

Total Shoulder/Reverse Shoulder Arthroplasty

1. Defined
 - a. Resurfacing of both the humeral head and the glenoid fossa with metal and plastic implants.
 - b. In shoulder hemi-arthroplasty, only the humeral head surface is replaced.
 - c. In reverse prosthesis procedures, the reversal of glenoid and humeral head components provides stability and creates an increased moment arm for the deltoid to elevate the shoulder and prevent superior migration of the humeral head. (Unverzgat, Ross, Hughes)
2. Goals
 - a. Protect healing tissue
 - b. Control post-operative pain and swelling.
 - c. Improve post-operative range of motion.
 - d. Improve functional strength, stability, and neuromuscular control.
 - e. Restore deltoid/ rotator cuff force couple.
3. Rehabilitation Principles
 - a. Be aware of compromised and/or repaired tissue.
 - b. Healing tissue should never be overstressed but appropriate levels of stress are beneficial.
 - i. Inflammatory phase days 1-3.
 - ii. Tissue repair with proliferation phase days 3-20.
 - iii. Scar tissue most responsive to remodeling 21-60 days but occurs from 1 to 8 weeks.
 - iv. Final maturation taking as long as 360 days. (Citation)
 - c. Tissue reactivity of the shoulder and tissue healing will dictate the rehabilitation process. Reactivity is determined by the clinical exam.
 - i. Level I Reactivity
 1. Resting pain, pain before end range.
 2. Aggressive stretching is not indicated.
 3. Grade I-II mobilization for neurophysiological effect.
 - ii. Level II Reactivity
 1. Pain onset occurs with end range resistance.
 2. Grade III and IV mobilization appropriate per patient tolerance.
 - iii. Level III Reactivity
 1. Engagement of capsular end feel with little or no pain.
 2. Pain occurs after resistance.

3. Grade III and IV mobilization and sustained stretching is appropriate.
- d. Eliminate inflammation as the cause of pain and neuromuscular inhibition.
- e. Ensure return of appropriate joint arthrokinematics.
- f. Apply techniques in the loose pack position and apply unidirectional movements to minimize the strain on the soft tissue and articular structures.
 - i. Reverse total shoulder- Protect change in deltoid's length tension relationship**
 - 1. No inferior glide > grade 2**
 - 2. No long arm traction > grade 2**
 - 3. If loss of motion in a particular direction, safest stretch is physiological motion**
- g. As mobility increases and reactivity decreases, initiate more multi-directional techniques.
- h. Re-establish voluntary and pain-free control of the deltoid and residual rotator cuff musculature. Progress by the following principles:
 - i. Deltoid-rotator cuff force couple training for total shoulder, hemi-arthoplasty, humeral head resurfacing**
 - ii. Deltoid and residual cuff strengthening for straight plane movements rather than for force couple restoration with reverse prosthesis**
 - 1. ER strength and subsequent active ER ROM expected to be limited as posterior cuff muscles integrity is typically poor with reverse prosthesis**
 - iii. Isometrics (submax/non-painful) intended for neuromuscular education and fluid decongestion.
 - iv. Isotonics "Downstairs" (<90 degrees) "Gravity Eliminated" elevation in a controlled fashion.
 - v. Isotonics "upstairs" (>90 degrees)
- i. Improve and or maintain scapular mobility and stabilization.
- j. Facilitate performance of complex skills with proprioceptive and kinesthetic techniques: Low to high, sagittal to frontal, bilateral to unilateral, stable to unstable, slow to fast, fixed to unfixed surface
- k. Encourage life-long activity modification with the use of safe zone principles.
- l. Factors that affect the rehab process
 - i. Tissue quality (appearance, temperature, texture)
 - ii. Presence of concomitant bicipital/deltoid/scapular pathology
 - iii. Age of patient
 - iv. Presence and severity of osteoporosis
 - v. Activity level
 - vi. Pre and intra-operative range of motion
 - vii. Pain and sensitivity levels
 - viii. Cognitive abilities

4. Post op functional guidelines
 - a. Functional Activities dependent upon: (will assist in decision to return to functional activity)
 - i. Glenohumeral ROM
 - ii. Pain
 - iii. Tissue healing restraints
 - iv. Rotator cuff and deltoid strength
 - v. Scapular strength and stability
 - vi. Proprioceptive/reflex control
 - vii. Quality of tissue and degree of discomfort
 - b. Driving-8-12 weeks Dependent upon:
 - i. Automatic Transmission
 - ii. Ability to maintain arm in a safe, functional position.
 - iii. Alleviation of sharp pains/muscle spasms.
 - iv. No dependency on pain medications
 - v. Car insurance restrictions on driving after surgery.
 - vi. Adequate confidence to handle car in challenging situations.
 - c. Work dependent upon:
 - i. Sedentary job- no earlier than 6-8 weeks
 - ii. Physical job- no earlier than 12 weeks
 - d. "Overhead" recreational activities 7-9 months (no high velocity)
 - i. Swimming, basketball, easy tennis/racquetball, easy throwing
 - ii. Initiate in sagittal/scapular plane
 - iii. Avoid pain increases with this motion
 - iv. Avoid significant thoracic extension substitutions
 - v. Initiate such activities first in the clinic, with supervision
 - e. Golf-5-6 months dependent upon:
 - i. Symptoms (pain frequency and intensity)
 - ii. Ability to tolerate prolonged dependency
 - iii. Ability to move arm in multiplanar, overhead motions
 - iv. No significant, unnecessary thoracic substitutions.
 1. encourage the following
 - a. Backwards golf (putting, chipping, short irons, progressing from 50-90% swings)
 - b. Avoid heavy grass or possibilities for increased ground contact.
 - c. Warm up properly with stretching
5. Post-operative equipment guidelines
 - a. Sling with abduction pillow at all times (includes night) except bathing and exercises for 4 weeks
 - i. Sling time may be decreased to 2 weeks per physician expectations in cases where lesser tuberosity osteotomy is performed to reattach subscapularis providing bone to bone fixation rather than soft tissue fixation
 - ii. If in doubt clarify sling expectations with physician/physician preferences

- b. Polar Care as prescribed
- c. CPM as prescribed
- 6. Rehabilitation
 - a. **Phase I** (0-2 weeks) *Protective ROM*
 - i. Goal: Protect the subscapularis and decrease tissue reactivity. Maintain joint integrity. Reduce pain.
 - ii. RX:
 1. Inspect incision sites for any significant drainage, odors, or discoloration that would necessitate MD contact.
 2. Hand/finger/elbow AROM exercises
 3. Scapular setting-without pain increases.
 4. Shoulder PROM (initiate in plane of the scapula and progress based on tissue tolerance)
 5. Grade I-II mobilizations-avoid pain, guarding.
 6. Postural education-initiate for brief periods, emphasize less kyphosis.
 7. Encourage trapezius/levator stretches in cervical region if needed.
 8. AAROM exercises (flex to 90, ER, Shrugs, table slides with contralateral assistance. (must first demonstrate safety and competence in clinic)
 9. Incorporate “core strengthening” as appropriate within framework of rehab.
 - iii. **Limitations/ Precautions**
 1. **Sling use at all times**
 2. **Sleep in recliner until MD clears for bed use.**
 3. **No AROM (no lifting or reaching back)**
 4. **No resisted or active IR**
 5. **No PROM for ER greater than 30 degrees**
 6. **No activities creating vibrational stress (running, jumping, horseback riding etc.)**
 - iv. Rx/Clinical Expectations
 1. Reduction in guarding with PROM
 2. Achieves at least 90 degrees flexion PROM
 3. Achieves at least 90 degrees abduction PROM
 4. Achieves at most 30 degrees ER PROM (plane of scapula)
 5. Achieves at least 40 degrees IR PROM (plane of scapula at 30 degrees of Abduction)
 - b. **Phase II** (3-4 weeks) *Protective PROM and AAROM- “gravity reduced”*
 - i. Goal: Protect subscap, increase PROM and decrease tissue reactivity. Reduce pain.
 - ii. RX:
 1. AAROM flexion/scaption (if patient demonstrates independent competence)
 2. Verbal and tactile queing for proper performance of home program.

3. Scapular exercises (no resistance)
4. Continue PROM (within restrictions)
5. Grade I-III mobilizations
6. Start elbow strengthening (while minimizing stress on shoulder)
7. Initiate upper extremity progressive weight bearing in an upright position with hands in “downstairs” position (avoid pain and encourage proper long axis closed chain mechanics)
8. Encourage trapezius/levator stretches in cervical region if needed.
9. Isometrics (submax/ subpain) Avoid IR.
10. Gentle soft tissue massage for alleviation of muscle spasm/fibrosis.
11. Incorporate “core strengthening” as appropriate within framework of rehab.

iii. Limitations/ Precautions

1. **Sling use at all times**
2. **Sleep in recliner**
3. **No activities creating vibrational stress (running, jumping, horseback riding etc.)**
4. **No AROM (no lifting or reaching back)**
5. **No resisted or active IR**
6. **No PROM for ER greater than 30 degrees**

iv. Rx/Clinical Expectations

1. No guarding with PROM.
2. Tolerates AAROM, isometric program
3. Achieves at least 140 degrees flexion PROM
4. Achieves at least 120 degrees abduction PROM
5. Achieves at most 30 degrees ER PROM (plane of scapula)
6. Achieves at least 50 degrees IR PROM (plane of scapula at 30 degrees of abduction)

c. Phase III (5-6 weeks) Active ROM

- i. Goal: Protect subscapularis repair, reduce pain, increase AAROM, increase to or maintain full PROM.
- ii. RX:
 1. Continue PROM and AAROM techniques
 2. Continue scapular strengthening techniques
 3. Continue isom. with gradual increase in force (add IR-submax/non-painful)
 4. Isotonic exercises for RTC (except subscap)-avoid substitutions with arthroplasty.
 5. Begin “gravity reduced” AROM, then progress to seated/standing positions (with elbow flexed initially to reduce lever arm)
 6. Grade I-IV mobilizations

7. Encourage trapezius/levator stretches in cervical region if needed.
8. Progress, upper extremity progressive weight bearing in an upright position with hands in “downstairs” position; progress complexity (follow proprioception principles)
9. Incorporate “core strengthening” as appropriate within framework of rehab.
10. Postural education.

iii. Limitations/ Precautions

1. **No resisted or active IR**
2. **No PROM for ER greater than 30 degrees**
3. **Activities which create large “vibrational stresses”**
4. **Avoid shoulder level and overhead activity.**

iv. RX/Clinical Expectations

1. Achieves full flexion PROM
2. No guarding with PROM
3. Achieves full abduction PROM
4. Achieves at most 30 degrees of ER PROM (plane of scapula)
5. Achieves symmetrical full IR PROM (plane of scapula at 30 degrees of abduction)
6. Able to actively elevate shoulder against gravity with good mechanics to 100 degrees (citation)

d. Phase IV (7-14 weeks) *Strengthening*

- i. Goal: Functional AROM and scapulohumeral rhythm, neuromuscular control.
- ii. RX:
 1. Isotonic rotator cuff exercises to initiate IR (no substitution or hiking) – (remember probable supra/infraspinatus deficit with reverse ball and socket procedures).
 2. Substitute deltoid strengthening with reverse ball and socket procedure.
 3. Scapular resistance may require gravity reduced positions initially.
 4. Initiate closed chain work at shoulder height (follow proprioception principles)
 5. Initiate sustained stretching
 6. Encourage trapezius/levator stretches in cervical region if needed.
 7. Initiate return of ER PROM as tolerated-begin in the scapular plane.
 8. Progress ER PROM >30 degrees (continue capsular mobilizations as appropriate)
 9. Controlled bicep/tricep strengthening, while minimizing stress on shoulder.
 10. Cervical stabilization

11. Incorporate “core strengthening” as appropriate within framework of rehab.
12. Continued postural education

iii. Limitations/Precautions

- 1. Exercise and functional activities that stress anterior capsule and surrounding tissues (no combined ER and abduction beyond 80 degrees of abduction)**
- 2. No activities outside the safe zone**
- 3. No Activities which create large “vibrational stresses”**
- 4. No Activities requiring sustained upper extremity activity (light bulbs, screwdrivers)**
- 5. No Frequent overhead activity**

iv. RX/Clinical Expectations

1. No guarding with PROM
2. Progress ER PROM from 30 degrees to 90 degrees by 12 weeks.
3. Achieves at least 140 degrees flexion supine AROM
4. Achieves at least 120 degrees abduction supine AROM
5. Achieves at least 70 degrees IR AROM (plane of scapula at 30 degrees of abduction in supine)
6. Able to actively elevate shoulder against gravity with proper mechanics to at least 120 degrees.

e. Phase V (12-16 weeks plus) *Advanced strengthening*

- i. Goal: Prepare for overhead activities
- ii. RX:
 1. Continue all previous, necessary techniques
 2. Multi-planar strengthening activities (PNF patterns) and overhead endurance work.
 3. Closed chain/kinesthetic work in overhead positions (proprioception principles)
 4. Advance RTC/deltoid strength as tolerated, avoiding substitutions.
 5. Continue glenohumeral and sustained stretching techniques/mobilizations
 6. Cleared for prone scapular activities if patient tolerates positioning (elbow flexed initially to minimize joint stress)
 7. Body blade activities
 - a. Progressing from:
 - i. “downstairs” to “upstairs”
 - ii. Short arm to elbow extension
 - iii. Sagittal plane to coronal positions
 8. Upper extremity plyometrics (including plyoball) can be initiated
 - a. Progressing from:
 - i. Two hands to one
 - ii. “downstairs” to “upstairs”

- iii. “Safe zone” to multi-planar positions
 - iv. Soft toss to higher speeds
 - v. Light to heavy weight
 - 9. Tailor final stage to particular work or hobby related activities and positions. (MD must clear for any dumbbell resistance workout programs)
 - 10. Incorporate “core strengthening” as appropriate within framework of rehab.
 - 11. Establish a life-long upper extremity fitness program to include appropriate stretching/strengthening activities, with solid education on global posture and joint protection.
- iii. Limitations/Precautions**
 - 1. Exercise and functional activities that stress anterior capsule and surrounding tissues (no combined ER and abduction beyond 80 degrees of abduction)**
- iv. RX/Clinical expectations
 - 1. Understanding of “safe zone” principles with ADL’s
 - 2. Gradually progress strengthening program
 - 3. Gradually return to moderately challenging functional activities.
- v. Late phase clinical expectations (4-6 months)
 - 1. Return to recreational hobbies, gardening, sports, golf, doubles tennis
- vi. Criteria for discharge from skilled therapy
 - 1. Patient able to maintain pain free AROM
 - 2. Maximized functional use of upper extremity
 - 3. Maximized muscular strength, power and endurance in upper extremity.
 - 4. Patient has returned to advanced functional activities.

7. References

- a. Blackburn, Turner A, et al. Rehabilitation after Ligamentous and Labral Surgery of the Shoulder: Guiding Concepts. *Journal of Athletic Training* 2000;35(3):373-381
- b. Reed BV. Wound healing and the use of thermal agents. In: *Thermal Agents in Rehabilitation* 3rd ed. 1996:3-29
- c. Unverzgat, Ross, Hughes; Case Report: Rehabilitation and Outcomes for a Patient Following Implant of a Reverse Delta III Shoulder Prosthesis. *Orthopaedic Physical Therapy Practice* 2006; 18 (2): 32-37
- d. Wilcox, Arslanian, Millett; Rehabilitation Following Total Shoulder Arthroplasty. *Journal of Orthopaedic and Sports Physical Therapy* 2005; 35(12): 821-836