

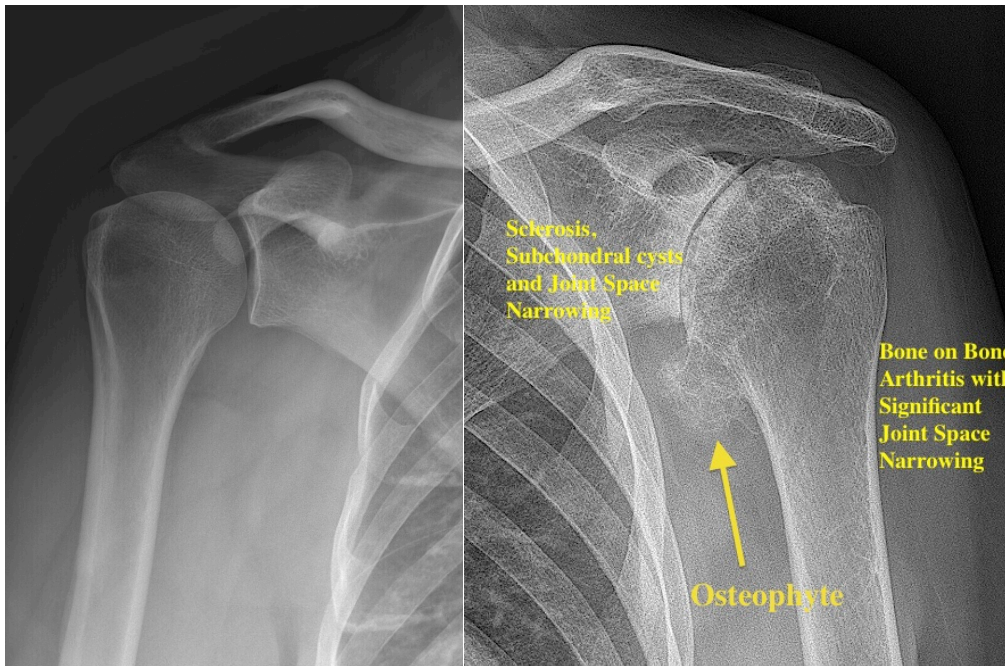
## REVERSE SHOULDER REPLACEMENT

The Reverse Shoulder Replacement is designed specifically for the use in shoulders with a deficient rotator cuff and arthritis, as well as other difficult shoulder reconstructive surgery including complex fractures and revision shoulder surgery. If you have a massive, irreparable rotator cuff tear and arthritis a Reverse Shoulder Replacement may be indicated. The U.S. Food and Drug Administration (FDA) approved the Reverse Shoulder Replacement for use in the USA in 2003. Reverse shoulder replacements have been used in Europe longer than in the USA, and the experience in Europe is guiding its use here.

The shoulder is a ‘ball and socket’ joint. In an arthritic shoulder, the normal smooth surface, or cartilage layer, is worn away, leading to a ‘bone-on-bone’ and uneven surface. The joint forms an irregular surface on both the ball and socket, which causes pain in the shoulder. Irregular bony growths form, called *osteophytes*, which is the body’s attempt to heal the damaged cartilage layer. The rough and uneven surfaces rub on each other inducing wear and tear. Typical changes in an arthritic joint seen on X-ray include *joint space narrowing*, *sclerosis* (hardening of the joint surface indicated by whitening), *subchondral cysts* and *osteophytes*.

Normal Shoulder Joint

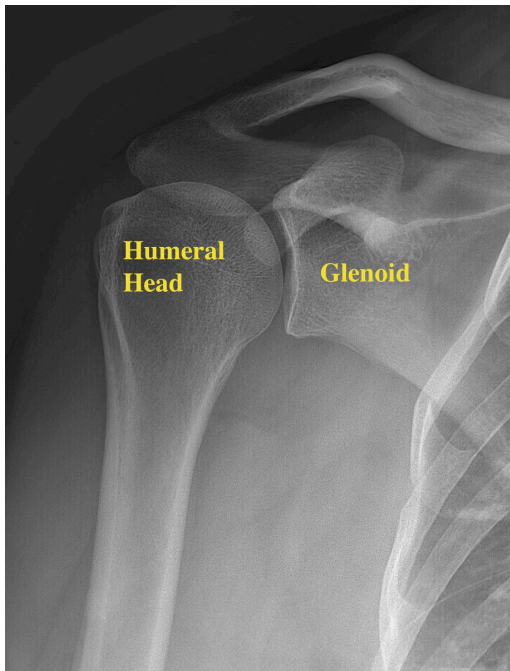
Arthritic Shoulder Joint



### Rotator Cuff Tear Arthropathy

Arthritis with a large rotator cuff defect (**Rotator Cuff Tear Arthropathy**) is a devastating disorder that genuinely compromises the normal function and kinematics of a normal shoulder, and causes severe pain. In a normal shoulder, the rotator cuff muscles balance the ball (*humeral head*) on the socket (*glenoid*). In rotator cuff tear arthropathy, the normal rotator cuff tendons no longer exist to depress the humeral head within the constraints of the glenoid, leading to superior migration of the humeral head, destabilizing the joint and affecting its function. In a normal shoulder, the rotator cuff holds the humeral head centered in the glenoid socket. Without normal function of the rotator cuff, the humeral head will move upward out of the glenoid socket causing difficulty with raising the arm. In this condition, a standard rotator cuff repair will not be effective because it will not help the arthritis, and a traditional total shoulder replacement will not be effective because the shoulder will continue to be in a position upward and out of the joint. Using a reverse shoulder replacement, shoulder specialists can improve the stability, function and comfort of the shoulder in the absence of a healthy rotator cuff and the presence of arthritis.

Normal Shoulder Joint



Rotator Cuff Tear Arthropathy

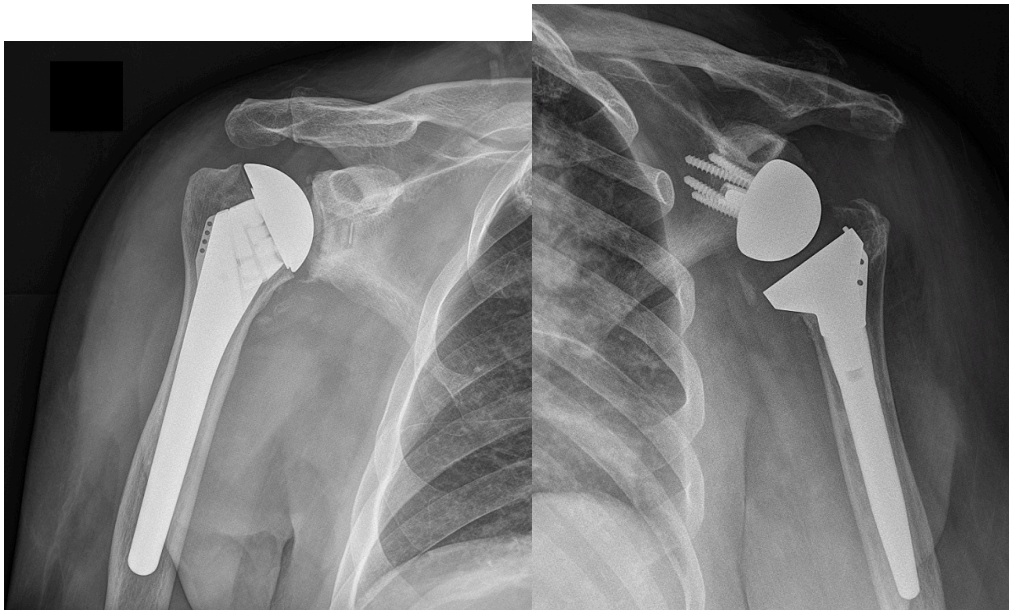


### How Does It Work?

In a traditional total shoulder replacement, the humeral head is replaced with an artificial ball and the glenoid is replaced with a smooth plastic socket. The reverse shoulder replacement changes the orientation of the shoulder so that the normal glenoid socket is now replaced with an artificial ball, and the normal ball (humeral head) is replaced with an implant that has a socket into which the artificial ball rests. This helps to restore pain-free shoulder function by enabling your deltoid muscle to become the principal functioning muscle in the presence of a torn rotator cuff. Its design completely changes the mechanics of the shoulder and enables the artificial joint to function without a rotator cuff. The goal of reverse shoulder replacement surgery is to restore function and provide pain relief to a shoulder destroyed by arthritis and a rotator cuff tear, by providing stability and a fulcrum against which the deltoid muscle can lift and rotate the arm.

Traditional Total Shoulder Replacement

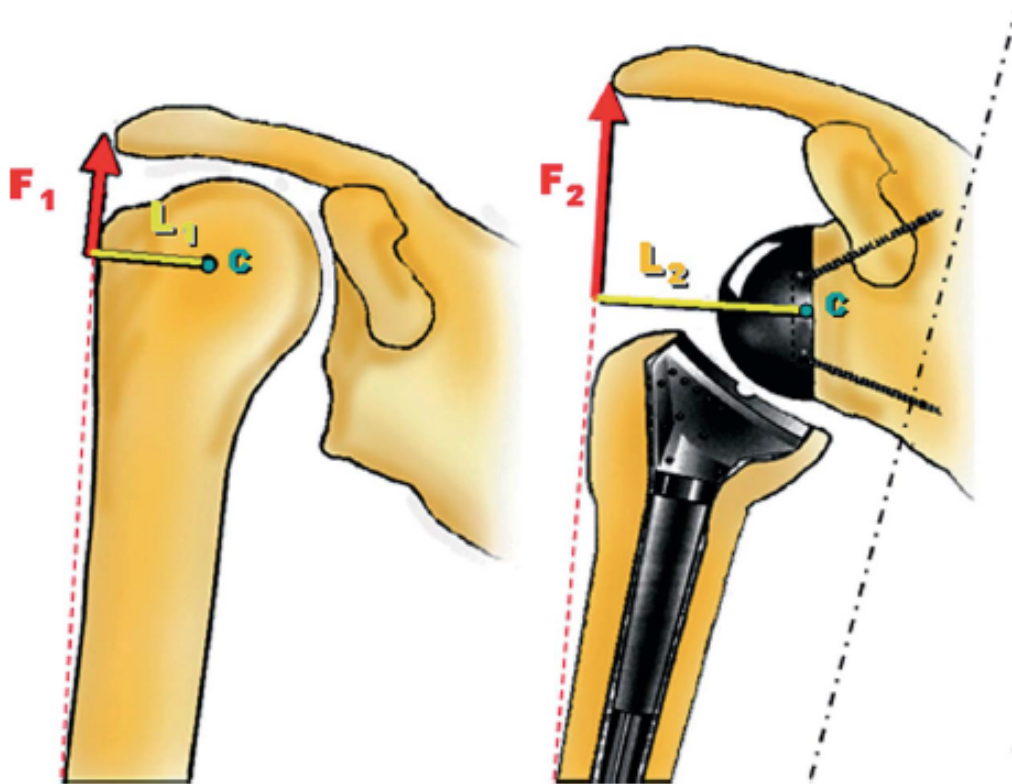
Reverse Shoulder Replacement



The worn out joint surfaces are replaced with an artificial joint made of metal (cobalt chrome) and plastic (polyethylene). These materials have been used for many years in hip and knee replacements, as well as in traditional total shoulder replacements.

### Mechanics

Reversing the ball and socket changes the mechanics of the shoulder in order to improve active range of motion and strength to a shoulder with a deficient rotator cuff and arthritis. This increases the force ( $F$ ) of the deltoid muscle by moving the center of rotation ( $C$ ) of the joint inward (medially) and downward (inferiorly). The deltoid muscle now has an improved mechanical advantage to raise the arm, as the lever arm ( $L$ ) of the deltoid is increased. This results in a patient that can now raise his or her arm higher and overhead.



This figure was published as follows:

Hatzidakis A, Norris T, Boileau P. Reverse Shoulder Arthroplasty: Indications, Technique, and Results. *Techniques in Shoulder and Elbow Surgery* 6(3):135 – 149, 2005

### Indications for Reverse Shoulder Replacement

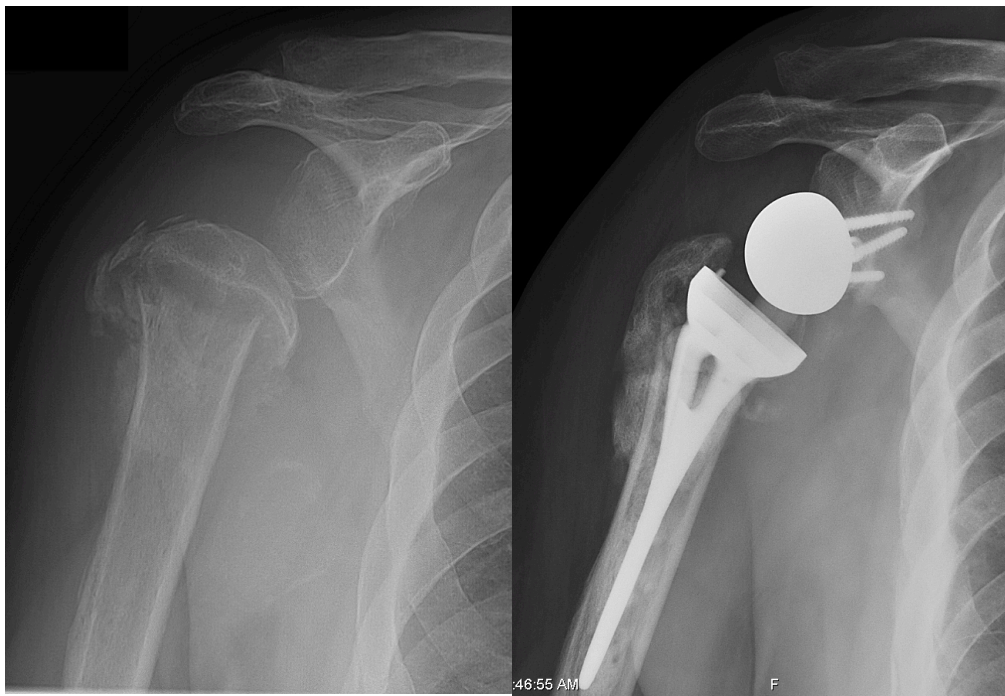
- 1) Rotator Cuff Tear Arthropathy (Rotator Cuff Tear and Arthritis)
  - See discussion on page 2

- 2) Shoulder Fractures

Some shoulder fractures are complex and involve the region of the bone where the rotator cuff attaches (the greater and lesser tuberosities). Conventional repair with a metal plate and screws may not work in certain cases where there is concern for the bone and rotator cuff tissue to heal. A Reverse Shoulder Replacement may be a good treatment alternative in these situations.

Fracture

Reverse Shoulder Replacement for Fracture



- 3) Failed Prior Shoulder Surgery

Failure of a prior shoulder surgery may result in a loss of rotator cuff function or tear and loss of bone on the humerus and glenoid. These include a failed total shoulder replacement, hemiarthroplasty, fracture repair or a failed rotator cuff repair. In certain cases a Reverse Shoulder Replacement may provide a restoration of shoulder function and pain relief.

#### Reasons Not To Have Surgery:

- Active Infection
- Nerve Injury affecting deltoid muscle function
- Young patient with expectations for heavy use of shoulder

### How Will It Feel and What to Expect?

The primary goal of Reverse Shoulder Replacement surgery is to help you enjoy your daily activities with reduced pain and increased mobility. Most patients report minimal or no pain after surgery and most are able to raise their arm much higher than before surgery. This shoulder implant has been in use in the USA for almost 10 years now, and even longer in Europe. The experience has been very successful, but complications have been reported. Complications include:

- Infection
- Instability of the joint replacement
- Problems related to anesthesia
- Loosening of the joint replacement
- Fracture surrounding the prosthetic joint
- Nerve injury

### Necessary Steps Prior to Surgery:

1. Imaging studies
  - a. X-rays, a CT scan, or an MRI
    - One or all may be necessary for surgical planning
2. Your primary care physician and/or specialist (ie Cardiologist), whose care you are under, should evaluate you for an assessment of your readiness to undergo surgery
3. A pre-operative assessment with Anesthesiology if you have a history of certain medical conditions, including cardiac disease, asthma, or diabetes.

### Day of Surgery:

You will arrive at the hospital 2 – 3 hours prior to the procedure. This is necessary for the nursing staff and anesthesiologists to prepare you for the surgery. It is important that you follow the instructions given to you to follow the night before surgery. These include:

- Nothing to eat or drink after midnight on the night prior to surgery
- Your primary care physician, or the anesthesiologist who you will see during your pre-operative assessment, will tell you whether or not to take your prescribed medications before surgery
- Aspirin, in most cases, should be stopped 7 days prior to surgery, and can be restarted 24 hours after

The surgery usually takes 2 – 3 hours to complete. An additional 2 hours is usually spent in the post-operative recovery room. You will then be brought to a patient ward where you will be monitored overnight by nursing staff. The usual stay in the hospital is 1 – 2 days.

### Post-Surgical Pain:

Pain is usually controlled for the first 18 – 24 hours by a nerve block that is administered by the anesthesiologist. The anesthesiologist will discuss this with you prior to surgery. Intravenous narcotic medications are also used to help control pain during the first 24 hours if necessary. Pain medications by mouth are then given to help control pain on as needed basis.

### Prophylactic Antibiotics:

Antibiotics are given through an intravenous line. They are given prophylactically to prevent an infection in your joint replacement. One dose is given at the time of surgery, and an additional dose is give post-operatively while on the patient ward.

### Sling:

You will remain in a sling or shoulder immobilizer for 2 weeks after surgery. However, this is mostly used just for comfort. You should come out of sling 3 times daily to move your elbow, wrist and hand. The sling should also be removed to eat, drink, shower and shave.

### Shower:

You may shower following discharge from the hospital while keeping the incision dry. A clear plastic bandage will be placed over the surgical site prior to leaving the hospital, which will protect the incision and keep it dry while in the shower. We will remove your dressing in the office upon your first follow up visit. This occurs within 1 week of the surgery (usually 3 – 5 days after), and at that point you will be permitted to get your incision wet in a shower only. Your incision should not be submerged in a bath or pool for 2 weeks following surgery and do not rub creams or lotions over the surgical site.

Rehabilitation Protocol for:

- **Reverse Total Shoulder Replacement**

Wear Sling for 2 weeks

- Come out of sling to move elbow, wrist, and hand (3 x daily)

Be careful not to use the arm to push out of a chair or bed (shoulder in internal rotation, extension and adduction)

**Return to Activities:**

•Computer •Eating •Holding a book •Typing •Writing	Immediately
• Golf, Tennis	4 Months

**Rehab:**

Phase 0	Week 0-1	<ul style="list-style-type: none"> <li>• Encourage ambulation one day after surgery</li> <li>• Wear sling while out in public and sleeping for 2 weeks</li> <li>• Remove sling daily to move elbow, wrist and hand</li> <li>• Remove sling to eat, write, get dressed and shower</li> </ul>
Phase I (Passive ROM)	Weeks 1 -2	<ul style="list-style-type: none"> <li>• Start formal PT at week 2. This early phase of passive motion is designed to regain forward flexion and prevent post-op stiffness</li> <li>• Pendulums to warm up</li> <li>• Passive ROM                             <ul style="list-style-type: none"> <li>○ Supine ER to 30</li> <li>○ Supine FF to 140</li> <li>○ IR to abdomen</li> </ul> </li> <li>• May progress to active assisted ROM                             <ul style="list-style-type: none"> <li>○ Patients should lie on their back and use opposite hand to raise their operative arm up overhead</li> </ul> </li> </ul>
Phase II (Active/Assistive)	Weeks 2-6	<ul style="list-style-type: none"> <li>• Pendulums to warm up</li> <li>• Active Assistive ROM with Passive stretch to:                             <ul style="list-style-type: none"> <li>○ ER 30, FF 140, IR to Abdomen</li> </ul> </li> <li>• Patient should continue to work with therapist on regaining active ROM and therapist will work with the patient on regaining normal scapulohumeral rhythm.</li> <li>• The assistance of a cane or pulleys to help with FF and ER can be used. IR is not a focus and should be avoided</li> <li>• “Walk the wall” exercises should be done everyday at home. The goal is to work up to 3 sets of 10, 3</li> </ul>



		<p>times a day. You may use opposite hand to facilitate this exercise in the beginning.</p> <ul style="list-style-type: none"> <li>• Goal is to have patient place their hand on head or achieve at least 90 degrees of FF by 6 weeks post-op. Most patients can achieve higher than this.</li> </ul>
Phase III (Resisted)	Weeks 6-12	<ul style="list-style-type: none"> <li>• Therapy is typically placed on “hold”</li> <li>• Patients will strengthen their shoulder on own by doing their daily “normal” activities. * <b><i>Too much weight too soon can cause an acromial stress fracture</i></b> *</li> <li>• Avoid Thera-Bands!!!!</li> <li>• Continue stretching and ROM exercises on own as instructed by therapist</li> <li>• Patients may use 1-2 lbs. (i.e. soup can) to strengthen their shoulder           <ul style="list-style-type: none"> <li>○ Lie on back holding soup can and raise over your head</li> <li>○ Then, do same activity while standing</li> </ul> </li> </ul>

*ROM – Range of Motion*

*ER – External Rotation*

*FF – Forward Flexion*

*IR – Internal Rotation*

*PRE’s – Progressive Resistance Exercises*