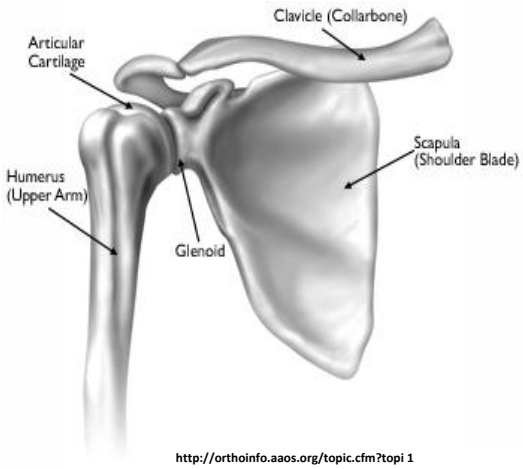
South Shore Hospital

Orthopedic, Spine and Sports Therapy

Total Shoulder Arthroplasty

Anatomy and Biomechanics

The shoulder is a complex structure that joins the arm to the body. It is comprised of three bones, including the humerus (upper arm bone), scapula (shoulder blade), and clavicle (collarbone). The main shoulder joint is a ball-and-socket joint where the ball-shaped head of the humerus attaches to a socket on the scapula called the glenoid. The glenoid is much smaller than the head of the humerus. This construct allows the shoulder to have a larger range of motion (ROM) than any other joint in the body. Both the head of the humerus and glenoid are coated with smooth cartilage, which allow the bones to glide easily on one another. This cartilage may naturally wear down over time creating a rough surface between the bones. Without smooth healthy cartilage the shoulder also has a hard time producing the natural joint "oil" (synovial fluid) that lubricates the shoulder during movement. Collectively, these degenerative processes that happen over time lead to the condition known as osteoarthritis. This process can happen naturally overtime, but can be more severe or develop quicker in some people, especially after trauma.



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As degenerative changes in the shoulder advance the joint becomes more and more painful and less and less mobile. Osteoarthritis typically produces stiffness in the joint, especially right after a period of immobility (i.e. first thing in the morning). The pain in the joint may subside after moving around, but become worse again with use of your arm. The pain in the joint may also affect sleeping. As the condition of the joint deteriorates some people develop a sensation of grinding or catching in the joint. It will become harder and harder to use your arm and eventually the shoulder may lose some of its range of motion.

Treatment Options

Regardless of the nature and severity of the osteoarthritis in your shoulder your physician will work with you to determine what the best course of treatment will be. When degenerative changes are not severe the associated pain and dysfunction may successfully be treated with rest, anti-inflammatory measures, activity modification and physical therapy. After a thorough evaluation your physician and their staff will recommend the most appropriate course of action to take.

Physical therapy is often recommended for treatment of pain and dysfunction associated with osteoarthritis. The physical therapist will evaluate your mobility, flexibility and strength with the purpose of determining any underlying deficits that contribute to increased stress on the painful joint. You will be counseled on which activities you can safely continue and which should be avoided. The physical therapist will teach you exercises that will help to reduce joint stress. In most cases this will include strengthening and stretching the muscles around the entire shoulder complex as well as the upper back.

When joint degeneration is severe and conservative measures are unsuccessful in restoring function your physician may recommend a total shoulder replacement procedure.

Surgery

Total Shoulder Arthroplasty (Replacement) is a complex procedure that involves the removal and replacement of both the ball and the socket. First an incision is made, most commonly along the side or in front of the arm, and the joint is exposed. The head of the humerus (ball) is removed and the glenoid cavity (socket) is cleaned out. A polyethylene plastic insert is placed in the glenoid and secured with cement to form the new socket. Next the humeral stem is fit into position. Depending on the fit of the stem and your surgeon's preference, cement may or may not be used to secure the stem. Lastly a carefully fit metal ball is secured to the end of the humeral stem and the shoulder is rejoined.

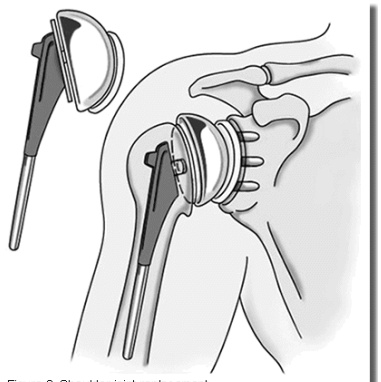

Figure 2. Shoulder joint replacement.
http://drgordongroh.com/shoulder.html 1

Total Shoulder Arthroplasty is not an outpatient day surgery procedure. You will be required to spend a few days in the hospital to recover. If the procedure and your early recovery goes well you will typically be discharged in 2-3 days. Some more complex cases require a short stay in a rehab hospital following the procedure.

Post-Operative Precautions

The new prosthetic joint is not as stable as a natural shoulder joint, and it needs to be protected while the surrounding soft tissue structures heal after surgery. You must wear a sling per your doctor's instructions after your operation to allow for this healing to occur. This may be as long as 3-4 weeks. Also, there are specific range of motion precautions you must follow after surgery:

- While lying on your back, a small pillow or towel roll should be placed behind your elbow to avoid stretching the repaired muscles and ligaments, *i.e. you should always be able to see your elbow in front of your body when lying on your back*.
- Do NOT place your operated arm behind your back or behind your head.
- NO active ROM forward

You must observe these precautions for at least 6-8 weeks after your operation unless otherwise instructed by your surgeon.

At Home

You will likely receive home care visits from a registered nurse and a physical therapist after being discharged home. The nurse will help monitor your medical status and the physical therapist will help you work to restore mobility, strength and tolerance for activity. You should replace your post-op dressing 2-3 days after surgery, and have the nurse and physical therapist inspect your incision for signs of infection. If you have staples closing your incision they will likely be scheduled to be removed around 10-14 days after the operation. Your home care physical therapist will work with your surgeon and their staff to determine when you are ready to attend outpatient physical therapy.

Showering

You may shower after 3 days, as long as the incision is not draining. If the incision is draining try to keep it from getting wet during showering by using a water-tight dressing.

Medication

Your surgeon will prescribe pain medicine for you after the operation. Please call the doctor's office if you have any questions regarding medication.

Driving

Your surgeon will tell you when you are ready to return to driving. Commonly, you are not permitted to drive until your sling is off, which may take 3-4 weeks. You cannot drive while taking narcotics.

Ice

You should use ice or the cryotherapy machine on your shoulder after the operation for management of pain and swelling. Ice should be applied 3-5 times a day for 10-20 minutes at a time. Always maintain one layer between ice and the skin. Putting a pillow case over your ice pack works well for this. The home care physical therapist can help you customize a plan on how and when to best apply ice to your shoulder.

Post Operative Visits

Your first post-operative visit will be 10-14 days after the operation. At this visit you will meet with the surgeon or the physician assistant who will look at your shoulder range of motion, examine your incision, and discuss when it will be appropriate to make an appointment to begin outpatient physical therapy. Your next visit will be around 6 weeks after the operation. At this visit you may have an X-ray

taken to make sure that the shoulder replacement components are aligned well. Additional follow up visits to the doctor's office will be based on your surgeon's discretion.

Recovery/Time off Work

Recovering from Total Shoulder Arthroplasty surgery is not easy. It is very important to realize that the recovery process is difficult and time consuming. You must be an active participant during this process, performing daily exercises to ensure there is proper return of range of motion and strength. There is a large amount of variability in the time it takes to fully recover from this procedure. It is usually estimated that it will take at least 4-6 months for the patient to feel as though he or she has completely returned to a pre-injury level of activity. Some cases may take as long as 9-12 months to make a full recovery. People with desk jobs should plan to take at least 4 weeks off from work and should have an extended absence plan in place should complications arise. People with more physical jobs that require excessive weight bearing and manual labor will likely be out of work for at least 3-6 months. **Recovery is different in each case**. Your individual time table for return to activities and work will be discussed by your surgeon during post operative office visits.

Rehabilitation

This protocol has been adapted from Wilcox, Arslanian, and Millet's protocol described in *Rehabilitation Following Total Shoulder Replacement,* which was published in the Journal of Orthopedic and Sports Physical Therapy, December 2005; 35: 821-836.

****The following is an outlined progression for rehab. Time tables are approximate and advancement from phase to phase, as well as specific exercises performed, should be based on each individual patient's case and sound clinical judgment by the rehab professional. ****

Phase 1: Immediate Post Op Phase (Surgery to Hospital Discharge)

Goals

- Protect and allow healing of soft tissue
- Control pain and swelling
- Independence with activities of daily living (ADLs), ie. Dressing, toileting etc.
- Independence with mobility
- Independence with home exercise program

Precautions

- Post-operative precautions (see page 1)
- Limited shoulder AROM (May perform forward reaching with ADL's in sagital plane)
- NO lifting or weight-bearing with operated arm
- NO reaching behind the back or behind the head

Recommended Exercises

- AROM: hand, wrist, forearm, and elbow
- PROM: shoulder flexion 0 to 140* as tolerated
- IR to chest, ER to 30*
- Pendulums
- Scapular mobilizations (elevation/depression, retraction/protraction)

Guidelines

- Perform PROM exercises 2-3x/day. Perform 10-15 repetitions of all elbow/wrist/hand exercises and scapular mobilization 3-5 times a day. Use ice after PROM for 10-20 minutes.

Inpatient Plan of Care

- Screen for sensory/motor deficits
- Continuous Cryotherapy
- Provide patient education for movement precautions and positioning to avoid shoulder extension past 0* (to prevent subscapularis stretch)
- Initiate exercise regimen
- Discharge planning
- **Must teach caregiver PROM for supine forward flexion to be done at home**

Phase 1(A): Passive ROM (PROM) phase (Hospital Discharge- Week 4)

Goals

- Protect and allow healing of soft tissue
- Control pain and swelling
- Begin to restore range of motion (ROM)
- Restore independent functional mobility
- Educate the patient regarding their post-operative precautions

Precautions

- Post-operative precautions (see page 2-3)
- Limited shoulder AROM (May perform forward reaching with ADL's in sagital plane)
- NO lifting or weight-bearing with operated arm
- Screen for sensory/motor deficits

Recommended Exercises

Range of Motion

- Supine PROM: forward flexion, gentle ER to 30 degrees in scapular plane, IR to chest
  - Surgeon may have specific ROM guidelines based on inter-operative findings
- AROM: elbow, wrist, hand
- Pendulum exercises
- Progress to Active Assisted ROM (AAROM) shoulder flexion, ER, and IR in the scapular plane by the end of this phase.
- No Repetitive AROM exercises for Shoulder

Strength

- Periscapular muscle AROM/isometric exercises

Functional Mobility

- Bed mobility
- Transfer training

Positioning (when in bed)

- While supine, always place a small pillow or towel roll behind the operated arm's elbow to avoid shoulder hyperextension, stretching the anterior capsule, or stretching the subscapularis.
- Wean sling towards the end of this phase or per MD recommendation
  - Encourage out of sling in sitting, Wear sling in public or when active around house

Guidelines

Perform PROM exercises 2-3x/day. Perform 10 repetitions of all elbow/wrist/hand exercises and periscapular isometrics 3-5 times a day. Use ice after PROM for 10-20 minutes.

Criteria for Progression to Phase 2:

- Good tolerance of PROM program with:
- PROM flexion at least 90°
- PROM abduction at least 90°
- PROM ER in the plane of the scapula at least 30°
- PROM IR in the plane of the scapula at 30° of abduction at least 70°

Phase 2: Active ROM (4 Weeks- 6 Weeks)

Goals

- Restore full PROM
- Begin restoring AROM
- Control pain and swelling
- Continue to protect healing tissue

Precautions

- Post-operative precautions
- NO heavy lifting or weight-bearing with operated arm
- NO sudden jerking movements in operated shoulder
- If poor shoulder mechanics are present, avoid repetitive shoulder AROM

Recommended Exercises

Range of Motion

- Continue with PROM exercises and slowly progress to normal range
  - Do not force passive ER
- Initiate AROM: flexion, elevation in the scapular plane, IR, and ER

Joint Mobilizations

- Gentle glenohumeral and scapulothoracic joint mobilizations as indicated

Strengthening

- Initiate sub-maximal shoulder isometrics in neutral
- Periscapular strengthening exercises as tolerated
- May initiate gentle glenohumeral and scapulothoracic rhythmic stabilization

Guidelines

Perform 10-20 repetitions of all ROM exercises 2x/day. Perform 10-20 repetitions of isometric shoulder exercises 1x/day, and 2-3 sets of 15-20 repetitions of periscapular strengthening exercises 1x/day.

Criteria for Progression to Phase 3:

- Good tolerance of PROM/AROM, isometric program
- PROM flexion at least 140°, PROM abduction at least 120°
- PROM ER in plane of scapula at least 45°,
- PROM IR in plane of scapula measured at 30° of abduction at least 70°

Phase 3: Strengthening (6-12 Weeks)

Goals

- Restore normal AROM
- Restore normal strength
- Optimize neuromuscular control in the shoulder complex
- Return to baseline functional activities

Precautions

- Continue to avoid stress on the anterior capsule
- NO heavy lifting (>5 pounds), pushing, or pulling
- NO sudden jerking movements in operated shoulder

Recommended Exercises

Range of Motion and Stretching

- Continue PROM as needed, progressing to gentle stretching
  - Do not force passive ER
- May initiate shoulder AAROM IR behind the back
- Progress AROM shoulder flexion, scpation, ER, IR as needed
  - Ensure correct scapulohumeral rythm

Joint Mobilizations

- Glenohumeral and scapulothoracic joint mobilizations as indicated

Strengthening *Delay resisted strengthening until phase 4 if concomitant rotator cuff repair (supra, infra, teres)

- Resisted shoulder ER in the scapular plane
- Delay resisted IR until 12 wks (unless otherwise indicated by MD)
- Initiate supine shoulder elevation strengthening at progressive inclines
- Progress to resisted flexion, abduction, and extension towards the end of this phase
- Continue periscapular strengthening progression

Guidelines

Perform 10-20 repetitions of all ROM exercises daily. Hold all stretches 20-30 seconds for 2-3 repetitions, 2-3x/day. Perform 2-3 sets of 15-20 repetitions of all strengthening exercises 4-6x/week.

Criteria for Progression to Phase 4:

- Tolerates AA/AROM/ strengthening
- AROM flexion supine at least 140°
- AROM abduction supine at least 120°
- AROM ER in plane of scapula at least 60°
- AROM IR in plane of scapula supine in 30° of abduction at least 70°
- Active shoulder elevation against gravity with good mechanics to at least 120°

Phase 4: Advanced Phase (12 Weeks and Beyond)

Goals

- Maintain pain-free ROM
- Maximize strength, power, and endurance
- Maximize UE function
- Progress weight-bearing tolerance
- Work with PT and MD to create customized routine to allow return to appropriate sports/ recreational activities (i.e. golf, doubles tennis, cycling, gardening)

Precautions

- Continue to avoid stressing the anterior capsule
- Ensure gradual progression of strengthening program

Recommended Exercises

ROM and Flexibility

- Continue AROM stretching exercises as indicated

Strengthening

- Continue with all strengthening exercises increasing resistance and decreasing repetitions
- Initiate and progress weight-bearing exercises

Functional Progression

- Activity/sport-specific training exercises

Guidelines

Perform ROM and flexibility exercises daily.
Perform strengthening exercises 3-5x/ week, performing 2-3 sets of 10-15 repetitions.

Time	Precautions	Goals	Recommended Exercises
Phase 1/1(A): Day 1 – 4 Weeks	• Dislocation precautions • Limited FF AROM • NO lifting or weightbearing with operated arm • Screen for sensory/motor deficits • PROM:FF to 140, IR to chest, ER to 30 in scap plane	• Protect and allow healing of soft tissue • Control pain and swelling • Begin to restore ROM • Restore independent functional mobility • Educate the patient regarding their dislocation precautions	<u>ROM</u> • Supine PROM: forward flexion, gentle ER in scapular plane, IR to chest • AROM: elbow, wrist, and hand • Pendulum exercises • Progress to AAROM shoulder flexion, ER, and IR in the scapular plane by the end of this phase <u>STRENGTH</u> • Periscapular muscle isometrics <u>FUNCTIONAL MOBILITY</u> • Bed mobility • Transfer training <u>POSITIONING (when in bed)</u> • While supine, always place a small pillow or towel roll behind the operated arm's elbow to avoid shoulder hyperextension, stretching the anterior capsule, or stretching the subscapularis • Wean sling towards the end of this phase
Phase 2: 4 Weeks – 6 Weeks	• Dislocation precautions • NO heavy lifting or weightbearing with operated arm • No sudden jerking movement in operated shoulder • If poor shoulder mechanics are present, avoid repetitive shoulder AROM	• Restore functional PROM • Gradually restore AROM • Control pain and swelling • Continue to protect healing tissue	<u>ROM</u> • Continue with PROM exercises until normal (no forced Passive ER) • Initiate AROM: flexion, elevation in the scapular plane, IR, and ER <u>Joint Mobilizations</u> • Gentle glenohumeral and scapulothoracic joint mobilizations <u>Strengthening</u> • Initiate sub-maximal shoulder isometrics in neutral • Periscapular strengthening exercises as tolerated • Initiate glenohumeral and scapulothoracic rhythmic stabilization
Phase 3: 6 Weeks – 12 Weeks	• Continue to avoid stress on the anterior capsule • NO heavy lifting (>5 pounds), pushing, or pulling • NO sudden jerking movements in operated shoulder	• Restore normal shoulder AROM • Optimize neuromuscular control in the shoulder complex • Return to baseline UE functional activities	<u>ROM</u> • Continue PROM as needed, progressing to gentle stretching • Initiate shoulder AAROM IR behind back, progressing to active stretching by the end of this phase • Progress AROM shoulder flexion, scaption, ER, and IR as needed <u>Joint Mobilizations</u> • Glenohumeral and scapulothoracic joint mobilizations as indicated <u>Strengthening</u> • Resisted shoulder ER and IR in scapular plane • Initiate supine shoulder elevation strengthening at progressive inclines • Continue periscapular strengthening progression

			• Progress to resisted flexion, abduction, and extension towards the end of this phase
Phase 4: 12 weeks and Beyond	• Continue to avoid stressing the anterior capsule • Ensure gradual progression of strengthening program	• Maintain pain-free ROM • Maximize strength, power, and endurance • Maximize UE function • Progress weightbearing tolerance • Work with PT and MD to create customized routine to allow return to appropriate sports/ recreational activities (i.e. golf, doubles tennis, cycling, gardening	<u>ROM</u> • Continue daily PROM and stretching exercises as indicated <u>Strengthening</u> • Continue with all strengthening exercises increasing resistance and decreasing repetitions • Initiate and gradually progress weightbearing exercises <u>Functional Progressions</u> • Activity/sport-specific training exercises