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Glenohumeral Hydyroplasty: The most effective way to manage FROZEN SHOULDER

By Michael N. Brown, DC, MD, DABPMR-PAIN. Reprinted with permission.

INTRODUCTION TO ADHESIVE CAPSULITIES: "The Frozen Shoulder"

Anyone who has ever suffered from adhesive capsulitis or "frozen shoulder" knows what a miserable condition this can be. This article will cover the topic of how to "thaw out" your frozen shoulder. We have been using a specialized protocol which we have modified over the years called glenohumeral hydrodistention or glenohumeral hydroplasty. This article will review the pathophysiology of adhesive capsulitis (frozen shoulder) as well as the rehabilitative and exercise management in addition to interventional orthopedic procedures that we do for this condiion at our facility. We will also discuss the reason why we believe it is more important to have early intervention of this condition rather than undergoing months and months of unnecessary physical therapy which often results in frustration and long-standing pain and disability.

WHAT IS ADHESIVE CAPSULITIS (FROZEN SHOULDER):

Frozen shoulder is a condition where inflammation of the articular capsule or the ligaments of the shoulder has led to adhesions that restricted range of motion. There are 2 basic categories of frozen shoulder or adhesive capsulitis:

1. Primary adhesive capsulitis: This means that there is no known cause for the loss of range of motion and adhesions restricting the range of motion.
2. Secondary adhesive capsulitis: This occurs when there is a specific condition that set off the episodes such as an acute bursitis, rotator cuff tendinitis or number of conditions.

There are a number of conditions which we will describe later that can restrict range of motion of the shoulder and make it appear as if the patient has adhesive capsulitis or frozen shoulder. We commonly have patients referred to us for frozen shoulder when in fact they do not have a frozen shoulder but some other condition affecting the range of motion. We will discuss those conditions within the context of this article as well as period before we begin discussing the topic of adhesive capsulitis we must first discuss the rotator cuff and pathology that affects the rotator cuff since there is a close interrelationship between the development of adhesive capsulitis and rotator cuff pathology.

THE PATHOLOGY OF ADHESIVE CAPSULITIS

The articular capsule of the shoulder is basically a complex ligament that supports shoulder stability. There are a number of ligaments found within the shoulder capsule which we will not address within the context of this article. The articular capsule colored in green in the picture to the left also has a redundant fold of ligamentous tissue on the inferior or lower portion of the joint. This is depicted by the green narrow on the picture to the right. It would make sense that you have to have some extra fold of ligament tissue underneath the joint in order to allow for arm elevation.

Once adhesive capsulitis begins adhesions develop predominantly in the anterior or frontal portion of the shoulder capsule as well as adhesions that bind the folds of tissue under the shoulder preventing you from being able to elevate the shoulder joint fully.

Adhesions and scarring of the shoulder capsule developed rapidly restricting the range of motion of the shoulder. There are 3 primary movements of the shoulder that are restricted and in fact a

specific pattern of shoulder joint restriction is seen in all patients with adhesive capsulitis. External rotation movement of the shoulder such as depicted in the picture on the right becomes the most restricted range of motion. In fact it is classic for the diagnosis of adhesive capsulitis to be made based on the significant restriction in external rotation movement of the shoulder. Notice the range of motion of the patient on the left. He is attempting to externally rotate both shoulders. Note that the shoulder on the left is unable to be externally rotated. This is a classic finding and adhesive capsulitis.

The next range of motion to be affected is the movement of shoulder abduction. Shoulder abduction movement is depicted by the picture on the right. Shoulder abduction means movement of the shoulder away from the body as shown. Typically range of motion becomes restricted with adhesive capsulitis so that the individual cannot elevate beyond about 90°.

The final movement restriction of adhesive capsulitis is restricted shoulder flexion. The movement of shoulder flexion is elevation of the shoulder above head from the forward position as noted in the picture to the left. Of the 3 range of motion restrictions classic for adhesive capsulitis this movement is the least affected. An individual may only have 5° of external rotation, 80° of abduction but they may be able to flex the shoulder to 90 or 100°. It is these 3 range of motion movements that we will focus on during the initial rehabilitation following the glenohumeral hydrodistention procedure.

Phases of glenohumeral adhesive capsulitis:
It is extremely important that you understand the following discussion in regards to adhesive capsulitis. There are basically 3 phases of the overall pathology of adhesive capsulitis. The 3 phases are as follows:

1. Freezing phase
2. Frozen phase
3. Thawing phase

Clinically these 3 phases are indistinguishable on physical examination. In the freezing phase of the condition of patient has developed the classic motion restriction of adhesive capsulitis but the adhesions are still forming and progressing. In the frozen phase of adhesive capsulitis the articular capsule has become thick and fibrinous in nature. This is the least desirable phase to see a patient in for management. It is much easier to treat a patient in phase I or phase 3 of the condition. We commonly have physicians in training rotating with us in our facilities. One of the ways in which I teach physicians in training the differences in the phases is as follows:

In phase I & phase 3: Insertion of the needle into the shoulder joint through the articular capsule is easy. The needle glides through the soft articular capsule with no resistance because the adhesions are not as advanced and the shoulder capsule is not as thickened as it is in phase 2.

In phase 2: A needle that is pushed or inserted into the articular capsule is met with significant resistance. Once the needle is in the joint is actually difficult to pull the needle out without resistance. It is always shocking to student physicians when I ask them to tug on the needle and removed the needle from the joint. They are always surprised at how much resistance is offered by a thickened articular capsule in phase 2 adhesive capsulitis.

Why is this important?
It is important to know which phase of the disease the patient is in because it drastically affects the outcome of both physical therapy, rehabilitative efforts as well as the outcome of glenohumeral hydrodistention procedures. Fortunately most individuals are seen in phases I and III were rapid resolution of adhesive capsulitis can occur with a simple hydrodistention procedure as described in this document. However, on occasion during the procedure as the needle is inserted into the joint one can encounter significant resistance secondary to a thick and fibrous capsule. The range of motion improvement will not be as dramatic as it is when the patient is not in phase 2 of the disease. On occasion we see an individuals with a severe phase 2 frozen

shoulder and it is not uncommon that we have to repeat a second procedure to restore adequate range of motion.

The rotator cuff:
Before we discuss the treatment of adhesive capsulitis I am going to address the rotator cuff since rotator cuff pathology commonly occurs simultaneously with adhesive capsulitis conditions. Some of the concepts described in this section are important for patient understand so they know which condition to treat first and the step-by-step approach that we use for management.

There are 4 muscles in the shoulder depicted in the picture to the right that as a group we refer to as "rotator cuff". These muscles include the subscapularis muscle in the front of the shoulder, the supraspinatous on the top of the shoulder and the infraspinatus and teres minor in the back of the shoulder. The biomechanics and function of these muscles are very complex. All of these muscles originate off the scapula and attach to various locations on a bony prominence of the humerus. Because as a group a significant portion of the function of these muscles is rotational movement together these muscles have been called "rotator cuff". There are many more functions of the rotator cuff which we will briefly discuss in this article. Once one begins to understand the anatomy and function of the rotator cuff you can begin to appreciate how easily degenerative disease and injury can affect these muscles.

The picture to the right is a view of the scapula (shoulder blade) from both the front and back view. You will see 3 important muscles of the rotator cuff from this view. In addition to fine tune control of motion of the shoulder these muscles also play an important role in providing stability of the shoulder joint. You will notice that many of the fibers of these muscles exert a downward pull as depicted with the yellow arrows noted to the right. It is this downward pull that lowers the head of the humerus so that the tendon and bursa on top of the shoulder can clear a shelf which we will describe later. This is also why we attempt to strengthen these muscles for many conditions of the shoulder also described later.

If you look at the shoulder from the side view you will notice an arch that forms the roof of the shoulder joint. This is noted by the orange colored line in the picture to the left. Notice part of the arch is bone (the acromion process) and part of it is ligament (coracoacromial ligament). A critical element in shoulder biomechanics has to do with this arch. Several of the rotator cuff tendons can be found under this arch depending on the motion and position of the shoulder. There is also an important bursa underneath the shelf also noted in the picture to the left. When you elevate her arm the tendons of the rotator cuff and the bursa underneath the shelf must "clear" the shelf in order to slide under the arch. There are many conditions that can affect the ability of the soft tissues that underlie the arch to clear as you elevate your arm. The bony portion of the arch (acromion) that forms a shelf over the shoulder can be shaped differently from person to person. As you can see in the picture to the right it can be flat, curved or even hooked. There are also many other congenital anomalies that can affect the shape of the shelf and narrow the space for the tendon and bursa to travel under it. If this shelf is hooked, or down-slopped the bursa and the rotator cuff can get pinched underneath this arch when you elevate your arm. The collar bone (clavicle) joins this bone to form a joint called the acromioclavicular joint named because of the two bones that make up the joint. One can also develop arthritis of this AC joint and bone spurs develop that point downward toward the bursa and rotator cuff tendon (supraspinatus). With normal motion of the arm, elevation of the arm one can now cause causing wear, tear and inflammation of the rotator cuff tendons underlying the arch. This is shown in the picture on the left.

With repeated microtrauma day after day eventually this can lead to cellular changes in the tendon. As the tendon is repeatedly compressed through impingement of the tendon under the arch the tendon changes over time. There are special cells in the tendon that undergo a transformation from this constant stress. The cell type actually changes from normal tendon cells to cartilage cells !! Now you may ask what would a cartilage cell be doing inside a tendon? The

normal tendon tissues are well designed to tolerate great tensile loads. But that is not the job of a cartilage cell. A cartilage cell normally lays down substances in cartilage like glucosaminoglycan and calcium. The process of laying down these substances within the tendon cause the tendon to thicken. Calcium deposits is a late finding indicating advanced degeneration of the tendon structure. The tendon becomes weak and is no longer able to hold up under the stress of shoulder motion and spontaneous small disruptions within the tendon begin to ensue at the attachment to bone. At the site of these small tears there is inflammation and an attempted healing. But, the healing is incomplete and the tears reform and a chronic inflammatory processes is set up that can cause persistent shoulder pain. This pain can worsen with use of the shoulder. Today there are a number of physiatrists who are becoming specialized in using ultrasound to examine the tendons and look for these changes in the tendon.

One of the common initiating events in developing an acute onset of adhesive capsulitis is where small flecks of the calcium deposited within the tendon rupture spontaneously through the tendon and irritate the bursa just above the rotator cuff. This often results in a sudden onset of severe shoulder pain which worsens with shoulder elevation. An individual will splint the shoulder movement holding the shoulder close to the body preventing the shoulder from elevating. The acute inflammation within the bursa quickly spreads to the shoulder capsule which is the ligament that surrounds the shoulder developing rapid adhesions and eventually causing the shoulder joint to become fibrosed and restricted in its range of motion. It is for this reason that I believe it is helpful to have a quick referral to a specialist who can do an ultrasound-guided simple corticosteroid injection into the bursa quieting the inflammation down quickly and preventing this condition. If this is not done then range of motion should be encouraged to prevent this unfortunate complication.

In addition to problems of the adhesive capsulitis it is also not uncommon to have a patient seen after an MRI which demonstrates not only adhesive capsulitis but also degenerative changes within the rotator cuff and rotator cuff tears. Before we discuss the manner in which we handle that combined problem we will discuss the pathology of the rotator cuff tear which is somewhat off the subject of adhesive capsulitis but unfortunately is often seen simultaneously and therefore is an important topic to cover.

WHAT DO I DO WHEN I HAVE A FROZEN SHOULDER AND A ROTATOR CUFF TEAR?
It is important to resolve the adhesive capsulitis or frozen shoulder first. It is not uncommon that a patient will present a frozen shoulder and also have an MRI demonstrating a rotator cuff tear as well. With a frozen shoulder motion is restricted and the rotator cuff becomes impinged under the acromion of the shoulder. The adhesive capsulitis makes impingement much worse and one will never be able to properly treat a rotator cuff tear without resolving the adhesive capsulitis and restoring proper range of motion.

The outcome is typically very poor if one attempts to treat a rotator cuff tear and not address restoring normal range of motion first. Since we can typically restore range of motion of the shoulder very quickly using the techniques described namely glenohumeral hydrodistention procedures we typically can resolve that problem in a single visit and then turn our attention to treating the rotator cuff. I have written another article on the rotator cuff that is available on this website and I refer you to that article for further information about rotator cuff management.

Subacromial bursitis and the development of adhesive capsulitis:
A bursal sac is an anti-friction device. Imagine placing 2 or 3 drops of oil into a balloon and rather than blowing it up with air you just tie it with the oil inside. Now, place the balloon between the palms of your hands. If you were to rub her hands back and forth the balloon with the oil and side would function as an anti-friction device. This is very similar to how a bursa functions. There are countless bursa in the body which are strategically placed at areas of increased friction between bone and tendon or between bone and muscle and other locations in the body. We have for example 13 named bursa in the knee, 7 in the hip and 9 in the shoulder. The most important bursa of the shoulder is the largest bursa that lies underneath the shelf of the shoulder that we

have been already discussing. This bursa (subacromial bursa) is an important source of potential shoulder pain since this bursa must clear the shelf and slide under it when you elevate her arm seen in the picture on the top left. With repeated microtrauma of the bursa secondary to impingement of both the bursa and tendon under the shelf during shoulder motion is a common cause of the pain.

This bursa can become acutely or chronically inflamed. It is not uncommon that bursitis which causes an individual to restrict her shoulder motion can lead to the development of adhesive capsulitis. Because the inflammation can spread to the ligamentous capsule of the shoulder one can develop adhesive capsulitis.

The bursa can easily be seen on an ultrasound examination. I commonly evaluate the bursa to determine whether or not the bursa has become thickened or possibly swollen secondary to chronic inflammation. In the picture to the left one can see a needle directed under ultrasound (demonstrated by the orange arrows to the left) into the bursa where we can specifically place anti-inflammatory medications within the bursa and thereby avoiding placing these medications into the tendon and other structures which are actually harmful to the shoulder. It is very common for an individual to present with both simultaneous subacromial bursitis and adhesive capsulitis. It is my practice to treat both at the same time because it is the only way to restore pain-free range of motion quickly.

Rotator cuff calcific tendonitis and its relationship to adhesive capsulitis:
As we have previously stated many time when the rotator cuff begins to degenerate some of the cells turn into cartilage cells and thereafter deposit calcium within the tendon. The tendon weakens in these regions and makes the tendon susceptible to tears and chronic inflammation. One of the things that we do to treat this in our office is to place a needle under ultrasound guidance and simply inject warm saline into thecalcified area then aspirate the calcium out of the cuff tendon.

You may be wondering how that is possible. It turns out the calcified area is not hard like bone but rather soft like toothpaste. On occasion small flecks of calcium as I have stated previously can rupture out of the tendon entering the bursa and causing an acute bursitis and ultimately leading to a case of adhesive capsulitis. Therefore it is not uncommon to see patient's with combined syndromes of calcific tendinosis and adhesive capsulitis.

If an individual presents with adhesive capsulitis and calcific tendinosis
once again it is more important to restore range of motion and resolving adhesive capsulitis first and then deal with the tendon pathology second. We utilize an ultrasound-guided aspiration of the calcification

within the tendon and often also utilize platelet derived growth factors to help dissolve calcification within the tendon. We are typically quite successful in resolving calcific tendinosis of the rotator cuff using simple ultrasound-guided procedures rather than having to resort to surgical intervention. Research has shown that the outcome of ultrasound-guided procedures is equal to open surgical procedures for this condition.

The muscles as a cause of restricted range of motion of the shoulder. There is a condition where the muscles of the rotator cuff can develop painful nodules called trigger points within the muscle. These trigger points can cause a sustained contraction of the muscle and restrict elevation and external rotation of the shoulder simulating a frozen shoulder. This is caused predominately by the subscapularis muscle. There are distinct differences in the clinical presentation. Typically this is not common knowledge to most physicians unless they work in a medical subspecialty such as physical medicine and rehabilitation and have studied myofacial pain syndromes. There are distinct differences in how to sort these various syndromes out.

If myofascial pain is the source of the restricted range of motion these patients typically respond to physical therapy, heat, massage, active release technique, and numerous other therapeutic interventions. One of my favorite methods of treatment for myofascial pain causing restricted range of motion of the shoulder happens to be acupuncture dry needling or better known as Gunn IMS. I have written an article on that topic that is on the website on myofascial pain where I discuss this method in more detail.

WHAT OTHER CONDITIONS CAN SIMULATE A FROZEN SHOULDER?
One of the conditions that can simulate adhesive capsulitis is glenohumeral arthritis. Bone spurs that form in and around the joint can restrict range of motion and create a motion restriction that can simulate adhesive capsulitis.

To make things more complicated patients with glenohumeral osteoarthritis can develop adhesions and restricted range of motion and thus individuals can present with a combination of glenohumeral arthritis and adhesive capsulitis. Interesting enough patients with glenohumeral osteoarthritis with or without adhesive capsulitis can benefit from the same glenohumeral hydrodistention procedures. We have found in countless patients that they have had restoration of range of motion and improved function after the procedure. More commonly over the past several years we now follow the hydrodistention procedure with a stem cell procedure to treat the arthritic joint following restoration of range of motion. We have had better long term outcome doing this.

Another condition that can simulate a frozen shoulder is a full-thickness tear of the rotator cuff. The patient can come in with the inability to elevate the shoulder and think that the pain and the inability to move the shoulder is a “frozen shoulder”. I have seen numerous patients present for consultation having been undergoing

physical therapy, chiropractic care, and other treatment for months when in fact they had an underlying large tear in the rotator cuff. These patients do not have the classic motion restriction that one sees with adhesive capsulitis/frozen shoulder. Remember patients with frozen shoulder have external rotation restriction as the most restricted movement. Individuals with rotator cuff tears have more restriction in elevation of the arm and less restriction in external rotation. So there are subtle differences that one can differentiate a frozen shoulder from a rotator cuff tear.

GLENOHUMERAL HYPOPLASTY / GLENOHUMERAL HYDRODISTENTION: The quick resolution for adhesive capsulitis.
Imagine that you have found a balloon in your drawer that has been in there for a long time. The balloon has collapsed and becomes stuck on itself. What is the best way to relieve the adhesion that sticks the balloon together? Simply “ blow it up.” By the process of blowing up the balloon you break the adhesions that are holding the balloon stuck together. This is the basic principle of breaking adhesions in the case of adhesive capsulitis. The articular capsule has formed internal adhesions that it becomes stuck together restricting range of motion. If you go under anesthesia for a procedure called “manipulation under anesthesia” the physician or surgeon will be aggressively manipulating your shoulder to break adhesions. Using external force to break internal adhesions results in tearing of the articular capsule which then ultimately requires additional physical therapy to prevent further adhesions. It is for this reason that I do not advocate or support the use of manipulation under anesthesia. Many years ago having been frustrated running a rehabilitation practice and focusing on physical therapy and range of motion exercises as a means to treat adhesive capsulitis I began to utilize a technique which I call glenohumeral hydroplasty or glenohumeral hydrodistention.

This involves injecting a local anesthetic with a corticosteroid into the joint which numbs or anesthetizes the ligamentous capsule. Following this additional fluid usually normal saline can be injected into the shoulder capsule as shown in the picture to the left. This is shown under x-ray guidance or under an x-ray procedure called fluoroscopy. The hydrostatic pressure of the fluid

expands the articular capsule thereby breaking the adhesions within the joint. This is followed by gentle manipulation in the 3 planes of movement previously described (external rotation, flexion, and abduction movement). Because of local anesthetics and additional "tricks" for reducing the pain of the manipulation procedure can be done gently without significant pain. Range of motion can be restored almost immediately. When I began utilizing this technique I had to ask myself "how could I have been using any other method of treatment?" I had been putting patients through 6-9 months of physical therapy week after week and putting them through all of this therapy when this treatment was so simple.

Noticed the picture on the right. This is a MRI picture and the white area is fluid that has been placed within the joint. Noticed where the fluid accumulates. The fluid expands within the joint and in the region below where adhesions predominantly form within the joint in adhesive capsulitis. One can see how easily it would be to expand the joint and break the adhesions and thereby restore range of motion in the frozen shoulder patient.

We typically inject a corticosteroid in the joint at the same time to relieve the chronic inflammation that has been present and to reduce the irritation that has occurred from the expansion of the adhesions and the mobilization. This also reduces pain and gets the patient back to activity more quickly. I have probably done 1000 of these procedures or more over the years. I have altered and improve the methods utilized for this procedure over the last 20 years. One of the first modifications that I made was to simply inject the subacromial bursa before I perform the procedure. The reason for this is that it was very common to numb the inside of the joint with the local anesthetic but still have the patient have pain with elevation and manipulation because the bursa was so irritated. In this case motion of the shoulder especially when the shoulder is still painful when the shoulder is elevated. By injecting the local anesthetic with corticosteroid into the bursa before the procedure we have noticed a substantial reduction in the discomfort of the procedure.

Another modification that we have made to this procedure is that I now perform the procedure only under x-ray or fluoroscopy guidance. For years I was utilizing ultrasound guidance for the procedure. However when I began to study this method and determined that there were too many occasions where I thought I was in the articular capsule and in fact the fluid was not flowing into the joint properly. When I injected contrast into the joint under ultrasound and compared the ultrasound finding to x-ray findings I determined that I did not want a single patient to undergo such a procedure again unless I had confirmation that I was indeed in the joint. I was eventually to establish a standard where I only do glenohumeral hypoplasty procedures under fluoroscopy guidance. Since I have a fluoroscopy unit in all of our offices it is readily available for this procedure when needed. There are several other reasons why I feel that fluoroscopy guidance is also important.

Fluoroscopy allows you to visualize the joint space and joint line during the procedure. One of the physical findings during the procedure is that you can confirm and demonstrate the expansion of the joint space before and after the procedure. Another improvement that I have made to this procedure over the years is that I stopped using simply fluid to hydrodistend the joint. I began to perform fluid hydrodistention up to a point where the x-ray starts to show joint expansion and then I exchange the fluid syringe for a syringe full of oxygen-ozone gas. I learned very quickly that the additional gas provides a rapid and more efficient method to expand the joint at the end of the procedure to maximize outcome. In addition, oxygen-ozone has beneficial effects in painful joints. Oxygen-ozone is a inflammatory cytokine inhibitor. Oxygen-ozone is oxidizing agent which also helps to dampen the swollen and thickened capsule. Oxygen-ozone works synergistically with corticosteroids to reduce inflammation and provides a means to reduce the amount of steroids utilized for the procedure and is also a "steroid sparing" technique that can benefit the patient.

WHAT CAN I EXPECT DURING THE HYDRODISTENTION PROCEDURE:

Prior to being placed onto a table and ultrasound-guided subacromial bursa injection is performed with a local anesthetic and corticosteroid. Following this an ultrasound-guided supraclavicular nerve block is also performed. This is a simple procedure were under ultrasound guidance a local anesthetic can be injected around the nerve that happens to innervate the shoulder rotator cuff. By creating an anesthesia of this nerve it makes it much easier to gently mobilize your shoulder during the hydrodistention procedure. Following this you will be placed face-up on a special fluoroscopy table. A fluoroscopic unit shown to the right will be brought over your shoulder where an x-ray picture can be obtained in various positions. A tiny amount of local anesthetic is injected with a 30- gauge needle which is smaller than in insulin needle. Once the superficial tissues are numb a needle under x-ray guidance can be directed into the shoulder joint by injecting small amounts of local anesthetic before the needle is advanced. By this means the placement of the needle is almost painless. Once the catheter or needle is in place a contrast is injected to confirm that the needle is in place inside the joint and that any fluid injected will expand within the joint capsule. Once this confirmation is made a series of syringes are made available to the physician for the injection procedure.

First the joint is injected with a local anesthetic and a corticosteroid. Most physicians utilize lidocaine for this purpose but we do not believe that lidocaine is healthy for the articular cartilage. Research has shown that lidocaine and Marcaine are both toxic to the cartilage of the joint and can cause progression of osteoarthritis of the shoulder joint. Therefore we utilize procaine or ropivacaine which are not toxic to cartilage cells. After the injection of approximately 5 cc of local anesthetic with corticosteroid sufficient time will be allowed for the anesthetic to take effect. Next a syringe full of normal saline is then injected into the joint until the shoulder joint on fluoroscopy is shown to begin to expand. Following this another syringe full of oxygen Ozone is attached to the needle and oxygen Ozone is then injected into the joint under observation of the fluoroscopy unit. The joint will be seen to expand where the adhesions are released.

Following the injection procedure the fluoroscopy unit is removed and the physician performing the procedure will then begin to gently go through a series of movements and manipulations to loosen the adhesions around the joint. This does not have to be done abruptly but is done slowly and gently. With each gentle stretch and each gentle mobilization the range of motion of the shoulder quickly improves. Typically one can experience almost complete restoration of range of motion during the procedure. Any residual range of motion restriction that is left is then treated over the course of several days by specific exercises. This will be done regularly over the course of several days to gain full movement. Some of these exercises are described below.

Following the procedure you will be asked to go home and perform the series of exercises noted below.

TREATING PHASE II ADHESIVE CAPSULITIS:
As previously described if the patient is in phase II of the adhesive capsulitis condition the patient may presents with an extremely thick and fibrous capsule that makes glenohumeral hydrodistention procedures more difficult. In this situation it typically takes more than one treatment to gain significant improvement in range of motion. It is still the most effective method of treatment that I have encountered but it is simply a little more difficult to gain the rapid improvement that we see in patients who do not have this particular problem.

WHAT EXERCISES SHOULD I DO FOLLOWING THE PROCEDURE?
Initially following the procedure we will request that you performed 3 basic movements. It is critically important that you do these exercises as frequent as possible for the first 72 hours following the procedure. Why? Because that is when there is fluid still left in the joint and a positive pressure is left within the joint that allows an individual to mobilize the joint more effectively. Typically there is a negative pressure or vacuum within the joint that holds the joints more stable. By injecting fluid and gas into the joint a positive pressure is realized allowing you to perform more effective mobilization and stretching exercises. You can often expect rapid gains in range of motion for the first several days if you do these exercises regularly. I recommend that

for the first 72 hours patients do these exercises every several hours. There are numerous techniques that have been utilized for mobilizing the shoulder in patients with adhesive capsulitis. You may have been given pulleys, or have been shown wall walking procedures etc. I have personally found that adopting a T-bar exercise technique works the best.

You do not have to purchase a commercial T-bar. A golf club, cane, stick or any object that allows you to grasp the end and use it as a mechanical leverage will do. The pictures noted below are utilizing a T-bar made from PCP pipe. You can also purchase various types of mobilization bars online but it will not be necessary. My favorite device actually is a golf club or cane.
The exercises that you will be requested to do are as follows:

1. Shoulder external rotation: Grasp the end of the golf club or cane with the hand on the affected side. Utilize the other hand to grasp the end of the stick, cane or club. Holds your elbow in close to your side. Use the bar to press the arm into an external rotated position. Put a stretch on the shoulder and hold it for approximately 5-10 seconds. Relaxed attention and repeat this repeatedly as you try to gain further and further range of motion improvement.

2. Common mistakes: A common mistake that individuals make when performing this particular exercise is not keeping the elbow tucked in close to the side. I often have the patient hold a towel or napkin between their body and elbow to prevent them from "cheating" and elevating the elbow away from the body. The reason an individual will do this is because the range of motion is so restricted that they will want to move the shoulder blade or scapula and elevate the elbow away from her body to make it appear they can externally rotate the shoulder when in fact they are not moving the shoulder much in that movement. So be cautious and not move the elbow away from the body and work the true "external rotation movement". Remember this motion will be the most restricted and will be the most difficult to restore.

3. Shoulder abduction: To perform the shoulder abduction stretch grabbed the bar as shown in the picture to the right. Once the arm is pressed up to the end of its range of motion push on the bar and stretch it further. Hold the stretch for a period of 5-10 seconds and then relax the tension. Repeat this 15-20 times.

4. Shoulder flexion: The final movement that you will be requested to do following the procedure is shoulder flexion stretching. Grasp the top of the cane or club and push the arm up into a flexion position as shown in the picture to the right. Push the arm into a flexed position until you reach the end of the range of motion. Once she reached the end of the range of motion push on the stick, cane or club to push the shoulder into further flexion. Hold this position for 5-10 seconds and then relax the tension off of the shoulder and repeat the procedure again 15-20 times.

Additional movements: In addition to the 3 movements described above a third stretch or mobilization procedure will be performed at a later stage. As your condition rapidly improves the movement noted on the left is also helpful. This is a combination of abduction or elevation of your shoulder away from her body and combined external rotation. You will be pushing this stick, cane or club downwards forcing your shoulder into further external rotation with the arm abducted as shown in the picture to the left.

I commonly also recommend that during the day one stop at the doorways and perform external rotation stretching. Utilizing pulleys that may have been provided to you is also helpful as an adjunct to the 3 basic movements described above. So feel free to use the pulley system in addition to the other exercises.

Another movement that is helpful in later stages of the rehabilitation process is to utilize a towel stretching exercises shown to the left. Place the hand of the restricted shoulder behind your

buttock and place a towel over the opposite shoulder and into the hand placed above your buttock. Grasp the towel with the unaffected hand on the opposite shoulder. Hold the towel and pull the towel upward to bring the lower hand up towards your shoulder blade. This movement will be quite restricted initially and you will have to work diligently to restore this final range of motion restriction.

CAN I USE ANTI-INFLAMMATORY MEDICATIONS AFTER MY PROCEDURE?
Yes. Because the glenohumeral hydrodistention procedure does not involve any regenerative injection procedure you can use nonsteroidal anti-inflammatory medications after the procedure to help with your recovery and reduce pain while you are doing stretching exercises and rehabilitation efforts.

WHAT IF I HAVE A ROTATOR CUFF TEAR IN ADDITION TO ADHESIVE CAPSULITIS?

As I have stated previously our focuses to restore range of motion first and then focused on the rest of the shoulder pathology which may include calcific tendinosis, degenerative tendinopathy, and rotator cuff tears. There are numerous methods that we utilize to treat rotator cuff tears depending on the type, degree and severity of the rotator cuff pathology. We are not going to cover this extensively in this document. However, most rotator cuff disease can be treated without surgery. If an extensive tear or full thickness tear exists that we feel does require surgery we still want to restore range of motion first and then undergo the surgical repair. If the rotator cuff tear or tendinosis is a good candidate for regenerative injection procedures then once range of motion is restored we can see you back within a period of approximately a month to begin repair and regeneration. A few of the techniques that we utilize are described below but this is not a comprehensive discussion of all of the methods that we use. We have advanced stem cell and regenerative medicine techniques that we utilize in our practice for certain types of rotator cuff disease and the methods that we use are somewhat proprietary and will not be discussed in detail in this document.

MY SURGEON SUGGESTED ARTHROSCOPIC SURGERY & ADHESIOLYSIS FOR MY FROZEN SHOULDER. SHOULD I DO THAT?

I have chosen not to go into a lengthy discourse on orthoscopic adhesiolysis procedures. But rather simply ask why would you undergo an arthroscopic procedure and surgery to lyse adhesions for adhesive capsulitis when you can undergo a simple injection procedure the resolve the majority of these problems. The cost of the surgery is 10-15 times greater and I am not convinced the outcome is any better. There may be rare occasions when it is appropriate to consider this procedure but this should be decided on the case to case basis. It is my opinion that the simple procedure of glenohumeral hydrodistention should be done first.

ROTATOR CUFF REGENERATIVE INJECTION THERAPIES: FROM PRP TO STEM CELLS:
We have already addressed some of the cellular transformations that occur within the rotator cuff that leads to degeneration and rotator cuff tears. Over 20 years ago we began utilizing platelets and platelet derive growth factors to heal soft tissues and I have addressed that topic on numerous articles published within this website. It is not uncommon that following a glenohumeral hydro-plasty procedure restoring range of motion of the shoulder following a frozen shoulder syndrome that I have to have the patient return for additional injection therapy to treat rotator cuff disease. One of the techniques that we utilize his platelet rich plasma injection. I refer you to our article on the rotator cuff for further information on platelet rich plasma techniques and methods. We also utilize stem cell injection procedures derive from bone marrow blood as well as adipose tissue depending on the degree of pathology and the therapeutic goals. There are numerous techniques that we utilize combining platelet derive growth factors and stem cell procedures. Not all patients fit criteria for this injection therapy and some patients will require surgical intervention. We typically addressed that

at the time of our initial consultation and make plans for subsequent treatment based on an individual's needs prior to performing the glenohumeral hydro-plasty procedure and adequate treatment for the frozen shoulder.

WHAT ABOUT PHYSICAL THERAPY?

I work very closely with physical therapists and I feel physical therapy is a important component of the shoulder management. One of my frustrations however is that physical therapy has become a standard method of treatment for adhesive capsulitis causing significant expense and months of blood, sweats and tears to get a patient through the exercises and mobilization required to restore range of motion after adhesive capsulitis. Our failure to recognize quick and effective methods of treatment of adhesive capsulitis and rely on physical therapy I think is a dismal failure in our healthcare system in this regard. The problem is ignorance and the fact that it is difficult to find specialty physicians were well trained in this procedure. Typically the physical therapist that works closely with me have learned to get our patients with adhesive capsulitis in to see as quickly as possible and undergo this simple procedure.

Range of motion will be restored quickly and then physical therapy can be of significant help. If the patient has an established relationship with our physical therapists we typically request the physical therapist to see the patient the day after the procedure so that for the first 72 hours a physical therapist can assist in mobilizing your shoulder and restoring range of motion. They typically are more helpful in pushing you to make sure you get these exercises done correctly. It is not necessary to have a physical therapist on board but there are individuals who will not push themselves unless the physical therapist is standing over you with a whip.

The physical therapist is also helpful in integrating various rehabilitation strategies especially for those patients who have concomitant rotator cuff pathology. Again, I believe that physical therapy and interventional orthopedic procedures need to be integrated and physical therapy alone in many diseases of the shoulder leads to unnecessary expense and a prolonged course of care.