Rehabilitation following Anterior Shoulder Stabilization:

Open and Arthroscopic

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The etiology of anterior shoulder instability can be either the result of a traumatic, acute episode resulting in a dislocation that may have to be reduced by a physician or a chronic condition. The recurrence rate for anterior dislocations is extremely high, especially in the younger, active population (1-4). The mechanism of injury for a traumatic anterior instability usually is some combination of shoulder external rotation, abduction and extension. Common mechanisms include falling on an outstretched hand or planting a ski pole and falling forward. Instability can also be chronic, resulting from repetitive activities that can cause excessive laxity of the shoulder capsule and or tearing of the labrum or due to individual general systemic laxity. Often the result of anterior shoulder instability is a “Bankart Lesion” which is defined as an avulsion of the anteroinferior glenoid labrum (5). Labral pathology and shoulder instability can be treated conservatively but often requires surgical intervention. This
chapter will discuss the HSS guidelines to rehabilitation following an anterior shoulder stabilization.

**Surgical Overview**

The labrum is a fibrocartilaginous structure that is attached to the glenoid rim. (Figure 46-1) There is a great deal of anatomic variation (6). The glenohumeral ligaments attach to the labrum. It contributes to glenohumeral stability by increasing the surface contact area for the humeral head and provides resistance to humeral head translation (6). An anterior stabilization may be performed open or arthroscopically. Patients with extreme laxity or who have multidirectional instability may be done through an open procedure. The most common open procedure performed is done by transecting a portion of the subscapularis muscle. The torn labrum is then repaired and the capsule is tightened by making a cut through it and overlapping the margins of the cut. (Figure 46-2).

In contrast to more traditional open procedures which have greater morbidity, anterior stabilizations can now be performed arthroscopically. The arthroscopic procedure reduces the morbidity and chance of range of motion loss. A Bankart lesion is commonly repaired with transglenoid
suture anchors. In addition, any excess laxity in the capsule can be reduced by a similar procedure (Figure 46-3). The degree to which the capsule is shifted is based upon the patient’s examination under anesthesia. Following the procedure, the patient’s shoulder is placed in an immobilizer in adduction and internal rotation.

**Rehabilitation Overview**

The rehabilitation program following an anterior stabilization generally begins 1 to 3 weeks post surgery. The patient wears the immobilizer constantly except when performing exercises or bathing. The program emphasizes early, controlled motion to prevent contractures and to avoid excessive passive stretching later on in the program. External rotation and extension of the shoulder are progressed slowly to protect the repair of the labrum and to avoid excessive stretching of the anterior capsule. Historically, there have been significant failure rates among these arthroscopic procedures (7-10). Range of motion progression following the arthroscopic procedure is slower than the open procedure secondary to the lesser fixation. Throughout the program a full upper extremity strengthening program will be progressed functionally to prepare the patient for return to activity. The goals are to restore normal strength, range of motion,
flexibility and proprioception since loss of proprioception has been demonstrated with shoulder instability(11-13). The program is based on the patient returning to sport specific activities no earlier than 3 months post surgery. Overhead activities are progressed to last. Patient education is a critical to avoid reinjury. Patients should understand the precautions associated with this surgery.

**Post-Operative Rehabilitation**

**Post-Operative Phase 1 (Week 1-3)**

The primary goal of the first phase of rehabilitation is on to gradually restore range of motion while protecting the healing structures. The patient is advised to wear the immobilizer at all times except when performing exercises or bathing. A goal is to minimize the adverse effects of immobilization and lessen the risk of contracture. Motion can stimulate mechanoreceptors that reduce pain and have a positive effect on collagen alignment and articular cartilage(14-16 ). The patient is instructed to limit external rotation and extension to neutral to avoid overstressing the repair.

At post-operative week 1-3 the surgeon will allow passive forward flexion and external rotation range of motion of the shoulder. For an arthroscopic
procedure, external rotation is limited to neutral. For the open procedure, 30 degrees of external rotation is allowed.

Gripping exercises are initiated to promote circulation and supported wrist and elbow range of motion exercises to avoid any contractures caused by the immobilizer.

Based on the principle of proximal stability for functional stability, scapula isometrics are initiated(17). (Figure 46-4) In addition, sub-maximal, pain-free deltoid isometrics are initiated. It is important that the patient is aware that the amount of tension generated should not increase shoulder pain or inflammation. The patient is instructed in the use of cryotherapy to reduce any postoperative swelling, pain or inflammation.
Post-Operative Phase 1 (Week 1-3)

Goals:
- Promote healing: reduce pain, inflammation and swelling
- Forward Flexion to 90 degrees
- Arthroscopic: External Rotation to Neutral; Open: 30 degrees
- Independent home exercise program

Precautions:
- Immobilizer at all times when not exercising
- External Rotation and Extension limited to neutral (30 degrees for Open)

Treatment Strategies:
- Immobilizer
- Elbow / wrist Active range of motion
- Gripping exercises
- Scapula isometrics
- Pain-free, submaximal deltoid isometrics
- Active assisted range of motion: Forward flexion (scapula plane)
- Active assistive range of motion: External Rotation to neutral
- Home Exercise Program
- Modalities as needed

Criteria for Advancement:
- External Rotation to neutral (30 degrees for open)
- Forward Flexion to 90 degrees
- Minimal pain or inflammation
**Troubleshooting Phase 1**

During this phase, the clinician should monitor the patient’s range of motion carefully to assess whether the patient’s motion is progressing too quickly and thus overstressing the repair. Secondly, especially with open procedures, monitoring the endfeel to assess that a possible contracture is developing. Either of these scenarios should be communicated to the surgeon.

The patient should be aware that isometrics for the deltoid should be pain-free and that any inflammation that occurs may slow the progression.

**Post-Operative Phase 2 (Week 3-6)**

During this phase, the immobilizer will be discharged and the patient will continue to progress with range of motion. Generally, this phase lasts 3-4 weeks for the open procedure and 4-6 for the arthroscopic. Wand exercises are utilized for active assistive range of motion. When the patient has
achieved approximately 110 degrees of flexion in supine, a progression to pulleys is allowed. Patients that are having difficulty restoring range of motion may benefit from hydrotherapy. The buoyancy of the water is helpful in assisting elevation of the upper extremity(18). Wand exercises are also utilized for external rotation. The arthroscopic patients will be allowed 45 degrees of external rotation and the open may progress to 60 degrees. Forward flexion is also progressed as tolerated.

Scapula strengthening is progressed by performing manual side lying stabilization exercises and physioball stabilization exercises are initiated when tolerated.( Figure 46-5 ) Closed chain exercises, performed with distal end of the limb fixed, have been shown to promote stability and stimulate proprioception of the joint( 19, 20). If the patient demonstrates adequate range of motion and is relatively asymptomatic, submaximal IR/ER isometrics may be initiated in a modified neutral position.( Figure 46-6) By beginning to activate the rotator cuff, the patient begins to restore dynamic stability to prepare the upper extremity for active range of motion. The patient should be aware that inflammation may result in a reflex inhibition of the rotator cuff(21).
Post-Operative Phase 2 (Week 3-6)

**Goals:**
- Continue to promote healing
- Arthroscopic: External rotation to 45 degrees; Forward flexion to 120 degrees
- Open: External Rotation to 60 degrees; Forward flexion to 145 degrees
- Begin to restore scapula and rotator cuff strength

**Precautions:**
- Limit External rotation to 45 degrees (arthroscopic)
- Avoid excessive stretch to anterior capsule
- Avoid rotator cuff inflammation

**Treatment Strategies:**
- D/C immobilizer (MD directed)
- Continue Active assistive range of motion – FF: wand exercises, pulleys
  Continue Active assistive range of motion – ER: wand exercises
- Hydrotherapy (if required)
- Manual scapula sidelying stabilization exercises
- Physioball scapula stabilization exercises
- IR/ER isometrics in modified neutral (sub-maximal, pain-free)
- Modalities as needed
- Modify Home Exercise Program

**Criteria for Advancement:**
- Minimal pain and inflammation
- Arthroscopic: External rotation to 45 degrees; Forward flexion to 120 degrees
- Open: External rotation to 60 degrees; Forward flexion to 145 degrees
- Internal rotation/external rotation strength 4/5

**Troubleshooting**

During this phase, the patient’s range of motion should continue to be monitored carefully. For the open procedures, the clinician should be
concerned with a slow progression of motion and continue to monitor the patient’s endfeel. With the arthroscopic procedures, too rapid a progression is monitored carefully. The patient must continue to be educated regarding the adverse effects of inflammation of the rotator cuff. Isometrics must continue to be pain-free.

**Post-Operative Phase 3 (Week 6-12)**

During this phase, normal range of motion is restored. Forward flexion and external rotation range of motion may be progressed to tolerance. Wand exercises and pulleys are continued to be utilized. The patient begins to restore internal rotation. In addition, general flexibility exercises for the entire upper extremity are initiated. Excessive passive stretching should continue to be avoided.

During this phase, a normal strength base is established. This is a prerequisite for the sport or activity phase. Scapula strengthening is progressed in ranges that continue to protect the anterior capsule and labrum. By restoring normal scapulothoracic function, a stable base for glenohumeral rotation is established. In addition, the scapular muscles tilt
the glenoid in the proper position for maximal congruency with the humeral head. Finally the proper length – tension relationship of the glenohumeral muscles is maintained(22,23). Isotonic exercises are initiated to include the trapezius, rhomboids, serratus and levator scapula. Exercises include rowing, shrugs and serratus punch. In addition, closed chain exercises such as wall pushups with a plus are incorporated (Figure 46-7).

If strength and range of motion are adequate, IR/ER strengthening may be progressed to elastic resistance in a neutral position. A towel roll under the arm moves the patient into a position of comfortable abduction which improves the blood supply to the shoulder(24). In addition, it positions the arm closer to the plane of the scapula, where there is the optimal length tension relationship of the glenohumeral muscles(25).

Latissimus strengthening is initiated using elastic resistance. The latissimus has been demonstrated to provide a compressive force to the glenohumeral joint thus promoting stability and reducing the load of the glenohumeral muscles(26). Initially, strengthening is limited to 90 degrees of flexion and not extended beyond neutral to avoid stretch of the anterior capsule and labrum. As strength improves, this is progressed to the overhead position.
If the strength of the rotator cuff and scapula are adequate, active forward flexion is initiated in the scapular plane. Emphasis is placed on restoring normal glenohumeral rhythm. The scapular plane is used because it provides the greatest joint conformity and thus the least amount of capsular stress(27). These exercises are performed with the thumb up to minimize the chance of rotator cuff impingement. (Figure 46-8)

As this phase progresses, functional demands must be met. Eccentric strengthening should be emphasized since EMG studies have demonstrated a great deal of eccentric muscle activity in certain sports(28-30).

When strength and range of motion are adequate, proprioceptive training is advanced. Neuromuscular exercises, such as rhythmic stabilization are initiated. These are initiated in the scapular plane where stress to the capsule is minimized(27). With adequate strength and range of motion, proprioceptive neuromuscular patterns are initiated. In particular, the D2 flexion pattern emphasizes the musculature that is utilized in many overhead activities(17).
It has been demonstrated that proprioception is compromised with fatigue(31). Endurance training is incorporated into the program during this phase. As the patient progresses, neuromuscular drills are performed to fatigue. Upper body ergometry is utilized to restore endurance. (Figure 46-9)

Isokinetic training is incorporated into the program to enable training at higher speeds and to further build endurance. Following a training regime, isokinetic testing will provide an objective assessment, especially for rotator cuff strength, which plays an integral role in the stability of the glenohumeral joint. In addition it provides specificity with regard to testing at faster and more functional speeds(32).
Post-Operative Phase 3 (6-12 weeks)

Goals:
- Restore full shoulder range of motion
- Restore normal scapulohumeral rhythm
- Upper extremity strength 5/5
- Restore normal flexibility
- Begin to restore upper extremity endurance
- Isokinetic IR/ER strength 85% of unaffected side

Precautions:
- Avoid rotator cuff inflammation
- Continue to protect anterior capsule
- Avoid excessive passive stretching

Treatment Strategies:
- Continue Active assistive range of motion for Forward flexion and External rotation to tolerance
- Begin Active assistive range of motion for internal rotation
- Progress scapula strengthening in (include closed chain exercises)
- Begin isotonic internal rotation/external rotation strengthening in modified neutral (pain-free)
- Begin latissimus strengthening (progress as tolerated)
- Begin scapular plane elevation (emphasis on correct scapulohumeral rhythm)
- Begin upper body ergometry to restore endurance
- Begin humeral head stabilization exercises (if adequate strength and ROM)
- Begin PNF patterns if internal/external rotation strength is 5/5
- Begin general upper extremity flexibility exercises
- Isokinetic training and testing
- Modalities as needed
- Modify Home Exercise Program

Criteria for Advancement:
- Normal scapulohumeral rhythm
- Minimal pain and inflammation
- IR/ER strength 5/5
- Full upper extremity range of motion
- Isokinetic IR strength 85% of unaffected side
Troubleshooting

During this phase, the clinician continues to carefully monitor that the patient is not developing excessive inflammation that may result in a capsular contraction and reflex inhibition of the rotator cuff\(^\text{21}\). In such cases the surgeon should be notified. Certain mobilization techniques may be indicated. Scapulohumeral rhythm is also monitored to avoid any development of abnormal movement patterns. The patient continues to be educated to avoid activities that evoke excessive pain and inflammation. Aggressive strengthening does not mean painful strengthening. In addition, flexibility exercises should not be performed in painful ranges. Patients often have the tendency to “over stretch”. The clinician must also monitor that the patient has adequate strength and range of motion to perform an exercise, such as a PNF pattern. This will avoid developing any muscular substitution or abnormal movement pattern.

Post-Operative Phase 4 (Week 12-18)

This is the transitional phase that prepares the patient for return to sport or other functional activities. During this phase the demands of the functional
activity are met and normal neuromuscular function is restored. For example, if the patient is returning to any overhead activities, IR/ER strengthening is advanced to the abducted “90-90” position. When the patient enters this phase, he or she must exhibit normal strength, range of motion, flexibility and endurance. An isokinetic test will provide some objective data regarding strength. The patient’s internal and external rotation strength should be at least 85% of the unaffected side. The patient must be pain free. If these criteria are met, if required, an activity specific plyometric program is initiated. The plyometric program should be functionally specific to the demands of the patient. Voight and Draovitch advocate stressing the quality of the exercise and using a program that is progressive in overload (33). Exercises are progressed by increasing the challenge to the shoulder. In addition, the demands of the trunk and lower extremities should be met. (Figure 46-10, 46-11)

If an after being cleared by the surgeon, the patient may begin a sport or activity specific program if the patient has completed a plyometrics program without symptoms. These programs range from sport specific activities such as interval throwing and tennis programs to work hardening activities. Regardless, the program is designed to be progressed individually so as to
minimize the chance of reinjury. Proper mechanics of the activity are emphasized. As the patient completes an individual program, return to the desired sport or activity is allowed.

During this phase, patients are also encouraged to maintain a strengthening and flexibility program and incorporate it into their normal exercise routine. The functional activity may result in a loss of strength and flexibility, thus resulting in reinjury. Upon discharge, IR/ER isokinetic strength should be at least equal to the unaffected side. In addition, an external rotation to internal rotation strength ratio of 66% has been demonstrated in the normal population(34,35). This criteria should also be met.
Post-Operative Phase 4 (Week 12-18)

Goals:
- Restore normal neuromuscular function
- Maintain strength and flexibility
- Isokinetic IR/ER strength at least equal to the unaffected side
- > 66% Isokinetic ER/IR strength ratio
- Prevent Reinjury

Precautions:
- Pain free plyometrics
- Significant pain with a specific activity
- Feeling of instability

Treatment Strategies:
- Continue full upper extremity strengthening program
- Advance Internal rotation/external rotation strengthening to 90-90 position if required
- Continue upper extremity flexibility exercises
- Isokinetic strengthening and testing
- Activity specific plyometrics program
- Address trunk and lower extremity demands
- Continue endurance training
- Begin sport or activity related program
- Modify Home Exercise Program

Criteria for Discharge:
- Pain free Sport or Activity specific program
- Isokinetic IR/ER strength at least equal to unaffected side
- > 66% Isokinetic ER/IR strength ratio
- Independent Home Exercise Program
- Independent Sport or Activity specific program
Troubleshooting

Plyometric exercises must be monitored carefully and the volume of work must be controlled. Any symptoms during or after these exercises may indicate that the patient is not prepared for them. Any symptoms should be reported to the surgeon. If the patient is unable to perform a certain exercise correctly and without symptoms, progression to the next level should not occur.

Any significant symptoms (sharp pain, instability) during the specific activity should be reported to the surgeon. However, the patient should be aware that muscle soreness is not uncommon as the activity level increases and at times the program may have to be interrupted until symptoms have subsided. The patient is advised to continue the use of cryotherapy on a consistent basis. Occasionally the patient may have to return to the prior phase of the program.

Although the volume of strengthening may be reduced during this phase, the patient should be educated as to the importance of maintaining strength and flexibility. Many sport or functional activities can result in selective strength
and flexibility deficits that can result in injury. A common finding is overhead athletes who tend to lose flexibility of their posterior capsule and posterior rotator cuff. Harryman, et al demonstrated that posterior tightness increases anterior and superior humeral head migration, thus leading to pathology such as a rotator cuff impingement(36). Patient education upon discharge is critical to avoiding reinjury or additional pathology.