

PHYSICAL THERAPY GUIDELINES FOR REHABILITATION FOLLOWING SHOULDER ARTHROPLASTY WITH REVERSED PROSTHESIS

GENERAL GOALS:

- Achieve functional range of motion while allowing for adequate soft tissue healing
- Maximize use of upper extremity for daily activities at or above shoulder height
- Educate patient to safely manage their rehabilitation and use of their arm throughout post-operative rehabilitation

1. GENERAL INFORMATION:

Shoulder arthropathy is characterized by advanced osteoarthritic disease of the glenohumeral joint with concomitant pain and loss of function. Neer introduced the term rotator cuff arthropathy to characterize a condition combining severe osteoarthritis of the shoulder and complete rotator cuff disruption.¹ Rotator cuff arthropathy with anterior superior migration of the humeral head contributes to non-physiological articulation and insufficiency of the deltoid muscle.^{2,3} This superior migration of the humeral head is a common sequelae of a deficient rotator cuff. Traditional shoulder arthroplasty has been less than optimal for treating shoulder arthropathy due to the loss of force coupling of the supraspinatus-deltoid complex resulting in a “rocking horse phenomenon” whereby the humeral head subluxes proximally on the glenoid rim.^{4,5} This abnormal force has been found to contribute to loosening of the glenoid component and at times prosthetic failure.^{6,7}

The reverse prosthesis arthroplasty is a type of non-constrained shoulder replacement that was designed in 1985 by Paul Grammont.⁸ Since 1991, several versions of this prosthesis have been successfully used in Europe, Delta III™ (DePuy Inc) and Tornier Aequalis Reversed Shoulder Prosthesis™.⁹ The FDA approved the Delta III™ Reverse Prosthesis (Figure 1) for use in the United States in March of 2004. As one can gather from the name, a ball like convex surface replaces the glenoid, and the humeral head is replaced by a glenoid-like concave surface. Reversal of the glenoid and head components provides stability and creates an increased moment arm of the deltoid to elevate the shoulder and prevent superior migration of the humeral head when there is a deficient rotator cuff.^{8,10,11} A functional deltoid muscle is needed for use of this device rather than a rotator cuff.





The indications for this surgical procedure have been reported in the literature for the following patient pathologic conditions:¹²

1. Severe osteoarthritis or rheumatoid arthritis with massive and irreparable rotator cuff tear
2. Fracture sequelae of the comminuted proximal humerus with tuberosity malposition and non-union
3. Revision of previously failed arthroplasty secondary to cuff tear arthropathy
4. Failed rotator cuff surgery with subsequent anterior-superior shoulder instability and superior migration
5. Following oncologic eradication of proximal humerus tumors with associated rotator cuff resection

Often, there is little anterior or posterior soft tissue constraint of the rotator cuff to assist with joint stability; thus the deltoid contraction is the primary stabilizer of this prosthesis. Therefore careful review of the operative report and communication with the surgeon are paramount with this patient population to reveal the quality/quantity of the remaining rotator cuff and to determine the presence of a concomitant tendon transfer (latissimus dorsi or pectoralis major). Remaining rotator cuff reattachment/ or concomitant tendon transfer requires additional protection in the early stages of rehabilitation to optimize tendon healing.¹³ Rehabilitation guidelines are different from a traditional shoulder arthroplasty as considerations for joint instability/dislocations are heavily emphasized.

Some surgeons do not consistently advocate the use of formal physical therapy to recover function and pain reduction following a reverse arthroplasty.^{13,14} However, when performed by an experienced surgeon, shoulder replacement arthroplasty with a reversed prosthesis followed by various physical therapy guided rehabilitation progressions has been shown to yield good to excellent results.^{3, 5, 9-11, 16-19} The expectations of this surgical procedure include improvements in ROM and function below shoulder height and likely some function for lighter activity above shoulder height.^{3,5,9,10,16-19} Clinical observation and results of kinetic modeling study reveals scapular substitution may be necessary for function with activities above shoulder height.² Active lateral rotation may be limited long-term without an intact teres minor.^{9,11,18} Education should emphasize long-term joint protection measures that include: avoiding contact sports or high demand leisure activity that could contribute to instability or prosthetic failure.⁹ Forceful IR stretching with assisted reaching behind the body has been thought to contribute to scapular notching, instability, and/or humeral component loosening as the humeral component notches into the scapula in this position with certain prosthetic designs.^{9,20} Clinical observation in this institution reveals a slight humeral abduction contracture may exist and is considered acceptable to maintain appropriate length tension relationship of the lengthened deltoid musculature contributing to joint stability. When performed by an experienced surgeon, shoulder replacement arthroplasty with a reversed prosthesis can provide improved stability along with improved shoulder comfort and function.



This is a relatively new surgical procedure in the United States; thus these guidelines are based mainly on literature review, biomechanics, prior published surgeon recommendations, and rehabilitation experience thus far. These guidelines may be revised as a greater number of patients with this surgical procedure are treated in physical therapy and study of optimal rehabilitation programs are published. For more detailed information on the surgical procedure, the following links/ websites may be helpful:

www.bostonshoulder.com
www.shoulderwork.com
www.orthop.washington.edu/uw/shoulderjoint
www.aaos.org

2. GENERAL INTERVENTION:

- The rehabilitation process is generally home based with physical therapy visits utilized to monitor progress, review precautions, provide activity guidelines, and modify/progress the HEP.
- Often formal physical therapy is not needed to meet pain and function with this patient population.
- Time frames for each phase, specifically clearance by physician for AROM and initiating strengthening exercises are based on associated soft tissue procedures (including tendon repairs of remaining rotator cuff, or adjunct latissimus/pectoralis major transfers) and therefore should be guided by the surgeon.
- Intervention should not be forceful or painful and limitations in ROM are given as safe guide lines.
- In general, physical therapy intervention is guided by:
 - a. Pain
 - b. Stage of post operative recovery
 - c. Associated soft tissue repairs/procedures
 - d. Associated medical conditions

3. SPECIFIC INTERVENTIONS BY PHASE:

The rehabilitation process is generally divided into three phases based on tissue healing:

- Phase I: PROM/AAROM phase
- Phase II: AAROM/ AROM phase
- Phase III: AROM/ strengthening phase

The specific goals and precautions are outlined for each phase. These phases and timeframes are just guidelines and may be modified by surgeon.



PHASE I: Initiate at Post-Operative Week 2-4

Protected PROM/AAROM

SPECIFIC GOALS:

- Protect repair and encourage compliance with immobilization
- Promote normal wrist elbow and hand motion, initiate gentle painfree shoulder PROM
- Edema and pain control measures

SPECIFIC PRECAUTIONS:

- Initial PROM/AAROM should be guided by intraoperative measurements or if not provided limited to less than 120° elevation, 30° external rotation, 45° abduction
- No AROM, resistance, or strengthening exercises are performed with involved upper extremity
- Immobilization with sling to protect tendon repairs/transfers when present is paramount

PATIENT EDUCATION

- Explain to the patient the nature of their surgery and stress precautions specific to their situation
- Discuss that advancement is dependent upon the physician's directions and emphasize the need to follow the physician's guidelines and to adhere to the precautions to avoid complications
- Outline the treatment plan and expected functional outcomes
- Emphasize the need to be an active participant in the rehabilitation process to prevent excessive stiffness and reach functional goals
- Instruct in upper extremity positioning for sleeping and the limited usage of their sling as directed by their surgeon
- Educate patient regarding transfers (supine-sit) keeping in mind, weight bearing on the operated arm is not allowed until the 4-6th post-operative week
- Driving not allowed until safe and occurs typically following MD clearance to stop using sling around the fourth week post-operatively
- Instruct patient in edema and pain control/ use medication as prescribed by physician
- Address postural impairments of the scapula and thoracic spine

JOINT MOBILITY

- Exercises to regain limited shoulder joint mobility, especially pendulum, may be initiated within 24 to 48 hours post-operatively
- In patients with rotator cuff repairs, PROM is usually begun in supine to assume good scapular stabilization, starting with P/ AAROM upper extremity elevation using the uninjured arm for guidance and support.
- The amount of ER/IR is determined by the surgeon and is usually limited to less than 30° degrees of external rotation as there is usually no RTC integrity to support the glenoid or repair of subscapularis has been performed
- Exercise usually progresses from gentle passive to active assistive in flexion <120°, ER <30°, Abd <45°
- Address limitations of periscapular muscle length and trunk mobility
- Address limitations of ROM in the distal upper extremity



PHASE II: Initiate at Post-Operative Weeks 4-6
AAROM/AROM

SPECIFIC GOALS:

- Improve PROM shoulder gradually into full ER in neutral, elevation $<140^\circ$, IR as tolerated
- Initiate active glenohumeral joint mobility primarily in elevation
- Continue joint protection education

SPECIFIC PRECAUTIONS:

- No strengthening or resistance exercises
- No forceful stretching or PROM
- No passive/active assistive with overpressure stretching in adduction, flexion $>120^\circ$ or combined external rotation and abduction,
- Continue joint protection education

JOINT MOBILITY

- When sling is discharged, encourage natural arm swing
- Progressively encourage the patient to increase the functional use of the arm for ADL, IADL as surgery guidelines dictates.
- Active ROM exercises of the upper extremity against gravity in elevation, external rotation, internal rotation behind the back and abduction are initiated
- Avoidance of PROM with stretching in adduction, horizontal adduction beyond neutral, internal rotation behind the back and flexion beyond 120° is advised unless otherwise instructed by surgeon



PHASE III: Initiate at Post-Operative Weeks 8-12+ AROM/ Strengthening

SPECIFIC GOALS:

- Improve glenohumeral joint mobility primarily in elevation and ER as function of teres minor allows
- Maximize strength of shoulder girdle, particularly deltoid, and upper extremity for light daily IADL function
- Long term joint protection education to avoid heavy, forceful activity/contact to upper quarter

SPECIFIC PRECAUTIONS:

- Forceful active assistive or stretching exercises in ROM greater than 140° flexion, 45° external rotation, internal rotation behind the frontal plane and horizontal adduction beyond neutral
- Do not stretch mild <20° abduction contracture
- Scapular substitution is expected with AROM in elevation to maximize efficiency of deltoid2
- No weight lifting above shoulder height or lifting with weights >5-10lbs unless otherwise instructed by surgeon

PATIENT EDUCATION

- Utilization of a pool exercise program, low resistance Theraband™ exercises, or light weights are usually preferred for deltoid strengthening. Include teres minor and subscapularis if intact per surgeon operative report
- Strengthening exercises are directed towards improving deltoid muscle balance and functional strength
- Progress from submaximal isometrics to limited-range to full-range isotonic, resistive exercises below shoulder height is encouraged
- External rotation strength long-term is usually compromised as there is decreased leverage of posterior deltoid to assist due to medialization of humerus.⁹ Teres Minor is often the only humeral external rotator that is present.
- Caution to avoid overloading this tendon with strengthening program is advised.

JOINT MOBILITY

- Forceful active assisted ROM in flexion > 140 degrees, external rotation > 45 degrees, GH internal rotation behind the body, and horizontal adduction beyond neutral is not recommended to avoid prosthesis instability or dislocation from contact of the humeral component on scapula, coracoid, or acromion



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