Tendon healing is a slow process. The blood supply to normal tendons is poor, so one can imagine that the blood supply to torn and degenerate tendons is very poor. Whilst a new blood supply may emanate from the underlying bone to which the tendon has been re-attached, this takes time to become established. What this means is that the tendon repair will need to be protected and nursed until such time as it has repaired sufficiently to be no longer beholden to the stitches and anchors that have been used for the repair. It is not that most repairs are necessarily weak. At the outset, the stitches and anchors are strong. The stitches however, are quite fine, despite their inherent strength. This means that they can be

Rehabilitation after Rotator Cuff Repair

Dr Keith Holt

The primary aims of any rehabilitation protocol for rotator cuff tendon repair are, firstly to get the tendon healed, and secondly, to regain motion. If these two aims are fully achieved, then shoulder function should slowly come back to normal, or near normal, with strength improving over about 15 months. Unfortunately, these two primary aims require conflicting protocols, the first needing rest and protection, the second needing early motion to prevent the healing tendon from gluing up to the exposed bone of the acromioplasty (sub-acromial decompression - removal of the spur) which is just above the repair.

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likened to cheese wire. If stressed, the stitches do not break; rather, they egg slice their way through the tendon, a process that happens by degrees with repetitive strain. Thus, whilst one sudden insult may not disrupt the repair, lots of lesser insults may lead to a gradual failure of the repair. This is a repetitive strain injury which can be likened to metal fatigue: a gradual failure of something that is strong.

Tendons initially heal by scar formation, just like skin. In order to become strong however, they need to develop special anchoring fibres made of cartilage. These so called ‘Sharpey’s Fibres’ are first seen under a microscope at about 3 - 4 months, and they continue to develop over several more months. They are strong, binding the tendon solidly to the underlying bone.

The literature on rotator cuff repair is voluminous, and what it shows is clear. The best treatment for rotator cuff repair in the first 3 months is rest. Up until the Sharpey’s fibres develop, there is no evidence that exercise, or stress on the healing repair helps: neither speeding it up, nor making it stronger. Indeed, the process seems independent of those external stimuli. What is also clear however, is that overdoing the motion and exercises will increase the failure rate of the repair because of repetitive strain.

What does the sling do?
The sling provides a means of resting the repair. The most important aspect of it is the cushion that keeps the arm away from the side. By using this, the elbow gets pushed away from the side of the body and, in turn, the tension on the rotator cuff tendons is reduced. This means that there is also less tension on the stitches, and hence, less chance of failure.

How long do I need the sling for?
There is no well established time for this and the usual answer is 6 weeks. What experience has shown however is that, for smaller tears, 4 weeks may be enough. Thus, if the tear is reasonably small, and if the repair is good, having been achieved without too much tension (and this is the majority), then 4 weeks seems to be adequate. On the other hand, if the tear is large, and/or the repair has been achieved only with a good deal of tension, then the full 6 weeks seems more appropriate. Rarely is more time than that required.

Do I need to move the shoulder at all?
For most people the answer is probably no. Despite the fact that the tendon repair is only millimeters from the acromioplasty, where the bone has been shaved off and exposed, direct healing to this seems either not to occur, or to break down subsequently. Hence, for most people, early motion may not be necessary for long term success. For some however, particularly those in the younger age groups where scarring is a more aggressive phenomenon, gluing up of the sub-acromial space, thereby tethering the tendon repair to the overlying bone, may be more of an issue. In this group therefore, if the tendon repair is strong enough to tolerate it, early motion may have some benefit.

What the limited studies on early motion compared to rest show, is that early motion improves the rate of motion recovery but at the expense of a higher failure rate: hence, the indications for early movement are relative. If you have a small, strong repair, in generally healthy tendon, with good anchor fixation in the bone, then early motion may be helpful. Clearly however, this needs discussion to make sure that it is appropriate for your particular situation.

If your repair will tolerate early movement this will be discussed at your first post-operative appointment which is usually at about 1 week post surgery. For a good number of people, an early motion regime can then be implemented, beginning at the 2 week mark. The aim of this will be to get some motion back into the shoulder, but to do this without stressing the repair.

Elbow and hand motion
Everyone should be encouraged to use their hand, to keep it moving and supple. Whether the elbow can be moved as well however, will depend on whether or not the biceps tendon has been repaired (tenodesed - i.e. anchored to the humerus). If the biceps has not been repaired, then the elbow should be moved at least 3 times a day so that it doesn’t stiffen up. To do this, the arm should be released from the sling with
the bolster left in place (see pictures in right hand column). The sling should be opened, and the arm allowed to hang down vertically over the top of the bolster, until the elbow is straight. This means that the arm can often be used to eat with, albeit that it still has to rest on the bolster to properly protect the rotator cuff repair. Importantly, the elbow should not be lifted off the bolster because this puts stress on the rotator cuff repair.

**Biceps Tenodesis**

If a biceps repair has been done, then the biceps will have been anchored to the humerus. The point of anchorage is then a weak spot until such time as it heals. This means that the biceps itself should not be stressed for a few weeks, and certainly not in the first 2 weeks. If performed gently however, the elbow may be straightened a couple of times a day as described above. As the repair needs to be protected however, no force should be put through the biceps tendon. Hence, unlike the above scenario where the biceps is intact, the arm cannot really be used for activities such as carrying, lifting or eating. In addition, it should be noted that the main biceps function is to turn the forearm such that the palm of the hand faces upwards. This motion should therefore be avoided in the first 4 weeks.

If both the biceps tendon and the rotator cuff have been repaired, then the sling will need to be left on to protect both. Again however, cautious elbow extension, a couple of times a day, should be carried out. For the first 2 weeks however, this should be very gentle, and perhaps only done once or twice per session. After 2 weeks, this amount can be increased, but moderate protection still needs to occur.

**Rehabilitation after a small to medium sized rotator cuff repair**

**First 2 weeks** - the arm should be left in the sling full time but some elbow motion, as described above, should be undertaken 2 - 3 times per day

**Weeks 3 & 4** - shoulder motion should begin. This is best done by leaning over to the side of the repaired shoulder and letting the arm gently swing backwards and forwards (not outwards and not in circles - see pictures on next page). This is not an exercise as such, so this only needs to be done a few times just to break down any scar that may be forming between the repair and the acromion above. It is not designed to increase strength or fitness. It may be best done in the shower when the shoulder is warm, and it should be done gently. More is not better.

In addition to the above, another good exercise is one of gentle passive abduction of the shoulder. This is done with the arm resting on a bench or table whilst sitting next to it, with all the weight being taken by...
the bench. The arm can then be gently slid down the bench, away from the side of the body, making sure that all of the weight of the arm is being taken by the bench. Again, this just needs to be done for 2 or 3 repetitions, perhaps 2 or 3 times per day: and it is very important that, whilst doing this, the arm is not actively lifted up off the bench. Such an action puts large forces through the repaired rotator cuff, and hence may be detrimental to the repair. On the other hand, with the elbow being pushed away from the body, and all the weight being taken by the bench, the rotator cuff becomes looser and the stitches are under less tension. Hence, this is thought not to be detrimental to the repair.

**Arm Swinging - Step 1**
The arm can be taken out of the sling to allow gentle back and forth swinging

**Arm Swinging - Step 2**
To achieve good forward motion, bend forwards and swing the arm. This gets gravity to do the work, not the tendon

**Abduction Exercise**
Lean out on to a table or bench top. All the weight must be taken by the bench. The arm should not lift itself

**Weeks 5 & 6** - for most people the sling can be removed. Often however, when first removed, the shoulder hurts because the arm finally comes to lie by the side of the body. This puts increased tension in the repair, and hence, can be a little bit sore until things start to stretch out. For this reason, the sling should be kept for a few days after removal so that it can be used for an hour or so, here and there, to rest the shoulder. This may need to be done for a few days, just until such time as the shoulder becomes comfortable when the arm is resting by the side.

In this period, the forward swinging motion can be increased: and this is best done by gradually leaning forwards whilst doing it.

**Weeks 7 - 12** - By this stage, the tendon repair should be starting to get a bit stronger, In this period therefore, the aim is to slowly get some motion back into the shoulder. By the end of the 6 week mark, it should be possible to get the arm close to shoulder height (90° of elevation), with the other arm being used to help it get there. The aim thereafter, is to get an increase in range of about 10 - 15° per week such that, by 12 weeks, the arm should be at about 150° of elevation, or 2/3 of its range. It is important that this process of regaining motion is passive (using gravity and the other arm, not using the repaired arm under its own power) and slow, in order to protect the repair which, at this stage, is still not very strong. Indeed, the highest incidence of failure of the repair is in the 6 - 12 week period, and not the first 6 weeks, perhaps
because the arm is out of the sling and being used a bit, so the repair is not being protected as much as in the first 6 weeks.

If the progress is slower than the above, this is not usually a problem. It may just mean that the repair has been bigger, and is thus tighter than average: and hence perhaps, should not be pushed to try and maintain a schedule. On the other hand, if the motion is returning easily and quickly, it should be looked after more carefully than when it is slow. Rapid return of motion is not an indication of good healing, but rather, an indication of reduced scarring: and the latter may have consequences for the strength of the repair given that the repair itself heals by scar in the first instance. For this reason therefore, it is important not to allow the recovery rate to exceed the above rate.

**Weeks 12 onwards** - By the 3 to 4 month mark, Sharpey’s fibres are forming. These are what give the long term strength to the repair. Once these have formed therefore, the repair may be put under some stress for the first time, and that stress may be slowly increased over the following months. If necessary, some formal therapy may be helpful at this stage and, if so, it will be discussed. Even without this however, the shoulder can be expected to undergo full recovery by the 9 - 12 month mark.

**Passive Elevation - Step 1**
The arm is fully supported by the good arm by putting a fist under the elbow.

**Passive Elevation - Step 2**
Keeping the arms bent to decrease the lever arm, the elbow can gradually be pushed up. 10º - 15º per week.

**Active Elevation**
The arm can be lifted forwards under its own power. It can also be used straight which increases the lever arm

**Week 12 onwards**

**Theraband Exercises**
If infraspinatus has not had a significant repair, then strengthening of that muscle may be started. A Physio may help this process and provide the theraband
Rehabilitation for a large or difficult rotator cuff repair

The elbow should be moved as described above (noting any restrictions that may apply if there has been an additional biceps tendon repair / tenodesis), but the arm should remain in the sling for the full 6 weeks. Gentle exercises to regain motion can then be started similar to the above regime, albeit 3 - 4 weeks further out from the time of surgery. Progress must be deliberately slowed down however, to protect the larger tendon repairs.

If such a modified program is necessary, it will be discussed at your first post operative visit.

After the repair

Immediate post-operative management

When leaving hospital, most people will be given a slow release pain killer which is to be used twice a day. There will also be some quick release painkillers provided, which are to be taken in between times. If you need more of these, please ring the office to get some. Most people require this level of analgesia for about 7 - 10 days. Of course, if you don't need this much analgesia, you can cease it all, or just change to over the counter medications such as paracetamol or paracetamol / codeine combinations. (More details on analgesics and their use can be found on the web site listed below). If you need more help with understanding this, do not hesitate to ring me, my office, your GP or the orthopaedic ward at Hollywood.

Most people find that it helps to sleep sitting up a bit. This is probably because the weight of the arm is such that it pulls the repair away from the overlying bone. Whatever the reason however, it seems to be a more comfortable way to sleep for the first week or so.

Ice or cold packs (or frozen peas wrapped in a towel) are helpful in the first 7 - 10 days. They decrease bruising a bit, and they help the pain. After that, hot packs are probably better. They lessen the pain and they help disperse any bruising. Heat should be avoided in the initial period because it can increase the amount of bleeding and bruising. After 7 - 10 days however, heat may provide better pain relief than cold. This is why doing your arm swinging in the shower is often the best method.

The average time to lie on the operated shoulder, having had a sub-acromial decompression without repair, is about 8 weeks. To lie on a repaired shoulder therefore, may take 3 months or more. Unfortunately, when lying on the opposite shoulder, the operated arm tends to fall across the body and stretch the repair, so this is also a difficult position to adopt initially. Ultimately however, both of these positions should be possible.

Pain following rotator cuff repair

Contrary to what you might think, the bigger the repair, the less sore it usually is. This is because small tears are usually seen in younger people, with healthier tendons, which are well innervated by nerves. In contra-distinction, large tears are more often seen in the elderly, with degenerate, chronically damaged tendons that no longer have a good nerve supply. Hence, the repair may not be felt all that much.

One of the important corollaries of this is that, if the tendon does not hurt, it does not mean the repair is doing well. Indeed, it may merely mean that it cannot be felt: and hence needs extra special care. These sort of repairs need a lot of vigilance to protect them so that they may heal properly without being pulled apart and, in these circumstances, more rest is better. Indeed, the literature would suggest that, if the repair does not hurt, then it is more likely to fail than if it does. Similarly, repairs that are very sore, are more likely to heal, and less likely to re-tear in the longer term.

Frozen Shoulder

Roughly 10% of shoulders that get operated on will go on to develop some degree of frozen shoulder. This is a capsulitis, an inflammation of the capsule surrounding the joint itself. No-one knows why this happens, or why it usually does not occur until some weeks following surgery, but it can be very painful. It also limits motion to a varying degree.

The treatment for frozen shoulder is rest and cortisone. As the latter interferes with healing of the tendon, it probably should not be injected into the joint in the first 3 months. On the other hand, if the pain and restriction is bad enough at the 4 - 6 week mark, then some oral cortisone may help. This will be prescribed if necessary and, although not quite as good as a local injection, it often helps considerably. If by 3 months the problem is not resolving, then an injection may then be considered.

Frozen shoulder is almost like the tendon and shoulder are over-healing. As such, although the initial recovery is slower and associated with more pain, the longer term is one of better strength and less likelihood of long term tendon failure. In other words, the healing seems to be better. There is therefore, some upside to this problem supervening.

How strong will the repair be?

The strength of the repair will depend on a number of factors. Let it be said from the outset however, that a repaired tendon is never as strong as a normal one, and can always be re-torn. Having said that, a young, healthy tendon, with a small repair that has been well
looked after, should end up being close to normal. The opposite of that is the large repair, of a thin, degenerate tendon, that required moderate tension to get it back together. In this situation, the tendon will need considerably more care, both initially, and in the long term, to protect it. Also, because of its degenerate nature, healing is not assured. If the tendon has run out of reasonable blood supply, and doesn't get this from the bone it has been repaired to, then the repair will inevitably either fail, or any dead tendon will get absorbed leaving a defect. If large this would then be considered unrepairable.

**Return to sport**

Time to return to any sport will be variable, and will necessarily be determined by the tendon strength (as determined by the factors described above), the nature of the sport, and the range of motion that has returned. For bowls, because of the weight of the bowl, some 4 - 5 months are required. For golf, 5 - 8 months. For weights, 6 - 12 months with limits being placed on the amount of weight being used. For combative sports, a full 9 - 12 months may be needed.

**What if I re-tear my rotator cuff?**

The healing rate of these tendons is not 100%, but perhaps nearer 85%. Obviously the likelihood of healing depends on the above described factors. Having said that however, there is a percentage of tendons that, either do not heal, or only partly heal. If the re-tear (or an un-healed portion of the initial repair) is small, pain is minimal, and strength is reasonable, then, having had an acromioplasty (sub-acromial decompression), the best option is usually to leave things alone and see what happens over the ensuing months. Particularly in the elderly, where the tendon is very degenerate, further attempts at repair maybe futile so, if function is reasonable and pain is minimal, things should be left alone. In the young, who may have re-torn this with a significant injury, re-repair may be the best long term option. This however, will need assessment and consideration, and will be based on individual factors.

**Questions and Concerns**

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**Further information** can also be obtained, on this and other related topics such as:

- Impingement and Rotator Cuff Tears
- Frozen shoulder
- Shoulder replacement
- Pain management after TKR (relevent information)

at: www.keithholt.com.au