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Superior Labrum Anterior Posterior (SLAP) Repair (Type I & III) Return to Sport Protocol

General Rehabilitation Guidelines:

- A specific Rehabilitation program is dependent on the severity of the pathology/injury and should specifically manage the healing and requirement of the procedure the patient underwent (Debridement vs. Repair), in addition to other concomitant injuries/procedures performed
- The emphasis of the SLAP protocol should be on restoration and enhancement of the dynamic stability of the glenohumeral and scapulo-thoracic joints while protecting the healing tissues from adverse stress
- Hypersensitivity in the axillary nerve distribution is a common occurrence
- For patients who sustained a SLAP lesion secondary to a fall/compression (MVA, Fall on out-stretched arm), weight-bearing exercises should be avoided to minimize compression and sheer on the superior labrum
- Patients who sustained a traction-type injury should avoid heavy resistance or excessive eccentric biceps contractions
- Patients with peel-back lesions (typically overhead athletes), should avoid excessive amounts of shoulder ER while the SLAP lesion is healing
- **SLAP Classifications:** (basic 4, recently additional classifications added):
 - **Type I:** Isolated Fraying of the superior labrum, with a firm attachment of the superior labrum to the glenoid (typically degenerative in nature).
 - **Type II:** (Most common, especially with overhead athletes): A detachment of the superior labrum and the origin of the long head of the biceps brachii tendon from the glenoid creating instability of the biceps-labral anchor.
 - **Type III:** A bucket-handle tear of the superior labrum with an intact biceps insertion.
 - **Type IV:** (The least common of the 4 main types): A bucket-handle tear of the superior labrum that extends into the biceps tendon. This type will also have instability at the bicep-labrum anchor.
 - **Type V:** SLAP lesions with the presence of a Bankart lesion of the anterior capsule extending into the anterior superior labrum.
 - **Type VI:** A disruption or separation of the biceps anchor with an anterior posterior superior labral unstable flap tear.
 - **Type VII:** Lesions that extended anteriorly to involve the area inferior to the middle glenoid ligament.
 - **Type VIII:** A type II SLAP tear with a posterior labral extension to the 6 o'clock position.
 - **Type IX:** Is a circumferential lesion involving the full 360° of labral attachment to the glenoid rim.
 - **Type X:** In involves a superior labral tear combined with a posteroinferior labral tear (a reverse Bankart lesion).
 - * It is common to have concomitant injuries with SLAP lesions, so these classifications can be beneficial for creating the most appropriate treatment plan*

Type I and Type III Repair (Debridement):

- This protocol can be aggressive at restoring motion secondary to the biceps-labral anchor being intact and stable.

Phase I Restoration of Motion Phase (approximately 1-10 days):

- Goals:
 - Achieve normal non-painful shoulder ROM
 - Prevent muscle atrophy
 - Decrease pain and inflammation
 - Have patient fill out a baseline Kerlan-Jobe Orthopaedic Clinic Overhead Athlete Shoulder and Elbow (KJOC) questionnaire- *more accurate assessment tool designed specifically for overhead athletes, or the American Shoulder and Elbow Score (ASES)
- Patient Education:
 - The sling is worn 3-4 days following surgery
 - Cardiovascular Fitness: Walking or Stationary Bike, **Wearing the Sling.**
- Treatment:
 - **Modalities:** Cryotherapy, Moist heat, ESTIM, Dry Needling
 - Assess any breathing dysfunctions and teach appropriate breathing exercises for diaphragmatic breathing
 - Desensitization techniques for axillary nerve distribution, if present
 - PROM and AAROM may be begun immediately, with full PROM expected to be restored within 10-14 days post-op
 - Manual stretching, joint mobilization, and evaluation and treatment of cervical, thoracic, and rib immobility and dysfunctional patterns
 - Pendulum exercises
 - Rope pulley exercises
 - Bar/Cane for flexion/extension, abduction/adduction, ER/IR (begin at 0° of abduction, then progress to 45° in the scapular plane and then to 90°)- by post-op day 4-5
 - Patient driven manual stretches (joint and capsular stretches, as well as any other tissue extensibility issue of other joints/muscles)
 - **Strengthening:**
 - Isometric strengthening (all planes)- Sub-maximally and pain-free during the first 7 days post-op to minimize atrophy. **No Biceps isometrics for 5-7 days post-op**
 - Light tubing may be initiated for ER/IR at 0° abduction late in this phase (approximately 7-10 days post-op)
 - **Criteria to Progress to Phase II:**
 - Full PROM
 - Minimal pain and tenderness
 - 4/5 MMT of IR, ER, and Flexion

Phase II: Intermediate Phase: (approximately 10 days-4 weeks post-op):

- Goals:
 - To regain and improve muscular strength
 - Normal Joint arthrokinematics- Cervical, Thoracic, Shoulder, Hips, and Ankles (if needed)
 - Improve neuromuscular control of the Shoulder, Scapula, Trunk, and Hips
- Patient Education:
 - Instruct patient on precautions and limitations while in this phase of rehabilitation

- Treatment:
 - Asses core stability and dysfunction- determine whether dysfunctions are true strength issues or if they are a result of muscular inhibition from a joint/movement restriction
 - Initiate neuromuscular control exercises for trunk/core, hips, and scapulothoracic areas
 - Initiate proprioceptive training exercises
 - Teach basic Dynamic Stretching Program (total body)
 - Light isotonic strengthening for shoulder and scapulothoracic musculature, (with the exception of the biceps), with resistance tubing and dumbbells
 - ***See Shoulder Muscle Function and high muscle activity with shoulder exercises sheet and progress appropriately**
 - ER/IR tubing and dumbbells at 0° abduction: side-lying ER, Prone Rowing, Prone horizontal Abduction, Prone ER, PNF manual resistance and dynamic stabilization techniques within all planes of scapular motion
 - Active elevation exercises: Scapular plane elevation (full can) and lateral raises
 - Begin using 1lb weights and progress weekly in 1lb increments (gradual, controlled, progressive resistance)
 - Light biceps resistance is not initiated until 2 weeks post-op to prevent debridement site irritation. *Caution with early over-aggressive elbow flexion and forearm supination exercises, particularly eccentric
 - Normalizing joint arthrokinematics:
 - Joint mobilization in the glenohumeral, cervical, thoracic, lumbar and rib joints
 - Continued stretching of tissue extensibility dysfunctional muscles/joints along the entire kinetic chain
 - As the strengthening program progresses, emphasis on obtaining muscular balance and promoting dynamic shoulder stability
 - The manual resistance and the end-range rhythmic stabilization drills combined with isotonic strengthening and core stabilization exercises, will help meet the ultimate goal of re-establishing dynamic humeral head and scapular control/stability
 - Thrower's Ten program may be begun approximately week 3-4 (**See Attached Sheets**)
 - Toward the end of this phase high emphasis is placed on rotator cuff and scapular strengthening
 - Patient should be riding a stationary bike or elliptical for continued endurance training
- Criteria to Progress to Phase III
 - Full non-painful PROM and AROM
 - No Pain or Tenderness with Exercises and ADL's
 - Comparative strength of 70% of the contralateral uninjured UE

Phase III- The Dynamic Strengthening Phase- (approximately 4-6 weeks post-op)

- Goals:
 - Improve Strength, Power, and Endurance
 - Improve neuromuscular control
 - Begin preparation to initiate throwing activities/exercises with the patient
 - Patient is evaluated with the Functional Movement Screen (FMS) and Y-Balance/ Star Excursion assessments for baseline values toward the end of Phase III
- Patient Education:
 - Instruct patient on precautions and limitations while in this phase of rehabilitation
- Treatment:

- Continue Throws Ten Program- Progressing to the Advanced Thrower's Ten program (**See Attached Sheets**), when tolerated
- Continue Strength training with weights, with the addition of the supraspinatus and deltoid- ***See Shoulder Muscle Function and High Muscle Activity with Shoulder Exercises Sheets-** progress appropriately
 - Advanced controlled weight training exercises/activities, with emphasis on proper technique
 - Patient should avoid excess shoulder extension with exercises such as bench press and seated rows to minimize stress on the shoulder
- Progress tubing exercises to 90° of flexion or abduction for IR and ER exercises- Sets should be performed at slow and fast paces
 - Begin tubing exercises for biceps strengthening
- Continue strength/endurance/stabilization exercises for scapulothoracic musculature- including closed-chain exercises
- Initiate UE Plyometric Phase I (Two-Handed) protocol at approximately 4-5 weeks post-op (* if criteria for phase III was met), then progress to UE Plyometric Phase II 1-2 weeks later (**See Attached Sheets**)
- Initiate PNF Diagonal patterns with tubing and Dumbbells in various positions (standing: DL-> Staggered stance-> SL-> uneven surface, DL and Half kneeling: even or uneven surface, seated on an exercise ball, etc)
- Initiate Walk-to-Run Protocol (**See Attached Sheets**) to keep patients endurance and prepare for return to activity phase
- Criteria for Progression to Phase IV
 - Full PROM
 - No pain or tenderness with exercises, ADL's, or advanced strengthening and plyometric activities
 - Strength comparison of $\geq 80\%$ to the contralateral uninjured UE
 - Score on the FMS of ≥ 14 , Demonstrate improvement in the Y-Balance/ Star Excursion Balance Test
 - Subjective Evaluation Form score or minimal detectable change improvement

Phase IV- Return to Activity Phase (*approximately 7+ weeks post-op) ***Dependent on concomitant injuries/procedures**

- Goals:
 - To progressively increase activities/exercises to assess and prepare patient for return to sport specific activities
- Patient Education:
 - Instruct patient on precautions and limitations while in this phase of rehabilitation
- Treatment:
 - Continue all exercises from Phase III that are still needed
 - Continue/ Progress Core, Hip, And Scapular Stabilization Exercises
 - Make sure to include: Deadlift variations, Chop-n-Lift variations, Bridging variations, Plank Variations, PNF Squatting variations, Push-Up Progressions, Balance/Proprioception exercises, and Reaction Training
 - Begin Phase III UE plyometric protocol (**See Attached Sheets**)
 - Initiate and evaluate with LE Plyometric Protocol (**See Attached Sheets**)

- Teach Sport Specific Dynamic Stretching Program- (**See Specific Sport Dynamic Stretching Sheet**)
- Continue Advanced Thrower's Ten program
- Initiate the Interval Running Protocol- **See Interval Running Protocol**
- Patient may begin specific sport skill activities/ Initiate interval sport programs, between weeks 8-12, depending on concomitant injuries
 - \leq 20%-30% Rotator Cuff Tear can progress at this time frame,
 - More extensive pathology may be delayed for up to 4 months- determined by ROM, Strength, functional assessment, and MD clearance

Criteria for entering Return to Specific Sport and Continued Interval Sport Protocols:

- 1- Clearance from the surgeon to begin the Return to Sport Specific Protocol.
- 2- No signs of any lingering shoulder instability with activities.
- 3- Restoration of all ROM needed to participate in desired sport.
- 4- Strength testing of \geq 90% compared to contralateral/uninvolved side.
- 5- Adequate strength and muscle endurance of the shoulder, rotator cuff, trunk, hips, and scapular musculature needed to perform sport specific drills/ activities with minimal to no pain or difficulty.
- 6- **If Available:** Perform Isokinetic testing: With the goals of the patient being able to achieve a ER peak torque/bodyweight ratio of 18%-23%, an ER/IR ratio of 66%-76%, and an ER/ABD ratio of 67%-75%, at 180°/sec testing.
- 7- Patient scores an appropriate score on the Kerlan-Jobe Orthopaedic Clinic Overhead Athlete Shoulder and Elbow (KJOC) Questionnaire, or ASES subjective evaluation forms, that would show ability to return to sporting activity.
- 8- $>$ 14 on the FMS and score equal to their peers for sport and age through the Y-Balance (Move2Perform database), or CKCUTEST equal to normative values.
- 9- No Pain with any of the previous exercises/ activities/ evaluations performed.
- 10- Completing the Throwers Ten Program, and Advanced throwers Ten Program, as well as the Upper Extremity Plyometric Protocols.
- 11- Passing of the Functional Tests listed below: (Testing can be over multiple sessions):
 - a. Trunk Testing: Re-Test (**See attached sheets**)
 - i. Deep Neck Flexor Test
 - ii. Segmental Multifidus Test
 - iii. Trunk Curl-Up Test
 - iv. Double-Leg Lowering Test
 - v. Prone Bridge Test
 - vi. Endurance of Lateral Flexors (Side Bridge) Test
 - vii. Extensor Dynamic Endurance Test
 - b. Upper Extremity Testing: (**See attached sheets**)
 - i. Alternative/Modified Pull-up Test
 - ii. Push-up Test
 - iii. Backward Overhead Medicine Ball Throw Test
 - iv. Sidearm Medicine Ball Throw Test
 - v. One-Hand and Two-Hand Seated Shot-Put Throw Test- 6-pound medicine ball (Dominant and Non-Dominant UE)
 - vi. *If patient is a baseball or Soft-ball pitcher/player:
 1. Functional Throwing Performance Index (FTPI) Test- **best assessed with video analysis**

2. Baseball pitchers only- PT/ATC fills out Upper Extremity Throwing Analysis Form- to determine areas of the throwing motion that need to be addressed in the Sport Specific/Return to Baseball Pitching Protocol

***See Return to Specific Sport and Interval Sport Protocol**

References

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Shoulder muscle function and high muscle activity with shoulder exercises

Rotator Cuff:

Supraspinatus:

- The supraspinatus compresses, abducts and provides a small ER torque to the glenohumeral joint
- At lower scaption angles, supraspinatus activity increase to provide additional humeral head compression within the glenoid fossa to counter the humeral head superior translation from the deltoids
- 'Full can' may be preferred over the 'empty can' for rehabilitation and supraspinatus testing:
 - 1. IR of the humerus with the 'empty can' does not allow the greater tuberosity to clear from under the acromion during humeral elevation, which increases subacromial impingement risk from decreased space width.
 - 2. Abducting while in extreme IR progressively decreases the abduction moment arm of the supraspinatus from 0° to 90° abduction, which creates a diminished mechanical advantage, increasing tensile forces on the healing tendon.
 - 3. Scapular kinematics are different between 'empty can' and 'full can' exercises. Scapular IR (transverse plane movement with the medial border moving posterior, resulting in 'winging'), and anterior tilt (sagittal plane movement with the inferior angle moving posterior), both of which decrease subacromial space width, are greater in the 'empty can' versus the 'full can'. The 'empty can' tensions both the posteroinferior capsule and rotator cuff (infraspinatus primarily). Tension in these structures contributes to an anterior tilted and internally rotated scapula, which protracts the scapula. Scapular protraction significantly reduces glenohumeral IR and ER strength by 13%-24% and 20% respectively. Scapular protraction has been shown to decrease subacromial space width, whereas scapular retraction has been shown to increase subacromial space width, as well as, enhance supraspinatus force production during humeral elevation, making strengthening scapular retractors and good posture very important
 - 4. The use of the 'full can' test position may be desirable in the clinical setting because there is less pain provocation, and it has been shown to be a more optimal position for supraspinatus isolation.
- High muscle activity of the Supraspinatus with exercises:
 - Prone horizontal abduction at 100° abduction with ER
 - Prone ER at 90° of abduction
 - Standing ER at 90° of abduction
 - Flexion above 120° with ER
 - Military Press (trunk vertical)
 - Side-lying abduction
 - PNF scapular clock, D2 diagonal pattern flexion and extension
 - Standing forward scapular punch
 - Rowing exercises
 - Push-up exercises
 - Two-Hand medicine ball overhead throws

Infraspinatus and Teres Minor

- The infraspinatus and Teres Minor comprise the posterior cuff, which provides glenohumeral compression, ER and abduction, and resists superior and anterior humeral head translation by exerting a posteroinferior force to the humeral head. The ER provided from the posterior cuff helps clear the greater tuberosity from under the coracoacromial arch during overhead movements, minimizing subacromial impingement
- Infraspinatus:
 - It's superior, middle, and inferior heads all generate its largest ER torque at 0° abduction. This implies that the infraspinatus is a more effective external rotator at lower abduction angles compared to higher abduction angles
 - As resistance increases, infraspinatus activity increases to resist superior humeral head translation due to the increased activity from the deltoids
 - High muscle activity of the Infraspinatus with exercises:
 - Prone horizontal abduction at 100° abduction with ER
 - Flexion
 - Side-Lying abduction
 - Standing Extension from 90° to 0°
 - D1 and D2 diagonal pattern flexion
 - Variety of Push-up exercises
 - Bipod position (alternating arm and leg)
- Teres Minor:
 - The Teres Minor generates a relatively constant ER torque throughout arm abduction movement, which implies that the abduction angle does not affect the effectiveness of the Teres Minor to generate ER torque
 - The Teres Minor is a weak adductor of the humerus regardless of the rotational position of the humerus, and because of its posterior position at the shoulder, it also helps generate a weak horizontal abduction torque
 - High muscle activity of the Teres Minor with exercises:
 - Prone horizontal abduction at 100° of abduction with ER
 - Standing high, mid, and low rows
 - Standing forward scapular punch
 - IR exercises (stabilizing the glenohumeral joint)

Subscapularis:

- The subscapularis provides glenohumeral compression, stability, IR and abduction
- The movement most optimal for isolation and activation of the subscapularis muscle is the Gerber Lift-off, against resistance, which is performed by lifting the dorsum of the hand off the mid-lumbar spine, against resistance, by simultaneously extending and internally rotating the shoulder. * This was originally developed as an assessment, however, can also be used as a treatment exercise since:
 - It tends to isolate the subscapularis muscle by minimizing pectoralis major, teres major, latissimus dorsi, supraspinatus and infraspinatus activity when performed with no resistance
 - It generates as much or more subscapularis activity as compared with resisted IR at 0° or 90° of abduction
 - It avoids the subacromial impingement position associated with IR at 90° of abduction

- * It is important to have the patient's hand at the mid-lumbar level to perform the exercise, because the lower and upper subscapularis activity decreases approximately by 30% when the exercise is performed at the buttocks level.
- **High muscle activity of the subscapularis with exercises:**
 - The 'Full Can' – it may be more effective in generating the subscapularis than the 'Empty Can'
 - Flexion and abduction above 120° with ER
 - Scaption in neutral rotation
 - Side-lying abduction
 - Military press
 - D2 diagonal pattern Flexion and Extension
 - PNF- scapular clocks, depression, elevation, protraction and retraction movements
 - Push-ups
 - Standing scapular dynamic hug
 - Standing forward scapular punch
 - Standing high, mid, and low scapular rows
 - 2-Handed overhead medicine ball throws

Deltoid Biomechanics and Function in Rehabilitation Exercises

- The anterior and middle deltoid are not effective abductors at low angles (especially anterior delts), while the supraspinatus, infraspinatus and subscapularis are more effective abductors at low abduction angles
- The anterior and middle delts activity generally peaks between 60° and 90° of scaption, while the supraspinatus, infraspinatus and subscapularis activity generally peaks between 30° and 60° of scaption
- At 60° ER and 0° abduction (full can position), the anterior deltoid is effective as an abductor, even at small abduction angles, not so with the empty can position, in IR
- High muscle activity of the Anterior and Middle Deltoid with exercise:
 - D1 and D2 diagonal pattern flexion
 - Flexion
 - Push-up exercises
 - Bench press
 - Dumbbell fly
 - Military press
 - 2-Handed overhead medicine ball throws
 - Press-ups
 - Dynamic hug exercise
 - Standing forward scapular punch
 - * Anterior deltoid increases as the trunk becomes more vertical (incline and military press), and less with bench press and decline press (least activity)
 - * Hand Grip also affects shoulder biomechanics and deltoid activity during the bench press
 - Wide hand grip results in slightly higher anterior deltoid activity during incline and military press
 - Narrow hand grip results in greater anterior deltoid and pectoralis activity during decline and bench press
 - Push-up technique variations also affect deltoid activity:
 - Anterior deltoid showed the least activity in a standard push-up, greater with a push-up with elevated feet, and greatest with the 1-arm push-up

- Anterior deltoid showed 60%-70% MVIC with the plyopush-up (clapping) and the 1-arm push-up, versus 40%-50% with the standard push-up, push-up with staggered hands, and push-ups with 1 or both hands on a ball
- * The highest Middle Deltoid activity is during shoulder abduction
- Posterior Deltoid
- It more effectively functions as a scapular plane adductor, and has low activity with scaption, flexion and abduction
- High muscle activity with the posterior deltoid with exercises:
 - The 'Empty Can' – which means the IR with scaption will fire the posterior deltoid
 - Rowing exercises
 - Prone horizontal abduction at 100° abduction with ER and IR (posterior and middle deltoid)
 - D1diagonal pattern extension, D2 diagonal pattern flexion
 - Push-up exercises
 - Shoulder extension
 - Side-lying ER at 0° abduction

Scapular Muscle Function in Rehabilitation Exercises

Scapulohumeral Rhythm:

- Near 30°-40° of humeral elevation the scapula begins to upwardly rotates in the frontal plane, rotating approximately 1° for every 2° of humeral elevation until 120° of humeral elevation, and there after rotating 1° for every 1° of humeral elevation (total of 45°-55° of upward scapular rotation)
- * The scapulohumeral rhythm is affected by humeral rotation
 - Scapular IR (winging) and anterior tilt are greater with humeral IR ('Empty Can') vs. ('Full Can')
 - Scapular IR and anterior tilt are also associated with a smaller subacromial space width, increasing impingement risk
 - During humeral elevation, in addition to scapular upward rotation, the scapula normally posterior tilts (the inferior angle moving anterior in the sagittal plane) approximately 20°-40° and externally rotates (lateral border moves posterior in the transverse plane) approximately 15°-35°
 - If normal scapular movements are disrupted by abnormal scapular muscle firing patterns, weakness, inhibition, fatigue or injury, the shoulder complex functions less effectively and injury risk is increased
 - The Primary muscle that creates and controls movements of the scapula are the Serratus Anterior, Trapezius, Levator Scapulae, Rhomboids and Pectoralis Minor
- Serratus Anterior
 - The serratus anterior works with the pectoralis minor to abduct (protract) the scapula, and with the upper and lower trapezius to upwardly rotate the scapula.
 - It contributes to all components of normal scapular movements during humeral elevation, which includes upward rotation, posterior tilt and external rotation.
 - It also helps stabilize the medial border and inferior angle of the scapula, preventing scapular IR (winging) and anterior tilting
 - High muscle activity of the Serratus Anterior with exercises:
 - D1 and D2 diagonal pattern flexion and D2 diagonal pattern extension

- Supine scapular protraction
- Supine upward scapular punch
- Military press
- IR and ER at 90° abduction- which is interesting since it was traditionally thought to be rotator cuff muscles only
- Flexion
- Abduction
- Standing scapular dynamic hug
- PNF scapular depression, and protraction
- 'Empty Can'
- Wall Slides- With forearms on the wall with protraction as they lean in and elevate their arms- patient reports less pain when performed this way
- Push-up plus
- Muscle activity is lower with wall push-up plus, moderate with push-up plus on knees, and high with push-up plus in standard push-up position or with their feet elevated
- * This is the suggested sequence to progress a patient

- Trapezius

- The general function of the trapezius includes scapular upward rotation and elevation for the upper trapezius, retraction for the middle trapezius, and upward rotation and depression for the lower trapezius.
- The inferomedial fibers of the lower trapezius may also contribute to posterior tilt and ER of the scapula during humeral elevation, which can decrease subacromial impingement risk
- High muscle activity of the Upper Trapezius with exercises:
 - Shoulder shrugs
 - Prone rows
 - Prone horizontal abduction at 90° and 135° of abduction with ER and IR
 - D1 diagonal pattern flexion
 - Standing scapular dynamic hug
 - PNF scapular clocks
 - Military press
 - 2-handed overhead medicine ball throws
 - Scaption and abduction below 80°, at 90°, and above 120° with ER
 - During scaption the upper trapezius activity increases from 0°-60°, remains constant from 60°-120°, and progressively increases from 120°-180°
- High muscle activity in the Middle Trapezius with exercises:
 - Shoulder shrug
 - Prone rowing
 - Prone horizontal abduction at 90° and 135° of abduction with ER and IR
- High muscle activity of the Lower Trapezius with exercises:
 - Prone rowing
 - Prone horizontal abduction at 90° and 135°
 - Abduction
 - D2 diagonal pattern flexion and extension
 - PNF scapular clocks
 - Standing high scapular rows
 - Scaption, flexion, and abduction above 120° with ER

- *Significantly higher activity of the lower trap with prone ER at 90° than with the 'Empty Can'
- Rhomboids and Levator Scapulae
 - Both the rhomboids and levator scapulae function as scapular adductors (retractors), downward rotators, and elevators
 - High muscle activity of the rhomboids with exercises:
 - D2 diagonal pattern flexion and extension
 - Standing ER at 0° and 90° of abduction
 - Standing IR at 90° of abduction
 - Prone horizontal abduction at 90° of abduction with IR
 - Scaption
 - Abduction and flexion above 120° with ER
 - Prone rowing
 - Standing high, mid, and low scapular rows
 - High muscle activity with the levator scapulae with exercises:
 - Scaption above 120° with ER
 - Prone horizontal abductors at 90° abduction with ER and IR
 - Prone rowing
 - Prone extension from 90° of flexion