

PHYSICAL THERAPY PROTOCOL

## Distal Biceps Tendon Repair

*Acute Rupture · Single-Incision Anterior Repair with Suture-Bridge Footprint Fixation (SPOC Technique)*

FOR THE PHYSICAL THERAPIST

### Overview and Goals

This protocol governs rehabilitation following repair of an acute distal biceps tendon rupture through a single-incision anterior approach with suture-bridge footprint fixation (the SPOC technique). The repair reattaches the tendon to its anatomic footprint on the radial tuberosity, restoring the biceps as the primary supinator of the forearm and a strong flexor of the elbow.

The pacing of this protocol is deliberately modern. A Level I randomized trial demonstrated that early mobilization after rigid distal biceps fixation — self-weaning from the sling with active motion as tolerated — produced better patient-reported outcomes (QuickDASH) and better passive supination than six weeks of immobilization, with no difference in rerupture (one per group, ~2% overall).<sup>1</sup> A systematic review and meta-analysis of 1,114 patients likewise found no clinically significant differences in failure, complications, ROM, or outcomes between early and delayed mobilization.<sup>2</sup> Across 42 studies of return to sport, protocols using  $\leq 2$  weeks of immobilization, early active ROM, and strengthening initiated by 10 weeks trended toward higher return-to-sport rates.<sup>3</sup> The suture-bridge footprint construct provides strong initial fixation that supports this approach.

Two principles guide rehabilitation. First, protect the repair from the loads that stress it directly: resisted elbow flexion, resisted forearm supination, and passive stretch into combined elbow extension with forearm pronation. These are restricted on a staged schedule — a 1-lb lifting limit for the first 6 weeks, no resisted biceps work until Week 6, and no eccentric biceps loading until Week 10.<sup>4,5</sup> Second, move early within those limits: motion begins in the first days after surgery inside a protected extension arc, because early motion is what the evidence rewards and terminal-extension stiffness is the most common avoidable problem.<sup>1,2,3</sup>

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 & KEY PRECAUTIONS

This protocol assumes a single-incision anterior repair with suture-bridge footprint fixation. If a **double-incision technique** or a different fixation construct was used, or the repair was **chronic / graft-reconstructed**, confirm the plan with Dr. Roth — pacing may differ.

- **1-lb limit × 6 weeks.** Nothing heavier than a coffee cup in the operative hand for the first 6 weeks.
- **No resisted elbow flexion or forearm supination until Week 6** — no curls, no twisting open jars or doorknobs against resistance, no carrying.
- **No passive stretch into elbow extension with the forearm pronated** during the early phases — this position maximally tensions the repair.
- **Watch the nerves.** Numbness or tingling of the anterolateral forearm (LABCN) is the most common issue after the single-incision approach and usually resolves; weakness of finger or wrist extension (PIN) warrants a call to Dr. Roth's office. Document sensory and motor status at each visit.

## Rehabilitation Phases

| PHASE                                                               | SPLINT / SLING                                                                                                                                                                                                                                     | RESTRICTIONS                                                                                                                                                                                                                                                                                                                                                       | ROM GOALS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | EXERCISES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CRITERIA TO ADVANCE                                                                                                                                                                                                                           |
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| <b>PHASE 1</b><br>Weeks 0–2<br><i>Protection &amp; early motion</i> | <ul style="list-style-type: none"> <li>Posterior splint at 90° (forearm neutral to slight supination) for ~1 week.<sup>4</sup></li> <li>Then sling for comfort and protection — self-wean as comfort allows over Weeks 2–4.<sup>1</sup></li> </ul> | <ul style="list-style-type: none"> <li>No active elbow extension beyond 30° from full (extension block at ~30°).</li> <li>1-lb weight limit.<sup>5</sup></li> <li>No resisted elbow flexion or forearm supination.</li> <li>No lifting, carrying, or weight-bearing through the operative arm.</li> <li>No passive extension with the forearm pronated.</li> </ul> | <ul style="list-style-type: none"> <li>Motion begins in the first days after surgery, within the protected arc:<sup>1,5</sup></li> <li><b>Elbow:</b> <ul style="list-style-type: none"> <li>Active-assisted flexion/extension, 30–130°</li> </ul> </li> <li><b>Forearm:</b> <ul style="list-style-type: none"> <li>Gentle active and passive pronation/supination with the elbow at 90°, as tolerated</li> </ul> </li> <li><b>Wrist / hand / shoulder:</b> <ul style="list-style-type: none"> <li>Full active ROM; pendulums and gentle shoulder AROM to prevent stiffness</li> </ul> </li> </ul> | <p><b>Pain &amp; edema control:</b></p> <ul style="list-style-type: none"> <li>Cryotherapy, elevation, retrograde massage</li> <li>Scar management once the incision is healed</li> </ul> <p><b>Motion (within the arc):</b></p> <ul style="list-style-type: none"> <li>AAROM elbow flexion/extension (30–130°)</li> <li>Dowel-assisted forearm rotation at 90° elbow flexion</li> <li>Wrist and hand AROM; grip / ball squeezes</li> </ul> <p><b>Proximal:</b></p> <ul style="list-style-type: none"> <li>Shoulder pendulums and AROM</li> <li>Scapular retraction sets</li> </ul> <p><b>Avoid:</b></p> <ul style="list-style-type: none"> <li>Any resisted biceps activity</li> <li>Terminal extension past the 30° block</li> <li>Leaning or pushing up through the operative arm</li> </ul>                                                                                                                                        | <ul style="list-style-type: none"> <li>Pain controlled</li> <li>Incision healed without concern</li> <li>Flexion ≥ 130°; extension to the 30° block</li> <li>No progressive LABCN or PIN symptoms</li> <li>Minimum 2 weeks elapsed</li> </ul> |
| <b>PHASE 2</b><br>Weeks 2–6<br><i>Progressive motion to full</i>    | <ul style="list-style-type: none"> <li>Sling self-weaned over Weeks 2–4; out of the sling by Week 4.<sup>1</sup></li> </ul>                                                                                                                        | <ul style="list-style-type: none"> <li>1-lb weight limit continues through Week 6.<sup>2</sup></li> <li>No resisted biceps contraction — no curls, no resisted supination.</li> <li>No passive elbow extension with the forearm pronated.</li> </ul>                                                                                                               | <ul style="list-style-type: none"> <li>Advance the extension block ~10° per week — full active extension by Weeks 5–6.<sup>4,5</sup></li> <li><b>Flexion:</b> <ul style="list-style-type: none"> <li>Active-assisted → active, to full</li> </ul> </li> <li><b>Forearm:</b> <ul style="list-style-type: none"> <li>Active pronation/supination to full</li> </ul> </li> <li><b>Goal:</b> <ul style="list-style-type: none"> <li>Full active ROM in all planes by Week 6</li> </ul> </li> </ul>                                                                                                    | <p><b>Motion:</b></p> <ul style="list-style-type: none"> <li>AROM elbow flexion/extension through the advancing arc</li> <li>Dowel-rod supination/pronation (unweighted)</li> <li>Gentle low-load, long-duration extension stretching late in phase if terminal extension lags — forearm supinated, never pronated</li> </ul> <p><b>Strength foundations (repair-safe):</b></p> <ul style="list-style-type: none"> <li>Grip strengthening; isometric wrist flexion/extension</li> <li>Scapular stabilization — rows omitted; retraction sets, serratus activation, postural work</li> </ul> <p><b>Function:</b></p> <ul style="list-style-type: none"> <li>Light ADLs with the operative arm — eating, typing, dressing — within the 1-lb limit</li> </ul> <p><b>Avoid:</b></p> <ul style="list-style-type: none"> <li>Resisted flexion or supination in any form</li> <li>Carrying bags, opening heavy doors, jar-twisting</li> </ul> | <ul style="list-style-type: none"> <li>Full or near-full active extension (0°) and flexion</li> <li>Full forearm rotation</li> <li>Pain ≤ 2/10 with all prescribed activity</li> <li>Minimum 6 weeks elapsed</li> </ul>                       |
| <b>PHASE 3</b><br>Weeks 6–10<br><i>Early</i>                        | <ul style="list-style-type: none"> <li>None.</li> </ul>                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>No eccentric biceps loading until Week 10.<sup>3,6</sup></li> </ul>                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>Full active ROM in all planes by Week 8.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p><b>Isometrics (from Week 6):</b></p> <ul style="list-style-type: none"> <li>Submaximal, pain-free biceps isometrics at multiple angles<sup>3,4</sup></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>Full, pain-free AROM</li> <li>Tolerates 3–5 lb</li> </ul>                                                                                                                                              |

| PHASE                                                                                  | SPLINT / SLING                                          | RESTRICTIONS                                                                                                                                                                                                                                                                 | ROM GOALS                                                                                                                                                                    | EXERCISES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CRITERIA TO ADVANCE                                                                                                                                                                                                                     |
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| <i>strengthening</i>                                                                   |                                                         | <ul style="list-style-type: none"> <li>No lifting more than 5 lb.</li> <li>Avoid loaded combined terminal extension + pronation.</li> </ul>                                                                                                                                  | <b>Stretching:</b> <ul style="list-style-type: none"> <li>Progressive terminal-extension stretching if any residual deficit — escalate if not resolving by Week 8</li> </ul> | <ul style="list-style-type: none"> <li>Isometric forearm supination and pronation</li> </ul> <b>Light isotonic:</b> <ul style="list-style-type: none"> <li>Elbow flexion 1–2 lb, progressing to 3–5 lb by Week 10</li> <li>Forearm supination/pronation with a dowel or light dumbbell</li> <li>Wrist curls and reverse wrist curls, light resistance</li> </ul> <b>Proximal:</b> <ul style="list-style-type: none"> <li>Scapular and rotator cuff strengthening — rows, side-lying ER</li> </ul> <b>Conditioning:</b> <ul style="list-style-type: none"> <li>Stationary bike; walking program</li> </ul>                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>isotonic flexion without pain</li> <li>No anterior elbow pain with isometric supination</li> <li>Minimum 10 weeks elapsed</li> </ul>                                                             |
| <b>PHASE 4</b><br>Weeks 10–16<br><i>Advanced strengthening &amp; eccentric loading</i> | <ul style="list-style-type: none"> <li>None.</li> </ul> | <ul style="list-style-type: none"> <li>Unrestricted lifting is generally permitted from Week 12.<sup>4</sup></li> <li>Progress loads gradually — no maximal-effort lifts yet.</li> <li>No sport-specific throwing or contact demands until Phase 5.</li> </ul>               | Full, symmetric, pain-free ROM maintained.                                                                                                                                   | <b>Progressive resistance:</b> <ul style="list-style-type: none"> <li>Isotonic biceps curls — advance ~1–2 lb per week as tolerated</li> <li>Eccentric biceps curls (controlled lowering) from Week 10<sup>3,6</sup></li> <li>Resisted supination/pronation with progressive load</li> <li>Hammer curls, reverse curls</li> </ul> <b>Graded high-load biceps exercises (late phase):</b> <ul style="list-style-type: none"> <li>Supinated-grip lat pull-downs, incline curls, pull-up progressions — moderate-to-high biceps demand, introduced in that order<sup>7</sup></li> </ul> <b>Closed chain / endurance:</b> <ul style="list-style-type: none"> <li>Push-ups on knees → full push-ups</li> <li>Upper-body ergometer</li> </ul> <b>Function:</b> <ul style="list-style-type: none"> <li>Begin occupation- or sport-specific movement patterns</li> </ul> | <ul style="list-style-type: none"> <li>Flexion and supination strength ≥ 85% of the contralateral side</li> <li>Pain-free eccentric loading</li> <li>No apprehension with functional tasks</li> <li>Minimum 16 weeks elapsed</li> </ul> |
| <b>PHASE 5</b><br>Months 4–6+<br><i>Return to sport / full activity</i>                | <ul style="list-style-type: none"> <li>None.</li> </ul> | <ul style="list-style-type: none"> <li>Heavy manual labor and maximal lifting resumed progressively — full unrestricted duties typically by months 5–6.</li> <li>Contact and throwing sport deferred until criteria are met and Dr. Roth has cleared the athlete.</li> </ul> | Full, symmetric ROM — flexion ~140°, full extension, rotation ~75–80° each way. <sup>5</sup>                                                                                 | <b>Sport-specific progression:</b> <ul style="list-style-type: none"> <li>Sport-specific drills from ~month 4</li> <li>Weightlifting: graded return toward preinjury loads</li> <li>Contact / throwing: progressive drills → full return at months 5–6</li> </ul> <b>Maintenance:</b> <ul style="list-style-type: none"> <li>Continue biceps, forearm, and scapular program 2–3×/week</li> <li>Home maintenance program established</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                   | <i>See Return-to-Activity Criteria section below.</i> <ul style="list-style-type: none"> <li>Return to sport averages ~5.4–6.3 months; 91.5% return to sport and 85.2% to preinjury level.<sup>3,6,8</sup></li> </ul>                   |

## Procedure-Specific Considerations

### Why This Protocol Moves Early

Historically, distal biceps repairs were immobilized for six weeks. The current evidence base does not support that caution when fixation is rigid: the Bergman Level I trial randomized cortical-button repairs to early mobilization versus six weeks of immobilization and found the early-motion group did

better on QuickDASH and passive supination with identical rerupture rates,<sup>1</sup> and pooled data across 1,114 patients show no outcome penalty for early motion.<sup>2</sup> The suture-bridge footprint construct used here compresses the tendon to a broad anatomic footprint and provides strong initial fixation — the mechanical basis for trusting early protected motion. Early motion is not unrestricted motion: the staged extension block, the 1-lb limit, and the resisted-loading restrictions are what make it safe.

### **The Protected Loads — Resisted Flexion, Resisted Supination, and Extension-in-Pronation**

The biceps flexes the elbow and supinates the forearm, so resisted versions of those motions pull directly on the repair; they are deferred until Week 6 and loaded progressively thereafter. The stretch position that maximally tensions the repair is combined elbow extension with forearm pronation — avoid passive stretching into that position through the early phases, and when terminal-extension stretching is needed, perform it with the forearm supinated.<sup>4,5</sup> Eccentric biceps loading (the controlled lowering phase of a curl) generates the highest tendon loads and waits until Week 10.<sup>3,6</sup>

### **Nerve Monitoring — LABCN First, PIN Always**

Lateral antebrachial cutaneous nerve (LABCN) irritation is the most common complication of the single-incision anterior approach — reported in up to roughly a quarter of single-incision cases — and presents as numbness or tingling over the anterolateral forearm. The large majority resolve spontaneously; document sensory status at each visit and reassure the patient while it recovers.<sup>9,10</sup> Posterior interosseous nerve (PIN) palsy is far less common (1.6–3.4%) but more important: new weakness of finger or wrist extension should prompt communication with Dr. Roth's office the same day. Most PIN palsies also resolve with expectant management, but they need to be identified and followed.<sup>9,10</sup>

### **Stiffness — Terminal Extension Is the Motion to Watch**

Loss of terminal elbow extension is the most common motion problem after this repair. The staged extension block means a small early deficit is by design — but extension should track the weaning schedule (~10° per week) and reach full by Weeks 5–6. A terminal-extension deficit that is not resolving by Week 8 warrants escalated low-load, long-duration stretching (forearm supinated) and communication with Dr. Roth's office rather than waiting.

### **Heterotopic Ossification — Brief Note**

Heterotopic ossification is predominantly a complication of the double-incision technique (7.6% vs 2.7% single-incision) and is uncommon with the single-incision repair this protocol assumes.<sup>9,11</sup> Progressive painful loss of motion — particularly rotation — accompanied by a firm end-feel should nonetheless prompt re-evaluation.

#### **COUNSEL ON THE RESIDUAL SUPINATION DEFICIT**

Outcomes after distal biceps repair are consistently excellent — mean DASH scores near 3.6 and Mayo Elbow Performance Scores of 96–97 — and flexion strength recovery is near-complete. Supination is the honest caveat: a mild residual supination strength deficit of roughly 9–11% versus the other arm is common even after full rehabilitation, and weightlifting athletes in particular should hear this early so a strong result is not misread as a failed one.<sup>5,8,13</sup> Return to sport is the norm: 91.5% return, 85.2% at preinjury level or higher, at a mean of 6.3 months.<sup>3</sup>

### **Return-to-Activity Criteria**

Return to activity is criterion-based, matched to the demands of the target activity. Return to sport averages approximately 5.4–6.3 months across studies, with heavy manual labor resuming progressively from month 3 and reaching full unrestricted duties by months 5–6.<sup>3,6,8</sup>

| Activity Tier                                         | Criteria & Timing                                                                                                                                                                                                                            |
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| <b>Activities of daily living (ADLs)</b>              | Light ADLs (eating, typing, dressing) within the 1-lb limit from Phase 2. Full ADLs as the lifting limit advances after Week 6; unrestricted household activity typically by Week 12.                                                        |
| <b>Light recreational (walking, jogging, cycling)</b> | Full pain-free ROM, out of the sling, no arm-loading demands. Typically ~6–8 weeks (avoid falls onto the arm).                                                                                                                               |
| <b>Weight training</b>                                | Unrestricted lifting generally from Week 12, progressed gradually toward preinjury loads; eccentric and high-demand biceps exercises (supinated pull-downs, incline curls, pull-ups) staged in Phase 4. Maximal lifts typically ~4–6 months. |
| <b>Heavy manual labor</b>                             | Gradual return from ~month 3; full unrestricted duties typically by months 5–6, gated on strength ≥ 85–90% and pain-free occupational tasks.                                                                                                 |
| <b>Sport (incl. contact / throwing)</b>               | Full symmetric ROM; flexion and supination strength ≥ 85–90% of the contralateral side; pain-free sport-specific progression complete. Typically ~5–6 months. Clearance by Dr. Roth required.                                                |
| <b>Strength &amp; ROM benchmarks</b>                  | Flexion ~140°, full extension, rotation ~75–80° each way, symmetric to the contralateral side. Flexion and supination strength ≥ 85–90% (expect a possible residual 9–11% supination deficit — counsel, don't chase it).                     |

#### INDIVIDUALIZE TO THE OPERATIVE FINDINGS

There is no universally standardized rehabilitation protocol for distal biceps repair, and pacing should reflect the technique, fixation, tissue quality, and chronicity documented in the operative report. This protocol assumes an acute, single-incision suture-bridge repair with rigid fixation; a chronic reconstruction, graft augmentation, or tenuous tissue warrants a slower course. When Dr. Roth's written instruction differs from the ranges above, follow his instruction.<sup>1,2</sup>

## References

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## Glossary

**AAROM / AROM / PROM** — Active-assisted / active / passive range of motion.

**DASH / QuickDASH** — Disabilities of the Arm, Shoulder and Hand score (and its short form); validated upper-extremity outcome measures — lower is better.

**Eccentric loading** — Loading a muscle-tendon unit as it lengthens (the controlled lowering phase of a curl); the highest-tension biceps load, deferred until Week 10.

**Extension block** — A staged limit on how far the elbow may straighten (starting ~30° from full), advanced ~10° per week to protect the repair while motion is restored.

**HO** — Heterotopic ossification; abnormal bone formation in soft tissue — predominantly a double-incision complication, uncommon with single-incision repair.

**LABCN** — Lateral antebrachial cutaneous nerve; supplies sensation to the anterolateral forearm. Irritation is the most common complication of the single-incision approach and usually resolves.

**MEPS** — Mayo Elbow Performance Score; a validated elbow outcome measure (0–100, higher is better).

**PIN** — Posterior interosseous nerve; motor branch of the radial nerve. New finger or wrist extension weakness warrants same-day communication with Dr. Roth's office.

**Radial tuberosity** — The bony footprint on the proximal radius where the distal biceps tendon inserts and is reattached.

**SPOC / suture bridge** — The single-incision anterior repair used here: suture-bridge fixation compressing the tendon onto its anatomic footprint, providing strong initial fixation that supports early protected motion.

**Supination / pronation** — Rotating the forearm palm-up (supination — the biceps' primary action) / palm-down (pronation).



### Kevin M. Roth, MD

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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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