

## Rehabilitation Guidelines for Biceps Tenodesis with Hardware Fixation

The shoulder has two primary joints. One part of the shoulder blade, called the glenoid fossa forms a flat, shallow surface. This is coupled with the humerus (shaped like a golf ball) to make up the joint. The glenoid labrum is a "ring" of cartilage that turns the flat surface of the glenoid into a slightly deeper socket, which is similar to resting a golf ball on a golf tee instead of a table top, providing more shoulder stability. Another part of the scapula, called the acromium, articulates with the clavicle (collar bone) to make the acromioclavicular (AC) joint.

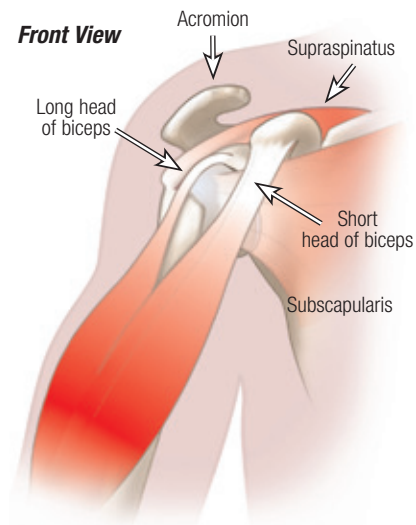
The rotator cuff is a group of four muscles: the supraspinatus, infraspinatus, teres minor and subscapularis. The rotator cuff tendons attach around the humeral head (ball) and connects the humerus to the scapula.

The long head of the biceps originates from the top of the glenoid fossa and labrum (top of the golf tee). It then runs through a groove in the humerus (upper arm bone) to join the short head of the biceps and inserts on a bone in the forearm (Figure 1). Because of its position, the long head of the biceps is also considered to be a secondary stabilizer of the shoulder joint.

The long head of the biceps is at risk of injury and degenerative changes due to its proximity to the rotator cuff and the acromium. Since the long head of the biceps can act as a

secondary stabilizer of the shoulder, it is also subject to injury during high speed overhead movements; repetitive overhead movements; or forceful shoulder activities when the elbow is straight. Specific injuries may include inflammation and irritation of the bicep tendon itself; a problem with the bicep tendon in conjunction with one of the rotator cuff tendons; or detachment of part of the tendon from the attachment point (SLAP tear). Bicep tendon degeneration and/or tearing can cause significant shoulder discomfort and dysfunction (Figure 2).

A biceps tenodesis is a surgical procedure which may be performed for treatment of severe symptoms involving the biceps tendon, including inflammation or partial tears. It may be performed in isolation or as part of a larger shoulder surgery, including surgery involving the rotator cuff. During the biceps tenodesis, the normal attachment of the biceps tendon on the shoulder socket (glenoid fossa) is cut and reattachment of the tendon is made on the humerus (upper arm bone). This takes the pressure off the biceps attachment and places the attachment below the actual shoulder joint. The goal is to eliminate the shoulder pain coming from the bicep tendon.



**Figure 1** Shoulder anatomy

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Different techniques are used to perform a biceps tenodesis. The surgical techniques can be broken down in to two categories: soft tissue techniques and hardware fixation techniques. Both techniques are effective and chosen based on surgeon preference and patient indications.

The hardware fixation techniques include screw fixation or endobutton fixation. In the screw fixation the tendon is detached and then placed in a hole made at the top of the bicipital groove. An interference screw is then placed over the tendon, in to the bone, to hold it in place. In the endobutton technique the released tendon is secured to a button, the button is then secured behind the bone by sliding it in to a

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**Figure 2a** Normal long head of bicep. The muscle has a smooth arc from the shoulder to the elbow.



**Figures 2b and Figure 2c** Torn long head of biceps. The muscle has retracted toward the elbow.

smaller hole at the top of the bicipital groove. Imagine a drywall type anchor where the pressure is applied from the inside out.

Appropriate rehabilitation is vital to optimizing your outcome after surgery. Below you will find rehabilitation guidelines. for hardware fixation techniques.

### PHASE I (surgery to 4-6 weeks after surgery)

<b>Appointments</b>	<ul style="list-style-type: none"> <li>Rehabilitation appointments begin 7-10 days after surgery and continue 1-2 times per week</li> </ul>
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>Protection of the post-surgical shoulder</li> <li>Activation of the stabilizing muscles of the gleno-humeral and scapula-thoracic joints</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>Sling immobilization required for soft tissue healing</li> <li>Hypersensitivity in axillary nerve distribution is a common occurrence</li> <li>No bicep tension for 6 weeks to protect repaired tissues-this includes avoiding long lever arm flexion range of motion and no resisted forearm supination, elbow flexion or shoulder flexion</li> <li>Limit external rotation (ER) to 40° for the first 4 weeks</li> <li>No extension or horizontal extension past body for 4 weeks</li> </ul>
<b>Range of Motion (ROM) Exercises</b> <i>(please do not exceed the ROM specified for each exercise and time period)</i>	<ul style="list-style-type: none"> <li>Gentle active and active assistive range of motion (AAROM) for the elbow and wrist</li> <li>Pain free, gentle passive and AAROM for shoulder flexion, abduction, internal rotation (IR) and ER; progress to active motion, as tolerated</li> </ul>

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<b>Suggested Therapeutic Exercise</b>	<ul style="list-style-type: none"> <li>• Begin week 3 with sub-maximal shoulder isometrics for IR, ER, abduction and adduction</li> <li>• Hand gripping</li> <li>• Cervical spine and scapular active range of motion (AROM)</li> <li>• Desensitization techniques for axillary nerve distribution</li> </ul>
<b>Cardiovascular Exercise</b>	<ul style="list-style-type: none"> <li>• Walking, stationary bike-sling on</li> <li>• No treadmill or swimming</li> <li>• Avoid running and jumping due to the distractive forces that can occur at landing</li> </ul>

### PHASE II (begin after meeting Phase I criteria, usually 6-8 weeks after surgery)

<b>Appointments</b>	<ul style="list-style-type: none"> <li>• Rehabilitation appointments are 1 time a week for 1-2 weeks</li> </ul>
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Full AROM</li> <li>• Full rotator cuff strength in a neutral position</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• Begin biceps progressive resistive exercises very gradually-this includes avoiding long lever arm flexion ROM and avoiding resisted forearm supination elbow flexion or shoulder flexion</li> <li>• No passive range of motion (PROM) for abduction and ER or extension</li> </ul>
<b>Range of Motion (ROM) Exercises</b> <i>(please do not exceed the ROM specified for each exercise and time period)</i>	<ul style="list-style-type: none"> <li>• Shoulder AROM</li> <li>• Shoulder passive range of motion (PROM) for flexion or abduction, if needed</li> </ul>
<b>Suggested Therapeutic Exercise</b>	<ul style="list-style-type: none"> <li>• Scapular squeezes</li> <li>• IR and ER in neutral with Theraband resistance-make sure patient is not supinating with ER movement</li> <li>• Ball squeezes</li> </ul>
<b>Cardiovascular Exercise</b>	<ul style="list-style-type: none"> <li>• Walking and/or stationary bike without using arms (no Airdyne)</li> <li>• No treadmill, swimming or running</li> </ul>

### PHASE III (begin after meeting Phase II criteria, usually 8-12 weeks after surgery)

<b>Appointments</b>	<ul style="list-style-type: none"> <li>• Rehabilitation appointments are 1-2 times per week</li> </ul>
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Full AROM in all cardinal planes with normal scapula-humeral movement</li> <li>• 5/5 (full strength) rotator cuff strength at 90° abduction in the scapular plan</li> <li>• 5/5 peri-scapular strength</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• All exercises and activities to remain non-provocative and low to medium velocity</li> <li>• Avoid activities where there is a higher risk for falling or outside forces to be applied to the arm</li> <li>• No swimming, throwing or sports</li> </ul>

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<b>Suggested Therapeutic Exercise</b>	<p><b>Motion</b></p> <ul style="list-style-type: none"> <li>• Posterior glides if posterior capsule tightness is present</li> </ul> <p><b>Strength and Stabilization</b></p> <ul style="list-style-type: none"> <li>• Flexion in prone, horizontal abduction in prone, full can extension and D1 and D2 diagonals in standing</li> <li>• Theraband, cable column and/or dumbbell (light resistance/high repetitions) in IR and ER in 90° of abduction</li> <li>• Rowing</li> <li>• Balance board in push-up position (with rhythmic stabilization), prone Swiss ball walkouts, rapid alternating movements in supine D2 diagonal and closed kinetic with narrow base of support</li> </ul>
<b>Cardiovascular Exercise</b>	<ul style="list-style-type: none"> <li>• Walking, biking, Stairmaster and running (if Phase II criteria is met)</li> <li>• No swimming</li> </ul>
<b>Progression Criteria</b>	<ul style="list-style-type: none"> <li>• The patient can progress to Phase IV if they have met the above stated goals and have no apprehension or impingement signs</li> </ul>

### PHASE IV (begin after meeting Phase III criteria, usually 12 weeks after surgery)

<b>Appointments</b>	<ul style="list-style-type: none"> <li>• Rehabilitation appointments are once every 2-3 weeks</li> </ul>
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Patient to demonstrate stability with higher velocity movements and change of direction movements</li> <li>• 5/5 (full strength) rotator cuff strength with multiple repetition testing at 90° abduction in the scapular plan</li> <li>• Full multi-plane AROM</li> </ul>
<b>Suggested Therapeutic Exercise</b>	<p><b>Motion</b></p> <ul style="list-style-type: none"> <li>• Posterior glides if posterior capsule tightness is present</li> </ul> <p><b>Strength and Stabilization</b></p> <ul style="list-style-type: none"> <li>• Dumbbell and medicine ball exercises that incorporate trunk rotation and control with rotator cuff strengthening at 90° abduction</li> <li>• Begin working towards more functional activities by emphasizing core and hip strength and control with shoulder exercises</li> <li>• Theraband, cable column and dumbbell in IR and ER in 90° of abduction</li> <li>• Rowing</li> <li>• Higher velocity strengthening and control, such as the inertial, plyometrics and rapid Theraband drills. Plyometrics should start with 2 hands below shoulder height and progress to overhead, then back to shoulder with one hand, progressing again to overhead</li> </ul>
<b>Cardiovascular Exercise</b>	<ul style="list-style-type: none"> <li>• Walking, biking, Stairmaster and running (if Phase III criteria has been met)</li> <li>• No swimming</li> </ul>
<b>Progression Criteria</b>	<ul style="list-style-type: none"> <li>• Patient may progress to Phase V if they have met the above stated goals and have no apprehension or impingement signs</li> </ul>

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### PHASE V (begin after meeting Phase IV criteria, usually 20 weeks after surgery)

<b>Appointments</b>	<ul style="list-style-type: none"> <li>• Rehabilitation appointments are once every 2-3 weeks</li> </ul>
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Patient to demonstrate stability with higher velocity movements and change of direction movements that replicate sport specific patterns (including swimming, throwing, etc.)</li> <li>• No apprehension or instability with high velocity overhead movements</li> <li>• Improve core and hip strength and mobility to eliminate any compensatory stresses to the shoulder</li> <li>• Cardiovascular endurance for specific sport/work demands</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• Progress gradually into sport specific movement patterns</li> </ul>
<b>Suggested Therapeutic Exercise</b>	<p><b>Motion</b></p> <ul style="list-style-type: none"> <li>• Posterior glides if posterior capsule tightness is present</li> </ul> <p><b>Strength and Stabilization</b></p> <ul style="list-style-type: none"> <li>• Dumbbell and medicine ball exercises that incorporate trunk rotation and control with rotator cuff strengthening at 90° abduction and higher velocities</li> <li>• Begin working towards more sport specific activities</li> <li>• Initiate throwing program, overhead racquet program or return to swimming program depending on the athlete's sport</li> <li>• High velocity strengthening and dynamic control, such as inertial, plyometrics and rapid Theraband drills</li> </ul>
<b>Cardiovascular Exercise</b>	<ul style="list-style-type: none"> <li>• Design to use sport specific energy systems</li> </ul>
<b>Progression Criteria</b>	<ul style="list-style-type: none"> <li>• Patient may return to sport after receiving clearance from the orthopedic surgeon and the physical therapist/athletic trainer</li> </ul>

These rehabilitation guidelines were developed collaboratively by UW Health Sports Rehabilitation and the UW Health Sports Medicine Physician group.

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### REFERENCES

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