

Impingement Syndrome and Tears of the Rotator Cuff

Impingement is a very common problem in which the tendons of the rotator cuff (predominantly supraspinatus) rub on the underside of the acromion (the bone at the point of the shoulder). This causes pain due to the repeated rubbing of those tendons and is especially bad in certain positions of the arm. In particular it is difficult to put the arm behind the back and to use it in the elevated position. This makes it difficult to drive, change gears, hang clothes, comb one's hair, and even to lie on the affected shoulder.

The cause of this problem can be:

- 1) A muscle imbalance problem due to poor functioning of the rotator cuff tendons themselves; thus allowing the arm to ride up and rub on the acromion squashing the rotator cuff tendons in the process, or
- 2) A mechanical problem where the space for the tendon is inadequate. One way this can occur is with an injury to the tendon itself which causes swelling of that tendon such that it becomes too large for the space at hand (primary tendonitis with secondary impingement). A large acromion can occur as part of normal growth or later in life spurs can develop along the front of the bone and can stick into the tendon. If this is bad enough these spurs can actually dig into the tendon to such an extent that the tendon becomes eroded away and ruptures.

How does the shoulder work?

The shoulder, like the hip, is a ball and socket joint (like a tow bar). Unlike the hip however, the socket is very small and is not big enough to hold the head of the humerus in place. This gives the joint a large range of motion but as a consequence it also means that it is potentially unstable. To function normally, muscles on both sides of the joint must work together to hold the joint in place during movement. This means that when the deltoid muscle (see diagram) lifts the arm out from the side of the body, the supraspinatus and other muscles of the rotator cuff must pull down on the top of the humerus. This causes a levering out of the humerus with the rotator cuff muscles working in conjunction with the deltoid. The rotator cuff thus prevents the deltoid from driving the humerus up into overhanging acromion.

In the normal shoulder this mechanism is so finely tuned that it always keeps the reaction force of the humerus at right angles to the joint. The joint therefore is always stable unless taken unawares.

How does the problem start?

The rotator cuff tendons can be injured by a single traumatic event such as, a fall onto the point of the elbow (which drives the humerus up into the acromion and squashes the tendons), a fall onto the point of the shoulder or a traction injury. A single incident may not always be the cause however and

tendons can be injured by overuse activities such as swimming, or jobs involving raising of the arms for long periods of time (ceiling fixing or plastering).

As the rotator cuff muscles are small in comparison to the deltoid they fatigue easily and hence can no longer resist the upward thrust of that muscle. With the deltoid now overpowering the rotator cuff muscles the reaction force starts to be upward rather than across the joint. This means that the cuff tendons start to become squashed when the arm is raised. Thus damage to the tendons begins, and the symptoms like the damage may come on slowly, gradually becoming worse.

Why does it progress?

Once the tendons have been damaged they become inflamed and swollen and thus narrow the gap between the head of the humerus and the acromion even further. As this occurs impingement occurs more easily and with less movement. The ache may thus become worse and may occur with smaller movements or even constantly. As such it is especially noticeable at night. With time the problem becomes compounded as a tendon previously mildly damaged now impinges and becomes increasingly inflamed and sore. With this increase in pain there is a concomitant decrease in function, thus causing more and more muscle imbalance, further impingement and a spiralling of problems.

Is age a factor?

Although not strictly age related, it can generally be said that different age groups tend to have different types of pathology at presentation even though we believe that the course of the disease is similar in each case. Usually those under 25 years present at the stage of swelling and inflammation, those between 25 and 35 present with fibrosis and scarring, and those over 35 present with tendon degeneration and sometimes tendon rupture. The problem becomes increasingly common with age as spurs develop on the anterior acromion and by the age of 65 years this is an extremely common condition.

What about the other shoulder?

In cases where the primary problem is the shape or size of the acromion (primary impingement) it would seem reasonable that the opposite shoulder might be similar. Studies in fact show that this is the case 60% of the time and hence the chances of the other shoulder becoming involved to some degree is of that order.

If the primary problem is an injury to the tendon rather than a narrow gap for the tendon (primary tendonitis), then the other shoulder is likely also to have a normal gap. In this situation therefore the other shoulder is almost never involved.

What is the treatment?

All those in stage 1 (swelling and inflammation – an acute injury) and about half those in stage 2 (fibrosis and scarring – chronic problem) can be treated by conservative means. This means treatment for the local pain and swelling (which may include injection of an anti-inflammatory such as cortisone) and a therapy program to re-balance the shoulder by strengthening the supraspinatus and other rotator cuff muscles. Once these muscles are functioning again they will hold the shoulder

down and prevent further impingement. The tendon injury will then gradually resolve, or settle. Those with more advanced disease generally will come to operative treatment. This includes long standing problems, rotator cuff tears and cases where the acromion is so large that impingement will clearly continue unless the bone is trimmed to widen the gap for the tendons.

Sub-Acromial Decompression

The surgery for this condition is called sub-acromial decompression. The main part of this procedure is called an acromioplasty whereby the acromion is reshaped and the prominent areas underneath are removed to increase the size of the space beneath it. This is done as an arthroscopy (through a telescope) which means that the shoulder itself is never actually opened. This means that the arm will have a full range of motion within 12 hours of surgery and that less than 24 hours is needed in hospital. Despite this good early range of motion however it has been found that most shoulders do not show marked improvement for 2 or 3 months and thereafter they gradually improve over 6 – 9 months. It is thought that the reason for the delay in recovery is that the tendons still have to recover even after any rubbing has ceased and like tendons elsewhere this takes several months and involves a fair degree of rest.

Where impingement (a narrow gap) is the primary problem the tendon recovers well and hence the chances that a normal shoulder will result is about 95%. Where tendonitis (a tendon injury or tendon inflammation) is the primary problem and the impingement develops because of the swelling of those tendons surgery seems less effective. A successful outcome here is only seen in about 85% of cases or less. Here the tendons seem to have more intrinsic damage and take longer to recover. That recovery may also be less complete leaving minor symptoms.

Rotator Cuff Repair

If there is a major tear of the tendons, then an attempt should be made to repair this if possible. If the tear is very large then this sometimes cannot be done, but in most cases it is possible. Once the stage is reached where the tendons require a large repair, the results tend not to be as good as they are when the tendons are intact or when only a small repair is needed. Although pain relief can often be achieved in the more severe cases by decompression and clean up of the tear, without those tendons functioning the shoulder will be weak and some of the shoulder movement may be lost.

Rotator cuff repair is always preceded by sub-acromial decompression, this being necessary to both remove any damaging spurs and also to increase the space to allow for the repair. Mostly the decompression can be done as an arthroscopic procedure which is then followed by an open operation to repair the cuff tendons. Whilst this is more complicated than doing the whole procedure open it has been found that the repair can be done through a split in the deltoid muscle rather than by having to take that muscle off the bone. This therefore allows for better strength post-operatively, much less pain and earlier motion.

The tendon repair is generally done by suturing the tendon ends into a trough in the bone. Healing is slow and it takes about 8 weeks to be strong enough to allow the arm to be raised up under its own power. Attempts to do this before that time may result in a breakdown of the repair.

Results of the repair are good provided that the tendon heals into the bone satisfactorily. Pain relief is almost universal and function and power return is related to the quality of that repair.

It is possible to do a decompression to stop rubbing of the tendons and yet leave a tendon tear unrepaired. The results of this however are nowhere near as good as a decompression with tendon repair and this procedure is reserved for cases where time and early function outweighs the need for the best possible result.

The Therapy Programme

Therapy consists of two factors. The first is to avoid further damage to the tendons and the second is to strengthen the rotator cuff tendons and make them functional. This means stopping all activities that cause pain and for swimmers and throwing athletes, this may also mean a style modification if that is possible. Resting the injured shoulder may be accompanied by local heat or ultrasound and sometimes an anti-inflammatory agent. As pain settles a strengthening program is begun with emphasis on strengthening supraspinatus and infraspinatus which are the main two muscles involved in this process. Often it is not possible to work on these muscles straight away and supraspinatus exercises particularly may cause pain. If this is the case the scapula stabilising exercises will need to be done first and this will require the supervision of a therapist skilled in this area.

Supraspinatus can be strengthened by holding a light weight (1/2 kg – such as a full drink can) in the hand, straightening the arm by the side and turning the hand in until the thumb points to the floor. The arm is then taken out from the side and slightly forwards and raised up about 45 degrees (it must not be raised into the area where the pain is felt). The weight is then held for a second and then lowered, resting before the next lift. Ten such lifts make up one set and the number of the sets is increased with training to about 15. Between sets the weight should be put down to allow the muscle and tendon to fully recover.

Infraspinatus can be strengthened by lying on the good side and holding the weight in the upper hand. With the elbow locked at the side and bent up to 90 degrees, the weight is then lifted until the forearm is parallel to the floor. As with the other exercise, sets of 10 can be performed without ever getting in to the area where pain begins.

If it proves impossible to start or continue this programme due to pain then sometimes an injection of anaesthetic and cortisone can be used to decrease the inflammation and pain in the area and hence break the cycle. Although this may settle the pain for quite some time, injection alone does not address the primary problem of muscle imbalance, and hence a therapy programme should still be embarked on. This means therefore, that even if an injection has resulted in a completely pain free shoulder, an exercise programme is recommended. By doing this it is hoped that the chance of recurrence will be reduced.