – 1 cm**
- **Medium**
  - **1 cm – 3 cm**
- **Large**
  - **3 cm – 5 cm**
- **Massive**
  - **>5 cm**



Rotator Cuff Shoulder Tendon and Muscle Injuries

Author(s): Sagar S. Parikh, MD, Laurent Delavaux, MD, Jonathan Wolbert, DO

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Systematic Review of Proposed Rehab Guidelines following RC repair

- Debate exists within the research and medical communities regarding early motion v. delayed motion protocols.
  - Based on current evidence, there is no consensus regarding which approach is best

- Early motion protocols may produce short term benefits in pain as well as shoulder stiffness but no difference in motion at one year.[9]

Systematic Review of Proposed Standardized Rehabilitation Guidelines Following RC repair

- Research generally agrees on the following points:
  - Large/massive repairs benefit from a less-aggressive program overall as there is a known risk of re-tear with larger tear sizes[12]
  - Small/medium tears in general benefit from a more-aggressive program and earlier mobilization[3]
  - Early passive motion protocols should progress slowly and within patient tolerance to avoid delay of tendon healing, gap formation of the repair, repair site failure at 1 year post op[3]

Research points continued:

- Research has proven that age has a significant impact on tendon healing and overall long-term success of RC repair. **Patients over the age of 55-60** have a greater risk of repair failure at 3-6 months post repair.[10]
  - Delay initiation of ROM
  - Slow the pacing of progression once ROM is initiated
  - Delay overhead and full-strength programs until at least 16 weeks

Post operative considerations:

Check the operative report and/or dialogue with your surgeon to determine:

- location of tear and tendons involved
- Tissue quality
- surgical approach
- repair confidence
- bicep tenodesis/tenotomy performed?
- subacromial decompression and/or clavicle excision

Post operative considerations:

Take into consideration:

- Patient age at time of the repair
- ROM along with general shoulder function prior to repair
- Underlying conditions
  - diabetes mellitus
  - bone density

American Society of Shoulder and Elbow Therapists (ASSET)

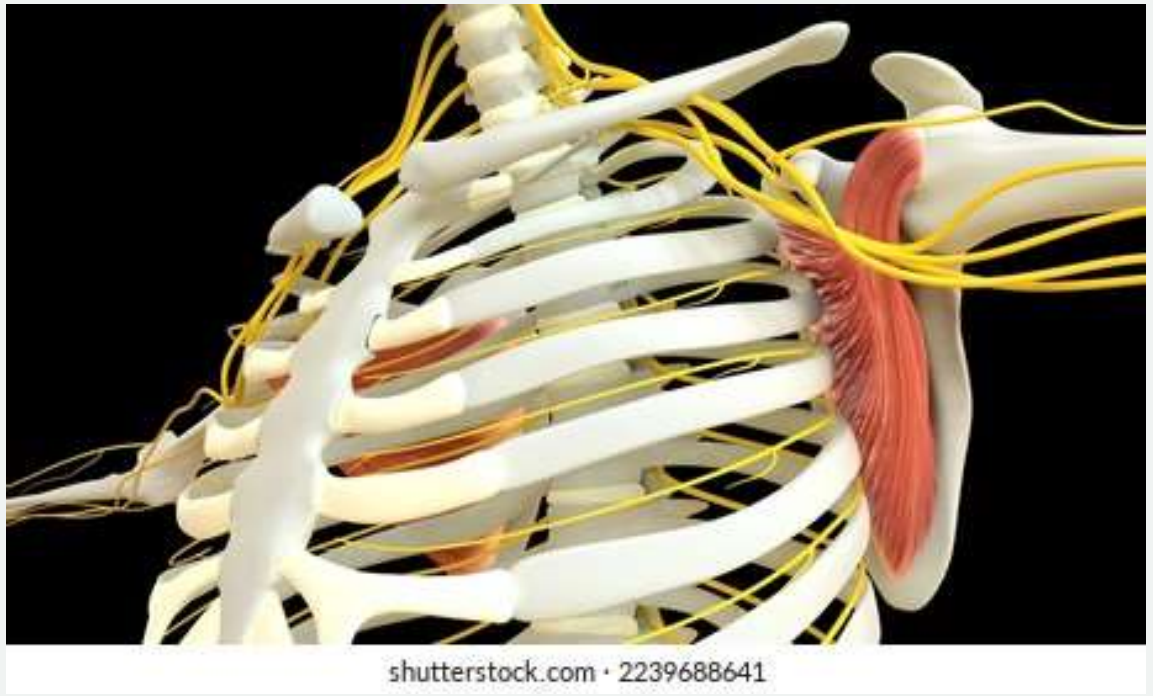
- The American Society of Shoulder and Elbow Therapists (ASSET) released a consensus statement to aid in clinical decision-making during post op rehabilitation of patients with arthroscopic RC repair.
- Opinions in this statement are based on available scientific evidence at the time along with expert opinion
- Article published in 2015
- The statement is the first of its kind developed by a multidisciplinary team

Thigpen CA, Shaffer MA, Gaunt BW, et al. The American society of shoulder and elbow therapists' consensus statement on rehabilitation following arthroscopic rotator cuff repair. J Shoulder Elbow Surg. 2016;25:521-535.

Subscapularis

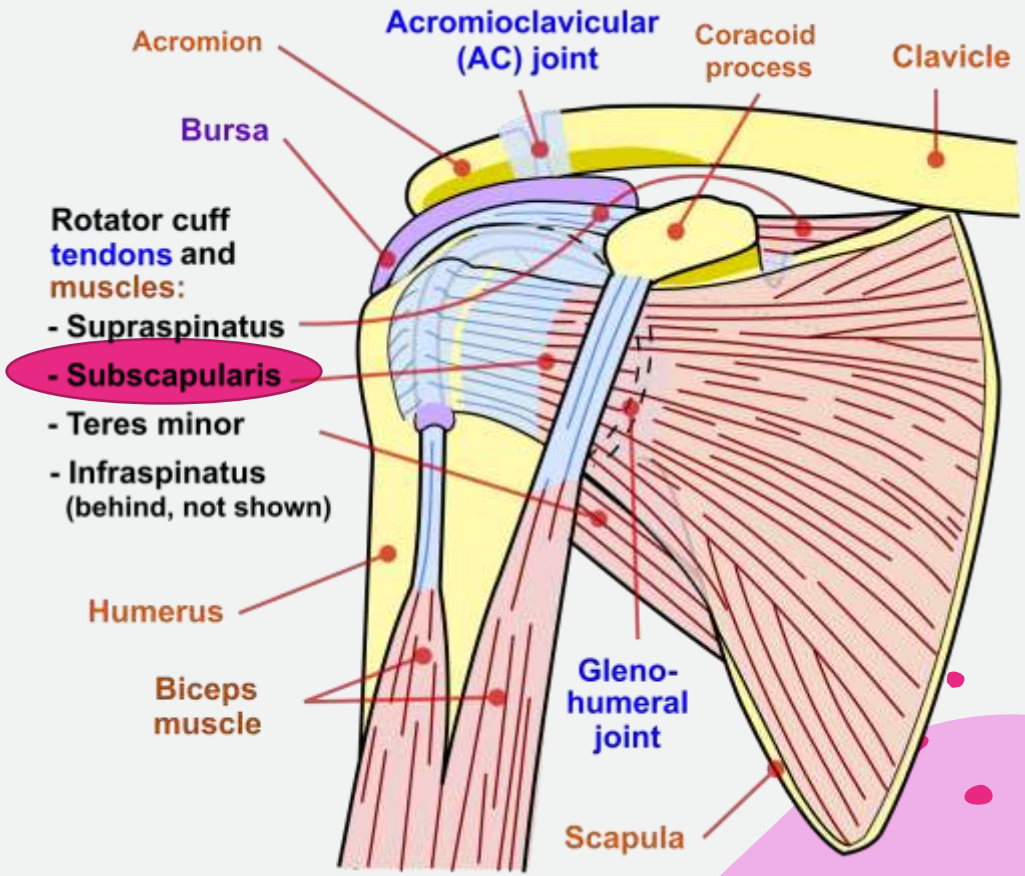
Frequency is approximately 30% of total RC tear/repairs seen clinically[15]

Origin: scapular fossa
Insertion: Lesser tubercle of the humerus
Action: humeral internal rotation



Considerations for repair of the subscapularis

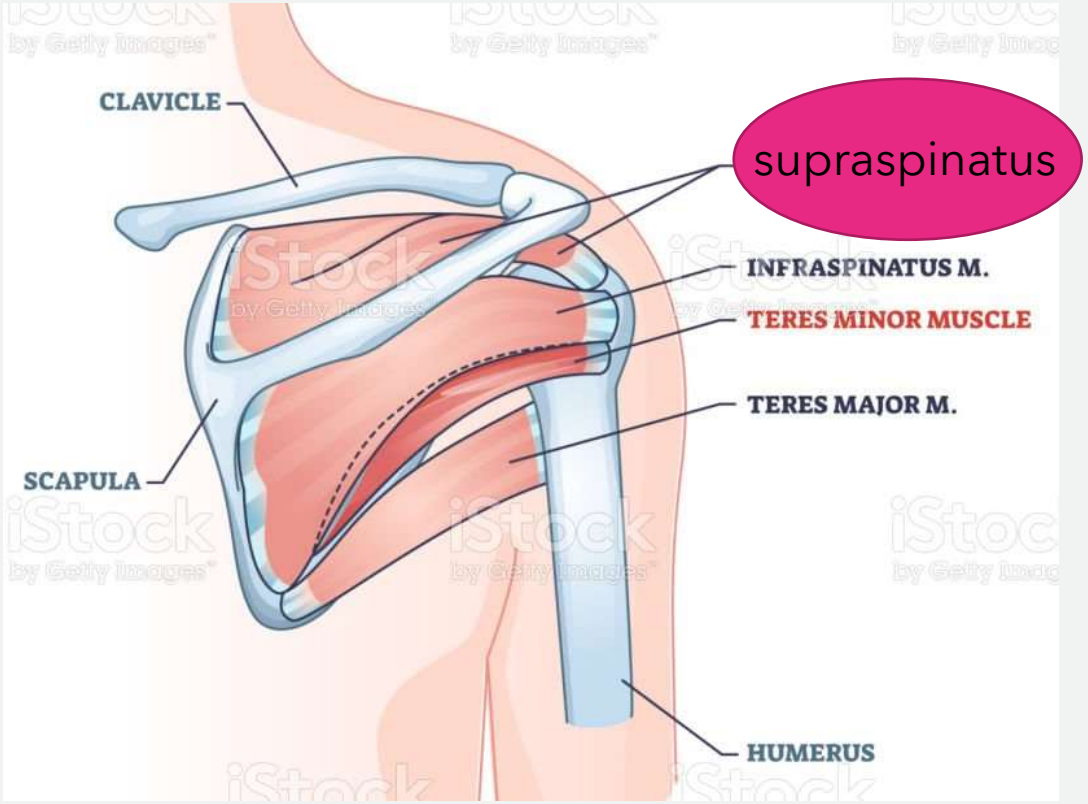
- No external rotation (ER) or limited ER to 10 degrees for 4-6 weeks post op
- ROM initiation and progression varies from supraspinatus/infraspinatus tears
- Perform gradual progression of motion with focus on protecting the anterior capsule
- Avoid resistive internal rotation until 8 weeks post op



Supraspinatus

Most commonly torn RC muscle[15]

Origin: supraspinous fossa
Insertion: greater tubercle of humerus
Action: Abduction of the arm and stabilization of the humeral head in the glenoid cavity



Infraspinatus

Commonly occurs concomitantly with a supraspinatus tear

Origin: Infraspinous process
Insertion: Greater tubercle of humerus
Action: arm external rotation, stabilizes the humeral head in glenoid cavity

The Bicep

Bicep tenotomy

- simple procedure
- may produce visible deformity
- subjective cramping or loss of supination strength

Bicep tenodesis

- no active bicep motion for 4 weeks after surgery. Some surgeons allow active elbow motion but no resistance for 4 weeks
- no bicep-related strengthening for 8 weeks postoperatively
- Tenodesis involves a longer recovery, but it has been hypothesized to achieve better outcomes in active patients[2]

Therapy goals following RC repair

- Pain relief
- Regain functional shoulder ROM (discouraging compensatory motion)
- Regain functional strength in the RC and scapular stabilizer muscles
- Return to optimal functional activity with confidence
- Establish independence in self management and performance of home program while following restrictions

Post op phase: Immobilization

Small/medium:

- Immobilization recommendations range 0-14 days post operatively (Only a minority of protocols reviewed (9.1%) recommended strict immobilization)[1,4]
- ASSET recommends strict postoperative immobilization for 2 weeks[14]

Large/massive:

- Immobilization recommendations range 7 days-6 weeks[1,4]
- ASSET recommends strict immobilization for 6 weeks[14]
- Majority of protocols reviewed allow Pendulum exercise as early as 1-2 weeks **(should not typically be initiated until you begin PROM phase)**

Exercises and interventions during immobilization phase:

- Education in Hemi-technique for activities of daily living (ADL)
- Educating the patient in Precautions and restrictions
- Cervical ROM, stretching of tight upper trapezius (UT), levator, and scalenes
- 1st rib mobilization
- Thoracic extension
- Pain management
- Sleeping positions
- Modalities
- Scar maturation and management
- Wrist, hand, and elbow ROM
- Address soft tissue restrictions

Sling wear

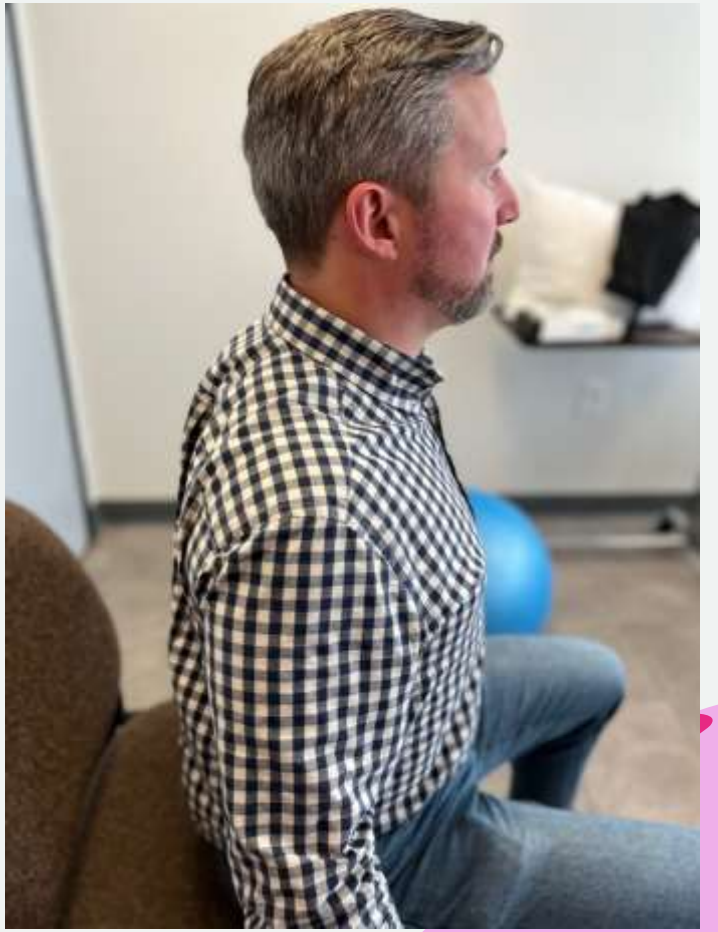
- Position of the arm on the ventral side of the trunk preventing shoulder extension
- Goal to allow protection during tendon healing
- Wrist and hand should be secured within the sling/immobilizer

Sleeping positions

- The first 2-4 weeks post operatively will be in a recliner or propped up in bed
- When transitioning back to bed suggest pillows or towel for support behind the elbow and under the arm to prevent shoulder extension

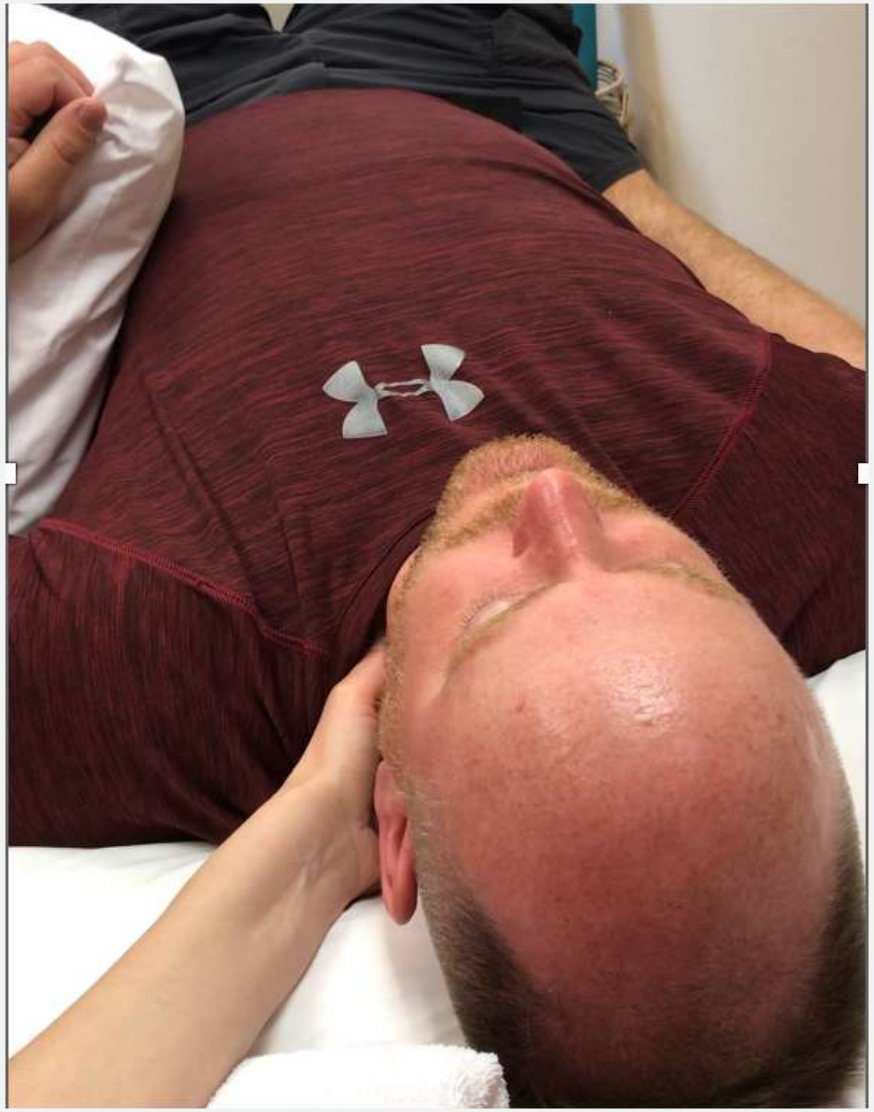
Addressing Posture:

Exercises: (1) Chin Tuck (2) Scap squeeze (3) Thoracic extension



1st Rib mobilization

- First rib elevation can be elevated following RC repair
- Addressing first rib elevation promotes improved shoulder elevation with decreased pain



Home exercise program:

- Shoulder shrugs
- Scapular squeezes
- Cervical AROM
- Thoracic extension
- Wrist, hand, and elbow motion
- Relaxation exercises/techniques
- Modalities – education in use and application

Phase I/mobilization: PROM

Large/massive tear:

- Beginning as early as 1 week-6 weeks[1,4]
- ASSET recommends beginning at 6 weeks[14]
- PROM progression recommendations vary widely amongst researched protocols
- Protocols reviewed reports a wide range in end of phase I and beginning of phase II (as early as 6 weeks and as late as 16 weeks post op)[1,4]

****subscapularis repair differs beginning at this phase**

Phase I/mobilization: PROM

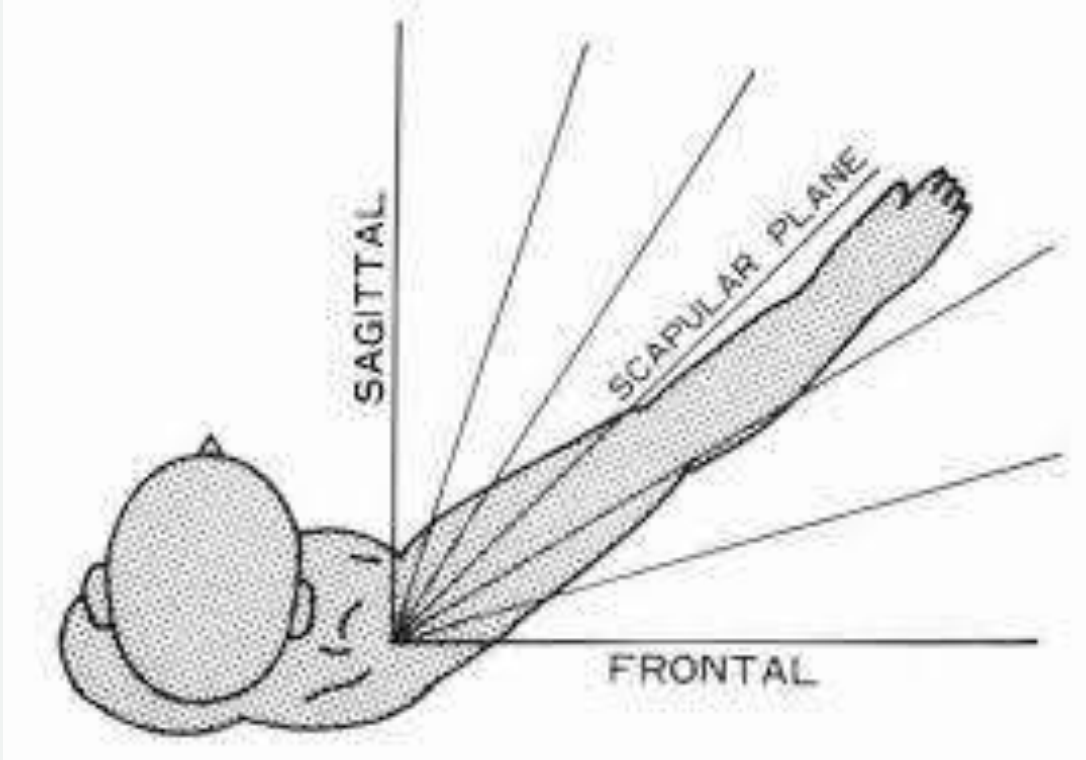
Small/medium tear:

- Beginning as early as day 3-week 2[1,4]
- ASSET recommends beginning at week 2[14]
- PROM progression recommendations vary widely amongst researched protocols[4]
- Protocols vary on how long this phase lasts with some protocols beginning phase II as early as 2 weeks post op and as late as 10 weeks post op[1,4]

Sample PROM progression for small/medium repairs

PROM to not exceed:

PROM	2 weeks	2-4 weeks	4-6 weeks
Scaption	90°	100°	120°
Flexion	80°	90°	110°
Abduction	0-50°	0-70°	0-90°
ER in scapular plane	30°	40°	60°
ER at 60 abduction	None	30°	60°
ER at 90 abduction	None	None	None
IR in scapular plane	To chest	To chest	30°
IR at 90 abduction	None	None	None
Extension	0°	0°	30°



Sample PROM progression for large/massive repairs

PROM to not exceed:

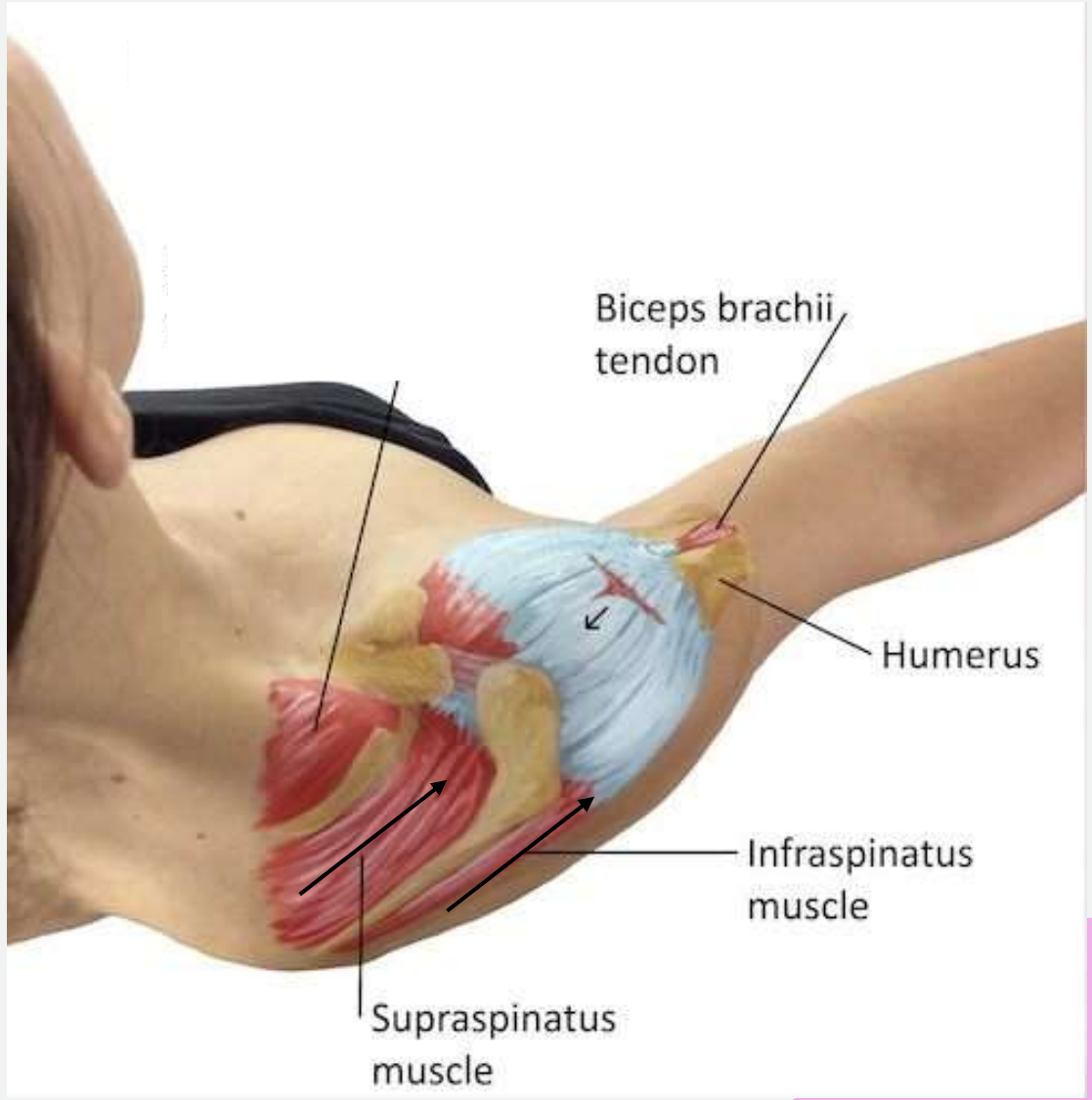
PROM	2 weeks	2-5 weeks	5-8 weeks
Scaption	80°	90°	120°
Flexion	70°	80°	100°
Abduction	0-45°	0-60°	0-75°
ER in scapular plane	20°	40°	50°
ER at 60 abduction	none	20°	40°
ER at 90 abduction	none	none	None
IR in scapular plane	to chest	To chest	20°
IR at 90 abduction	none	none	None
Extension	0°	0°	0°

- Avoid stretching**
- Work within patient tolerance
- These are ranges to aim for not exceed
- Cue patient to what you will be doing before you start motion

Positioning during PROM

Positioning of the shoulder in the scapular plane allows for decreased stress on the RC tendons during ROM.

Most stressful position is rotational forces with the shoulder at 90 degrees abduction



Patient positioning

Supine ER PROM

PROM should be gentle with oscillations not end range stretching

Use a variety of hand positions and body positions depending on patient comfort

Use verbal and tactile cues to inhibit guarding, promote relaxation, and facilitate GH joint motion

PROM ER in side-lying position

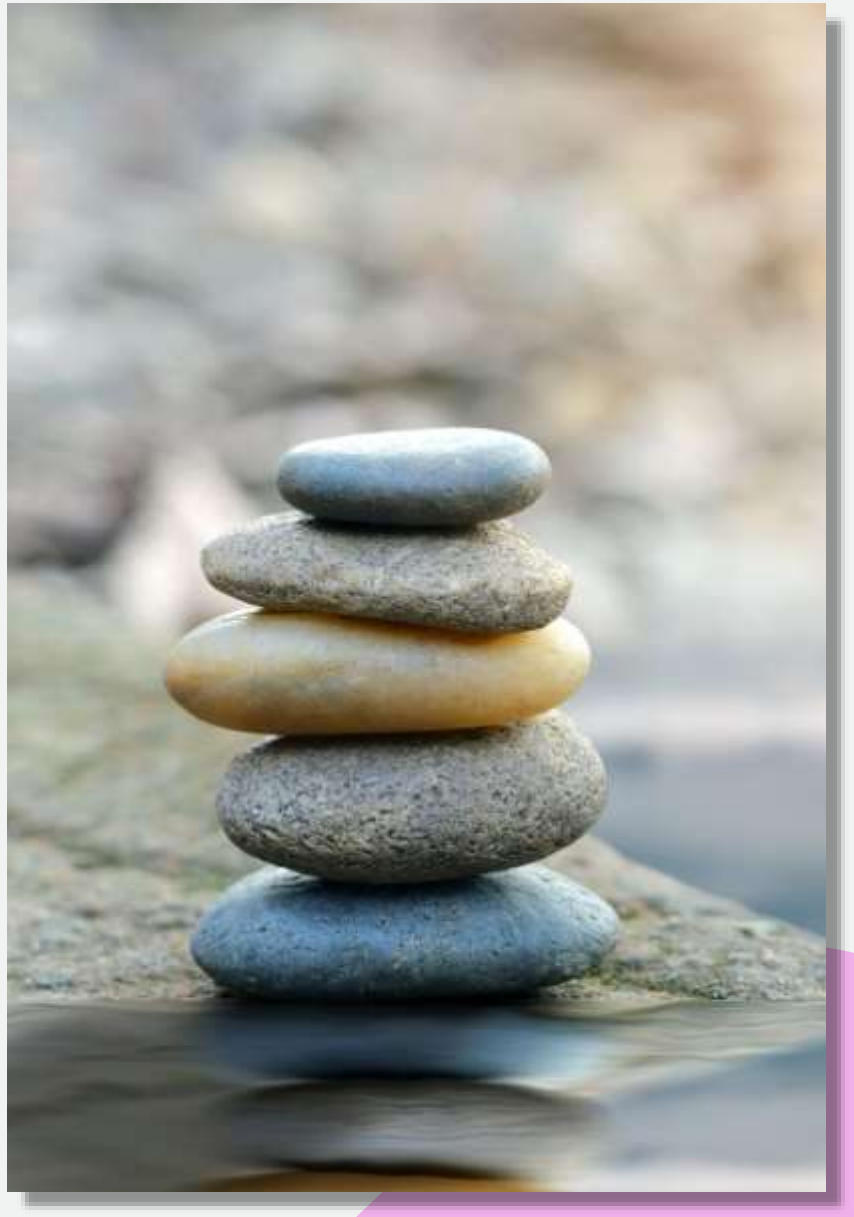
PROM ER in supine (alternate position)

PROM: Scaption in supine

PROM: Flexion in side-lying position

Benefits of utilizing Relaxation techniques

- Helps modulate the perception and interpretation of painful stimuli[17]
- Gives the patient an increased sense of control[17]
- Has been proven to decrease opioid use in the first two weeks post operatively[17]
- Cue patient in deep breathing techniques
- Get creative: smart watch for biofeedback, modulate lighting, aromatherapy if appropriate to create calming environment based on patient's anxiety and pain level

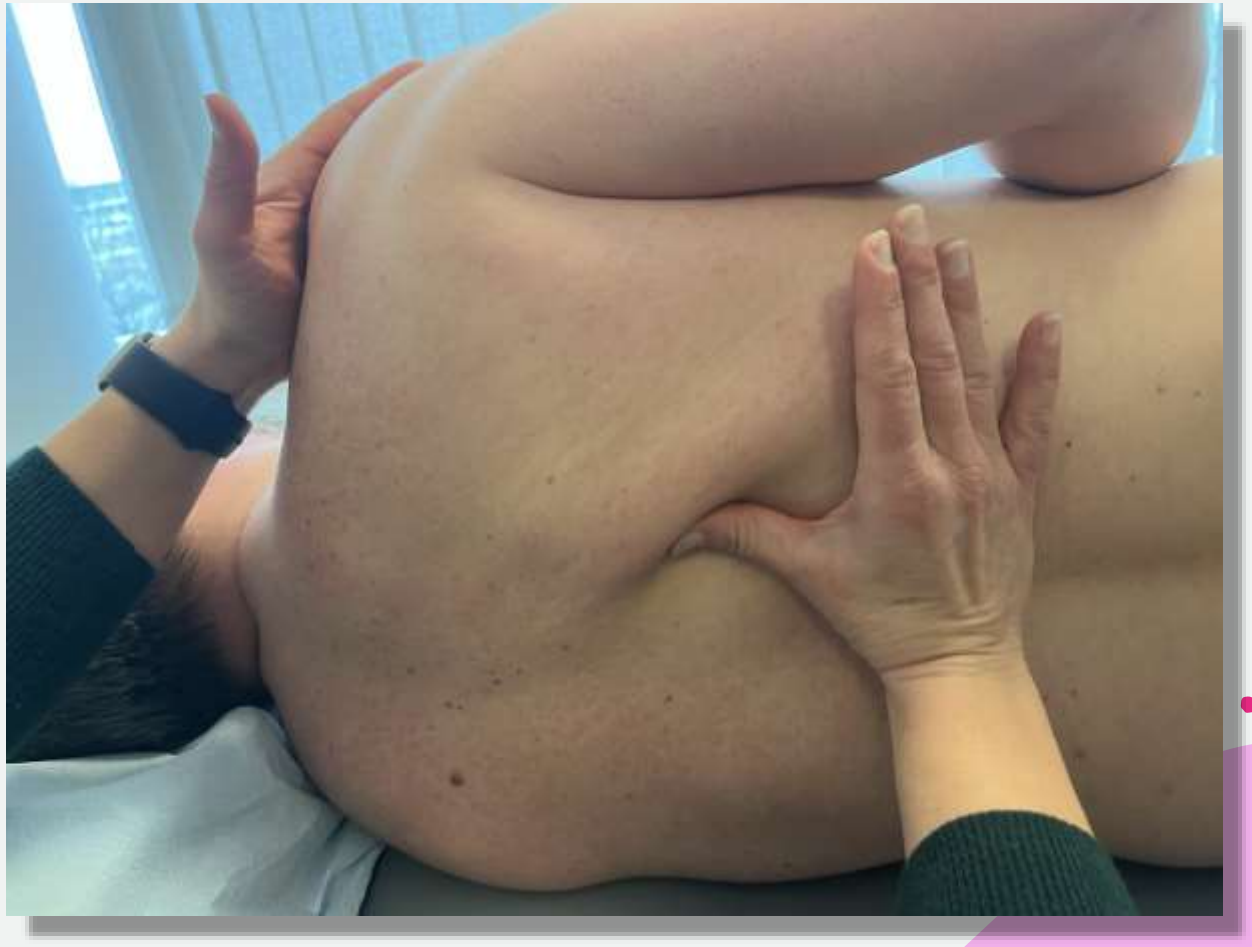


Scapular mobilization

- Addressing the scapula is important from day one
- Good motion starts with a good foundation in understanding of scapular stability

Addressing the scapula cont.

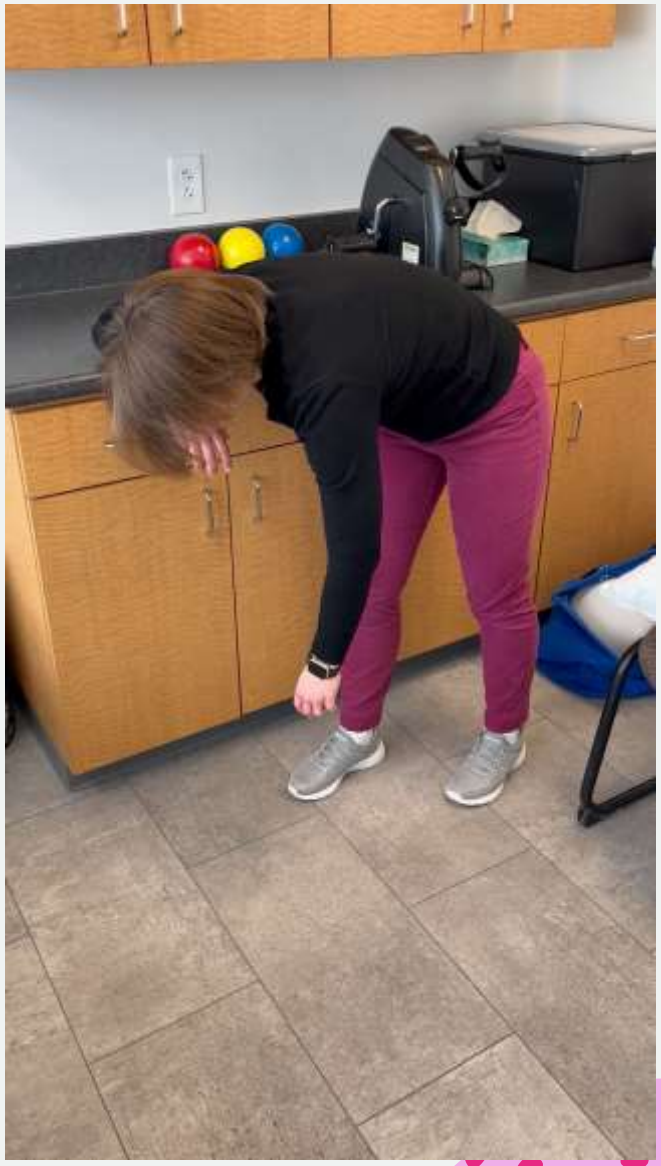
- Scapular mobilization with patient in side-lying
- Place and hold scapula submaximal isometrics: adduction and depression
  - increases scapular awareness
  - Foundational for AAROM and AROM



Scapular Adduction isometric

- Scapular place and hold with submaximal isometric contraction

- Cue patient that the shoulder isn't moving the arm. The trunk/hip motion is allowing the arm to move.
- Pendulum should be avoided in subscapular repairs[2]
- Pendulum vs. Rock the Baby[2]



Rock The Baby

Pendulum/Codman

Patient directed PROM

- Patient directed PROM is a good option for patients who have increased guarding and anxiety with therapist PROM
- A good addition to home program for the patient experiencing increased pain and shoulder stiffness

Gentle patient-guided shoulder oscillations - flexion

Table slide

Cue patient to:

- relax the operated upper extremity
- Direct motion with the opposite arm
- Allow trunk forward flexion to slide arm forward

Phase II/Intermediate: AAROM to AROM

Small/medium repair protocols

- Protocols report beginning as early as 2 weeks and as late as 10 weeks[1,4]
- Protocols that do differentiate AAROM and AROM recommend no AROM before week 8[4]

Large/massive repair protocols

- Protocols report beginning as early as 6 weeks and as late as 16 weeks[1,4]
- Protocols that differentiate AAROM and AROM recommend no AROM before week 10[4]

Phase II/Intermediate: AAROM to AROM

- Protocols on average progress this phase much more aggressively than ASSET recommends[14]
- Surgeons determine AA/AROM **initiation** however its up to the therapist to determine ROM **progression.** [4]
- Goal of returning to full ROM at 3-4 months[9,1,4,6]
- This phase is the most debated amongst research as to when to begin, how to progress, and what exercises to include[4]
- Significant pain/muscle guarding may slow the progression of this phase. Important not to force ROM progression but work within patient tolerance[16]

Intermediate phase (AAROM to AROM)

AAROM: begin low and slow. Repetitions starting at 3 and building up to 15

AROM: beginning in gravity decreased plane and progressing to against gravity with focus on mechanics and scapular stability.

Monitor and correct substitution patterns

Dowel exercises

Chest press to 90°

Progression: stance dowel work

Progress to dowel work into overhead ranges. Motion should lead with the thumb to provide some ER of the humerus and minimize impingement symptoms

Variety with Dowel assisted exercises

Seated dowel ER

Supported incline sit dowel scaption. Leading with thumb into overhead

Phase II cont.

- Monitor scapula during AAROM
- Provide tactile and verbal cues as necessary to correct scapulohumeral rhythm

Ball roll on wall: assisted flexion

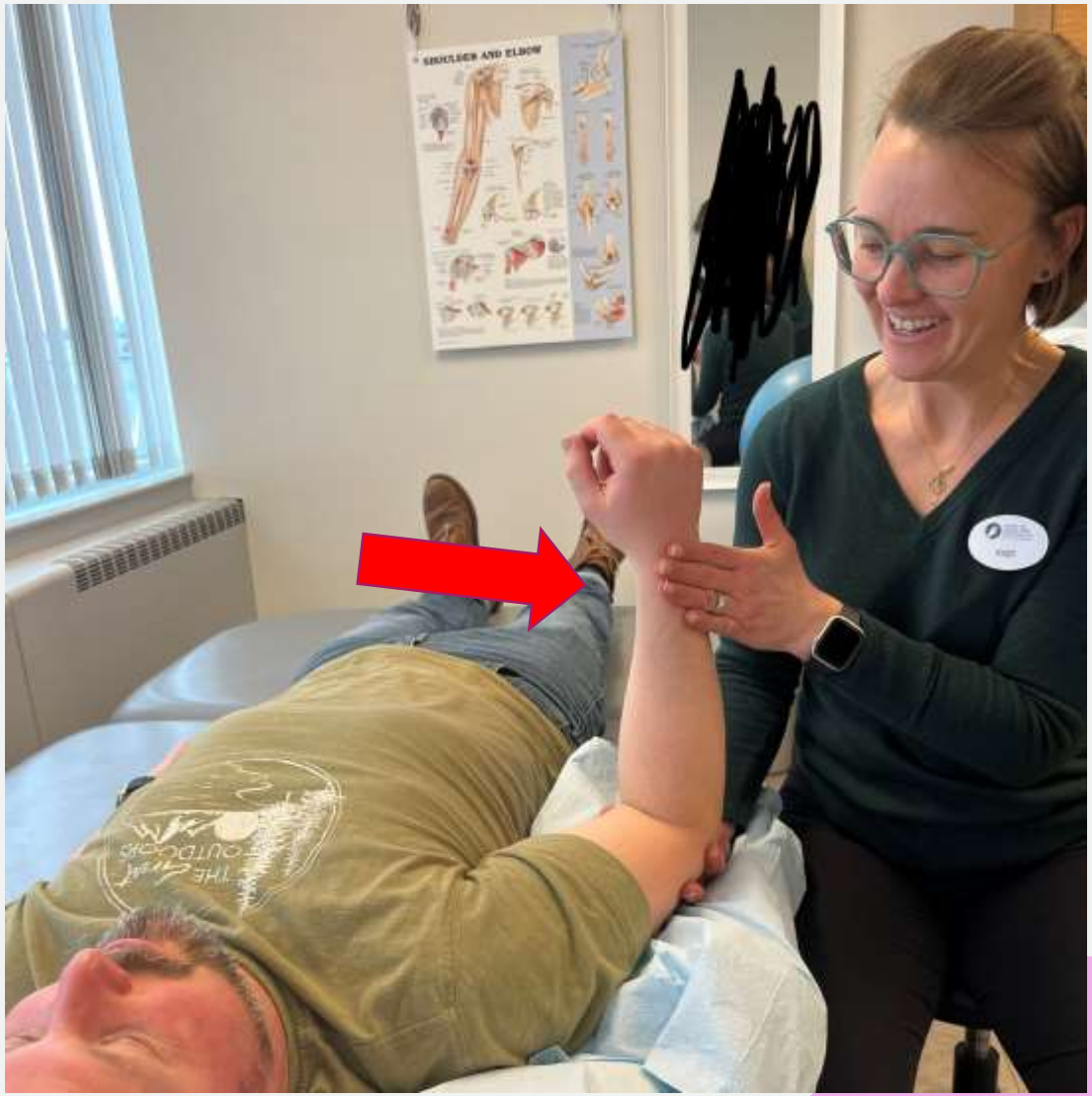
Isometrics: phase II (6-8wk S/M, 8-10wk L/M)

Dialogue with the patient:

- “we are going to begin an exercise to isolate and identify muscles of the shoulder and rotator cuff”
- “I’m going to apply pressure to different parts of your arm and you are going to **match** my resistance”
- “I want you to think about how hard you can push and do about 50% of that effort”
- This exercise/activity should be completely pain-free.

ER Isometric

- Rarely given for home in early stages
- When given for home will include variations depending on patient's ability to be compliant with submaximal and pain-free contraction.



Isometric abduction

Isometric extension

Progressing from AAROM to AROM

- A **gradual** progression
- Begin with exercise in gravity eliminated planes and below 90 degrees
- Begin in scapular plane and work into straight planes
- Goal should be ROM with good mechanics!
- Keep all exercises **pain free**
- If patient is lacking more than 30% of full ROM at week 10 focus more on scapular exercises and AAROM with gentle end range progression
- Progression varies depending on patient specific response

Problem solving at this stage

Patient demonstrates persistent pain with AROM initiation:

- Isometrics in pain free ranges (add to home program)
- Scapular work with education and strengthening
- Short arc, pain free motion with focus on scapular setting
- Spend more time in supine to further improve their scapular stabilizer strength before transitioning to standing

Patient demonstrates shoulder stiffness:

- Table slides with end range progression
- Dowel rotation with end range progression
- Adjust timeline to meet patient needs
- Don’t strengthen in shortened range

Scapular mechanics during this phase

The Pilates warm up:

1. Flatten the back and tighten the core
2. Shoulder blades together
3. Make your arms slightly longer by reaching towards your toes
4. Gently Lift and lower the arms

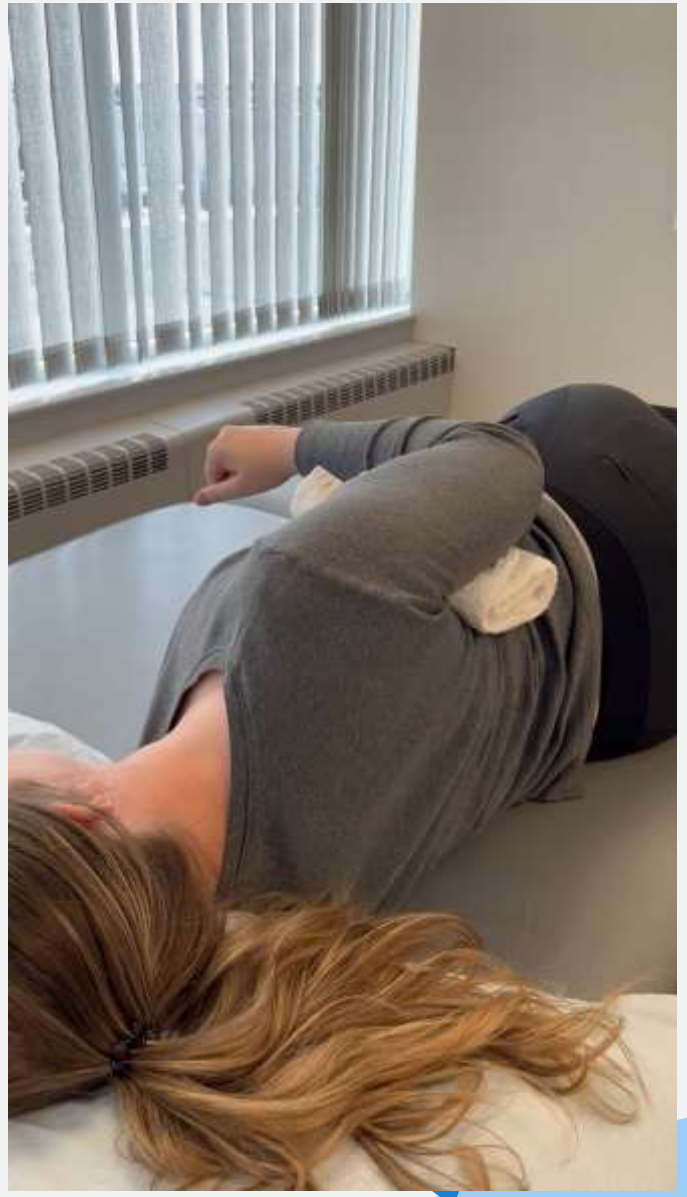
*make sure the patient is not losing their shoulder blade squeeze or arching their back

AROM in gravity eliminated plane

- Utilizing supine, incline sit, and side lying positions to isolate scapular mechanics

Side-lying position for ER and abduction AROM

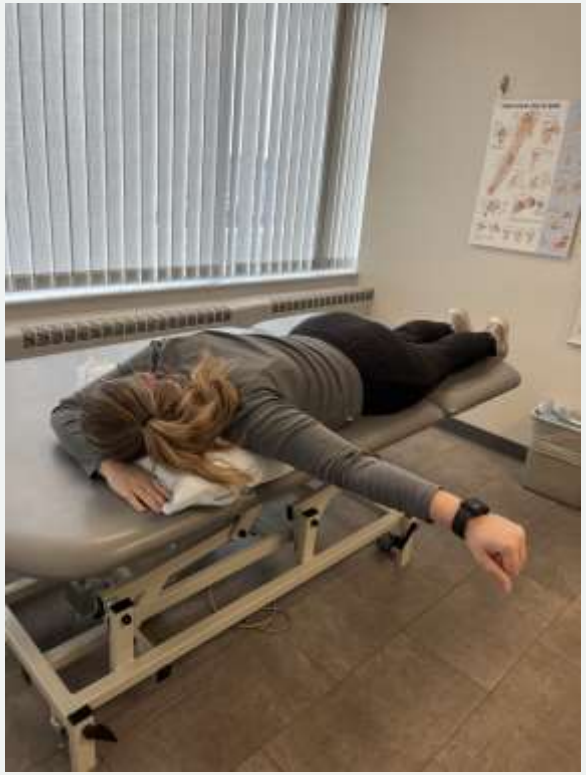
- Therapist provides scapular cues (verbal and tactile)
- Decreased activation of the Upper Trapezius (UT)
- Promotes rotator cuff activation

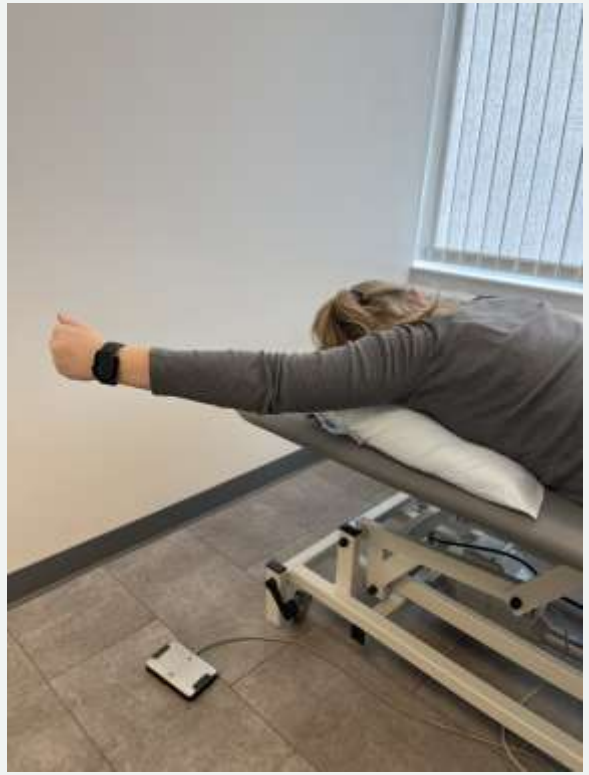


Prone exercises

Cue patient to:

- Activate the core
- Squeeze their glute
- Relax muscles of the UT and levator scapulae
- Hold end position for 3 seconds





Phase III: Strength and conditioning

Small/medium repair

- Reports beginning as early as week 8 and as late as week 12[1,4]
- Strength is generally encouraged to begin at 90 degrees and below in supine and beach chair positions progressing to stance and OH

Large/massive repair

- Report beginning as early as week 12 and as late as week 16[1,4]
- Avoid overhead (OH) strengthening until 4 months

Phase III: strength and conditioning

- Majority of online protocols that were reviewed do not follow any standardized strength guidelines[4]
- ASSET recommends a gradual strength progression beginning at postop week 12 while simultaneously recommending exercises of various EMG activations before the 12th postop week[14]
- Gradual strengthening based on MVIC (maximum voluntary isometric contraction) is most appropriate to reduce stress and overload of the repaired tendon[2]

Progression

Supine position for weighted short arc motion flexion/extension 60–120
Or
Alphabet on the ceiling

Begin in low level ranges and in gravity eliminated planes. Advance to supported sit and stance with gradual work above 90. This phase is when you see a lot of variability and deviation depending on the patient you are working with.

- Get creative!
- Make it functional
- Revisit patients' personal goals frequently
- Continue to provide cues for scapular mechanics throughout the strength process (scapular stabilizers are key!)
- Keep in mind what type of tear your dealing with. (Some say to wait 6-9 months before you do any aggressive strength)

Make it Practical and Functional

Functional reaching for home:

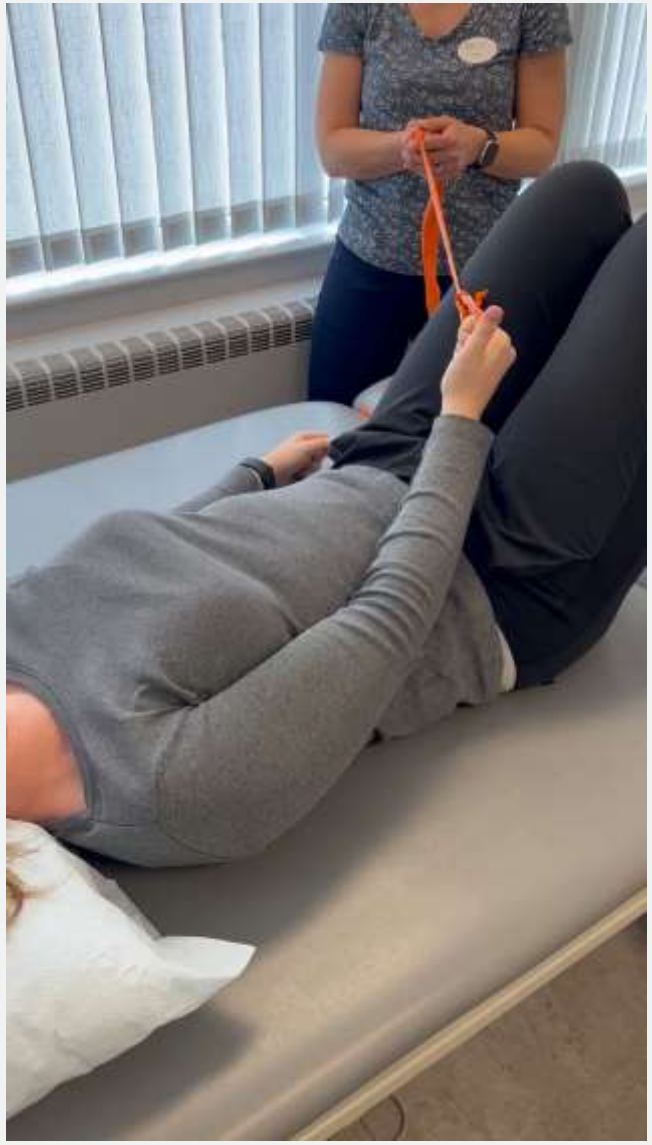
- Kitchen, bathroom, bedroom
- Vary heights and resistance
- Have patient practice in front of a mirror at home
- Gradual increase in number of reps with daily activities

Variety with Strength, conditioning, and stabilization

- Isometrics
- Supine strengthening (circumduction, supine alphabets, weighted short arc motion in supine, band)
- dynamic reaching in stance with good mechanics
- Closed-Kinetic-Chain (CKC) exercises (4 point, wall pushups, band on the wall)
- Standing dumbbell ER in scapular plane, scaption to 90, flexion to 90 (wk 12)
- Elastic band resistance (shoulder flexion, ER, IR, scaption, D2 flexion)

Importance of addressing the scapula

Scapular punches in supine



PNF D2 flexion with band resistance

Stabilization

- Protects the joint from injury and optimize strength performance
- Lack of stability can lead to OH shoulder pain
- Stabilization exercises promote better shoulder kinematics

Band stabilization in supine position

Shoulder stabilization ball on wall (flexion/extension and horizontal abd/add)

Stabilization

Flexbar perturbations

Alternatively use with body blade

Resistance Bands

Band bilateral extension: posterior cuff, low trap, rhomboids

Band Row: mid trap and rhomboids

Higher level strength exercises

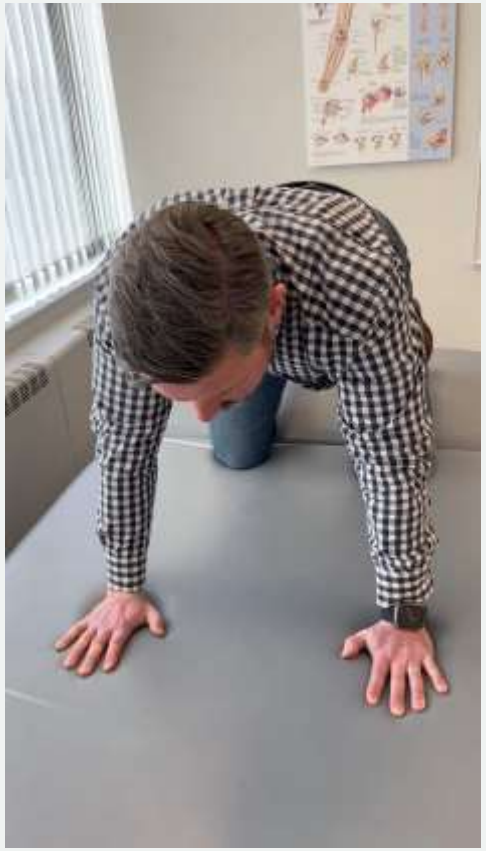
Band bilateral ER with scap squeeze

Band standing PNF D2 flexion (be sure patient is not excessively kicking in the UT)

Resistance band on the wall: increases recruitment of the lats, serratus and rotator cuff while performing shoulder motion

Band pull apart with shoulder motion: increases recruitment of the scapular stabilizers

Closed Kinetic Chain in 4pt



- Improves shoulder proprioception
- Promotes joint stability
- Simulation of functional movement patterns

Weight bearing in 4 point:

- Weight shift front and back
- Weight shift side to side
- Forward reach while weight bearing into weak arm

Transitioning to a home program

- Transition to home program depends on patient long term goals
- Gradual reduction in formal therapy: 2x/wk to 1x/wk to once every other week

Sample home program progression:

Progression	3-6 month	6-9 month	9 month+
Resistance	Keep it light Work at or below shoulder height	Light to medium: working into gradual overhead	medium
Reps	Begin at 3-5. progress to 8, 10, 12, and 15	Begin at 3-5. progress to 8, 10, 12, and 15	Begin at 3-5. progress to 8, 10, 12, and 15
Sets	3	2-3	2-3
Frequency	1-2x/day	1x/day	3-4x/week

Returning to sports and work

- Excessive tendon loading should be avoided for 12 weeks [3]
- If patient is worker's compensation, consider work conditioning or a work hardening program
- Majority of protocols recommend waiting 6 months before returning to overhead throwing and dynamic Overhead sports [1,4]
- Majority of protocols recommend return to light sports activities at 4 months

Common Complications following RC repair

- Shoulder stiffness is the most common complication following RC repair in approximately 30% of patients[1,5]
  - Diabetes, age, full-thickness tears, single tendon involvement[1]
  - Defined as a loss of >70 degrees in total passive ROM at 3 months post op
  - Treated conservatively with therapy including joint mobilization, stretching, and comprehensive home program
  - If persists surgeon may consider manipulation at 1 year post op

Common complications continued...

- Re-tear: Most recurrent tears happen at 3-6 months post op[6]
  - RC failure rate is shown to be 50-60% at 12-month mark[3,10]
  - Large animal studies report repair strength to be nearly mature by week 15 post repair[4,12]
- Scapular dyskinesis related to muscle imbalance

Clinical outcome: shoulder ROM

- At one-year post-surgery majority of patients have returned to pre-surgery activities with minimal to no pain
- Can take up to 6 months for ER to return to pre-operative baseline[6]
- Length of participation in formal therapy program varies depending on the patient's individual progress, goals, and post-op contributing factors

Considerations

Limited high-level evidence has illustrated how we should personalize or categorize patients post operative RC repair rehab protocols. Therapists should consider providing a customized therapy program based on:

- Injury size
- Tissue quality
- Patient age
- Patient activity level
- Patient sports and work involvement

Thank You!

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