

Glenohumeral Joint Surgery and Postoperative Management

Abdul Munem



1

GH Arthroplasty

GH arthroplasty falls into several categories, the most common of which are *total shoulder arthroplasty* in which both the glenoid and humeral surfaces are replaced and *hemireplacement arthroplasty (hemiarthroplasty)*, in which only the humeral head is replaced.

Reverse total shoulder arthroplasty (rTSA) is another type of arthroplasty, typically used when rotator cuff integrity is compromised.

Other categories of shoulder arthroplasty include interpositional and resurfacing arthroplasties, which involve less extensive removal of bone.

2

Agenda

Glenohumeral Joint Surgery and Postoperative Management



- **CLINICAL EVALUATION**
- **SURGICAL INDICATIONS AND CONSIDERATIONS**
- **SURGICAL PROCEDURE**
- **POSTOPERATIVE MANAGEMENT**

CLINICAL EVALUATION

History
Physical Examination



History

The most common complaint in patients with advanced osteoarthritis (OA) of the shoulder is pain—more specifically, night pain. Most often, the pain is insidious in its onset, although an occasional patient will report acute symptomatology only to discover severe osteoarthritic changes in the glenohumeral (GH) joint. In many cases night pain is a major problem; specifically, difficulty with lying on the affected side is a common complaint.

A careful history should be taken with respect to prior injuries and prior surgical procedures. For a total shoulder replacement to be viable and functional, an intact rotator cuff is necessary. In certain patients with long-standing rotator cuff disruption, the initial clinical signs are progressive

pain that comes with the developing secondary arthropathy.

Another area of concern is whether the patient has undergone any prior stabilization procedures.

Presentation title

2021

5

5

Physical examination

The most important predictor of the outcome of a total shoulder replacement is the preoperative range of motion (ROM). It is **therefore incumbent on the physician to document all directions of the patient's motion and to discuss the implications of lack of mobility on the overall outcome.** Another important aspect is the integrity of the rotator cuff; a successful standard replacement depends very heavily on the presence of an intact cuff. The supraspinatus, infraspinatus, teres minor, and the subscapularis should all be carefully examined.

If any doubt exists as to the function of the cuff, magnetic resonance imaging (MRI) is indicated. In cases in which a rotator cuff disruption coexists with severe OA, a determination should be made as to the possibility of repairing the cuff. In those cases in which significant chronicity of the cuff is noted, either by history or MRI examination, a simple hemiarthroplasty or a reverse total shoulder replacement

Presentation title

2021

6

6

SURGICAL INDICATIONS AND CONSIDERATIONS

The following structural and functional impairments associated with these pathologies are widely accepted indications for GH arthroplasty.

- Persistent and incapacitating pain (at rest or with activity) secondary to GH joint destruction is the primary indication for GH arthroplasty.
- Secondary indications include loss of shoulder mobility or stability and/or loss of upper extremity strength with an inability to perform functional tasks.

Presentation title

2021

7

7



Presentation title

8

POSTOPERATIVE MANAGEMENT

The patient and therapist must be aware that the primary goal for nontraumatic TSA is pain relief. It appears that the achievement of functional ROM goals are more achievable today than 5 years ago; however, the improvement of ROM is not as well substantiated in the literature as the successful achievement of decreased pain



Glenohumeral Joint Surgery and Postoperative Management

2021

9

9

Complications Specific to Glenohumeral Arthroplasty

Glenohumeral Joint Surgery and Postoperative Management

BOX 17.2 Complications Specific to Glenohumeral Arthroplasty

Intraoperative Complications

- Insufficient lengthening of a tight subscapularis muscle-tendon unit
- Intraoperative damage to the axillary or suprascapular nerves, affecting the deltoid and supraspinatus/infraspinatus muscles, respectively
- Humerus fracture

Postoperative Complications Related to Soft Tissue

- Re-tearing a repaired rotator cuff mechanism
- Disruption or failure of the repaired subscapularis
- Chronic GH joint instability or dislocation
- Dislocation (higher after rTSA than TSA)
- Progressive erosion of the glenoid fossa articular surface (after hemiarthroplasty)

Postoperative Complications Related to the Implants

- After TSA mechanical (aseptic) loosening, premature wear, or fracture of the polyethylene glenoid implant
 - Most often seen in a rotator cuff-deficient shoulder
 - Due to excessive stresses at the bone-prosthesis interface
 - Low incidence with unconstrained designs but higher with early-generation constrained designs
- Loosening of the humeral prosthesis after hemiarthroplasty

2021

10

10

Common Postsurgical Precautions & Positioning in Max Protection Phase

Glenohumeral Joint Surgery and Postoperative Management

BOX 7-3 Common Postsurgical Precautions

Passive range of motion for up to 6 weeks
Abduction pillow for up to 8 weeks
External rotation limited to 30° with humerus at 0° of adduction
Sling to be worn for comfort

BOX 17.3 Positioning After Shoulder Arthroplasty: Early Postoperative (Maximum Protection) Phase

Supine

- Arm immobilized in sling that is worn continuously
 - Elbow flexed to 90°
 - Forearm and hand resting on abdomen
- Arm supported at the elbow on a folded blanket or pillow slightly away from the side and anterior to the midline of the trunk
 - Forward flexion (10° to 20°), slight abduction, and internal rotation of the shoulder
 - Head of bed elevated about 30°

Sitting

- Arm supported in sling or resting on a pillow in the patient's lap or on the armrest of a chair

With Tenuous Rotator Cuff Repair

- In some cases, if a sling does not provide adequate protection of a repaired cuff, an abduction splint must be worn

BOX 7-2 Preoperative Factors for Better Outcomes Following TSA

Better Outcomes

No previous surgery
Higher level of preoperative function^{14,22}
Minimal rotator cuff pathology²⁶
Overall well-being of the patient before surgery²³
Surgery because of primary osteoarthritis

Worse Outcomes

Surgery because of rheumatoid arthritis or trauma
Severe loss of passive range of motion
Increased number of comorbidities²⁸
Radiographic evidence of humeral head subluxation
Loss of posterior glenoid bone
Significant rotator cuff pathology
Increased fatty degeneration of the infraspinatus, subscapularis²⁹

2021

11

11

BOX 17.4 Precautions for the Maximum Protection Phase of Rehabilitation Following Shoulder Arthroplasty

Exercise

- Short but frequent exercise sessions (four or five times per day)
- Low number of repetitions per exercise.
- Only passive or assisted shoulder ROM exercises and only within the "safe" limits of ranges noted during surgery. *Absolutely no end-range stretching.*
 - Passive external rotation to neutral after rTSA or to less than 30° after TSA to avoid excessive stress to the surgically repaired subscapularis muscle.
- During passive or assisted shoulder rotation with the patient lying supine, position the humerus slightly anterior to the midline of the body (by placing the arm on a folded towel) to avoid excessive stress to the anterior capsule and suture line.
- No hyperextension or horizontal abduction (beyond neutral) of the shoulder to avoid stress to the anterior capsule.
- No combined extension, adduction, and internal rotation
- If an overhead rope-pulley system is used for assisted elevation of the arm, initially have the patient face the doorway and pulley apparatus, so shoulder elevation occurs only within a limited range.
- Maintain an erect trunk during passive or assisted elevation of the arm while sitting or standing to avoid subacromial impingement of soft tissues.

- In most instances, no active (unassisted), antigravity, dynamic shoulder exercises, particularly resisted internal rotation.
- No resistance (strengthening) exercises.
- In general, a more gradual progression of exercises following rTSA and for a patient with a severely damaged and repaired or irreparable rotator cuff mechanism who underwent TSA than for a patient with a preoperatively intact cuff.

Activities of Daily Living

- Limit activities to those that can be performed with the elbow at waist level, such as eating or writing.
- Avoid reaching behind the back to tuck in a shirt, reach into a back pocket, or following toileting.
- Avoid weight bearing on the operated extremity, such as pushing during transfers or when moving in bed, especially the first few weeks after surgery.
- Avoid lifting objects with the operated arm.
- Support the arm in a sling during extended periods of standing or walking.
- Wear the sling while sleeping or outside in crowded areas.
- No driving for 4 to 6 weeks.

Exercise: Maximum Protection Phase

Glenohumeral Joint Surgery and Postoperative Management

12

12

Exercise: Maximum Protection Phase

Glenohumeral Joint Surgery and Postoperative Management

The maximum protection phase of rehabilitation following TSA begins on the first postoperative day and extends for 4 to 6 weeks. The emphasis of this phase is patient education, pain control, and initiation of ROM exercises to prevent tissue adhesions and restore shoulder mobility to the ranges achieved during surgery as early as possible. Early motion is permissible after uncemented and cemented fixation.

While the patient is hospitalized, patient education includes reviewing early postoperative precautions and teaching the initial exercises of the patient's home program. Precautions during the first 4 to 6 weeks after TSA, when protection of soft tissues is crucial

13

13

Exercise: Maximum Protection Phase

Glenohumeral Joint Surgery and Postoperative Management

Goals and interventions.

■ ***Control pain and inflammation.***

- Use a sling or splint for comfort.
- Use prescribed analgesic and anti-inflammatory medication.
- Use cryotherapy, especially after exercise.

■ ***Maintain mobility of adjacent joints.***

- Active movements of the spine and scapula (while wearing the shoulder sling and when it is removed for exercise) to maintain motion and minimize muscle guarding and spasm. Incorporate "shoulder rolls" by elevating, retracting, and then relaxing the scapulae to reinforce an erect posture of the trunk. Emphasize active scapular retraction and spinal extension.
- Active ROM of the hand, wrist, and elbow when the arm is removed from the sling.

14

14

The way to get started is to quit talking and begin doing.

Walt Disney

Glomerular Joint Surgery and Postoperative Management

2021

15

15



■ Restore shoulder mobility.

■ Passive or therapist-assisted shoulder motions *within the safe ROM limits determined during surgery*. With the patient lying supine and the arm slightly away from the side

of the trunk on a folded towel and the elbow flexed, perform elevation of the arm in the plane of the scapula to tolerance, external rotation to no more than 30° to 45°, and internal rotation until the forearm rests on the chest.

■ Pendulum (Codman's) exercises. In addition, encourage the patient to periodically remove the sling and swing the arm gently during ambulation at home.

Exercise: Maximum Protection Phase



Glomerular Joint Surgery and Postoperative Management

16

16



Exercise: Maximum Protection Phase

Glenohumeral Joint Surgery
and Postoperative
Management

- Later in this phase, progress to *supine self-assisted* shoulder ROM (elevation and rotation) by first assisting with the sound hand and later with a wand or dowel rod. Add horizontal abduction to neutral and adduction across the chest with the assistance of a wand.
- Self-assisted shoulder ROM with a wand *in sitting or standing* position by performing “gear shift” exercises by sliding the arm forward on a tabletop or with an overhead rope pulley system. Remind the patient to maintain an erect trunk when performing assisted shoulder motions while seated or standing.
- Self-assisted reaching movements (to the nose, forehead, or over the head as comfort allows) to simulate functional movements.
- For some patients, transition to *active* (unassisted) shoulder ROM is often possible by 4 weeks. ■ Functional activities with the elbow at waist level, such as hand to face and writing, are permissible.



17

17

Exercise: Maximum Protection Phase

Glenohumeral Joint Surgery and Postoperative
Management

- **Minimize muscle inhibition, guarding, and atrophy.**
- Gentle muscle-setting of shoulder musculature (excluding the internal rotators) with the elbow flexed and the shoulder in the plane of the scapula or neutral. Teach these exercises prior to discharge from the hospital by having the patient practice isometric contractions of the muscles of the *sound* shoulder. Postpone setting exercises (light isometrics) of the operated shoulder until about 4 to 6 weeks after surgery.
- Scapular stabilization exercises in non weight-bearing positions. Target the serratus anterior and trapezius muscles.

18

18

Exercise: Maximum Protection Phase

Glenohumeral Joint Surgery and Postoperative Management

NOTE: For a patient who underwent TSA with repair of a large rotator cuff tear, it may not be permissible to begin ROM exercises immediately after surgery. When the sling or splint can be removed for exercise, perform only passive or assisted ROM throughout the first phase of rehabilitation. The range of shoulder elevation and external rotation initially permitted may be less than for shoulders that did not require cuff repair.

Postpone active (unassisted), antigravity ROM and light isometrics until the second phase (approximately 6 weeks postoperatively, when repaired soft tissues are reasonably well healed).

Following rTSA, patients have a lifting limit of 1 lb or less for 6 weeks, and external rotation and elevation ROM are limited to 0° to 20° and 90° to 120°, respectively, for 3 months.^{20,127} In addition, hyperextension, lifting, and supporting of body weight with the involved shoulder are all precautions following rTSA.

19

19

Criteria to progress next Phase

Glenohumeral Joint Surgery and Postoperative Management

- ROM: At least 90° of passive elevation, at least 45° degrees of external rotation, and 70° of internal rotation in the plane of the scapula with minimal pain or *almost* full, passive shoulder motion based on intraoperative measurements with little to no pain.
- No pain during resisted, isometric internal rotation of the subscapularis.
- Ability to perform most waist-level activities of daily living (ADLs) without pain.
- For rTSA, criteria include tolerance of assisted ROM and demonstration of the ability to isometrically activate the deltoid and periscapular musculature while the joint is positioned in the scapular plane.

20

20

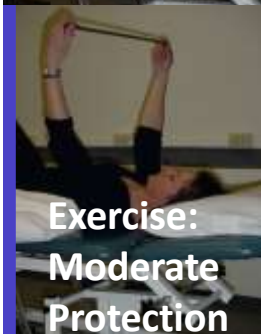
Exercise: Moderate Protection Phase

Glenohumeral Joint Surgery and Postoperative
Management

- 4 to 6 weeks postoperatively and extends to at least 12 to 16 weeks, focuses on gradually establishing active (unassisted) control, dynamic stability, and strength of the shoulder while continuing to increase ROM
- **PRECAUTIONS:** During this phase of rehabilitation, although it is safe to place increasing stresses (stretching or resistance) on periarticular soft tissues, it is important to do so gradually so as not to irritate tissues that are continuing to heal. Therefore, continue with short but frequent exercise sessions and avoid vigorous stretching or resistance exercises or overuse of the involved shoulder during functional activities.

21

21



Exercise: Moderate Protection Phase

Glenohumeral Joint Surgery and Postoperative
Management

Goals and interventions. The goals and exercises for this phase of rehabilitation are as follows.

- **Continue to increase ROM of the shoulder.**
 - Transition from passive or assisted ROM to *low-intensity, pain-free* stretching in all anatomical and diagonal planes of motion to achieve intraoperative ROM.
 - Gentle joint mobilization techniques for specific capsular restrictions.
 - In addition to therapist-assisted stretching, teach the patient how to perform gentle self-stretching exercises to increase elevation, internal/external rotation, extension, and horizontal adduction/abduction.



22

22



Exercise: Moderate Protection Phase

Glennohumeral Joint Surgery and Postoperative Management

■ **Develop active control and dynamic stability and improve muscle performance (strength and endurance) of the shoulder.**

- Continue with or gradually transition to *active* shoulder ROM exercises, initiating antigravity abduction when the patient can perform the movement without substituting scapula elevation.
- Scapular and GH joint stabilization exercises (alternating isometrics and rhythmic stabilization) can progress from nonweight-bearing to minimal weight-bearing positions.
- Pain-free, low-intensity (submaximal) resisted isometrics of shoulder muscles can be incorporated, including the subscapularis and any other repaired muscle-tendon units.
- Begin dynamic resistance exercises for the scapula and shoulder musculature (between 0° and 90° of shoulder elevation) using light weights or light-grade elastic resistance.

Begin in the supine position to support and stabilize the scapula and progress to the sitting position.

- Begin upper extremity endurance training with a stationary ergometer or a portable reciprocal exerciser on a table. Progress by increasing repetitions or time to increase muscular and cardiopulmonary endurance.

23

23

Criteria to progress next Phase

Glennohumeral Joint Surgery and Postoperative Management

- Full, passive ROM of the shoulder (based on intraoperative ranges) or pain-free, passive or assisted shoulder flexion of at least 130° to 140° and abduction of 120°.
- In the plane of the scapula, at least 60° pain-free, passive external rotation and 70° internal rotation.
- Active (unassisted), antigravity elevation of the arm to at least 100° to 120° in the plane of the scapula while maintaining joint stability and using appropriate shoulder mechanics, particularly no scapula elevation during arm elevation.
- 4/5 strength of rotator cuff and deltoid muscles.
- rTSA patients should have documented improvements in function and increasing strength of the deltoid and periscapular muscles prior to progressing to the next phase.

24

24

Exercise: Minimum Protection Phase/Return to Function Phase

Glenohumeral Joint Surgery and Postoperative
Management

- Begins around 12 to 16 weeks postoperatively (depending on rotator cuff tissue quality and function) and extends for several more months.

Goals and interventions.

■ **Continue to improve or maintain shoulder mobility.**

- End-range self-stretching.
- Grade III joint mobilization and self-mobilization, if appropriate.

■ **Continue to improve neuromuscular control and muscle performance of the shoulder.**

- Pain-free, low-load, high-repetition progressive resistive exercise (PRE) of shoulder musculature in anatomical and diagonal planes and in patterns of movement that replicate functional tasks throughout the available ROM. Position the patient in a variety of gravity-resisted positions.
- Closed-chain, resisted shoulder exercises, gradually increasing the amount of weight bearing through the upper extremity.
- Use of the involved upper extremity for lifting, carrying, pushing, or pulling activities against increasing loads.

25

25

Exercise: Minimum Protection Phase/Return to Function Phase

Glenohumeral Joint Surgery and Postoperative
Management



26

26

Exercise: Minimum Protection Phase/Return to Function Phase

Glenohumeral Joint Surgery and Postoperative Management

- **Return to most functional activities.**
- Use of the operated upper extremity for progressively more advanced functional activities.
- Recreational activities, such as swimming and golf are possible.
- Modification of high-demand, high-impact work-related or recreational activities to avoid imposing excessive forces on the GH joint that could lead to loosening or premature wear of prosthetic implants.

27

27

Summary

Total Shoulder Arthroplasty (Intact Rotator Cuff)

Progression of rehab

Phase 1: postop weeks 0-4
Phase 2: postop weeks 4-12
Phase 3: postop weeks 12+

Immobilization

- No immobilizer unless rotator cuff repaired
- Sling worn for comfort when shoulder unsupported and when in crowded, public areas or during sleep for about 4 weeks
- Sling removed for exercise soon after surgery as directed by surgeon

ROM restrictions

Limit from 0-4 weeks:

- Elevation of the arm: up to 120°
- External rotation up to 30° (arm at side)

Limit for 4-6 weeks:

- No GH extension past neutral

After 6-12 weeks:

- Combined adduction, internal rotation, extension permitted



Glenohumeral Joint Surgery and Postoperative Management

2021

28

28

Summary

ROM exercises,
stretching, and
joint mobilization

During Phase 1:

- Grade I /II joint oscillations
- AROM: scapula and distal extremity joints only
- Pendulum exercises
- PROM→A-AROM GH joint
 - Perform in supine (0–3 weeks)
 - Progress to A-AROM in sitting and standing
- AROM of GH joint by 4–6 weeks
- No active internal rotation for at least 6 weeks (to protect subscapularis repair)

During Phase 2:

- Continue AROM
- Gradually increase GH rotation
- Gentle stretching after 6–8 weeks, if needed

During Phase 3:

- Progress end-range self-stretching



Glenohumeral Joint Surgery and Postoperative Management

2021

29

29

Summary

Resistance exercises

During Phase 1:

- Only light, NWB isometrics of ST and deltoid muscles with shoulder in scapular plane

During Phase 2:

- Emphasis on improving function of rotator cuff and ST muscles
- Submaximal isometrics of GH muscles combined with light weight bearing (closed-chain) through UE
- Delay resisted rotation for several weeks (to protect repaired rotator cuff)
- Progress to low-resistance dynamic strengthening of elbow and wrist; ST and GH joints if mechanics during AROM allow

During Phase 3:

- Progress PRE in functional patterns
- Progress closed-chain stabilization exercises



Glenohumeral Joint Surgery and Postoperative Management

2021

30

30

Summary

ADL precautions

For first 4 to 6 weeks:

- Observe ROM restrictions:
 - Do not reach behind the back or into hip pocket
 - When supine, support arm on pillow to avoid GH extension past neutral
 - Light ADL permitted with elbow at waist level (writing, eating, washing face)

- Do not lean on involved arm (rising from or sitting down in chair)

- Lifting limit: 1 lb (cup of coffee or glass of water)

From 6–12 weeks:

- Limit *unilateral* lifting to 3 lb

After 12 weeks:

- Ultimate *bilateral* lifting limit: 10–15 lb
- Gradual return to light functional activities



Thank you