

Rehabilitation Guidelines for Biceps Tenodesis with Soft Tissue 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 acromion, 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 acromion. 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.

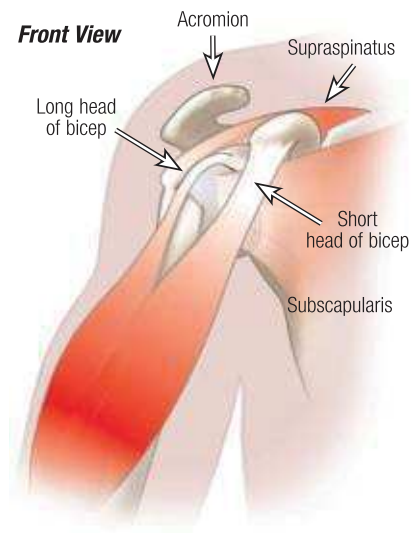


Figure 1 Shoulder anatomy

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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 primary soft tissue technique is the "open keyhole procedure". An open keyhole technique relocates the tendon within the groove of the humerus bone after cutting it from its original location in the shoulder. The procedure involves the proximal end (the portion closest to its original location in the shoulder) of the biceps tendon being rolled into a ball and then sutured together as a mass. A keyhole is made in the

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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 bicep. The muscle has retracted toward the elbow.

groove of the humerus, the tendon mass is then inserted into the keyhole and pulled downward so that the tendon mass is locked in place.

The Pitt technique uses two needles to pierce the bicep tendon in opposite directions. Sutures are then threaded through the needles to

make a suture. This procedure is repeated with the needle placement reversed to create a locking pattern of the sutures. A knot is used to secure the sutures to the transverse ligament in the shoulder instead of to the bone.

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

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

Appointments	<ul style="list-style-type: none"> Rehabilitation appointments begin 7-10 days after surgery and continue 1-2 times per week
Rehabilitation Goals	<ul style="list-style-type: none"> Protection of the post-surgical shoulder Activation of the stabilizing muscles of the gleno-humeral and scapula-thoracic joints
Precautions	<ul style="list-style-type: none"> Sling immobilization required for soft tissue rest and comfort for 3-10 days Hypersensitivity in axillary nerve distribution is a common occurrence No excessive bicep loading for 6 weeks to protect repaired tissues-shoulder flexion with weights or bands
Range of Motion (ROM) Exercises	<ul style="list-style-type: none"> Gentle active and active assistive range of motion (AAROM) for the elbow and wrist Pain free, gentle passive and AAROM for shoulder flexion, abduction, internal rotation (IR) and external rotation (ER); progress to active motion as tolerated

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Suggested Therapeutic Exercise	<ul style="list-style-type: none"> • Begin 1 week with sub-maximal shoulder isometrics for IR, ER, abduction and adduction • Hand gripping • Cervical spine and scapular active range of motion (AROM) • Desensitization techniques for axillary nerve distribution
Cardiovascular Exercise	<ul style="list-style-type: none"> • Walking, stationary bike-sling on • No treadmill or swimming • Avoid running and jumping due to the distractive forces that can occur at landing

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

Appointments	<ul style="list-style-type: none"> • Rehabilitation appointments are 1 time a week for 1-2 weeks
Rehabilitation Goals	<ul style="list-style-type: none"> • Full AROM • Full rotator cuff strength in a neutral position
Precautions	<ul style="list-style-type: none"> • Progressive and graduated nature of return to activity
Range of Motion (ROM) Exercises	<ul style="list-style-type: none"> • Full elbow ROM • Shoulder AROM • Shoulder passive range of motion (PROM) for flexion or abduction, if needed
Suggested Therapeutic Exercise	<ul style="list-style-type: none"> • Scapular stabilization exercises • IR and ER in neutral with Theraband resistance • Gentle bicep and tricep strengthening exercises
Cardiovascular Exercise	<ul style="list-style-type: none"> • Progressive return to cardiovascular fitness. Avoid activities where there is a higher risk for falling or outside forces to be applied to the arm

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

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

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Suggested Therapeutic Exercise	<p>Motion</p> <ul style="list-style-type: none"> • Posterior glides if posterior capsule tightness is present <p>Strength and Stabilization</p> <ul style="list-style-type: none"> • Flexion in prone, horizontal abduction in prone, full can extension and D1 and D2 diagonals in standing • Theraband, cable column and/or dumbbell (light resistance/high repetitions) in IR and ER in 90° of abduction • Scapular stabilization exercises • 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
Cardiovascular Exercise	<ul style="list-style-type: none"> • Walking, biking, Stairmaster and running (if Phase II criteria is met) • No swimming
Progression Criteria	<ul style="list-style-type: none"> • Full rotator cuff and bicep strength on manual muscle testing

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

Appointments	<ul style="list-style-type: none"> • Rehabilitation appointments are once every 2-3 weeks
Rehabilitation Goals	<ul style="list-style-type: none"> • 5/5 (full strength) rotator cuff strength with multiple repetition testing at 90° abduction in the scapular plane • Patient to demonstrate stability with higher velocity movements and change of direction movements that replicate sport specific patterns (including swimming, throwing, etc.) • No apprehension or instability with high velocity overhead movements • Improve core and hip strength and mobility to eliminate any compensatory stresses to the shoulder • Cardiovascular endurance for specific sport/work demands
Suggested Therapeutic Exercise	<p>Motion</p> <ul style="list-style-type: none"> • Posterior glides if posterior capsule tightness is present <p>Strength and Stabilization</p> <ul style="list-style-type: none"> • Dumbbell and medicine ball exercises that incorporate trunk rotation and control with rotator cuff strengthening at 90° abduction • Begin working towards more functional activities by emphasizing core and hip strength and control with shoulder exercises • Theraband, cable column and dumbbell in IR and ER in 90° of abduction • Scapular stabilization exercises • 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 • Initiate throwing program, overhead racquet program or return to swimming program depending on the athlete's sport

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Cardiovascular Exercise	<ul style="list-style-type: none"> • Design to use sport specific energy systems
Progression Criteria	<ul style="list-style-type: none"> • Patient may return to sport after receiving clearance from the orthopedic surgeon and the physical therapist/athletic trainer

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

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

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

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