

Management of Shoulder Instability Non-operatively and Operatively

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Disclosures

- **Author of Current Clinical Concepts: Nonoperative Management of Shoulder Instability (Online J. Athl Train, 2023)**
- **ASES: Research committee member**
- **Editorial Board:**
 - Shoulder and Elbow (British Journal)
 - Sports Health
- **Grant/Research funding from:**
 - National Institute of Occupational Safety and Health
 - Department Homeland Security/ FEMA- Fire Prevention and Safety



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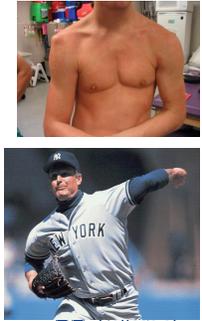
Objectives

- Participants will understand option for managing patients using a non-operative exercise program focusing on neuromuscular control
- Participants will learn post-operative restrictions and phases of rehabilitation following surgery for shoulder instability
- Present phased rehabilitation approaches based on healing and patient progression

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Classification of Shoulder Instability

- **Frequency**
 - Solitary - 1st Episode
 - Occasional - 2-5 Episodes
 - Frequent - >5 Episodes
- **Etiology**
 - Traumatic
 - Atraumatic
- **Direction**
 - Anterior
 - Inferior
 - Posterior
- **Severity**
 - Subluxation
 - Dislocation - someone put it in




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Epidemiology by Category

- 54% Anterior dislocation
- 5% Posterior dislocation
- 0.5% Inferior dislocation
- 28% Anterior Subluxation
- 1.4% Inferior Subluxation
- 10.5% Posterior Subluxation

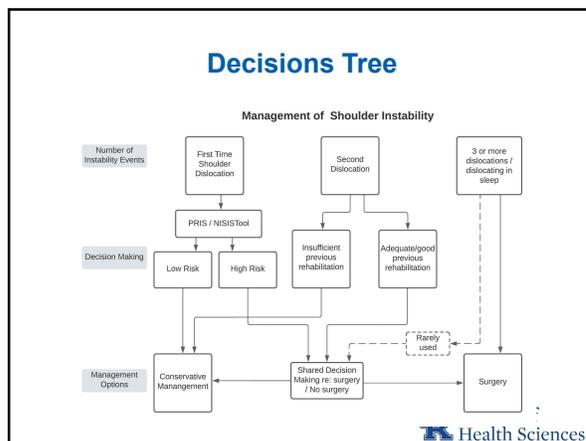
- Young male physically active population reinjury rates of
 - 83% < 20 y.o.
 - 63% 20 - 40 y.o.
 - 16% > 40 y.o.

- Rowe JBJS 1956

• From 383 patients from MOON Shoulder Registry for 5 yrs.
- Hettrich 2019 JSES



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Non-Operative Instability Severity Index Score

- Risk factors Low or High in HS athletes
- Scores ≥ 7 = High Risk for Non-operative approach
 –Tokish Sports Health 2020

Factor	Points
Collision Sport	3
Age >15	2
Bone Loss on X-Ray	2
Type of Instability (Dislocation v. Subluxation)	1 (dislocation)
Dominant arm involved	1
Sex = Male	1
17y.o dominant arm baseball player with dislocation without bone injury	2+1+1+1 = 5 (Low Risk)

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Non-operative Program for Traumatic Anterior Shoulder Dislocation (SINEX)

- Shoulder Instability Neuromuscular Exercise for 12 weeks
- 7 exercises (45 minutes)
- 5 basic levels A-E – low load, large base of support, focus on local motor control 2 x 25 performed daily
 –Speed controlled 3 seconds concentric & eccentric
- 2 elite levels F-G – high load, less body support, increased speed & performed based on individual demands, 3 x week
- Progressed by satisfactory motor control, symptoms <5/10, adequate repetitions performed

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7 Exercises

1. Scapular Setting and control
2. GH setting and control with IR
3. GH setting and control with ER
4. GH co-contraction
5. Dynamic GH muscle stability
6. GH proprioception with exercise ball
7. GH proprioception with laser pointer
 - Protocol and appendix: Eshoj Trials 2017
 - RCT: Eshoj OJSM 2020

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Example of Exercise 2 GH setting and Control (A-B) (Open chain emphasis)

• Patient Education: Optimize position and control of GH jt during rotational movements while avoiding over activation of humeral adductors

Basic level (2x20-25 repetitions)			
Level	Performance	Photos	Feedback to the patient
A	Lying supine with knees flexed Injured shoulder in 45 degrees of abduction, elbow flexed 90 degrees Place a folded towel underneath the elbow to obtain neutral alignment between the elbow and shoulder Activate the subscapularis to retract the glenohumeral head slightly into the coracoid fossa Count to five, relax and repeat		Facilitate the extension by placing the opposite fingers in front of the injured shoulder Sense that the shoulder moves away from the fingers Alternatively, place a thin, folded towel on the back of the shoulder joint. To retract the glenohumeral head back into the coracoid fossa, squeeze the towel slightly
	Starting position as in A Set the glenohumeral joint as in A		Make sure that it is a local glenohumeral joint retraction (small movement) and not a retraction of the entire shoulder belt
B	Rotate the glenohumeral joint into internal and external rotation while maintaining the glenohumeral setting The axis of movement should be through the humerus		As above

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Example of Exercise 2 GH IR Control (C-E)

C	Lying supine with knees flexed. Dislocate shoulder in 90 degrees of abduction, elbow flexed 90 degrees Place a folded towel underneath the elbow to obtain neutral alignment between the elbow and shoulder Set the glenohumeral joint Rotate the glenohumeral joint into internal rotation with the use of a therapist or resistance (resistance activation) Return to neutral while controlling and maintaining the glenohumeral setting (resistance activation) The axis of movement should be through the humerus		As above Furthermore, a laser pointer, fixed at the wrist, pointing at an imaginary line at the ceiling may be used as visual feedback to control the movement (axis through the humerus)
	Starting position as in C – but with no support underneath the elbow Set the glenohumeral joint Rotate the glenohumeral joint into internal rotation and back to neutral while controlling and maintaining the glenohumeral setting		As above
E	As one end of a horizontal band the body just above shoulder height Place the other end of the band on the hand at the agreed side Standing with the leg opposite to the injured shoulder in front, knees slightly flexed, bodyweight transferred to the front leg (front base aligned with the leg and foot) Upper and lower back positioned in neutral Place the shoulder in 90 degrees of abduction, elbow flexed, shoulder in neutral rotation (hand against the ceiling) Set the glenohumeral joint Rotate the glenohumeral joint into internal rotation with the use of a therapist or resistance (resistance activation) Return to neutral while controlling and maintaining the glenohumeral setting (resistance activation)		As above Furthermore, a laser pointer, fixed above the elbow, pointing at a fixed point can be used as visual feedback to control the movement (axis through the humerus)
	Starting position as in E Place the shoulder in 90 degrees of abduction, elbow flexed, shoulder in neutral rotation (hand against the ceiling) Set the glenohumeral joint Rotate the glenohumeral joint into internal rotation with the use of a therapist or resistance (resistance activation) Return to neutral while controlling and maintaining the glenohumeral setting (resistance activation)		As above

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Example of Exercise 2 GH IR Control (F-E) Elite Level

Elite level (2x8-12 repetitions)			
Level	Performance	Photos	Feedback to the patient
F	As in E, but with the injured shoulder in 120-130 degrees of abduction (starting position)		As above
G	As in F, but only with the leg opposite to the injured shoulder in the ground If further progression is needed: Increase the shoulder abduction angle, increase the speed or the resistance of the exercise, close the eyes		As above

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Glenohumeral Muscle Co-contraction Progression (Closed chain emphasis)

Basic level (2x20-25 repetitions)			
Level	Performance	Photo	Feedback to the patient
Prone lying with an exercise ball supporting the lower extremities lockdowns the thighs and arms extended carrying the weight of the upper body.			
A	Activate the scapular muscles and protect the shoulder girdle performing a push-up plus. Walk backwards to flex the shoulders, relax and repeat.		Sense that your shoulder blades move forward on the chest.
Starting position as in A			
B	Activate the scapular muscles and protect the shoulder girdle performing a push-up plus. Shift the weight from side to side. Avoid scapular winging.		Sense that your shoulder blades move forward on the chest.



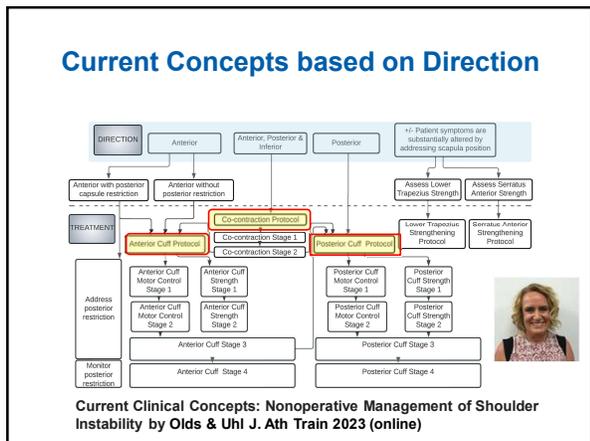
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SINEX v. Strengthening

- 56 traumatic solitary or recurrent Anterior Shoulder Dislocations performed either SINEX or PRE shoulder strengthening program (Burkhead & Rockwood JBJS 1992)
- Patient reported functions were 228 points lower than PRE program in the WOSI total scale (p =0.028)
- 3/27 vs 6/24 went on to request surgery in the SINEX program
- Focus is control, Key is stability not just strength
 - Eshoj OJSM 2020



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Anterior Protocol Phase

- Isolate and activate the subscapularis
- Using palpation and reciprocal inhibition to bias subscapularis



- Progression phase 2 once when patient can demonstrate good motor control by activating and relaxing the subscapularis isometrically 15 times without difficulty



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Anterior Protocol Phases

- Continue emphasis on subscapularis motor control but now dynamic control is needed
- Patient should be able to demonstrate smooth eccentric and concentric movement through 0-90° with the arm abducted to 90° in supine with 1-1.5kg (2-3 pounds) load for 15 repetitions with continuous palpable subscapularis contraction.

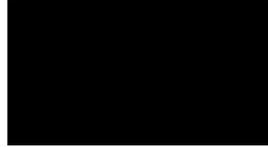




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Posterior Protocol

- Isolation of humeral external rotation without scapular substitution
- Focus in infraspinatus activation
- Phase 1 goal: Patient in prone can hold their arm at 90° of abduction and 90° of external rotation for 30 seconds with no weight with minimal scapula movement to achieve this position.
- Phase 2: 30 reps with 1kg (2lbs) without scapular substitution

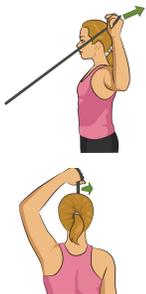




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Phase 3 for both Anterior/ Posterior is Pacing through full arc of motion

- Posterior protocol with elastic band
- No scapular motion
- 30 second bout
- Pace 30bpm on metronome =45°/sec
- Pace increases ~ 5 days by 20 bmp up to 120 = 180°/sec
- Level 1 Arm at side
- Level 2 Arm at 90°
- Level 3 Arm at 135°



es

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Phase 4 for both Anterior/ Posterior is Perturbation Intervention

- After establishing motor control and endurance
- Incorporate perturbations
 - moving humerus in unexpected directions during exercise
- Start Eyes open → close
- Ball drops for anterior cuff programs to decelerate perturbation into position of apprehension




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Co-Contraction for MDI

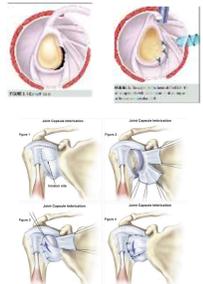
- Same phases of progression but works system to co-contract and compress or center humerus into glenoid
- Open progressing to closed chain
- Incorporate anterior and posterior cuff as needed




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Considerations for Various Surgical Intervention

- Surgical techniques alter rehabilitation program by patient and surgeon
- Bankart Lesion
- Capsular Shift




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Post-op Guiding Principles

- Goal is to facilitate Clinical Decision Making following surgical intervention

1. Need to understand surgical procedure (Surgeon Communication Key)
2. Understand tissues involved in surgery, healing rate, quality of repair
3. Understanding how to apply techniques at appropriate intensity
4. Immobilization periods and motion progression vary so adapt and work on surrounding structures
 - Gaunt JOSPT 2010



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References for Post-op Exercise Program

[CLINICAL COMMENTARY]

THE AMERICAN SOCIETY OF SHOULDER AND ELBOW THERAPISTS' CONSENSUS REHABILITATION GUIDELINE FOR ARTHROSCOPIC ANTERIOR CAPSULOLABRAL REPAIR OF THE SHOULDER



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Rehabilitation Principles

- Regain Power
- Enhance Confidence
- Return to sport

Functional

Recovery: RROM

AAROM

Acute: PROM

- Regain Strength
- Enhance Endurance
- Normalize Function
- Regain motion & function while protecting tissue
- Activate inhibited muscles gradually
- Protect weakened tissues
- Minimize effects of immobilization
- Prevent Adhesions

Kibler, Functional Rehabilitation Med Sci Sport Exerc 1998

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Key Concept in Shoulder Rehabilitation: Force Couples of the Shoulder

- Force couple is two opposing forces acting on same object to create synergistic rotation
- Provide tremendous mobility extremity
- Glenohumeral
 - Deltoid
 - Rotator Cuff
- Scapular
 - Lower, Upper Trap
 - Serratus Ant.

Figure 7-6 Concise compression of the rotator cuff. (Adapted from Jensen 2010, Li, Upper Limb: Shoulder complex: principles and practice, p 80, Philadelphia, 2010, WB Saunders)

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Understanding Physics and Muscular Biomechanics

- With little deltoid and rotator cuff function how do you keep the humerus head centered to allow for arm elevation
- Facilitation of subscapularis promotes humeral head centering
- Minimizing gravity
- Shorten lever arms
- Allows active elevation in supine for this patient to strengthen what he has working

-Levy JSES 2008

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Acute: Post-Operative Care

- Check for signs of infection & wound complications
 - Body & Shoulder Temperature
 - Neurological status - Axillary Nerve
 - Pulmonary Emboli, Venous emboli (excessive arm pain)
- Educate patient on surgical procedure
 - Pictures and models
- Set Reasonable Expectations for recovery
 - When can I...

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Road to Recovery: Set Expectations

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Initiate Motion

- Communication with physician is **KEY**
- Understand surgical procedure and tissues involved
- Depends on patient's tissue characteristics and goals
- Encourage motion in proximal (trunk and neck) and distal (hand and elbow) non-immobilized joints

TABLE 2	STAGED RANGE-OF-MOTION GOALS FOLLOWING ARTHROSCOPIC ANTERIOR CAPSULOLABRAL REPAIR			
	PFE	PER at 20° Abd	PER at 90° Abd	AFE
POW 3	90°	10°-30°	Contraindicated	NA
POW 6	135°	35°-50°	45°	115°
POW 9	155°	50°-65°	75°	145°
POW 12	WNL	WNL	WNL	WNL

Abbreviations: Abd, abduction; AFE, active forward elevation in the scapular plane; NA, not applicable; PER, passive external rotation; PFE, passive forward elevation; POW, postoperative week; WNL, within normal limits.

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Actively Controlled Motion Promotes Stabilization

- Re-establishes neuromotor control of the joint
 - Activate neural pathway of stabilizers and prime movers
 - Initiates strengthening progression
- Concavity compression
 - Net joint reaction is balanced
 - Lippitt et al, JSES 1993
- Orientation of rotator cuff muscular pull is primarily compression (85%)
 - Lee et al., JBJS 2002
- Humeral head centered in shallow glenoid by active rotator cuff
 - Produces more stability
 - Functions as a fulcrum
 - Graichen J Biomech 2000

• Caution "Respect Healing Rates"

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Acute: Maintaining Adjacent Joint ROM

- Elbow, Wrist, Hand
- **Cervical and Thoracic Spine**
- Scapular motion integrated with trunk to promote proximal to distal activation
 - Cross body reach
 - Downward reach
- Caution for certain surgeries due to activity of rotator cuff
 - Bimanual tasks (SLAP)
 - Pulling (Rotator Cuff)
 - Fast forward reaching
 - Smith et al, J Sh Elb Surg 2004

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Scapular Stabilization

- Focus on comfortable position
- Scapular control
- Retraction / Protraction
- Depression / Elevation

1. Sternal Lift
Begin with knees and trunk slightly flexed. Extend trunk and knees while gently squeezing shoulder blades down and back. Hold 5 seconds, then relax. Repeat exercise 10 times; add 1-2 repetitions a day until can do 20. Do exercise 1 x day.

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Pain Control: Cryotherapy

- Ice for 20-30 minutes decreases pain medication usage and discomfort
- Does not decreasing intra-articular temperature
 - Singh, JSES 2001
 - Levy, Arthroscopy 1997
- Pain inhibits muscle function but ice reduces inhibition
 - Ingersoll & Hopkins JSR
- Surgeons are using new medical interventions to minimize opioid usage
 - Tylenol pre and post-op
 - NSAID
 - Nerve Blocks
- Pain may not be a great guide for mobility progression

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Phase 2 6-12 weeks

- Achieve ROM goals without increasing pain and overstretching tissue
- Begin motor control development, strengthening, and endurance
- AROM and PROM should improve together
 - Manual therapy may not be needed to gain motion
- Neuromuscular re-education and patterns of movement more important than absolute strength

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EMG Activity following SLAP Repair

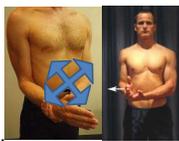
- Muir et al., Shoulder & Elbow 2012

Normalized To 5lb load & weight of arm

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Post-Surgical Anterior Capsular Repair

- Sub-maximal isometrics with scapula and neck in good posture
 - Start when AAROM allowed
- Keep arm in appropriate position for sub-max isometrics
 - Avoid posterior shear forces for posterior repairs
 - Avoid anterior shear forces and external rotation torques for anterior repairs
- Contralateral arm exercises (Cross-Education)
 - Magnus J Appl Physiol
- Must know if tissue involved
- If Subscapularis was taken down or repaired
 - No IR isometrics
 - Limits ER range of motion



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AROM and RROM Progression

- RROM progressed from low to high demand
 - Watch for substitutions, indicates fatigue or too demanding
 - Perform 3 x 5, 10, 15 with perfect form prior to progressing
- Watch progression of motion carefully to prevent adhesions or stretching of repair
 - A little stiff at 3 months at very end of range is expected
- AROM and RROM started at ~6 weeks post-op
- Use EMG exercise progression for months 2-4 based on demands of patient

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Phase 3 12-24 weeks

- Full motion should be nearly established
- Strength between 50-75% and progressing
- Ready for more dynamic and sport related activities
- Between surgical visits puts the rehabilitation provider in charge of functional decisions
 - Return to Work / Sport / Recreational Activities
- Justification for Follow up (High Demand Activities) are made here
 - In PT we lose many patients in this phase (AT more control)
- Alternate days between strength and power and endurance reduce boredom
 - Monday and Thursday Arm Strengthening
 - Tuesday and Friday endurance or power after 18 weeks if relevant for patient
 - Wed and Saturday core and lower body



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Resistance Exercises based on EMG

- Elastic resistance commonly used for shoulder exercises
 - (3-7lb loads)
- Developed for throwing athletes (on-field) for preventative program
- Identified 7 exercises that moderately activated primary muscle involved in throwing
 - Myers JAT 2005



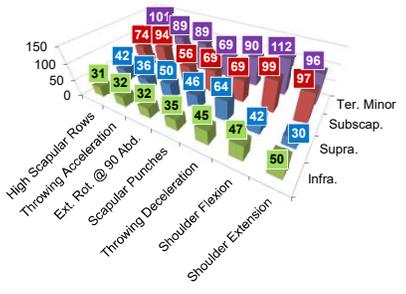

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High Rows	Punches	ER @ 90	Accel. Diag.	Decel. Diag.
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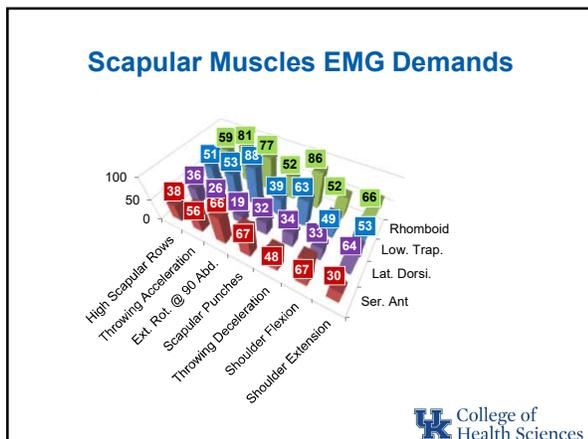
Rotator Cuff Muscles EMG Demands



Exercise	Ter. Minor	Subscap.	Supra.	Infra.
High Scapular Rows	107	89	89	89
Throwing Acceleration	74	94	42	31
Ext. Rot. @ 90 Abd.	36	32	32	32
Scapular Punches	56	50	46	35
Throwing Deceleration	69	69	64	45
Shoulder Flexion	90	99	42	47
Shoulder Extension	112	99	30	50



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Return to Sport Rate and Recurrence

- RTS in athletes after 1st time anterior dislocations
- Low rate a pre-injury levels
- Recurrence rate is 54% but 79% in collision athletes

—Hurley Bul Hosp Jt Dis 2023

Outcome	N	Studies
Overall RTP	76.5% (520/680)	16
RTP at Pre-Injury Level	51.5% (268/520)	8
RTP in Level I Studies	77.9% (278/357)	10
RTP at Pre-Injury Level in Level I Studies	51.5% (268/520)	8
RTP Collision Athletes	88.1% (141/160)	6

RTP, return to play.

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Return to Sport Rate and Recurrence

- Bern Consensus on Shoulder Injury prevention and RTS
- Schwank JOSPT 2022
- Injury prevention programs/exercises are appropriate to prescribe for athletes of all levels to prevent shoulder injury 2x/wk
- The balance between capacity and load plays an important role in injury risk management, rehabilitation, RTS, and performance enhancement.
- To obtain estimates of the applied load, measures should include the number of repetitions (throws), the magnitude of load applied per repetition (throwing velocity), and the distribution of load over tissue structures applied /repetition (type of throw). Carried out weekly

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Key Principles of Rehabilitation

1. Let Irritability Guide Rehabilitation
2. Address Clinically Relevant Glenohumeral ROM Deficits Using Active Exercise Therapy
3. Do Address the Scapula in Rehabilitation but Do Not Screen for Dyskinesia
4. Select the Appropriate Exercise (Open Chain Versus Closed Chain)
5. Include Plyometrics Early in a Rehabilitation Program
6. Train the Brain
7. Sport-Specific Exercises

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Functional Testing to Return to Sport

- Patient Reported Outcomes (KJOC)
- Confidence scales (TSK)
 - Shah KM, Baker T, Dingle A, et al. Early Development and Reliability of the Timed Functional Arm and Shoulder Test. J Orthop Sports Phys Ther. 2017;47(6):420-431.10.2519/jospt.2017.7136
 - Tucci HT, Felicio LR, McQuade KJ, et al. Biomechanical Analysis of the Closed Kinetic Chain Upper-Extremity Stability Test. J Sport Rehabil. 2017;26(1):42-50.10.1123/jsr.2015-0071
 - Olds M, Coulter C, Marrant D, et al. Reliability of a shoulder arm return to sport test battery. Phys Ther Sport. 2019;39:16-22.10.1016/j.ptsp.2019.06.001
 - Silva YA, Novaes WA, Dos Passos MHP, et al. Reliability of the Closed Kinetic Chain Upper Extremity Stability Test in young adults. Phys Ther Sport. 2019;38:17-22.10.1016/j.ptsp.2019.04.004
 - Cools AM, Maenhout AG, Vanderstukken F, et al. The challenge of the sporting shoulder: From injury prevention through sport-specific rehabilitation toward return to play. Ann Phys Rehabil Med. 2020.10.1016/j.rehab.2020.03.009

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SARTS Shoulder Arm Return To Sports

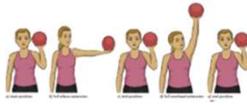
- Perform 1-minute open chain count reps Learning

Fig. 4. Open chain physical performance tests.

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Rotator Cuff Endurance (Open Chain Emphasis)

- **Standing Abduction and Elevation (BABER)**
 - Repeat for 1-minute count repetitions
 - Reliability was with a 3kg ball shifting to a dumbbell
 - Based on weight of patient
- **Posterior Shoulder Endurance Test (PSET)**
 - Hold static and time
 - Load based on BW
 - Shifting to 3%
 - Evans Phy Ther in Sport 2021




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SARTS Shoulder Arm Return To Sports

- Do as many as you can do in 1-minute
- Clapping Pushups
- Line hops from knees (test bilaterally)
- Side hold Rotations (test bilaterally)
- Modified CKQUEST
 - Oids Phy Ther in Sport 2019






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Capsulolabral Post-operative Management¹

Phase 1 0-6 weeks	
Goals	<p>Maximally protect the surgical repair (capsule, ligaments, labrum, sutures)</p> <ul style="list-style-type: none"> • Achieve staged ROM goals. Do not significantly exceed them: <ul style="list-style-type: none"> - PFE: POW 3, 90°; POW 6, 135° - PER at 20° abd: POW 3, 10°-30°; POW 6, 35°-50° - PER at 90° abd: POW 3, contraindicated; POW 6, 45° - AFE: POW 3, NA; POW 6, 115° • Patient education in postoperative restrictions • Minimize shoulder pain and inflammatory response • Ensure adequate scapular function
Precautions	<ul style="list-style-type: none"> • Do not allow or perform ROM/stretching significantly beyond staged ROM goals, especially external rotation both by the side and in abduction • Do not allow the patient to use arm for heavy lifting or any use of the arm that requires ROM greater than the staged ROM goals
Importance	<ul style="list-style-type: none"> • Patient education regarding limiting use of the arm despite lack of pain or other symptoms <ul style="list-style-type: none"> • Protection of repair • Achieve staged ROM goals through gentle ROM activities • Minimize inflammation <p>ROM:</p> <ul style="list-style-type: none"> • Following the absolute immobilization period begin: <ul style="list-style-type: none"> - Pendulum exercises (unweighted) - Passive/active assisted forward elevation to achieve staged ROM goals listed earlier. ROM should not be forceful - Passive/active assisted external rotation with the shoulder in slight abduction to achieve staged ROM goals listed earlier. ROM should not be forceful - Scapular clock exercises or alternately elevation, depression, protraction, retraction. Progress to scapular strengthening as patient tolerates^{78,79} • Active ROM of uninvolved joints <p>Pain management:</p> <ul style="list-style-type: none"> • Activity restriction • Proper fitting of sling to support arm • Electrophysical agents
Supplemental Exercises	<ul style="list-style-type: none"> • Normalize scapular position, mobility, and dynamic stability • ROM of uninvolved joints • Begin restoration of shoulder strength through isometric exercises as tolerated • Postural awareness/education
Immobilization	<ul style="list-style-type: none"> • Via standard sling • Absolute immobilization (no glenohumeral ROM exercises and constant sling use) for variable time of 0 up to 4 weeks, based on patient-specific factors and surgeon recommendation

	<ul style="list-style-type: none"> • Relative immobilization (out of sling for ROM exercises, sitting with the arm supported, and standing for short periods), starting after the period of absolute immobilization and continuing for the remainder of phase 1, followed by sling use for comfort
Education	<ul style="list-style-type: none"> • Explain nature of the surgery • Discuss precautions specific to the nature of the surgical repair <ul style="list-style-type: none"> - Importance of not significantly exceeding staged ROM goals - Importance of tissue healing - Proper sling use (assure sling provides upward support to the glenohumeral joint) - Limiting use of arm for ADLs
Milestone/ Criteria to progress to next phase	<ul style="list-style-type: none"> • Appropriate healing of the surgical repair by adhering to the precautions and immobilization guidelines. • Staged ROM goals achieved but not significantly exceeded • Minimal to no pain (NPRS, 0-2/10) with ROM
Phase 2 6-12 weeks	
Goals	<ul style="list-style-type: none"> • Achieve staged ROM goals to normalize passive ROM and active ROM. Do not significantly exceed: <ul style="list-style-type: none"> - PFE: POW 9, 155°; POW 12, WNL - PER at 20° abd: POW 9, 50°-65°; POW 12, WNL - PER at 90° abd: POW 9, 75°; POW 12, WNL - AFE: POW 9, 145°; POW 12, WNL • Minimize shoulder pain • Begin to increase strength and endurance • Increase functional activities
Precautions	<ul style="list-style-type: none"> • Do not perform stretching significantly beyond staged ROM goals • Do not perform any stretch to gain end range external rotation or external rotation at 90° of abduction unless significant tightness is present • Do not allow the patient to use arm for heavy lifting or any activities that require ROM beyond the staged ROM goals • Do not perform any strengthening exercises that place a large load on the shoulder in the position of horizontal abduction or the combined position of abduction with external rotation (eg, no push-ups, bench press, pectoralis flys) • Do not perform scapular plane abduction with internal rotation (empty can) at any stage of rehabilitation due to the likelihood of impingement
Importance	<ul style="list-style-type: none"> • Passive/active assisted ROM as needed to achieve but not significantly exceed staged ROM goals • Establish basic rotator cuff and scapular neuromuscular control within the allowed ROM <p><u>ROM:</u></p> <ul style="list-style-type: none"> • Passive/active assisted ROM as needed to achieve staged ROM goals in all planes. Many times only light stretching or no stretching is needed • If ROM is significantly less than staged ROM goals, gentle joint mobilizations may be performed. However, they should be done only into the limited directions and only until staged ROM goals are achieved

- Address scapulothoracic and trunk mobility limitations. Ensure normal cervical spine ROM and thoracic spine extension to facilitate full upper extremity ROM

Neuromuscular re-education:

- Address abnormal scapular alignment and mobility PRN
 - Strengthen scapular retractors and upward rotators
 - Increase pectoralis minor flexibility if limited
 - Biofeedback by auditory, visual, or tactile cues
 - Weight-bearing exercises with a fixed distal segment. Examples: quadruped position while working to maintain proper position of the scapula, quadruped with scapula protraction, progressing from quadruped to tripod position, no push-ups⁸⁷
- Address core stability deficits PRN
- Activities to improve neuromuscular control of the rotator cuff and shoulder girdle such as use of unstable surfaces, Bodyblade, manual resistance exercises

Strength/endurance:

- Scapula and core strengthening
- Balanced rotator cuff strengthening to maintain the humeral head centered within the glenoid fossa during progressively more challenging activities
 - Should be initially performed in a position of comfort with low stress to the glenohumeral joint, such as less than 45° elevation in the plane of the scapula (eg, elastic band or dumbbell external rotation, internal rotation, forward flexion)
 - Exercises should be progressive in terms of shoulder elevation (eg, start with exercises performed at waist level progressing to shoulder level and finally overhead activities)
 - Exercises should be progressive in terms of muscle demand. It is suggested to use activities that have muscle activity levels documented with EMG
 - Elevation activities may progress from assistive exercises (eg, rope and pulley, wall walks) to active, to resistive upright exercises, then, finally, to prone exercises
 - Nearly full active elevation in the plane of the scapula should be achieved before progressing to elevation in other planes
 - Exercises should be progressive in terms of adding stress to the anterior capsule, gradually working towards a position of elevated external rotation in the coronal plane, the “90-90” position PRN
 - Rehabilitation activities should be pain free and performed without substitutions or altered movement patterns
 - Rehabilitation may include both weight-bearing and non-weight-bearing activities
 - Rehabilitation may include both isolated and complex movement patterns

	<ul style="list-style-type: none"> - Depending upon the goals of the exercise (control versus strengthening), rehabilitation activities may also be progressive in terms of speed once the patient demonstrates proficiency at slower speeds - The rotator cuff and scapula stabilizer strengthening program should emphasize high repetitions (typically 30-50 reps) and relatively low resistance (typically 1-2 kg) - No heavy lifting or plyometrics should be performed during this stage - Elbow flexion/extension strengthening with elbow by the side can begin in this phase <p><u>Pain management:</u></p> <ul style="list-style-type: none"> • Ensure appropriate use of arm during ADLs • Ensure appropriate level of therapeutic interventions • Electrophysical agents as needed
Education	<ul style="list-style-type: none"> • Counsel about using the upper extremity for appropriate ADLs in the pain-free ROM (starting with waist-level activities and progressing to shoulder-level and finally to overhead activities over time) • Continue education regarding avoidance of heavy lifting or quick, sudden motions • Education to avoid positions that place stress on the anterior inferior capsule during ADLs
Milestone/ Criteria to progress to next phase	<ul style="list-style-type: none"> • Staged active ROM goals achieved with minimal to no pain (NPRS, 0-2/10) and without substitution patterns • Appropriate scapular posture at rest and dynamic scapular control during ROM and strengthening exercises • Strengthening activities completed with minimal to no pain (NPRS 0-2/10)
Phase 3 12-24 weeks	
Goals	<ul style="list-style-type: none"> • Normalize strength, endurance, neuromuscular control, and power • Gradual and planned build-up of stress to anterior capsulolabral tissues • Gradual return to full ADLs, work, and recreational activities
Precautions	<ul style="list-style-type: none"> • Do not increase stress to the shoulder in a short period or in an uncontrolled manner • Do not perform advanced rehabilitation exercises (such as plyometrics or exercises requiring end range ROM) if the patient does not perform these activities during ADLs, work, or recreation • Do not progress into activity-specific training until patient has nearly full ROM and strength • Do not perform weightlifting activities that place excessive stress on the anterior capsule. (Example) latissimus pull-downs, and military press performed with the hands behind the head stress the anterior capsule with no additional benefit in terms of muscle activity. Similarly, activities which encourage end range shoulder extension, such as dips, should also be avoided
Importance	<p><u>Activities of primary importance:</u></p> <ul style="list-style-type: none"> • Progressive strengthening and endurance exercises • Progressive neuromuscular control exercises • Activity-specific progression: sport, work, hobbies <p><u>Supplementary activities:</u></p>

- Normalize core and scapular stability

ROM:

- Passive ROM, stretching, and joint mobilizations as needed to address any remaining deficits

Neuromuscular re-education:

- Address any remaining deficits of the rotator cuff, scapula musculature, or trunk musculature

Strength/endurance/power:

- Continue shoulder-strengthening program as initiated in phase 2, with increasing emphasis on high-speed multiplanar activities that incorporate the entire kinetic chain
- Gradually progress rehabilitation activities to replicate demanding ADL/work activities
- Progressive return to weight-lifting program emphasizing the larger, primary mover upper extremity muscles (deltoid, latissimus dorsi, pectoralis major)
 - Start with relatively lightweight and high repetitions (sets of 15-25 repetitions), and gradually decrease repetitions and increase weight after several months
- Suggested upper extremity exercises for early phase 3
 - Biceps curls, shoulder adducted (added in phase 2)
 - Triceps press-downs or kick-backs, shoulder adducted (added in phase 2)
 - Shoulder shrugs
 - Rows (scapular retraction), shoulder adducted
 - Latissimus bar pull-downs, with hands in front of the head
 - Dumbbell overhead shoulder press with hands starting in front of the shoulders (not in the abducted/externally rotated position)
 - Push-ups as long as the elbows do not flex past 90°
- Suggested upper extremity exercises to be added in intermediate phase 3
 - Isotonic pressing activities (eg, flat or incline presses using machines, barbells, or dumbbells)
 - Dumbbell shoulder raises to 90°
 - Rows (scapular retraction), shoulders elevated
 - Machine or barbell shoulder presses that do not require end range abduction/external rotation
- Suggested upper extremity exercises to be added in late phase 3
 - Overhead presses with shoulders in abduction with external rotation (military press)
 - Pectoralis major flys
 - Dead lift
 - Power cleans
- Upper extremity exercises that are not advisable for this patient population
 - Dips
 - Latissimus pull-downs or military press with the bar behind head

Plyometric program (as necessary):

- Criteria to initiate plyometric program
 - Goals of returning to overhead athletics or other work or recreational activities requiring large amounts of upper extremity power

	<ul style="list-style-type: none"> - Adequate strength (4+/5) of entire shoulder girdle musculature - Pain free with basic ADLs and current strengthening program - At least 3 weeks of tolerance to high-speed multiplanar activities that progressively mimic functional demands • Parameters <ul style="list-style-type: none"> - Due to the explosive nature of this type of exercise, emphasis of plyometrics exercises should be on quality not quantity - Perform a few times a week and utilize moderate repetitions (eg, 3-5 sets of 15-20 repetitions) - Begin with unweighted balls and progress to lightly weighted balls (plyoballs) <p>Interval sport programs for activities such as throwing, swimming, and golf, once approved by physician (usually POW 16 or longer)</p>
Education	<ul style="list-style-type: none"> • Counsel in importance of gradually increasing stress to the shoulder while returning to normal ADLs, work, and recreational activities, including heavy lifting, repetitive activities, and overhead sports
Milestone/ Criteria to progress to next phase	<ul style="list-style-type: none"> • Clearance from physician • No complaints of pain at rest and minimal to no pain (NPRS 0-2/10) with activities • No or minimal sensation of instability with activities • Restoration of sufficient ROM to perform desired activities • Adequate strength and endurance of rotator cuff and scapular muscles to perform activities with minimal to no pain (NPRS 0-2/10) or difficulty • If the patient struggles with confidence or shoulder stability, a stabilizing brace may be considered for return to activity, but is most commonly used only for collision sports

References

1. Gaunt BW, Shaffer MA, Sauers EL, Michener LA, McCluskey GM, Thigpen C. The American Society of Shoulder and Elbow Therapists' consensus rehabilitation guideline for arthroscopic anterior capsulolabral repair of the shoulder. *J Orthop Sports Phys Ther.* Mar 2010;40(3):155-68. doi:2407 [pii]

10.2519/jospt.2010.3186