CQ HAND + UPPER LIMB
SPECIALIST ORTHOPAEDIC SURGEON

EVIDENCE SUMMARY

Biceps Tenodesis

Biceps Tenodesis — Post-operative Rehabilitation Evidence Summary

Topic scope: the evidence behind post-operative rehabilitation after **isolated biceps tenodesis** (re-anchoring the long head of biceps to the humerus) — fixation methods and their healing implications, when to protect versus load the construct (active elbow flexion and resisted supination), shoulder ROM restrictions, return-to-activity timing, and the failure/complication profile (Popeye deformity, fixation failure). The combined cuff-repair pathway defers to the **rotator-cuff-repair** protocol and is out of scope here.

> *Defining principle of the surgical rehab here: a tenodesis is a healing construct that must be protected — the tendon has been detached from its native anchor and fixed into bone, and that bone–tendon interface needs weeks to heal. Because the biceps bends the elbow and turns the palm up (supination), the early restrictions are unusually centred on the elbow, not the shoulder: active elbow flexion and resisted supination are the loads that pull directly on the fresh tenodesis, so they are deferred while the construct heals. The shoulder itself is generally less restricted — only positions that tension the tendon (external rotation past ~40°, extension/horizontal abduction behind the body) are limited early. This is the inverse of a rotator-cuff or labral repair, where the shoulder is the protected structure.*

A. THE PROCEDURE & WHY THE REHAB IS SHAPED THIS WAY

In a biceps tenodesis the long head of biceps is released from its origin on the superior glenoid/labrum and re-fixed into the proximal humerus, most commonly with an **interference screw**, a **suture anchor**, or a **cortical/unicortical button** (or combinations). The location is either **suprapectoral** (higher, usually all-arthroscopic, in or above the bicipital groove) or **subpectoral** (lower, usually open, below the pectoralis major tendon). Both achieve the same goal — remove the painful intra-articular biceps as a pain generator while preserving the muscle's length-tension relationship to avoid a Popeye deformity and cramping.

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The rehab is built around the **time for the tendon to incorporate into the bone tunnel/socket**. The biceps' two actions — **elbow flexion and forearm supination** — are precisely the movements that load the tenodesis, so resisted/active use of these is staged in last. Shoulder motion is restored earlier because most shoulder positions do not pull hard on the construct.

B. EVIDENCE BY THEME

1. TENODESIS VS TENOTOMY — THE DECISION UPSTREAM OF REHAB

Tenotomy (simply releasing the tendon) and tenodesis give **broadly equivalent pain relief and function**, but tenodesis trades a slightly more demanding recovery for a **lower rate of Popeye deformity and cramping/fatigue**, particularly relevant in younger, leaner and more active patients. A prospective double-blinded RCT and multiple reviews support this trade-off [Castricini RCT; Frost/Hackney review; Slenker review]. *Moderate–strong (RCT + SR).* This is why a tenodesis — and therefore a protected construct needing staged rehab — is chosen in the first place.

2. FIXATION STRENGTH AND WHAT IT PERMITS

Interference screws and suture anchors both provide clinically adequate fixation; biomechanical load-to-failure figures vary between studies and **clinical outcomes do not differ** meaningfully by fixation type [biomechanical cadaver series; clinical comparisons]. The practical point for rehab: the construct is strong at time zero but the **biological bond to bone is what is healing over the first 6–12 weeks** — which is why loaded elbow flexion is deferred regardless of the hardware used. *Moderate (biomechanical + clinical cohorts).*

3. DOES THE REHAB PACE ACTUALLY NEED TO BE SLOW? — THE KEY CONTROVERSY

The traditional protocol protects the elbow for ~6 weeks before active flexion and reserves resisted biceps work for ~10–12 weeks. However, **Mazzocca et al. challenged this**: in 105 open subpectoral tenodeses (dual-fixation button + interference screw) rehabilitated with **immediate, unrestricted motion and no postoperative restrictions**, the failure rate was only **2.2% (2 of 98)** at minimum 2-year follow-up, with excellent ASES/DASH scores. Both failures occurred early (5 and 9 weeks). The conclusion: with a robust dual-fixation construct, **early mobilisation is reasonable and may improve outcomes** [Mazzocca, *JSES* 2018, DOI 10.1016/j.jse.2018.02.061]. A subsequent comparison of early versus delayed active ROM reached similar reassurance [PMID 34458384]. *Moderate (single-arm cohort + comparative).* This protocol nonetheless follows the **more protective published pace** — it is the safer default across mixed fixation methods and does not assume a dual-fixation construct.

4. COMPLICATIONS AND FAILURE RATES — WHAT REHAB IS PROTECTING AGAINST

A review of **1,526 shoulders** found a **low overall complication rate**: persistent anterior shoulder pain ~11–13%, **Popeye deformity ~4.6–4.7%**, with no meaningful difference by fixation type or location; reported **fixation failure/re-rupture is ~0.8%** [Nho/Virk review, DOI 10.1016/j.jse.2018.09.005]. The small early-

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failure window (the Mazzocca failures at 5 and 9 weeks) is exactly the period the protective phases cover. *Moderate (large pooled review).*

5. SUPRAPECTORAL VS SUBPECTORAL — DOES IT CHANGE REHAB?

A systematic review and meta-analysis of arthroscopic suprapectoral versus open subpectoral tenodesis found **comparable clinical outcomes and complication profiles** [DOI 10.1177/2325967120945322]. The rehabilitation pathway is therefore **the same for both techniques** — this protocol covers arthroscopic and open subpectoral alike. *Moderate (SR-MA).*

C. PHASED POST-OP TIMELINE (isolated tenodesis)

Consistent with the synthesis protocol. The hallmark is **protect the elbow** (no active flexion / no resisted supination) while keeping the hand, wrist, scapula and most of the shoulder moving.

Phase	Window	Sling	ROM	Strengthening	Notes
I – Protecting the tenodesis	**Week 0–4**	Yes, incl. at night; wean from ~wk 3	**Passive** elbow flexion/extension + forearm rotation; active hand/wrist; gentle shoulder PROM/AAROM – flexion/scaption to ~90°, **ER to 40°**, IR to ~45°; pendulums	None (biceps stays unloaded)	**No active elbow flexion, no resisted supination**; no shoulder extension / horizontal abduction past neutral; no lifting/carrying. **No driving while in the sling.**
II – Active movement	**Week 4–6**	Off	Progress shoulder AAROM → AROM all planes; **active (unloaded) elbow flexion/extension + supination/ pronation** begins	Submaximal shoulder isometrics	Biceps moving but not working – keep lifting minimal (≤ a cup of tea). Driving once out of sling and able to control the car safely.
III – Strengthening	**Week 6–12**	Off	Maintain full ROM	Cuff + scapular strengthening from wk 6; **resisted biceps curls / resisted supination from ~week 10**	Resisted biceps deliberately last; published protocols introduce it wk 6–10, this protocol uses the protective end. Running/cycling/golf from ~wk 8.
		Off	Full		

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Phase	Window	Sling	ROM	Strengthening	Notes
IV – Return to full activity	**Week 12+**			Progressive load, power, sport-specific	Gym/manual work/ recreational sport ~3–4 months; overhead/ throwing/contact staged over ~4–5 months+.

Branch point – combined cuff repair: if a rotator cuff repair was performed at the same time, the **rotator-cuff-repair** protocol takes priority (sling ~6 weeks, ROM restrictions, slower strengthening, ~5 months total). The surgeon confirms post-operatively which pathway applies.

D. KEY CONTROVERSIES / EVIDENCE QUALITY

1. **How fast is safe?** The strongest single piece of rehab-specific evidence (Mazzocca 2018) suggests **immediate unrestricted motion is safe with a robust dual-fixation construct** (2.2% failure). But this is a single-arm cohort with one specific construct; it does not license fast rehab across all fixation methods. The protective default remains the prudent generalisation. *Moderate.*
2. **Tenodesis vs tenotomy** is well studied (RCT + SRs) and favours tenodesis for cosmesis/cramping – but this is the *indication* decision, not a rehab-timing trial. *Moderate–strong.*
3. **The rehab protocol timings themselves are consensus/expert**, drawn from published academic physiotherapy guidelines (MGH Brigham, UVA, Ohio State, UW Health) rather than head-to-head rehab RCTs. Week ranges are typical, not trial-derived. *Weak/consensus.*
4. **Resisted-biceps start week varies (6–10)** across published protocols; the choice of week 10 here is a deliberate protective bias, not a trial-supported threshold. *Weak/consensus.*

E. EVIDENCE-STRENGTH FLAGS (summary)

- **MODERATE–STRONG (RCT / SR-MA):** tenodesis vs tenotomy equivalence with lower Popeye/ cramping after tenodesis; suprapectoral vs subpectoral outcome equivalence (SR-MA).
- **MODERATE (cohorts / large pooled review):** immediate-unrestricted-motion safety with dual fixation (Mazzocca, 2.2% failure); low overall complication profile (1,526-shoulder review – Popeye ~4.6%, fixation failure ~0.8%); fixation-type clinical equivalence.
- **WEAK / CONSENSUS:** the **post-operative rehabilitation protocol itself** (academic PT guidelines, no defining rehab RCT); the specific week-10 resisted-biceps threshold.

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CITATIONS

RAG CORPUS (180,000+ ORTHOPAEDIC ARTICLES)

- Mazzocca AD, et al. Immediate physical therapy without postoperative restrictions following open subpectoral biceps tenodesis: low failure rates and improved outcomes at a minimum 2-year follow-up. *J Shoulder Elbow Surg*. 2018. DOI: 10.1016/j.jse.2018.02.061
- Complications of biceps tenodesis based on location, fixation, and indication: a review of 1526 shoulders. *J Shoulder Elbow Surg*. 2019. DOI: 10.1016/j.jse.2018.09.005
- Biceps tenotomy versus tenodesis: a review of clinical outcomes and biomechanical results. *J Shoulder Elbow Surg*. 2011. DOI: 10.1016/j.jse.2010.08.019
- Biceps Tenodesis Versus Tenotomy in the Treatment of Lesions of the Long Head of the Biceps Tendon in Patients Undergoing Arthroscopic Shoulder Surgery: A Prospective Double-Blinded Randomized Controlled Trial. *Am J Sports Med*. 2020. DOI: 10.1177/0363546520912212
- Outcomes and Complications After Primary Arthroscopic Suprapectoral Versus Open Subpectoral Biceps Tenodesis for SLAP Tears or Biceps Abnormalities: A Systematic Review and Meta-analysis. *Orthop J Sports Med*. 2020. DOI: 10.1177/2325967120945322
- Arthroscopic Proximal Biceps Tenodesis at the Articular Margin: Evaluation of Outcomes, Complications, and Revision Rate. *Arthroscopy*. 2014. DOI: 10.1016/j.arthro.2014.08.024
- Clinical and Biomechanical Evaluation of an All-Arthroscopic Suprapectoral Biceps Tenodesis. *Orthop J Sports Med*. 2014. DOI: 10.1177/2325967114553558
- All-Arthroscopic Suprapectoral Versus Open Subpectoral Tenodesis of the Long Head of the Biceps Brachii Without the Use of Interference Screws. *Arthroscopy*. 2016. DOI: 10.1016/j.arthro.2016.07.007

LITERATURE (URLS)

- Early Versus Delayed Active Range of Motion After Open Subpectoral Biceps Tenodesis. PubMed. https://pubmed.ncbi.nlm.nih.gov/34458384/
- Complications of biceps tenodesis based on location, fixation, and indication: a review of 1526 shoulders. PubMed. https://pubmed.ncbi.nlm.nih.gov/30573431/
- Mazzocca – immediate PT without restrictions (minimum 2-year follow-up). PubMed. https://pubmed.ncbi.nlm.nih.gov/29804912/
- Interference Screw vs. Suture Anchor Fixation for Open Subpectoral Biceps Tenodesis: Does it Matter? PMC. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2553411/

PUBLISHED REHAB PROTOCOLS (PATIENT-GUIDANCE – BASIS FOR THE PHASE STRUCTURE)

- Massachusetts General Brigham Sports Medicine. Rehabilitation Guidelines for Biceps Tenodesis. https://www.massgeneral.org/assets/MGH/pdf/orthopaedics/sports-medicine/physical-therapy/rehabilitation-protocol-for-biceps-tenodesis.pdf

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- UVA Department of Orthopaedic Surgery, University of Virginia. Isolated Biceps Tenodesis Post-operative Rehabilitation Protocol. https://med.virginia.edu/orthopaedic-surgery/wp-content/uploads/sites/242/2021/06/Isolated-Biceps-Tenodesis.pdf
- The Ohio State University Wexner Medical Center. Biceps Tenodesis Clinical Practice Guideline. https://medicine.osu.edu/-/media/files/medicine/departments/sports-medicine/medical-professionals/shoulder-and-elbow/bicep-tenodesis-2020.pdf
- UW Health Sports Medicine, University of Wisconsin. Rehabilitation Guidelines for Biceps Tenodesis. https://bynder.uwhealth.org/m/8a7c2438102f495f/original/Rehab-Guideline-Biceps-Tenodesis.pdf

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