**Reverse Shoulder Replacement**

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Reverse Shoulder Replacement is a procedure that was originally designed for shoulders with unrepairable rotator cuff pathology which had gone on to develop osteoarthritis. Over the last decade, given the good to excellent results in this group, which was previously considered inoperable except by fusion of the shoulder, the indications have been expanded to include arthritis in the elderly with intact but failing rotator cuff function, non arthritic and non painful loss of shoulder function due to cuff failure, and for the management of some fractures.

**Reverse Shoulder Replacement**

This procedure is called a reverse replacement because the shoulder is reconstructed with the components back to front compared to the normal situation. That is, the ball is placed on the glenoid side, and the socket is on the humeral side. The reason for this relates to the mechanics of the shoulder and how this is altered by rotator cuff failure.

**Anatomic Shoulder Replacement**

Here the ball and socket are in the correct anatomic position.

**Reverse Shoulder Replacement**

Here the ball and socket are back to front so as to compensate for lack of rotator cuff function.

**Shoulder Prostheses**

Anatomic shoulder replacement on the left

Reverse replacement on the right.
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 (the ball) 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 diagrams) 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 socket. The joint is therefore always stable, unless taken unawares.

When the rotator cuff (supraspinatus especially) is torn or non-functional, the deltoid acts unopposed. Instead of the arm being levered out therefore, the deltoid merely pulls the humerus upwards into the acromion. For a while, if the capsule remains reasonably intact, the arm may still be able to be elevated. Ultimately however, when there is no capsular tethering of note left, the humerus just gets jammed up under the acromion. This leads to the situation where the hinge point for the shoulder is where the humerus abuts on the acromion, which may be only a few millimetres to a centimetre from the deltoid insertion. This change in the centre of rotation from the middle of the humeral head to the acromion abutment site, significantly affects the amount of leverage that the deltoid can supply to the arm. This loss off leverage is felt as an increasing weakness and inability to elevate or abduct the arm: and ultimately the arm cannot be moved out from the side at all.

By itself, this loss of function may or may not be painful, but it ultimately leads to degenerative change (osteoarthritis) of the shoulder joint which can be painful, and progressively so. It is likely that the wear of the shoulder joint comes from the upward migration of the humerus. When this happens, the ball of the humerus no longer rests in the centre of the socket, but rather on the top lip of the socket. Articulating on the lip, rather than the centre of the socket, leads to wear of the humeral head which can be quite rapid. As the humeral head loses its low friction lining and becomes rough, it, in turn, erodes into the glenoid. This
pattern ultimately progresses until substantial arthritis (osteoarthritis = wear) is present.

**Fixing the problem**

‘Osteoarthritis’ due to tendon failure, so called ‘cuff tear arthropathy’, is, unfortunately quite common. Traditionally the solution has been to arthrodese (i.e. fuse) the shoulder joint, joining the arm to the scapula or wing bone. When this is done, there is still some movement available because the scapula moves on the chest, but clearly, it is by no means a full range of motion. Also, whilst this initially gives a pain free result, the longer term can be one of shoulder girdle pain due to the abnormal movements required by the scapula to use the arm.

When hemi-arthroplasty (replacing the ball only to make it smoother) became available, this was widely used for this purpose but, as there are no tendons remaining at the top of the shoulder, the humeral head usually just continued to migrate upwards, or even dislocate. Until reverse shoulder replacement became available, this latter complication could only be solved by fusion.

In recent times, the reverse total shoulder replacement has become the procedure of choice for both cuff tear arthropathy and other problems associated with rotator cuff deficiency. In this design, the socket goes on the humeral side and the ball (glenosphere) goes on the glenoid side. In this configuration, the humerus is prevented from upwardly migrating, and hence, rotator cuff tendons are not required. Whilst not a perfect solution to the problem, these give good pain relief and generally improved function.

Strength improves, firstly because the deltoid muscle is stretched and re-tensioned by virtue of the humerus
being pushed down (it is actually pushed down more than the normal humerus), thereby giving it more strength; and secondly because of the increased leverage that is achieved by restoring the centre of rotation. Such restoration moves the centre of rotation much further away from the deltoid insertion on the edge of the acromion, thus significantly increasing the leverage of the deltoid. This increased power, then partly makes up for the loss of the rotator cuff.

**Compared to all previous procedures for these problems, this one has passed the test of time.**

**Bone Loss**

Osteoarthritis is essentially wear. Initially this may be just wear of the hyaline cartilage surface of the joint, that shiny white, low friction surface that is seen in all healthy joints. Once this has worn through however, the underlying bone is exposed, and this is not low friction. Because of this, some people can hear their shoulder grating like wet leather, and the motion is jerky rather than smooth. The resulting high friction joint causes more significant erosion, wearing away the underlying bone as well as the cartilage covering. Eventually, significant bone loss occurs and, because of the mechanics of the normal shoulder, this tends mostly to be at the back of the glenoid and not so much at the front.

Progressive wear of the back of the glenoid means that the face of the glenoid comes to face posteriorly, so called 'retroversion'. As this occurs, the humeral head starts to move down the slope, eventually progressing to posterior dislocation.

**Increased Power**

The centre of rotation has been returned to normal increasing the distance from the deltoid insertion, and thus increasing power

**Reverse Replacement**

Note that the humerus is pushed down away from the acromion. Note also that the glenosphere is also pushed below the native glenoid so that impingment with the lateral scapula is minimised

** Whilst longevity may not be as good for a reverse replacement as it is for a standard shoulder replacement, the age group in which this is used tends to be older, hence placing less demand on the prosthesis. Accordingly, this procedure now represents a very good option for the treatment of unrepairable rotator cuff tears (except perhaps in the younger age group where tendon transfers may sometimes be considered despite their limited gains and average longer term outlook). As this procedure is, by it's nature, a replacement, it also deals with any osteoarthritis that is present: hence it is, without doubt, the option of choice for cuff tear arthropathy, providing good pain relief by removing the osteoarthritis, as well as better function by improving the mechanics.**
Dealing with bone loss

The most difficult problem to deal with in shoulder replacement is glenoid bone loss. Despite all the problems that have plagued metal backed glenoid components in anatomic shoulder replacement, these are part and parcel of all reverse replacements. They succeed because the glenosphere (ball on the glenoid side) can be solidly fixed to an underlying base plate thus avoiding loosening. In addition, the polyethylene bearing surface is either locked into the humeral component or, if the polyethylene is on the glenosphere side, it is large, does not undergo much wear, and can be well fixed.

The advantage of always having a metal base plate is that these are the best way of dealing with bone loss on the glenoid side. Screws can be used to secure the baseplate, holding it still until the bone grows into the bone ingrowth surface underneath; a process requiring at least 6 weeks to occur.

Some of these metal backed components have significant bulk in the form of a short stem which is often big enough to avoid bone grafting a defect in the glenoid. Bone grafting is technically difficult and fraught with failure: hence, the current trend is to have off the shelf augments, or custom made glenoid base plates, to make up for loss of bone stock.

Augmented Glenoid Components

Recently, off the shelf, augmented glenoid components have been made available allowing for correction of some degrees of bone loss. These are limited in size and range, but seem to be working well at this stage. It is however, very early in their history, so any tendency for these to loosen prematurely has not yet been detected. As they are off the shelf however, they are relatively inexpensive and readily available.

Custom Glenoid Components

Where there is a substantial deficiency of the bony glenoid, and particularly when it faces very posteriorly, it can be almost impossible to install a satisfactory ‘off the shelf’ glenoid component: one that faces the correct way, is solidly fixed, and fills up enough of the underlying bony defect to provide long term stability.

To get around this, the prosthetic companies can now make custom implants which are individually designed based on 3D CT scans of the shoulder. Once designed, implants are then manufactured specifically to deal with the bone loss that was found, thereby fully correcting the defect and correcting alignment. These are made to order and come with Trabecular Titanium already attached. They also come with guide blocks that fit accurately into the defect in the glenoid, and then allow the definitive screw holes to be drilled in perfect position.

Whilst the success of these custom components seems to be much better than for bone grafting techniques: especially noting that the latter is done without the aid of jigs to get the orientation and placement correct, the technology is still young. The biggest problem to date is the fact that some of the manufactured prostheses are in fact a bit too large, hence ‘overstuffing’ the joint. This may then lead to a painful joint that doesn’t move all that well. It can also give rise to excess tension on the sub-scapularis repair which, in turn, may fail and become unfixable. Given time however, these teething problems will undoubtedly be overcome.

The other problem is cost. This individualised technology is expensive ($20,000 to $30,000 per component). It is done overseas, meaning that it takes 6 or so weeks between getting the CT scan organised and receiving the prosthesis but, when the situation demands it, such prostheses can be arranged. Some health funds will help with the cost of this if no other alternatives are available.
Navigation and Image Derived Instrumentation

In the last year or so, the computer based design and insertion tools that have been used for knee replacement, have finally come to shoulder replacement. Like the knee, these come as 2 options, and both require acquisition of digital information that is uploaded from a 3D CT scan of the shoulder region. The aim of this technology is to get the replacement ever closer to the original shoulder that is being replaced: that being thought to be most likely outcome to provide the best results.

1) Computer navigation

At the time of surgery, the shoulder anatomy is marked out with a probe to which is attached a tracker that provides detailed position information to a computer. Once landmarks have been defined, these are overlaid on the digital information that the CT has provided. Once obtained, planning can be done on the computer model of the shoulder, and components can then be prepared for and implanted using the model as a guide.

This is new technology in the shoulder and, whilst showing much promise, there have been some problems with loosening of the pins that hold the base trackers to the scapular; hence leading to some imperfect placement of components. This is a problem that will ultimately be overcome with the development of better ways of achieving, and maintaining, tracker attachment.

The advantage of this technology is that it can be used as soon as the CT information has been uploaded and processed: often just a matter of days given that no specific manufacturing of jigs or guides is required.

2) Image derived cutting blocks

Based on the 3D CT information, a computer model of the shoulder can be created by company engineers. The surgery can then be planned, optimising component size and position. Nylon cutting blocks can then be made, usually by 3D printing. One block is made to fit exactly onto the humerus, and contains a cutting slot, or pin holes for a cutting block, to allow precise cutting of the bone. The ‘designed for’ prosthesis can then be inserted. A second guide can also be provided to prepare the glenoid in similar fashion.

The downside of this technology is that it requires not just a CT scan, but also a design and manufacturing process. This generally takes about 6 weeks from the time of scanning to implantation but, as some of these processes are now starting to be done in Australia, and as the implants are off the shelf and not custom made, this time is getting shorter. It is currently thought that this process could be reduced to about a week as this technology becomes more available.

Current thought is that these sorts of technologies will be the future of shoulder replacement, but only time and follow up will prove this to be the case.
Shoulder Replacement - the procedure

Replacement of the shoulder has been carried out since the early 1960’s and the method of insertion of the joint has been largely standardised in that time. In general, it takes about an hour to an hour and a half to perform a shoulder replacement, but this may be extended out to two hours depending on the degree of difficulty. The most technically demanding part of shoulder replacement is the insertion of the glenoid component (the socket). This can be very difficult, particularly when the shoulder joint is very tight before hand, and where there has been an extremely limited range of motion for some time. In addition, if there is a large amount of bone loss, or the bone has been eroded more at the back of the socket than the front (sometimes called retro-version because the socket faces somewhat to the back rather than square to the scapular), then it may take some time to either build the bone up at the back (augmented components and / or bone graft), or to bevel the bone down at the front to make it face in a more normal direction.

The procedure is done through a wound at the front of the shoulder which goes from the bottom of the collar bone down the front of the deltoid (approximately 12-15cm). It usually requires a general anaesthetic to perform, and it requires the help of assistants. It is somewhat harder to perform than a hip replacement or a knee replacement. Despite this however, it tends to be less sore than either of those procedures, often allowing discharge from hospital within 1 - 2 days.

Shoulder Replacement - after surgery

In general, both components are un-cemented. The humeral component is made to be a tight (press) fit into the humeral shaft, and is therefore very stable right from the outset. The glenoid is screwed in. Both components have ingrowth surfaces into which the bone will grow and attach, a process that takes about 6 - 8 weeks. What limits, or slows down, recovery is neither of these factors, but rather, the subscapularis muscle and its re-attachment to the humerus.

The sub-scapularis is a large muscle which forms the part of the rotator cuff that sits at the front of the shoulder. It lies underneath the pectoral muscles and the deltoid, and causes the arm to rotate inwards for activities like putting the arm behind the back. In order to get to the shoulder joint proper, this muscle has to be moved out of the way.

The subscapularis tendon is usually taken off the bone and repaired back by taking the repair sutures around the stem of the prosthesis to provide a stable construct. Despite this, the tendon is often thin and damaged, and hence does not hold stitches all that well. Accordingly, care needs to be taken not to do excess motion or repetitive motion until the tendon is at least partly healed. A sling is required to protect the repair, at least for 4 - 6 weeks post surgery. Gentle motion exercises may begin between 2 and 4 weeks post surgery. Tendon healing is reasonable by 6 weeks and passive motion exercises can then be increased such that the arm can be taken above shoulder height. Full healing may take 4 months or more.

The Subscapularis Muscle

This large muscle coming from the front of the scapula has to be released or cut to allow exposure to the front of the shoulder joint.

Repair of the Subscapularis

Many different repairs are available depending on the nature of the prosthesis. Here, the sutures will have been taken around the stem of the head of the prosthetic implant.
with any force, this being one of the main functions of the biceps.

The range of motion obtained whilst in hospital is usually within the 90° range, although occasionally better motion can be achieved. Initially the motion is quite hard to regain but, over a period of some months, this gradually returns. Ultimate shoulder function is somewhat dependent on pre-operative function, meaning that those joints that are extremely tight and have very limited motion pre-operatively, are unlikely to ever get full range. However, the more rotator cuff function that is present pre-operatively, the more strength there will be afterwards.

Even though supraspinatus may be gone (or released), the infraspinatus (the muscle at the back which turns the arm out), and the subscapularis (the one at the front which turns the arm in) are very important to post operative function. If these are unrepairable at the time of surgery, then strength and function in those directions may be limited. If that limitation is significant, then occasionally a muscle transfer can be considered. The commonest reason for this is the inability to bring the hand to the mouth because of the lack of infraspinatus power – which is fortunately uncommon.

Independent of how much motion is achieved in hospital, the range of motion will continue to improve throughout the recovery period, and indeed, improvements may be seen out to about one year following surgery.

**Physiotherapy**

Whilst in hospital there will be ongoing physiotherapy, and most people are seen twice a day. Once leaving hospital, a home program will be organised. This will include a variety of exercises aiming to regain some motion in the shoulder. It is important to realise that these are designed to take the shoulder through a range of motion but are not intended to help regain either strength or fitness. Too much activity can harm the repair even with the newer methods of tendon repair that are used, so, whilst obtaining a good range of motion is important, it should be done carefully and not too often.

Following discharge, physiotherapy outside the hospital can be organised. In general however, most patients are able to do all their exercises at home very adequately. So, the benefit of getting more intensive therapy may be lost given the difficulties and problems associated with travelling. In addition, too much activity can damage the subscapularis repair. Accordingly, in most instances, immediate follow up physiotherapy will not be organised and, generally, is not considered necessary.

Either way, this will be assessed during the hospital stay, and arrangements can be made if necessary. Similarly, further assessments will be made during the follow up period.

**Home help etc.**

If not noted at the pre-operative clinic, then certainly whilst in hospital, the staff can assess as to whether or not home help will be required. If this looks necessary, then an Occupational Therapist visit to discuss the situation with you and your family, can be organised. The Occupational Therapists have considerable experience with joint replacement patients, and will therefore be able to offer advice on home aids as well as support. If it is clear from the outset that some help will be required, then this is best discussed with the clinic sister pre-operatively so that everything can be organised in time for discharge.

It is to be remembered that, after your shoulder is replaced, you will not be able to drive a car for at least six to eight weeks, and hence, you may need help with shopping, cooking and so on. Initially some help with showering and other daily activities may also be required. If this looks necessary, then the O.T. may be able to organise such. Please remember however, that services such as silver chain are stretched, and therefore not always available. For this reason, home help from family members may be very important, and indeed, this should form the mainstay of your post-operative care.

**Expectations and Results**

Reverse Shoulder Replacement is generally considered to be a good operation. The vast majority end up being either pain free or have minimal aches and pains. In a lot of ways it is more akin to hip replacement than to knee replacement in that pain relief is often extremely good, and motion returns reasonably quickly. It is not certain as to why hip and shoulder replacements are better than knee replacements in terms of pain, but it may be because these are deep within the body and well surrounded by muscle on all sides. In contradistinction, knee replacements are relatively superficial and have no muscle cover. It may also be that these are ball and socket joints, and hence have much simpler mechanics than the more complicated ones seen in the knee. Independent of the reason however, good pain relief can reliably be expected.

Most people can do normal household and daily activities with the replaced shoulder within 3 months. Most can drive by about eight weeks, and return to
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of this is to proceed to a revision whereby the glenoid which the shoulder can dislocate. The usual management will be a deficiency in the front of the shoulder through muscle. If absent, or if the repair has failed, then there

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Instability problems.

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usually giving rise to posterior pain. If this is the case, the prosthesis will eventually become loose, and pain will develop. Although not a very frequent occurrence, when this does occur, revision surgery is required.

Complications and Problems

Residual pain is rarely a major problem. Nevertheless, a reverse replacement does not restore normal anatomy. Accordingly, some patients do experience an ongoing residual ache. Some of this may be due to the arm being pushed down away from the acromion, thereby stretching the deltoid past its normal length. Sometimes however, the cause is difficult to elucidate, and hence, difficult to fix.

Occasionally, the upper screw that affixes the glenoid baseplate, comes close to the suprascapular nerve. Whereas significant injury to that nerve is rare, the presence of that screw can cause the nerve to ache, usually giving rise to posterior pain. If this is the case, and the glenoid is well healed onto the bone, then the screw can be removed without causing any significant problems.

Instability is perhaps the most common problem in reverse shoulder replacement. The most significant stabiliser of a reverse shoulder is the subscapularis muscle. If absent, or if the repair has failed, then there will be a deficiency in the front of the shoulder through which the shoulder can dislocate. The usual management of this is to proceed to a revision whereby the glenoid polyethylene is up-sized to a larger component. Unfortunately, this pushes the humerus down a bit further, lengthening the arm in the process; a problem that can cause ache and fracture of the acromion or coracoid process. In addition, without that muscle, the tissues can just stretch out and go on to dislocate again. Ultimately, a more constrained prosthesis may be necessary. This however, is very uncommon.

Over-stuffing of the joint is a problem that is difficult to assess at the time of surgery. When the aim is to provide a stable construct that will not dislocate, trying to make sure that this is not too tight can be hard. The general test is to make sure that the hand can reach the opposite shoulder and the abdomen easily. Testing anything like a full range of motion however, is not really possible.

Sometimes, both of the above criteria cannot be met at the same time, in which case, a compromise situation is taken in which stability is usually seen as being of primary importance.

Acromial fracture is an uncommon, though not rare, occurrence. Because the arm is deliberately pushed down away from the acromion, thus making the deltoid muscle tighter, there is an increased stress on the acromion to which the deltoid is attached. Over time, and especially when the acromion bone is weakened from osteoporosis, a stress fracture can develop between the acromion process and the main body of the scapula. Unfortunately, by the time this appears, the fracture has usually pulled apart a bit and therefore won't heal. In addition, unlike a stress fracture in the tibia (shin bone), it cannot be protected because the stress cannot easily be relieved. As such, a sling and some rest is usually not enough to promote healing. The solution therefore, is to plate the fracture, and have the plate take the stress off the bone whilst the fracture heals. This is almost always successful.

Coracoid fracture is less common than acromial fracture. Nevertheless, it occurs for the same reason but in this case it is due to the strap muscles at the front of the shoulder pulling on the coracoid process rather than due to the deltoid pulling on the acromion. Again however, the treatment is usually one of internal fixation rather than sling and rest.

Infection is fortunately uncommon and, in most series, it occurs in less than 1 or 2 percent of cases. Obviously it is higher in those who are at risk of infection such as in diabetics, haemophiliacs, those on anticoagulation, and those with poor white cell function (such as some rheumatoid arthritics, particularly those on drugs like the TNF blockers). In every case however, significant steps are taken to try and reduce this complication to...
a minimum.

To decrease the risk of infection:

1. All patients are given special antibacterial solutions to wash their skin with pre-operatively.
2. A double skin preparation is performed at the time of surgery.
3. Antibiotics are given at the time of surgery.
4. Special operating theatres with laminar flow air-conditioning are used.
5. And space suits are used to isolate all operating personnel from the wound.

Whilst the shoulder can become infected at the time of surgery, late infection is probably more common. It is thought that the organisms reach the prosthesis through the blood stream and then land on the metal. Because the metal is not living, the organisms can hide from the bodies defences, and hence can grow and multiply to the extent whereby a significant infection evolves. If this happens, and it is detected early, it can be treated with a wash out of the joint, an exchange of the polyethylene liner and glenosphere, plus antibiotics. This process means that the dead space under the glenosphere, which may contain infectious organisms, can be cleaned out; and the polyethylene and under which the organisms can hide, is replaced with a new one: both of which are essential to success with this method of treatment.

If detected late, or if the above does not work, then the most expedient treatment, and the one with the highest success rate, is to remove the prosthesis, insert a cement spacer full of antibiotics, and then to give high dose systemic antibiotics until the site is sterile. The antibiotics are then ceased and, if there is no flare up of the infection, a revision replacement is undertaken. This whole process usually takes 2 - 3 months and has a reasonable chance of success, albeit not guaranteed.

Just as has happened in the knee, there has been much interest in trying to reduce a 2 stage replacement into a 2 in 1 stage. This means just one operation in which the old prosthesis is removed, the joint is thoroughly debrided (cleaned with removal of any seemingly infected material and soft tissue), then soaked in antibiotic and anti-bacterial solutions for up to half an hour, and then a new prosthesis is inserted. In the knee, it is well known that this process can be successful in up to 90% or so of cases. In the shoulder this is perhaps less successful, but sometimes worth trying given that a 2 (separate) stage replacement is still not 100% guaranteed.

C. Acnes. Of concern in the shoulder, is an organism called Cutibacterium Acnes. This is an organism that we all have on our skin. It is a weak organism and, up until the last few years, its appearance in the laboratory was always thought to be contamination. Certainly, if you blink over a Petri dish with standard culture medium in it, you will see colonies of C. Acnes growing. We now know however, that this organism can cause infection. It is slow growing, often presents as pain in what is seemingly a good and well functioning replacement, and there may be little in the way of swelling or other signs. The infection markers in the blood (ESR and CRP) can be near normal or normal, and culture of fluid from the joint may not yield anything.

The organism is very difficult to grow in the laboratory, and often, only 1 colony may eventuate even from prolonged culture. This often means that repeated fluid samples may need to be sent off along with several tissue samples: and to achieve this may mean one or more arthroscopies, or even open surgery. The diagnosis often takes months or more to arrive at, and even then may be uncertain. The treatment however, is revision by 1 or 2 stage replacement.

Interestingly, if swabs from arthritic joints that are being replaced are sent to the laboratory, something like 40% will grow this organism. Is this a cause of shoulder arthritis in some, or is this just a surgical contaminant? No one knows; Clearly however, we need better ways to diagnose this problem and better ways to prevent it.

DVT's (deep venous thromboses or clots in the vein) generally do not occur in upper limb surgery and, as a consequence, prophylaxis is not routinely given. In exceptional instances, where the risk is high (previous episodes of DVT or pulmonary embolus etc.), some prophylaxis will generally be used.

Nerve injury at the time of surgery is perhaps the most concerning complication. The nerves are extremely close to the area being operated upon, and two nerves in particular (the axillary and the musculocutaneous) are close. The commonest injury is in the form of a stretch to one of these two nerves leading to some transient weakness of the arm and some loss of sensation. Recovery of such a stretch is usually within days, but certainly within three months. More significant injuries such as a full scale tearing or division of the nerve is, fortunately, rare in most series.

Vascular injury is very uncommon because the main artery and veins of the arm are some distance from the wound itself. Nevertheless, it is theoretically possible for this to occur, particularly when the surgery is difficult.
Revision Replacement

Reverse replacement is not only a primary procedure for those described above, but it is also the ultimate revision procedure for anatomic replacements that, for one reason or another, may not be satisfactory. Like all revision procedures in the shoulder, it can be difficult and fraught with risk. Getting stems out can be very difficult, and humeral fractures can ensue. Getting well cemented or well fixed sockets out can likewise lead to bone loss etc. Fortunately, once in situ, revision of a reverse replacement is an uncommon procedure and, if the humeral stem and glenoid baseplate are both well fixed, they do not need to be removed at the time. If just changing tension by up or down sizing the polyethylene component, or by changing the glenosphere, then the humeral stem and baseplate can usually be left in situ. All reverse replacements are now modular and, as such, intermediate components be changed without having to remove the stem or the baseplate.

Summary

Reverse Shoulder Replacement is now a commonly performed, and generally very successful, procedure. Indeed, it is now more commonly performed than is Anatomic Shoulder Replacement because of the enormous numbers of rotator cuff tears that are seen in the elderly, and the significant percentage of these that prove unrepairable. Similarly, it is now seen as the best solution to the difficult problem of complex fractures of the upper humerus, a problem often seen in the elderly. Of course, it does have complications, but the majority of these can be avoided or treated. For those with severe arthritic pain, and / or significant weakness of the shoulder, the results can be extremely gratifying, making this an extremely worthwhile procedure.

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

- Shoulder Replacement - The Journey
- Reverse Replacement
- Impingement and rotator cuff tears
- Frozen shoulder
- Arthritis
