

Electrothermal Capsular Shift

Rehabilitation Program

Methodist Sports Medicine Center, Indianapolis, IN
Department of Physical Therapy

Description and basic science: for many years orthopedists have recognized that overhead athletes can have subtle anterior instability of their shoulder which contributes to a secondary impingement syndrome and pain with their overhead sports. Standard strategies for management of this problem include a temporary period of rest from their offending activities and a thorough rehabilitation program emphasizing rotator cuff and parascapular strengthening. If this program fails in three-six months, surgical capsular reconstruction has been recommended. The standard surgery involves open capsular plication. In some cases that means detachment of the subscapularis tendon and potential increased scarring because of the open approach and dissection. Because of the possibility of motion loss associated with this procedure orthopedists began to search for other, less invasive alternatives. Since the early 1990s there have been reports of the use of thermal techniques to arthroscopically alter the capsule. Initially for thermal energy you were solely limited to the use of a laser. Subsequently other techniques such as radio frequency probes became available which deliver the same type of thermal energy without some of the risks of using a laser device.

Several basic science studies have been done to analyze the effects of thermal energy on connective tissue such as the shoulder capsule. The application of thermal energy to collagen, the main protein constituent of connective tissue, causes a change in the three-dimensional configuration of the protein molecule. In its normal state collagen is a three stranded molecule which has a very organized, longitudinally oriented three-dimensional state. When heat is applied some of the bonds in the molecule are altered such that the molecule assumes a random, coiled three-dimensional configuration instead of its normal longitudinal orientation. On a macroscopic level this means that the tissue becomes shortened. If you have ever fried bacon you have seen this phenomenon occur. The bacon starts out normal sized and then shrinks throughout the procedure of cooking. The percentage of shortening is related to the density of the collagen in the tissue and the amount heat applied.

Unfortunately, biomechanical studies have shown that there is a decrease in the ultimate tensile strength of the tissue after treatment with thermal energy. This effect can last for several weeks or even months after the application of this technique. It has been recommended that the affected tissue should be protected for a period of time so that it can heal in its contracted state. Otherwise if stress is applied to early the tissue can plastically deform back to its original length.

Surgical technique: the technique of thermal capsular shift is relatively simple and straightforward. This is one of the reasons that it has gained such early, widespread popularity. Standard arthroscopy portals are utilized as in other arthroscopic shoulder surgeries. With the arthroscope placed in the posterior glenohumeral joint an anterior portal is established. The thermal probe is inserted through the anterior portal and the tip of the probe is placed in the anterior/inferior capsular recess. Using a gentle back and forth motion the probe delivers

thermal energy to the capsule from medial to lateral causing the capsule to contract. The probe is then slowly moved superiorly "painting" the capsule with thermal energy. The anterior/inferior glenohumeral ligament, middle glenohumeral ligament and rotator interval regions are typically treated. An auxiliary posterior/inferior portal is then made and the probe is placed through this portal into the inferior axillary recess. The process is then started once again beginning in the area that was just treated anterior/inferior and now moving posteriorly throughout the axillary pouch and posterior/inferior capsule. One can tailor the amount of tightening by limiting the thermal treatment to certain regions of the capsule. For instance, if someone has a anterior/inferior instability then treatment of the anterior/inferior capsule alone may be adequate. On the other hand, patients with more global laxity need more diffuse treatment of the capsule. Unfortunately, there is no way to control the percent of shortening on the ligament. Patients respond to varying degrees with regards to the application of thermal energy. In some cases the capsule contracts a great deal causing obvious shortening of the ligament. In other cases it seems as though the capsule barely responds. After surgery the patient is placed in a shoulder immobilizer. Routine pain management is prescribed.

Rehabilitation: because of the basic science studies that have been completed to date most surgeons agree that the shoulder should be protected for 3-4 weeks to allow the contracted capsule to heal. In addition, there is a secondary capsular contracture, which occurs as the scar tissue matures following surgery. This process obviously is very individual and is not under the surgeons or therapists control. Because of the lack of the uniform response to capsular thermal shrinkage, and the difference in healing rates and scar tissue formation, there is no agreed-upon "cookbook" recipe for postoperative therapy. My personal belief is that it is better to be conservative and slowly regain ROM rather than stretch the capsule out prematurely. In general after the four weeks of the immobilization a gentle rehabilitation program is initiated concentrating on a slow resumption of normal ROM. Stretching in abduction/external rotation is limited until the eight-week mark. Even after that period of time the goal is to get back functional ROM not a pre-op ROM. For example, most throwing athletes have exaggerated external rotation. It is desirable to regain enough external rotation to allow the athlete to throw well but it is undesirable to regain so much external rotation that the shoulder once again becomes unstable. Strengthening is initiated at the four-week postoperative visit. Initially the focus should be on isometric and isokinetic strengthening. As time passes more functional strengthening exercises and light plyometrics should be added. I believe that patients should not return to overhead activities such as swimming, throwing, and overhead hitting until three months postoperative at the earliest. Patients should be placed in a very slow and cautious progression to avoid recurrent irritation of the shoulder. This point cannot be overemphasized because patients that return to quickly will experience shoulder irritation. Potential return to full activities typically requires approximately six months on average.

Phase I: Pre-operative

With this protocol, patients presenting with an acute or chronic glenohumeral dislocation or subluxation must be seen in physical therapy prior to an anterior capsular repair. The area of focus with the preoperative visit includes preparing the shoulder for surgery and mental preparation of the patient to deal with surgery and the postoperative rehabilitation course. Patients with glenohumeral instability will be placed on appropriate rehabilitation to decrease

pain and restore range of motion and strength. Appropriate patient education of the surgical techniques and postoperative rehabilitation will assist in mental preparation of the patient.

Clinical Goals

- ◆ Restore full active and passive range of motion
- ◆ Restore full strength
- ◆ Decrease the patient's apprehension
- ◆ Restore pain free, functional ADL's
- ◆ Ensure complete understanding of surgery and postoperative rehabilitation

Testing

- ◆ Bilateral ROM
- ◆ Assess functional ability and apprehension

Exercises

- ◆ Codman's
- ◆ Wand exercises
- ◆ Thera-tubing and/or dumbbell exercises for rotator cuff strengthening
- ◆ Modified weight lifting as tolerated

Phase II: 0 to 4 Weeks

Clinical Goals

- ◆ Pain free, restricted ADL's in an immobilizer (24/7)

Testing

- ◆ Measure ROM

Exercises

- ◆ The patient's shoulder will be protected to allow healing of the capsule. This protection is achieved by using a shoulder immobilizer during the day and during sleep. Patients are allowed waist level and hand to face activities (e.g. eating, writing, bathing, keyboarding) as tolerated
- ◆ Patient will return to see the physician at 1 week to have stitches removed
- ◆ The Cryo/Cuff should be used during this phase to control pain and swelling

Clinical Follow-up

- ◆ Patient will return to see both the physician and therapist at 4 weeks post-op

Phase III: 4 Weeks to 2 Months

Clinical Goals

- ◆ Active and passive ROM equal to 90% of noninvolved shoulder with good scapular control at 2 months
- ◆ Pain free functional ADL's
- ◆ Begin light strengthening

Testing

- ◆ Measure AROM and PROM
- ◆ Assess functional ability

Exercises

- ◆ The patient will discontinue using the immobilizer at this time. Normal use of the involved extremity for ADL's is encouraged within reason (no overhead or heavy lifting, repetitive activities, or fast-jerking motions).
- ◆ It should be strongly encouraged that the patient's main focus in this phase of rehabilitation is to restore range of motion slowly and incrementally and that strengthening is secondary.
- ◆ ROM exercises:
 - PROM (depending on patient discomfort and initial ROM)
 - Active assistive ROM using wand
 - Gravity assisted pendulum exercise
 - Active shoulder flexibility exercises
- ◆ Range of motion exercises for the shoulder in the "90°-90°" position is contraindicated until 8 weeks post-op
- ◆ The Patient will begin progressive resistance exercises as tolerated including the following:

- Theraband exercises; grade of tubing will vary according to the patient’s strength and tolerance. The exercise planes will include first internal/external rotation with the elbow tucked at the patient’s side then progress to flexion/extension and abduction/adduction to 90°.
- Dumbbell exercises for the rotator cuff are implemented. Standing flexion and abduction exercises, scaption with internal rotation, side-lying external rotation, and Hughston exercises are performed as tolerated.
- ◆ Emphasis must be made on proper scapular stabilization and control. Accurate assessment of the scapular stabilizing musculature strength and flexibility is critical to proper shoulder function.
- ◆ Isokinetic exercises are discouraged by our physicians at this time
- ◆ The patient may begin light impact activities (i.e. jogging, easy agilitys) towards the end of this phase

Clinical Follow-up

- ◆ The patient will follow-up weekly with the therapist for home exercise program updates during this time
 - The patient should have 90% active and passive ROM (equal to noninvolved side) with good scapular control.
 - Adequate strength to perform painfree ADL’s and non-contact/non-throwing activities.
 - Some, controlled, modified weight lifting may also begin toward the end of this phase.

Phase IVa: 2 Months to 3 Months

Clinical Goals

- ◆ Active and passive ROM equal to noninvolved shoulder with scapular control at three months
- ◆ Return to near normal strength
- ◆ Minimal tenderness and apprehension

Testing

- ◆ Measure AROM and PROM
- ◆ Assess functional ability

Exercises

- ◆ This phase is a transition period where the patient finalizes his or her ROM and increases progressive resistance exercises. **However, strength progression is delayed if the patient does not show signs of attaining their goal of full ROM by the end of phase IV.**
- ◆ General upper extremity flexibility and stretching exercises to address the patient’s ROM deficits are continued with increased intensity. The patient may now begin stretching in the “90-90” position
- ◆ Thera-tubing and/or weight lifting exercises are performed for entire shoulder girdle

strengthening and stabilization

- ◆ The patient is cautiously progressed back into a modified weight lifting routine for upper body

Clinical Follow-up

- ◆ The patient will follow-up as needed per the discretion of the therapist for home exercise program updates during this time
 - The patient should have full active and passive ROM (equal to noninvolved side) with good scapular control.
 - The patient should have minimal tenderness, discomfort, and apprehension in the “90°-90°” position.
 - The patient should demonstrate near normal strength, sufficient to begin return to full weight lifting, restricted sports and/or job-related activities.

Phase IVb: 3 to 4 Months

Clinical Goals

- ◆ Equal bilateral AROM and PROM
- ◆ Equal bilateral strength

Testing

- ◆ Measure AROM and PROM
- ◆ Test strength using Cybex isokinetic dynamometer
- ◆ Assess functional (sport specific) ability

Exercises

- ◆ The patient will continue with a more aggressive shoulder-stretching program as indicated. This may include self-stretching or partner stretching to address specific ROM deficits.
- ◆ The patient will increase the resistive strengthening program to include heavier weight with any and all lifts as tolerated.
- ◆ Highly sport-specific, functional, high-speed, overhead strengthening may begin towards the end of this phase according to the patient's athletic/occupational demands.
- ◆ Generally it takes 3-4 four months for return to full activity.
- ◆ A throwing progression for dominant arm athletes will not begin prior to 4 months post-op. This timeframe is highly unpredictable and will vary greatly between each individual patient.
- ◆ Bracing may be used for return to contact or collision sports up to 6 months post-op.

Clinical Follow-up

- ◆ The patient will follow-up monthly or as needed between 4 and 6 months post-op
- ◆ The patient will return at 6 months post-op for the final time to see the physician and the therapist. A Cybex strength evaluation will be performed at this time as well as at 1 year post-operative.

DISCLAIMER

These general rehabilitation guidelines are created by physical and occupational therapist for the rehabilitation of various shoulder and elbow pathologies. These are to simply be used as guidelines. This information is provided for informational and educational purposes, only. Specific treatment of a patient should be based on individual needs and the medical care deemed necessary by the treating physician and therapists. The University of Kentucky and The American Society of Shoulder and Elbow Therapists take no responsibility or assume no liability for improper use of these protocols. We recommend that you consult your treating physician or therapist for specific courses of treatment.