Reverse Total Shoulder Replacement

Therapy Protocol

General Information:

Reverse Total Shoulder Replacement (rTSR) is designed specifically for the treatment of glenohumeral (GH) arthritis when it is associated with irreparable rotator cuff (RC) damage, complex fractures as well as for a revision of a previously failed conventional Total Shoulder Replacement (TSR) in which the rotator cuff tendons are deficient.

The rotator cuff is either absent or minimally involved with the rTSR; therefore, the rehabilitation for a patient following the rTSR is different than the rehabilitation following a traditional TSR. 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 therapy rTSR program are:

- Joint protection: There is a higher risk of shoulder dislocation following rTSR than a conventional TSR.

    - **Avoidance of shoulder extension past neutral and the combination shoulder adduction and internal rotation should be avoided for 12 weeks postoperatively**.

    - **Patients with rTSR do not dislocate with the arm in abduction and external rotation**. **They typically dislocate with the arm in internal rotation and adduction in conjunction with extension. Such as, tucking in a shirt, pushing up from a chair, or performing bathroom / personal hygiene with the operative arm. These are especially dangerous activities particularly in the immediate peri-operative phase.**

- Deltoid function: Stability and mobility of the shoulder joint is now dependent upon the deltoid and peri-scapular musculature. This concept becomes the foundation for the post-operative therapy management for a patient that has undergone rTSR.

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

- ROM: Expectation for range of motion (ROM) gains should be set on a case-by-case basis depending upon underlying pathology. Normal/full active ROM of the shoulder joint following rTSR is **not** expected. However, functional active elevation of at least 105° should be anticipated.

Reverse Total Shoulder Replacement Biomechanics:

The rTSR 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 increases the deltoid moment arm and deltoid tension, which enhances both the torque produces by the deltoid and the line of pull of the deltoid. This enhanced mechanical advantage of the deltoid compensates for the deficient RC as the deltoid becomes the primary elevator of the shoulder joint. This results in an improvement of shoulder elevation and often individuals are able to raise their upper extremity overhead.

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

A. 

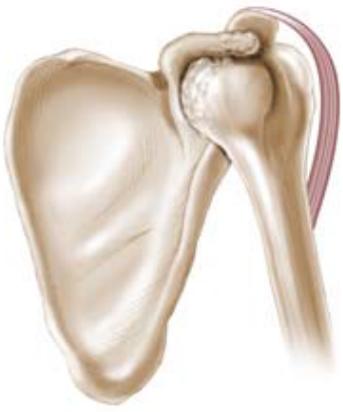
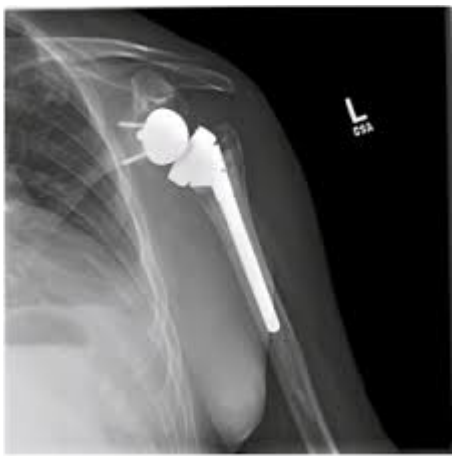
B. 

Figure 2. Anterior Posterior radiograph (C) and an illustration of a shoulder (D) after reverse total shoulder replacement.

C. 

D. 

Reverse Total Shoulder Replacement Protocol:

The intent of this protocol is to provide the physical or occupational therapist with a guideline and treatment protocol for the postoperative rehabilitation management for a patient who has undergone a Reverse Total Shoulder Replacement (rTSR). It is by no means intended to be a substitute for a therapist's clinical decision making regarding the progression of a patient's postoperative rehabilitation based on the individual patient's physical exam, progress, or the presence of postoperative complications. If the therapist requires assistance in the progression of a postoperative patient who has had a rTSR, the therapist should consult with the referring surgeon.

Therapists need to be aware of a number of factors that may affect rehabilitation. Factors may include the patient's preoperative shoulder status, bone quality, integrity of the remaining RC, concomitant RC repair or tendon transfers, and overall component stability at the time of surgery. There is a wide variance of functional and ROM outcomes following rTSR; therefore, patients must be reminded that their shoulder mechanics and function will have some limitations when compared to their unaffected shoulder. Patients with more active lifestyles typically will require additional education regarding their restrictions to ensure proper longevity of their new prosthesis, as well as to minimize their risk for dislocation.

This protocol is outlined in 4 phases. Each phase is structured based on postoperative timelines that respect healing and soft tissue parameters. Progression to the next phase is based on clinical criteria and time frames as determined appropriate.

- **Protocol Delays:**

    - **The start of this protocol will be delayed 3-4 weeks following rTSR for a revision or in the presence of poor bone stock based on the surgeon's assessment of the integrity of the surgical repair. In the case of a delayed therapy start, the following timeframes are to be adjusted so that day 1 is the first day of therapy.**

- Definition:

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

Phase I -- Immediate Post Surgical Phase / Joint Protection (Day 1 to Week 6)

Goals:

- Patient and family independent with:
    - Joint protection
    - Passive range of motion (PROM)
    - Assisting with putting on and 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 3-4 weeks postoperatively and only removed for exercise and bathing once able. The use of a sling often may be extended for a total of 6 weeks, if the current rTSR procedure is a revision surgery.
- While lying supine, the distal humerus and 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 regardless of what they are doing."** This precaution will assist in avoiding shoulder extension and adduction.

- When out of the sling, the patient should be advised not to reach across the abdomen and chest wall with the operative upper extremity, as this involves combined internal rotation (IR) with adduction and again increases their risk of dislocation.
- No shoulder AROM.
- No lifting of objects with operative extremity.
- **No supporting of body weight with involved extremity.** This can particularly be a problem for patients when getting up from a chair.

Day 1 to 4: Acute Care Therapy

- Begin PROM in supine <u>after complete resolution of interscalene block.</u>
    - Forward flexion and elevation in the scapular plane in supine to 90°.
    - External rotation (ER) in the scapular plane to available ROM as indicated by operative findings; typically 20°-30°.
    - <u>No IR ROM</u>.
- Active / Active Assisted ROM (A/AAROM) of cervical spine, elbow, wrist, and hand.
- Begin periscapular sub-maximal pain-free isometrics in the scapular plane.
- Postoperative cryotherapy application 4-5 times daily for 20 minutes.
- Insure patient is independent in bed mobility, transfers, and ambulation.
- Insure proper sling fit, alignment, and use.
- Instruct patient in proper positioning, posture, and initial home exercise program.
- Provide patient and family with written home program including exercises and protocol information.

Day 5 to 21:

- Continue all exercises as above (typically 2-3 times per day).
- Begin sub-maximal pain-free deltoid isometrics in scapular plane (avoid shoulder extension when isolating posterior deltoid.)
- Continue cryotherapy 4-5 times daily for 20 minutes.

Weeks 3 to 6:

- Progress above exercises.
- Progress PROM:
    - Forward flexion and elevation in the scapular plane in supine to 120°.
    - ER in scapular plane to tolerance, respecting soft tissue contraints.
- Gentle resisted exercises for elbow, wrist, and hand.
- Continue cryotherapy.

Criteria for progression to Phase II:

- Tolerates shoulder PROM and isometrics.
- Tolerates AROM of elbow, wrist, and hand with minimal resistance.
- Patient demonstrates ability to isometric activate all components of the deltoid and periscapular musculature in the scapular plane.

Phase II – AROM and Early Strengthening (Weeks 6 to 12)

Goals:

- Continue progression of PROM (full PROM is not expected).
- Gradually restore AROM.
- Control pain and inflammation.
- Allow continued healing of soft tissue (do not overstress healing tissue).
- Re-establish dynamic shoulder and scapular stability.

Precautions:

- Due to the potential of an acromion stress fracture, one needs to continuously monitor the exercise and activity progress of the deltoid. A sudden increase of deltoid activity during rehabilitation could lead to excessive acromion 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 and activities.
- Restrict lifting of objects to no heavier than a coffee cup.
- No supporting of body weight by involved upper extremity.

Week 6 to 8:

- Continue PROM program.
- Begin PROM IR to tolerance (not to exceed 50°) in the scapular plane.
- Begin shoulder AA/AROM as appropriate.
    - Supine forward flexion and elevation in the scapular plane with progression to sitting / standing.
    - Supine ER and IR in the scapula plane with progression to sitting / standing.
- Begin supine gentle scapulothoracic rhythmic stabilization and alternating isometrics as appropriate. Minimize deltoid recruitment during all activities and exercises.
- Progress strengthening of the elbow, wrist, and hand.
- Gentle glenohumeral and scapulothoracic joint mobilization as indicated (Grade I and II).
- Continue cryotherapy as needed.
- Patient may begin to use hand of operative extremity for feeding and light ADL's including dressing and bathing.

Week 9 to 12:

- Continue above exercises and functional activity progression.
- Begin gentle glenohumeral IR and ER sub-maximal pain free isometrics.
- Begin gentle periscapular and deltoid sub-maximal pain free isotonic strengthening exercises. Begin AROM supine forward flexion and elevation in the plane of the scapula with light weights (1-3 lbs.) at varying degrees of trunk elevation as appropriate. (i.e. supine lawn chair position progressing to sitting / standing).
- Progress to gentle glenohumeral IR and ER isotonic strengthening exercises in sidelying position with light weight (1-3 lbs.) and/or with light resistance resistive bands or sport cords.

Criteria for progression to Phase III:

- Improving function of shoulder.
- Patient demonstrates the ability to isotonic activate all components of the deltoid and periscapular musculature and is gaining strength.

Phase III – Moderate strengthening (Weeks 12 to 16)

Goals:

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

Precautions:

- No lifting of objects heavier than 6 lbs. with the operative extremity.
- No sudden lifting or pushing activities.

Week 12 to 16:

- Continue with the previous program as indicated.
- Progress to gentle resisted flexion, elevation in standing as appropriate.

Criteria for progression to Phase IV and discharge from skilled therapy:

- Patient is able to maintain pain free shoulder AROM demonstrating proper shoulder mechanics. (Typically 80°-120° of elevation, with functional ER of about 30°).
- Patient able to complete light household and work activities.
- Patient demonstrates independence of a home exercise program.

Phase IV – Continued Home Program (Typically 4+ months postop)

Home Exercise Program:

- Provided by therapist.
- Performed 3-4 times per week with focus on:
    - Continued strength gains.
    - Continued progression toward a return to functional and recreational activities within limits as identified by progress made during rehabilitation and outlined by surgeon and therapist.

References:

Boudreau, S.; Boudreau, E.; Higgins, L.; and Wilcox, R.: Rehabilitation Following Reverse Total Shoulder Arthroplasty. J. Orthopaedic and Sports Physical Therapy, **37:** 734-743, Dec. 2007.

Boudreau, S., Boudreau, E., Canoa, D., Higgins, L., and Wilcox, R.: Reverse Total Shoulder Arthroplasty Protocol. Updated Mar. 2011. Brigham and Women's Hospital, Department of Rehabilitation Services, A Teaching Affiliate of Harvard Medical School, 75 Francis St., Boston, Massachusetts 02115

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