

PHYSICAL THERAPY PROTOCOL

Greater Tuberosity Fracture ORIF

Open or Arthroscopic Reduction and Internal Fixation of Isolated GT Fracture

FOR THE PHYSICAL THERAPIST

Overview and Goals

This protocol governs rehabilitation following open or arthroscopic reduction and internal fixation of an isolated greater tuberosity (GT) fracture of the proximal humerus. Fixation may be achieved by screw-and-washer construct, suture anchor (single- or double-row), or arthroscopic suture-bridge technique — all yield comparable functional outcomes when performed correctly.^{1,2} The protocol below applies regardless of fixation technique.

The greater tuberosity is the insertion site of the supraspinatus and infraspinatus tendons. The rehabilitation challenge is therefore identical in principle to a rotator cuff repair — the construct must be protected from cuff-tension forces (active abduction, active external rotation) during early healing — but with one important added concern. Stiffness is the most common complication after GT ORIF: Yoon et al. reported a 31% rate of postoperative stiffness requiring arthroscopic capsular release in their screw-and-washer cohort, attributable to prolonged immobilization.³ The literature therefore supports a careful balance: enough protection to allow bone-to-bone healing of the tuberosity fragment, but not so much that adhesive capsulitis develops.

The framework is consistent with the 2016 ASSET consensus statement on rotator cuff repair rehabilitation⁴ and the 2025 AAOS Clinical Practice Guideline on Rotator Cuff Injuries,⁵ which together provide the strongest evidence base for cuff-insertion-protective rehabilitation. GT-specific modifications are drawn from Yoon 2018, Huntley 2020, and Liao 2016.^{1,2,3} The approach here uses 4-week sling immobilization with PROM beginning POD 1 — earlier than the historic 6-week immobilization, in line with the modern evidence base supporting early gentle mobilization to prevent stiffness without compromising fixation integrity. A Cochrane review of proximal humerus fractures showed early mobilization within 1 week provides short-term Constant score advantages (MD 6.5 points) at 3 months without increasing complications.⁶

Two principles guide rehabilitation. First, protect the tuberosity fragment and the cuff insertion through sling protection, restricted external rotation ($\leq 30^\circ \times 6$ weeks), and deferred resistance training. The cuff insertion, like any tendon-to-bone construct, is most vulnerable in the first 6–12 weeks; resistance training is deferred until 12 weeks regardless of how strong the patient feels.^{4,5} Second, prevent stiffness by initiating gentle PROM POD 1 and progressing through a deliberate AROM and AAROM program — given the 31% stiffness rate in some series, vigilance for limited motion is more important here than in routine cuff repair rehabilitation.

Progression between phases is criterion-based. Time ranges represent typical windows, not gates. Patients who do not meet criteria should remain in the current phase regardless of elapsed time.

READ BEFORE STARTING — SCOPE OF THIS PROTOCOL

This protocol applies to isolated greater tuberosity fractures treated with ORIF.

- If the fracture pattern includes **multi-part proximal humerus involvement** (e.g., 3- or 4-part fracture with surgical neck, lesser tuberosity, or head involvement), use Dr. Roth's Multi-Part Proximal Humerus Fracture ORIF protocol instead, which is more conservative throughout (sling 6 weeks, AROM Week 6 with radiographic confirmation, strengthening Week 8–12).
- If a **concomitant rotator cuff tear** was identified and repaired at the time of ORIF, this

protocol applies — the GT fixation and the cuff repair share the same biological constraints (tendon-to-bone healing, cuff-tension protection).

Rehabilitation Phases

PHASE	SLING	RESTRICTIONS	ROM GOALS	EXERCISES	CRITERIA TO ADVANCE
PHASE 1 Weeks 0–4 <i>Fixation protection & passive motion</i>	- Sling at all times, including at night.^{4,7} - Remove only for prescribed PT, hygiene, and elbow/wrist/hand exercises.	- No active shoulder elevation, abduction, or rotation. - No lifting, pushing, pulling, or reaching with the operative arm. - No support of body weight through the operative arm. - No use of the operative arm to push up from a chair or bed.	- Passive ROM begins POD 1 within pain-free limits:^{3,5} Forward elevation (scapular plane): - Progress 0–120° over Weeks 0–4 ER at 0° abduction: - Progress 0–30° over Weeks 0–4 Internal rotation: - Hand to belt-line as tolerated. No PROM behind the back. No cross-body adduction beyond hand-to-opposite-shoulder. Elbow / wrist / hand: - Full active ROM as tolerated	Pain & edema control: - Cryotherapy, NSAIDs per Dr. Roth's instructions, gentle scar mobilization once incisions healed Passive ROM (PT-led and home): - Pendulum (Codman) — gentle, gravity-assisted - Supine PROM forward elevation with therapist or contralateral-arm assistance - Supine PROM ER with broomstick / wand at 0° abduction - Table slides (gentle, gravity-eliminated) Scapular sets / isometrics: - Scapular retraction and depression isometrics (no shoulder motion) - Postural awareness training Distal extremity: - Elbow, wrist, hand AROM; ball squeezes for grip preservation Avoid: - Active shoulder motion of any kind - Resisted exercises - End-range PROM beyond phase limits - Sling-off ambulation in public spaces (fall risk; reflex arm-out reaction strains fixation)	- Pain controlled at rest and with prescribed PROM - No effusion or inflammation around incision sites - PROM forward elevation ≥ 120° - PROM ER ≥ 30° at 0° abduction - Tolerates sling weaning - Minimum 4 weeks elapsed
PHASE 2 Weeks 4–6 <i>Sling weaning & PROM completion</i>	Wean sling over Weeks 4–5; discontinue entirely by end of Week 5 except for comfort during long days or crowded environments.^{4,7}	- No AROM against gravity. - No resisted exercises. - No lifting more than coffee-cup weight. - External rotation remains restricted to ≤ 30° in scapular plane × 6 weeks.	- Progressive PROM toward full range:⁴ Forward elevation: 120° → 160° ER at 0° abduction: 30° (do not exceed until Week 6) ER at 90° abduction: - Not yet Internal rotation: - Hand to lumbar spine Cross-body adduction: - Progress slowly AAROM introduced: - Pulley, table slides, wand-assisted forward elevation — smooth, scapular-controlled motion without compensation	PROM and AAROM: - Continue all Phase 1 PROM with progressive range - Pulley exercises for forward elevation and abduction - Wand-assisted forward elevation Scapular strengthening (low-load): - Scapular retraction with light resistance band - Shoulder shrugs (low load) - Postural strengthening Manual therapy: - Gentle joint mobilization (Grade I–II) and soft-tissue mobilization to scapular / periscapular musculature. Aggressive glenohumeral mobilization at end-range remains contraindicated until fracture union (typically 12 weeks). Aquatic therapy: - Once incisions fully healed (~Week 4–5), pool-based PROM and AAROM offload the construct while supporting motion recovery	- Sling discontinued without arm guarding - Full or near-full pain-free PROM in flexion / IR / cross-body adduction - PROM ER ≥ 30° at 0° abduction - Pain ≤ 2/10 with all prescribed exercises - Tolerates AAROM without compensatory scapular elevation - Minimum 6 weeks elapsed

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PHASE	SLING	RESTRICTIONS	ROM GOALS	EXERCISES	CRITERIA TO ADVANCE
PHASE 3 Weeks 6–12 <i>Active motion, ER progression on & scapular control</i>	None.	- No resisted rotator cuff exercises until Week 12.^{5,8} - No lifting more than 2–3 lbs with the operative arm. - No overhead lifting or push/pull through resistance. - Radiographic confirmation of fracture union typically obtained by end of Phase 3 prior to introducing resistance.	- Full active ROM in all planes. Goal: full, symmetric, pain-free AROM by Week 12.^{4,5} ER progression after Week 6: - PROM ER at 0° abduction: progress beyond 30° toward full - PROM ER at 90° abduction: introduce gradually starting Week 6, target 60° by end of phase - AROM ER permitted starting Week 6 (gravity-eliminated → against gravity) Internal rotation: - Hand behind back — progress to mid-thoracic level	AROM progression (gravity-eliminated → against gravity): - Side-lying supported active elevation^{4,5} - Supine washcloth press-up, supine press-up - Reclined wedge press-up — progress incline - Standing AROM forward elevation — initially no weight, progress to short lever (elbow bent) - Wall walks / wall slides - Towel slide on counter / horizontal dusting - Supine elastic-band forward elevation (very light, no rotator cuff resistance) - Aquatic AROM at slow speeds Scapular strengthening: - Progressive scapular retraction / protraction with band - Rows (low load) - Prone Y, T, W (gravity only initially) - Wall push-up plus Periscapular & trunk: - Postural strengthening - Core stabilization - Continue PROM at full range to maintain motion gains Stiffness vigilance: - If AROM lags PROM by more than 20° in any plane at the end of Phase 3, contact Dr. Roth's office for re-evaluation	- Full or near-full pain-free AROM - No scapular hike with active forward elevation - Smooth scapulohumeral rhythm - Pain ≤ 1/10 with prescribed AROM - Radiographic confirmation of fracture union - Minimum 12 weeks elapsed before resistance
PHASE 4 Weeks 12–24+ <i>Strengthening & return to function</i>	None.	- Resistance progresses gradually. - Avoid aggressive overhead loading or sport-specific demands until appropriate criteria are met.	Full pain-free AROM.	RTC isometric → isotonic progression: - Submaximal isometrics in neutral (ER, IR, abduction, flexion) — Weeks 12–14^{4,5} - Light theraband ER and IR at 0° abduction (yellow → red → green) - Side-lying dumbbell ER (start 1–2 lbs, progress) - Standing dumbbell ER in scapular plane - Elastic-band forward punch and forward elevation Scapular & periscapular strengthening: - Progressive rows (high, middle, low) - Prone Y, T, W with light dumbbells - Reverse flies, scapular pull-downs - Push-up plus progressions Compound movements (later Phase 4): - Seated military press (light load, late phase) - Lat pull-downs (front, not behind neck) - Bicep / tricep strengthening - Deltoid strengthening Functional:	<i>See Return-to-Activity Criteria section below.</i> Most patients return to weight training, golf, and recreation by ~6 months; throwing sports, tennis, and overhead athletics typically deferred to ~8 months. Full functional recovery averages ~8 months.⁹

PHASE	SLING	RESTRICTIONS	ROM GOALS	EXERCISES	CRITERIA TO ADVANCE
				• Sport- or job-specific training at progressive intensity • Functional progression for manual labor, recreational, or athletic demands • Establish home maintenance program for ongoing strength and ROM gains beyond formal PT	

Procedure-Specific Considerations

STIFFNESS IS THE MOST COMMON COMPLICATION — PREVENT IT EARLY

Yoon et al. (2018) reported a 31% rate of postoperative stiffness requiring arthroscopic capsular release in their cohort of GT fractures fixed with screw-and-washer construct, attributing it to prolonged immobilization.³ Across the broader GT ORIF literature, stiffness is consistently the most frequent complication.^{1,2} This is the single most important point of difference between GT ORIF rehabilitation and routine rotator cuff repair rehabilitation: the population is generally younger, the bone-on-bone construct is biomechanically sound earlier than a tendon-to-bone construct, and the cost of being too cautious (a second operation for capsular release) is higher than the cost of starting PROM appropriately on POD 1.

Practical implications for the PT:

- Initiate gentle PROM POD 1 — do not wait. Pendulum and supine PROM forward elevation are safe within phase limits even on the first post-op day.
- Do not extend sling immobilization beyond 4 weeks. A patient well-controlled in pain and tolerating PROM should wean on schedule.
- Track the AROM–PROM gap at every Phase 3 visit. A persistent gap > 20° in any plane at the end of Phase 3 is a stiffness warning sign and warrants re-evaluation by Dr. Roth.
- If end-of-Phase 2 PROM (forward elevation, ER, IR) does not approach the criteria for Phase 3 advancement, escalate manual therapy and contact Dr. Roth's office.

External Rotation Is the Protected Motion Through Week 6

The GT is the insertion site of the supraspinatus and infraspinatus. Active external rotation generates direct tension on the cuff insertion at the GT and risks displacing the fragment or compromising the fixation construct.^{1,4} ER is therefore restricted to ≤ 30° at 0° abduction during Weeks 0–6, with no AROM ER and no ER at 90° abduction during this window. From Week 6 onward, ER progresses gradually as the construct matures. Patients who report new-onset anterior shoulder pain with ER progression in Phase 3 should be re-evaluated to rule out fixation failure or fragment displacement.

No Resisted Rotator Cuff Exercises Before Week 12 — Confirm Union First

Tendon-to-bone healing at the GT footprint is biologically incomplete before 12 weeks regardless of fixation method.^{5,8} Resisted RTC strengthening before this window can compromise the construct and is one of the most common avoidable causes of revision surgery. Bone union is typically achieved within 3 months across fixation methods; this is also the point at which radiographic confirmation should be obtained before introducing resistance.^{1,3} Scapular and periscapular strengthening can begin earlier (Phase 2–3), but isolated rotator cuff resistance — internal rotation, external rotation, abduction with weight or band — is deferred to Week 12.

Scapular Mechanics Matter More Than Raw Strength

GT ORIF patients commonly compensate with scapular hike (shoulder-shrug substitution) when active forward elevation is introduced. This pattern is not benign — it indicates poor periscapular control and predicts higher rates of persistent dysfunction. Smooth, scapular-controlled motion without elevation compensation is a better marker of readiness to advance than raw degrees of motion. Prioritize scapular awareness training and periscapular strengthening as foundational throughout Phases 2 and 3.⁴

Return-to-Activity Criteria

Return to activity after greater tuberosity ORIF is criterion-based, with progression matched to the demands of the patient's target activity. The criteria below should be met before clearance to the corresponding activity tier. Full functional recovery averages approximately 8 months across the GT ORIF literature.⁹

Activity Tier	Criteria & Timing
Activities of daily living (ADLs)	Full pain-free PROM and symptom-free AROM. Radiographic union confirmed. Typically by Week 12–16. Lifting up to 5 lbs at this point.
Light recreational (walking, golf, cycling, non-overhead swim)	Pain-free AROM, RTC isotonic strength approaching the contralateral side, no scapular compensation. Typically ~5–6 months.
Weight training, manual labor, basketball, skiing	RTC strength symmetry approaching 90% on isokinetic or HHD testing, pain-free overhead motion, no apprehension. Typically ~6 months.
Throwing sports, tennis, volleyball, overhead swim	Full strength symmetry, pain-free overhead motion, sport-specific drill progression complete. Typically ~8 months; throwing athletes may require longer. Clearance by Dr. Roth required.
Strength & ROM benchmarks	RTC strength LSI $\geq$ 90% on isokinetic or HHD. Full pain-free AROM matching the contralateral side. No apprehension or pain with overhead positions.

REALISTIC EXPECTATIONS FOR RECOVERY

Even with successful fixation and rehab, full functional recovery after GT ORIF averages ~8 months, and strength gains often continue through 12–18 months post-op.⁹ Patients should be counseled that this is a normal trajectory and not a sign of impaired healing. Persistent pain, weakness, apprehension, or stiffness after 6 months should prompt re-evaluation by Dr. Roth.

References

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Glossary

AAOS — American Academy of Orthopaedic Surgeons.

AAROM — Active-assisted range of motion; the patient initiates motion with assistance from gravity, pulley, wand, or therapist.

ADL — Activities of daily living.

AROM — Active range of motion; the patient moves the joint independently against gravity.

ASSET — American Society of Shoulder and Elbow Therapists; published the 2016 consensus on RTC repair rehabilitation.

ER — External rotation.

GT — Greater tuberosity; the insertion site of the supraspinatus and infraspinatus tendons on the proximal humerus.

HHD — Hand-held dynamometer; a portable device for objective strength measurement.

IR — Internal rotation.

LSI — Limb Symmetry Index; the operative limb's strength as a percentage of the contralateral limb (operative ÷ contralateral × 100).

ORIF — Open reduction and internal fixation.

POD — Postoperative day.

PROM — Passive range of motion; the therapist or contralateral limb moves the joint while the patient stays relaxed.

ROM — Range of motion.

RTC — Rotator cuff.



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Dr. Roth completed his orthopaedic surgery residency at Harvard Medical School and his sports medicine fellowship at the Kerlan-Jobe Orthopaedic Clinic in Los Angeles. In practice since 2013, he specializes in advanced arthroscopic techniques and sports medicine procedures, and sees patients at Palo Alto Medical Foundation's Palo Alto and Dublin offices. He welcomes calls from physical therapists about his patients or this protocol.

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