

ROTATOR CUFF TEAR

Anatomy

The shoulder is one of the most complex joints in the human body. It is complex because it allows a range of motion greater than any other joint. The shoulder is made up of the shoulder socket (called the glenoid, which is part of the scapular or shoulder blade) and the humerus which is the upper bone of the arm. The collarbone or clavicle also contributes to the shoulder joint.

Movement of the shoulder occurs at two sites. Firstly, the shoulder ball “humeral head” moves within the socket (glenoid). Secondly, the entire shoulder blade or scapular moves over the chest wall or ribcage.

a) **Ball and Socket**

There are numerous ball and socket joints within the human body. The shoulder joint is remarkable because relatively speaking it has the largest ball in the smallest socket. This is necessary to allow its wide range of motion. It is analogous to a golf ball sitting on a tee. The disadvantage of this arrangement is that it increases the risk of dislocation. That is to say that it is not hard to knock the golf ball off the tee. The hip joint is an example of a ball and socket joint where there is a very large socket which strongly resists any dislocation of the ball out of the socket.

Like most joints in the human body, a smooth surface coating not unlike Teflon, covers the ball and the socket. This is called the articular cartilage. It allows for easy movement of the two surfaces over one another with minimal friction. It is lubricated by joint fluid.

Because the shoulder socket is relatively small it has a rim of strong cartilage tissue around it called the labrum. The labrum effectively increases the size of the socket, adds stability and improves cushioning.

b) **Shoulder capsule**

There is a capsule around the shoulder joint which extends from the edges of the socket to the margins of the ball. The capsule is thickened and strengthened in places by ligaments referred to as the glenohumeral ligaments which pass from the socket to the ball. The inner surface of the capsule is lined by synovium which produces the fluid which lubricates the joint. All fluid containing joints have a synovium.

- c) **Rotator cuff**
The next layer outside of the capsule is the rotator cuff. This is a convergence of four major tendons. These tendons help hold the ball centered in the socket and also assist in movement of the shoulder joint. Each of these tendons arises from a muscle. The muscles that form the rotator cuff are the muscles surrounding the shoulder blade. The four muscles of the rotator cuff are:
1. **Supraspinatus**
This muscle sits at the top of the shoulder blade and the tendon of supraspinatus runs over the top of the ball. It is the tendon which is most commonly inflamed or torn.
 2. **Subscapularis**
This muscle sits at the front of the shoulder blade (thus it is between the shoulder blade and the ribcage). It then passes to the front of the ball and helps turn the arm inwards.
 3. **Infraspinatus**
This sits at the back of the shoulder blade below the spine of the scapular and passes to the back of the ball of the shoulder joint. It helps turn the arm outwards.
 4. **Terres minor**
Sits below infraspinatus. It is the smallest of the muscles of the rotator cuff. It also assists in rotating the arm outwards.
- d) **Bursa**
The subacromial bursa is a lubricating sac which sits between the rotator cuff tendons and the bone above them. This bone is called the acromion and is part of the shoulder blade or scapular. The bursa helps tendons glide smoothly when they come in contact with bone or at prominent areas on your body. For example we have a bursa at the elbow and also at the knee and the back of your heel.

Type of tear

- a) **Full thickness tear**
When a tendon tears completely it usually pulls off its attachment to the bone of the humerus. The tendon is no longer attached and cannot function in its role of moving the shoulder and containing the ball within the socket. Once it has torn off the bone the muscle begins to shrink as it is no longer functioning. Gradually the tendon retracts and a larger and larger gap forms between the tendon and bone. These tears usually start with the supraspinatus tendon which is on the top. Over time the tear spreads to involve

the other tendons and also possibly the long head of biceps tendon. We talk about full thickness tears as being recent or acute and longstanding or chronic. A recent tear is much more likely to be repairable because the tendon and muscle can still stretch back to the bone where it tore. A chronic tear is more retracted and the muscle has shrunk and scarred and is less likely to be repairable back to its attachment.

- b) **Partial tears**
A partial tear implies that some of the tendon fibres are still attached to bone. Therefore the muscle is still working and the tendon has not retracted greatly. Partial tears can still be a cause of significant pain and weakness. A partial tear may be contained completely within the tendon (in substance tearing). These tears are not visible through the arthroscope when we look at the shoulder at the time of surgery. They are however very well demonstrated on the MRI scan.

Cause

- a) **Acute tear**
An acute tear occurs as a result of a fall onto the arm or a forceful contraction of the muscles.
- b) **Degenerative tear**
Degenerative tears are more common and are age related. Studies show that up to one third of people over the age of sixty have a rotator cuff tear although they may not be aware of it. Degenerative tearing occurs as a result of several factors. As we age the tendons blood supply is impaired and the tendons ability to repair is reduced. Over many years the tendons are subjected to repetitive stresses which can lead to overuse tearing. A very common problem is the development of bone spurs at the acromion which sits above the rotator cuff tendons. These spurs rub on the tendon causing it gradually to fray and eventually tear. As a result of the fraying the tendon can tear suddenly with fairly minimal force.
- c) **Risk factors**
People over the age of forty are at much greater risk of rotator cuff tearing. There are some occupations which involve repetitive overhead activity which increases the risk of rotator cuff tearing. Painters, carpenters, and ceiling fixers are at risk. Sporting activities that involve repetitive overhead actions such as swimming and tennis also present a risk. The repetitive action of throwing a ball is potentially a cause of rotator cuff problems.

The majority of tears in young patients under the age of forty are the result of a significant traumatic injury. Rotator cuff tears can occur in conjunction with shoulder dislocation or shoulder fractures.

Symptoms

- Inability to lift the arm after significant injury.
- Pain when lifting and lowering the arm.
- Weakness when lifting the arm.
- Pain at rest and particularly pain at night.
- Inability to lie on the affected shoulder.
- Clicking or cracking sensation when moving the shoulder.

After the initial injury the pain may settle over a period of weeks and some degree of function will return. Some patients with a rotator cuff tear may achieve a full range of motion. However a degree of weakness is likely to persist.

Medical examination

The examination aims to determine range of movement and strength within the rotator cuff muscles. It is important to rule out other conditions such as pain coming from the neck as a result of pressure on a nerve, or frozen shoulder.

Investigations always include plain x-rays looking for a spur or for arthritis of the shoulder. Ultrasound and MRI scan will evaluate the rotator cuff tear. MRI scan is more accurate in determining whether this is a recent tear or an old tear.

Treatment

Like most orthopaedic problems, the choice of treatment depends on pain and function.

1. Non-surgical treatment

Initial treatment with simple painkillers such as Panadol and anti-inflammatories in conjunction with rest, ice and activity restriction will lead to some improvement in pain levels. A physiotherapist can then instruct in stretching and strengthening exercises. In particular strengthening the deltoid muscle will compensate for some underlying rotator cuff weakness.

If non-surgical treatment has been decided upon, steroid (cortisone) injections may be considered for the initial pain.

More recently some patients are opting for PRP injections (Platelet Rich Plasma). The theory is that this may promote healing of a partial tendon tear.

For pain relief a temporary or permanent suprascapular nerve block may also be an option.

Non-surgical treatment would generally be considered in an older age group (over sixty-five years of age) where there is minimal pain and weakness associated with good movement. Non-surgical treatment is also usually chosen when there are significant other medical conditions which would make surgery a risk.

2. Surgical treatment

Rotator cuff repair surgery is extremely common. It is generally considered for patients who have significant pain, particularly pain interfering with her sleep. There is generally associated loss of movement and weakness. Patients under the age of sixty-five are more likely to be candidates for surgical treatment. Recent or acute tears are preferred for surgery, whereas large chronic tears may not be repairable.

Surgery involves reattaching the tendon to bone.

Types of surgery

There are two common types of surgery for rotator cuff repair. The first is “all arthroscopic repair” and the second is “mini open repair”. The choice of method depends on several factors including the size of the tear, the location of the tear, and the quality of the tendon tissue as well as whether this is a recent or old tear.

Regardless of the method of performing the surgery, the stay in hospital and the post-operative rehabilitation is identical.

Most people stay in hospital for one or two nights following rotator cuff repair surgery.

At the time of the rotator cuff repair it is quite common to perform other procedures. This might include addressing a tear of the long head of the biceps tendon, a bone spur, or arthritis of the AC joint at the end of the clavicle. These additional procedures may alter the post-operative management and the recovery time.

All arthroscopic repair

This method involves using a telescope (arthroscope) and several small incisions to use specialised instruments to undertake the repair without making a larger incision.

Mini open repair

This method utilizes arthroscopic surgery to undertake the initial part of the procedure, removing the bone spur and any arthritic wear at the end of the collarbone as well as removal of bursitis and scar tissue. The tendon can then be repaired utilizing a small incision approximately five centimeters long. The second part of the procedure is done under direct vision and does not utilize the arthroscope. In common with the arthroscopic procedure, this method allows preservation of the deltoid muscle attachment.

The older method of open rotator cuff repair is seldom indicated today although for specific tear patterns it may be appropriate.

It is important to note at this point that a large number of surgeons believe that the arthroscopic method offers no real advantage over the mini open repair and may in actual fact have some disadvantages. Specifically the post-operative rehabilitation is identical regardless of which method is chosen. This is because the rate of rehabilitation is determined by tendon healing back onto bone rather than the skin incisions. The tendon healing proceeds at the same rate for both procedures. Furthermore the success of the surgery is in large part determined by the strength of the fixation of the tendon to bone using screws called anchors which are inserted into the bone. These screws have sutures attached to them and the sutures are passed through the tendon allowing the tendon to be tied back down to bone. It is much easier to obtain a good grip on the tendon with the suture using the mini open method. There is a potential for technical difficulties associated with the arthroscopic surgery to impair the quality of the tendon suturing. Arthroscopic surgery of any sort is only advantageous if it achieves an equal or better quality result with less tissue damage.

Rehabilitation

When it comes to rotator cuff repair the surgery is only fifty percent of the battle. The success of surgery depends on appropriate rehabilitation. The rehabilitation is generally supervised by a physiotherapist.

For the initial four to six weeks you will be required to wear a sling. The duration of immobilization is determined by the size and extent of the tendon tear.

While you are wearing the sling it is still very important to maintain some movement in the shoulder joint. This is called passive exercise. It is passive because the shoulder is moved without the use of your own muscles. The physiotherapist will demonstrate exercises for you while you are in hospital. Exercises such as pendulum swings allow

shoulder movement without using the muscles or putting tension on the repair.

Once you come out of the sling you commence active exercises using your own muscles to move the shoulder. Again a physiotherapist will instruct you on a graduated program of strengthening and range of motion exercises.

Recovery from rotator cuff repair is notoriously slow. It is generally not appropriate to drive for the first six weeks. Most people have reasonable function by three months. Shoulder strength and movement will continue to improve for twelve to eighteen months.

Results

Rotator cuff repair is generally a very successful operation of restoring strength and movement to the shoulder. The published results for arthroscopic and mini open surgery are similar.

The single biggest factor determining the success of surgery is the nature of the tear being repaired. Younger patients with small tears and good quality tendons generally have excellent results. Most patients achieve ninety to ninety-five percent of their pre-injury function. Large tears associated with poor quality tendon tissue which is extensively retracted are going to have a higher failure rate. Smoking impairs the tendons healing capacity. Patients over the age of sixty have poorer tendon healing. Failure to undertake an appropriate rehabilitation program can lead to poor results.

Complications

All surgical procedures can be complicated by infection. Relatively speaking the infection rate for shoulder surgery is quite low. A general figure is one in two hundred cases.

Surgery always carries a risk of injuries to nerves and arteries. This is particularly uncommon for shoulder surgery.

The two commonest complications associated with rotator cuff repair are stiffness and tendon re-tearing. Stiffness is often referred to as post-operative frozen shoulder. It generally occurs when the rehabilitation has been inadequate and in a large part it should be preventable. A small number of patients do get frozen shoulder even if they are diligent with their rehabilitation. This complication is treatable and although it can drastically increase recovery times, the movement does usually return.

Tendon re-tearing generally occurs because of the poor quality tendon that has been repaired. There are some factors that we simply cannot

change and the quality of the tendon and its blood supply will have a major impact on its ability to heal. A second attempt at repairing the tendon is only undertaken in selected cases. There are alternative procedures including tendon transfer.

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