BRIGHAM AND WOMEN'S HOSPITAL
A Teaching Affiliate of Harvard Medical School
75 Francis St., Boston, Massachusetts 02115

Department of Rehabilitation Services

Reverse Shoulder Arthroplasty Protocol:

General Information:

Reverse or Inverse Shoulder Arthroplasty (RSA) is designed specifically for the treatment of glenohumeral (GH) arthritis when it is associated with irreparable rotator cuff damage, complex fractures as well as for a revision of a previously failed conventional Total Shoulder Arthroplasty (TSA) in which the rotator cuff tendons are deficient. It was initially designed and used in Europe in the late 1980s by Grammont; and received FDA approval for use in the United States in March of 2004.

The rotator cuff is either absent or minimally involved with the RSA; therefore, the rehabilitation for a patient following the RSA is different than the rehabilitation following a traditional TSA. The surgeon, physical therapist and patient need to take this into consideration when establishing the postoperative treatment plan.

Important rehabilitation management concepts to consider for a postoperative physical therapy RSA program are:

- Joint protection: There is a higher risk of shoulder dislocation following RSA than a conventional TSA.
    - **Avoidance of shoulder extension past neutral and the combination of shoulder adduction and internal rotation should be avoided for 6 weeks postoperatively.**
    - **Patients with RSA don't dislocate with the arm in abduction and external rotation. They typically dislocate with the arm in internal rotation and adduction in conjunction with extension. As such, tucking in a shirt or performing bathroom/personal hygiene with the operative arm is an especially dangerous activity particularly in the immediate post-operative phase.**
- Deltoid function: Stability and mobility of the shoulder joint is now dependent upon the deltoid and periscapular musculature. This concept becomes the foundation for the post-operative physical therapy management for a patient that has undergone RSA.

- Function: As with a conventional TSA, maximize overall upper extremity function, while respecting soft tissue constraints.

- ROM: Expectation for range of motion gains should be set on a case-by-case basis depending upon underlying pathology. Normal/full active range of motion of the shoulder joint following RSA is not expected.

Reverse Shoulder Arthroplasty Biomechanics

The RSA prosthesis reverses the orientation of the shoulder joint by replacing the glenoid fossa with a glenoid base plate and glenosphere and the humeral head with a shaft and concave cup. This prosthesis design alters the center of rotation of the shoulder joint by moving it medially and inferiorly. This subsequently increases the deltoid moment arm and deltoid tension, which enhances both the torque produced by the deltoid as well as the line of pull/action of the deltoid. This enhanced mechanical advantage of the deltoid compensates for the deficient rotator cuff as the deltoid becomes the primary elevator of the shoulder joint. This results in an improvement of shoulder elevation as compared to pre-operative status and often individuals are able to raise their upper extremity overhead.

Standard exercises for rotator cuff strengthening are not indicated or affective and may cause excessive stress at the deltoid insertion. This could result in deltoid tendinopathy or acromial stress fractures. Strengthening should focus on peri-scapular musculature, gentle deltoid strengthening and isolated teres minor strengthening.

Figure 1. Anterior Posterior radiograph (A) and illustration (B) of a left shoulder with rotator cuff arthropathy. The superiorly migrated humeral head indicates rotator cuff deficiency.

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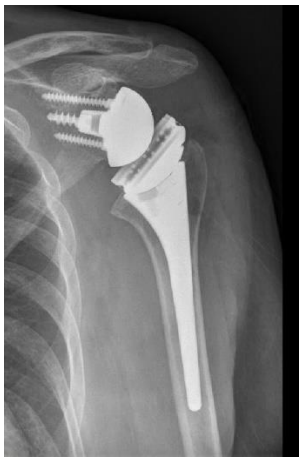
Figure 2. Reverse Total Shoulder Arthroplasty Components . The prosthesis has 5 parts: the glenoid base, the glenosphere, a polyethylene cup, humeral neck, and the humeral stem.

Figure 3. Anterior Posterior radiography of a right shoulder (A) and an illustration of a left shoulder (B) after reverse total shoulder arthroplasty.



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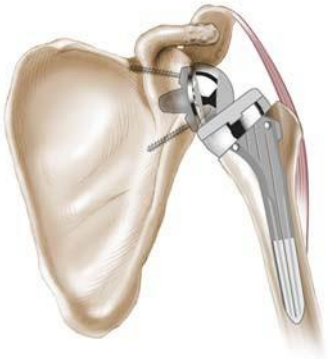

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Reverse Shoulder Arthroplasty Protocol:

The intent of this protocol is to provide the physical therapist with a guideline/treatment protocol for the postoperative rehabilitation management for a patient who has undergone a Reverse Shoulder Arthroplasty (RSA). It is not a substitute for a physical therapist's clinical decision making regarding the progression of a patient's postoperative rehabilitation based on the individual patient's physical exam/findings, progress, and/or the presence of postoperative complications. If the physical therapist requires assistance in the progression of a postoperative patient who has had RSA the therapist should consult with the referring surgeon.

The **scapular plane** is defined as the shoulder positioned in 30 degrees of abduction and forward flexion with neutral rotation. ROM performed in the scapular plane should enable appropriate shoulder joint alignment.

Shoulder Dislocation Precautions:

- **No shoulder motion behind back. (NO combined shoulder adduction, internal rotation, and extension.)**
- **No glenohumeral (GH) extension beyond neutral.**

*****Precautions should be implemented for 6 weeks postoperatively unless surgeon specifically advises patient or therapist differently.

Surgical Considerations:

The surgical approach needs to be considered when devising the postoperative plan of care.

- Deltopectoral approach
  - Unless stated otherwise by the surgeon a RSA is completed via deltopectoral approach, which minimizes surgical trauma to the anterior deltoid.
  - An incision is made from the coracoid, extending 5cm distally along the deltopectoral groove. The cephalic vein is mobilized and the deltoid is gently retracted laterally. Meticulous care is taken to protect injury to the deltoid muscle. The biceps tendon is released and later tenodesed. If intact, the subscapularis tendon is peeled off the lesser tuberosity allowing for exposure of the humeral head.

Delayed Start of Therapy

- The start of this protocol is delayed 2-4 weeks for a revision surgery
  - In the case of delayed start to physical therapy adjust below timeframes so that day 1 is the first day of physical therapy.

Progression to the next phase based on Clinical Criteria and Time Frames as Appropriate.

Phase I- Immediate Post Surgical and Initiation of Range of Motion Phase Day 1-6 weeks

Goals:

- Patient and family independent with:
  - Joint protection
  - Passive range of motion (PROM)
  - Assisting with putting on/taking off sling and clothing
  - Assisting with home exercise program (HEP)
  - Cryotherapy
- Promote healing of soft tissue / maintain the integrity of the replaced joint.
- Enhance PROM.
- Restore active range of motion (AROM) of elbow/wrist/hand.
- Independent with activities of daily living (ADL's) with modifications.
- Independent with bed mobility, transfers and ambulation or as per pre-admission status.

Precautions:

- Sling is worn for 2 weeks postoperatively and only removed for exercise and bathing once able. The use of a sling maybe extended for a total of 6 weeks, if the current RSA procedure is a revision surgery.
- While lying supine, the distal humerus/elbow should be supported by a pillow or towel roll to avoid shoulder extension. Patients should be advised to "always be able to visualize their elbow while lying supine."
- No lifting of objects with operative extremity.
- No supporting of body weight with involved extremity.
- May shower at 3 days
- Outside of showering, keep the incision clean and dry. No soaking/submerging for 2 weeks; No whirlpool, fresh or salt water for 4 weeks.

Activity:

Day 1- 2 weeks

- Insure patient is independent in bed mobility, transfers and ambulation
- Insure proper sling fit/alignment/use.
- Active/Active Assisted ROM (AROM/AAROM) of cervical spine, elbow,

wrist, and hand.

- Continuous cryotherapy for first 72 hours postoperatively, then apply as needed for pain

2 weeks to 6 weeks:

- Continue all exercises as above
- Continue to maintain precautions of combined internal rotation and extension (reaching behind back) as well as no lifting heavier than 1-2 lbs
- Passive Range of Motion (PROM) typically begins at 2 weeks:
    - Forward flexion and elevation in the scapular plane in supine to 120 degrees.
    - ER in scapular plane to tolerance, respecting soft tissue constraints.
    - No internal rotation
- Gentle resisted exercise of elbow, wrist, and hand
- May begin gentle pain free scapular pinches (Figure 1)
- ***Begin to wean from sling at 2 weeks post-op***
    - May also begin pendulums (Figure 2a-2c) and pain free sub-max deltoid isometrics at this time
    - May use arm for pain free waist level activities
- Active Assisted Range of Motion (AAROM) typically begins at 2 weeks
    - Forward flexion and elevation in scapular plane in supine with progression to lawn chair (figure 3) then to standing
    - ER in scapular plane in supine
- Active Range of motion (AROM) typically begins at 3 weeks
    - Based on response to AAROM
    - Progress from supine to lawn chair to standing
- Manual Therapy
    - Soft tissue massage upper trapezius, pec minor, scapular stabilizers
    - Desensitization scar tissue

Criteria for progression to the next phase (Phase II):

- Tolerates shoulder PROM, AAROM, AROM well with gradual improvements.
- Patient demonstrates the ability to isometrically activate all components of the deltoid and periscapular musculature in the scapular plane.

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Phase II – Restoration of Functional Motion
Weeks 6 to 8

Goals:

- ROM goals to be achieved by week 8
    - Forward elevation 0-140° degrees
    - ER 0-30° in neutral
    - Functional external rotation (to mouth and behind head)
    - **Internal rotation not beyond 50 degrees in scapular plane or back pocket (initiated at 6 weeks)**
- Continue progression of PROM
- Restore full prosthesis appropriate AROM.Re-establish dynamic shoulder and scapular stability.
- Control pain and inflammation.

Precautions:

- Due to the potential of an acromion stress fracture one needs to continuously monitor the exercise and activity progression of the deltoid. A sudden increase of deltoid activity during rehabilitation could lead to excessive acromial stress. A gradually progressed, pain-free program is essential.
- Continue to avoid shoulder hyperextension.
- In the presence of poor shoulder mechanics avoid repetitive shoulder AROM exercises/activity.
- Restrict lifting of objects no more then 1-2 lbs
- No weight bearing through involved upper extremity.

Activity:

- Continue progression of PROM, gentle stretching allowed.
- Restore full AROM
- May initiate active IR, adduction and extension (to back pocket) at 6 weeks for functional activities only. No stretching behind the back.
- Begin gradual return to all non weight bearing and light lifting ADL's
- Initiate gentle scapulothoracic rhythmic stabilization and alternating isometrics in supine as appropriate.

Criteria for progression to the next phase (Phase III):

- AROM goals met with 140 deg flexion, 30 deg ER, IR to PSIS without pain
- Patient demonstrates the ability to isotonically activate all components of the deltoid and periscapular musculature and is gaining strength.

Phase III – Restoration of Functional Strength Weeks 8 to 12

Goals:

- Restoration of deltoid, periscapular and teres minor strength for functional activities.

Precautions:

- If subscapularis was repaired, internal rotation strengthening may begin at 12 weeks
- Monitor closely for acromial tenderness. Discontinue all strengthening and consult surgeon if acromial pain persists.

Activity:

- Strengthening typically begins at week 8-10
    - Peri-scapular musculature (see figure 4-6)
    - Gentle deltoid strengthening (figure 7a/7b, figure 8)
        - 7b once demonstrate good quality of motion, without excessive compensation and minimal symptoms
    - Focused teres minor strengthening (figure 9).
    - Gentle (grade I and II) glenohumeral and scapulothoracic joint mobillizations as needed. Note that anatomic arthrokinematic rules do not apply for the reversed joint.
- ***If subscapularis is repaired, may begin gentle IR strengthening at 12 weeks.***
- In the absence of an intact subscapularis, IR strengthening is not indicated.
- May weight bear through the arm only as needed for activities of daily living.

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Phase IV – Return to Activity and Independent Home Program
Week 12- 16 +

Goals:

- Enhance functional use of operative extremity and advance functional activities.
- Enhance shoulder mechanics and endurance.

Precautions:

- No lifting of objects heavier than 7 kg (15 lbs) with the operative upper extremity
- Avoid repetitive overhead sports
- No sudden lifting or pushing activities.
- No ballistic activity (hammering, punching)

Activity

- Gradual return to light sport activity at 16 weeks, i.e. golf, pickle ball.
- Functional and recreational activities within limits as identified by progress made during rehabilitation and outlined by surgeon and physical therapist.
- Continue with the previous program as indicated.

Criteria for discharge from skilled therapy:

- ROM goals achieved.
- Independent with home exercise program.
- Able to complete light household, work and recreational activities.

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Authors:
Stephanie Boudreau, PT
Ed Boudreau, PT
Debbie Canoa, PT
Laurence D. Higgins, MD
Reg B.Wilcox III, PT
4/06

Reviewers:
Janice McInnes, PT
Roya Ghazinouri, PT

Reviewed: 6/1/06, 5/21/07, 6/13/07, 8/21/07, 9/8/07, 12/13/07

Updated by:
Reg B. Wilcox III, PT
3/11

Reviewed by:
Stephanie Boudreau, PT
Phil Kidd, PT
Laurence D. Higgins, MD

Updated by:
Eric Phillips, PT, DPT, OCS
Cristin Taylor, PA-C, PT
1/24/17

Scapular Pinches

Figure 1: Standing in with upright posture, squeeze shoulder blades together.

Pendulum Exercises

Figure 2a (Side to side): With nonsurgical arm, support yourself on stable surface, with surgical arm hanging down, gently allow arm to freely swing side to side by shifting your body weight.

Pendulum Exercises *(continued)*

Figure 2b (front to back): With nonsurgical arm, support yourself on stable surface, with surgical arm hanging down, gently allow arm to freely swing front to back by shifting your body weight.

Figure 2c (circles): With nonsurgical arm, support yourself on stable surface, with surgical arm hanging down, gently allow arm to freely swing in a circle clockwise and counter clockwise motion by shifting your body weight.

AAROM Flexion in Lawn Chair Position

Figure 3: Lie on back holding wand. Raise arms over head.

Scapula Strengthening

Figure 4: Medium to wide stance. Thumbs up, pull arms back, squeeze shoulder blades together.


Figure 5: Feet shoulder width apart. Thumbs up, pull arms back, squeeze shoulder blades together.

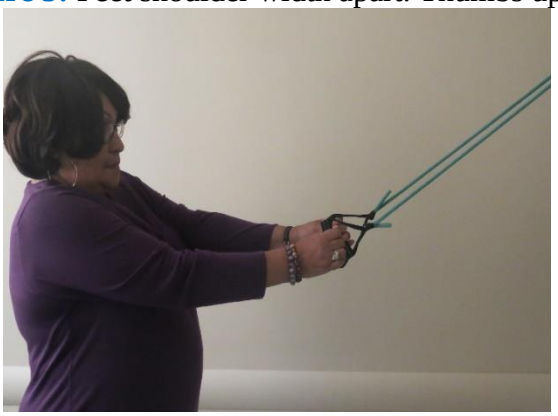


Figure 6: Face anchor with knees slightly flexed. Palms down, pull arms down to sides. One arm at a time.


Deltoid Strengthening

Figure 7A: Bring arms straight out in front and raise to shoulder height. Keep palms facing each other.

Figure 7B: Bring arms straight out in front and raise as high as possible without pain. Keep palms facing each other.

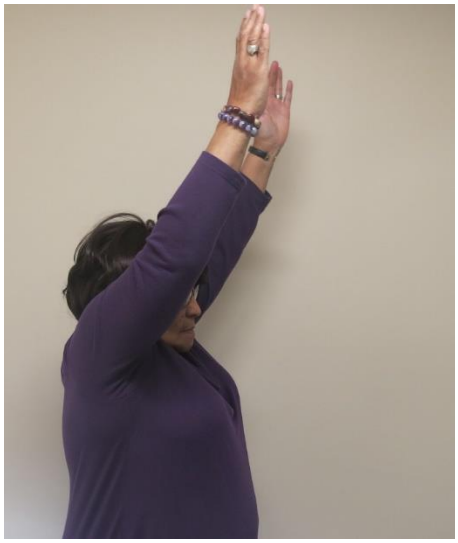

Figure 8: With towel under hand, slide arm up railing until straight. Once in this position, lift towel off railing a few inches.

Focused Teres Minor Strengthening

Figure 9: Sit with your arm resting on the table so that your shoulder is at 90 degrees or slightly lower from your body. Keeping your elbow on the table, rotate your hand upward towards the ceiling. Slowly lower back to table. Can do with or without weight.