

Pectoralis Major Repair

Pectoralis Major Tendon Repair – Post-operative Rehabilitation

Topic scope: Rehabilitation after surgical repair of a pectoralis major (PM) tendon rupture/tear (typically a humeral-insertion avulsion in a 20-40 yr-old male, classically during the eccentric phase of a **bench press**). Covers protected positioning, the early restrictions on **abduction (ABD)** and **external rotation (ER)**, ROM progression, when active ROM and strengthening start, and return to heavy lifting / bench press / sport.

Defining principle (contrast with frozen-shoulder release): PM repair rehab is a classic protect-the-repair protocol – the OPPOSITE of frozen-shoulder release. The repaired tendon runs anteriorly to its humeral insertion; abduction and external rotation stretch/tension the repair, so both are strictly limited early and the arm is held in adduction + internal rotation in a sling/immobiliser. Progression is deliberately slow, and heavy resisted pec loading (bench press, flyes, dips, contact sport) is delayed to ~4-6 months to avoid re-rupture.

A key modifier throughout: **repair type dictates the timeline**. Bone-tendon repairs (suture anchors/cortical buttons into humerus) heal slower than tendon-tendon or muscle-tendon repairs and wean from the sling later (MGH protocol).

CONSENSUS PHASED TIMELINE

Synthesised from the Mass General Brigham (MGH) Sports Medicine protocol (rev. 7/2023, the most granular degree-by-degree protocol) and the University Orthopedics protocol, cross-checked against the published literature (Cordasco/HSS 2017; Manske & Prohaska 2007; Schepsis 2000; Haley/Zacchilli 2014). Both published protocols agree on the core structure; the ROM numbers below are the MGH degree targets.

Phase	Window	Sling / position	ROM allowed + RESTRICTIONS	Active ROM	Strengthening	RTS / lifting
I – Immediate	0-3 wk (UnivOrtho: 0-2 wk)	Sling/ immobiliser, arm in NEUTRAL or INTERNAL ROTATION, worn day & night	PROM only, started ~week 2. ER limited: start at 0 deg in adduction, progress ~5 deg/week. Flexion start 45 deg, +5-10 deg/wk. ABD start 30 deg, +5 deg/wk. Elbow/wrist/hand AROM free. No active shoulder motion; no ER beyond limit; no abduction/extension stretch	None at shoulder (distal joints only)	Wk 3: periscapular only (inferior glide <35 deg ABD, low row), ball squeeze. No pec loading	None
II – Intermediate	4-6 wk	Begin weaning sling: bone-tendon at 4 wk; tendon-tendon / muscle-tendon at 5-6 wk (UnivOrtho: immobiliser to 6 wk for all)	PROM continues (ER +5 deg/wk; flex +5-10 deg/wk to ~65-85 deg; ABD +5 deg/wk to ~50 deg). Begin AAROM (cane flexion, cane ER stretch, washcloth press). Still no aggressive ER/ ABD past targets	AAROM introduced	Submaximal isometrics: ABD, extension, ER – explicitly NO IR isometrics (IR/ adduction tension the pec); periscapular setting	None
III – Late	6-8 wk	Sling discontinued	PROM continue to full (ER, flex, ABD each +5 deg/wk to full). Initiate	Active ROM starts ~6 wk	Sidelying ER, periscapular rows/ extension, biceps/	None

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Dr Kieran Hirpara – Specialist Orthopaedic Surgeon

Suite 2, Level 1, Mater Private Hospital Rockhampton, 31 Ward Street, The Range, QLD 4700

Phone 07 4863 6556 · office@cqupperlimb.com.au · cqupperlimb.com.au

Phase	Window	Sling / position	ROM allowed + RESTRICTIONS	Active ROM	Strengthening	RTS / lifting
			AROM (supine flexion, salutes, supine punch). Can begin weight-bearing through arm		triceps; rhythmic stabilisation; sleeper/cross-body stretch	
IV – Transitional	9-14 wk	None	Restore full PROM/AROM (full by wk 12-14 for bone-tendon)	Full	Initiate shoulder IR isometrics + pec major isometrics (~week 9) – shortened position first, then lengthened; ER w/ band, ABD; PNF D1/D2	None
V – Advanced strengthening	14-20 wk (~3.5-5 mo)	None	Full	Full	Pectoralis isotonic begin ; IR w/ band, counter push-ups -> push-ups, lat pulldowns; doorway pec stretch gentle	Begin sport-specific prep
VI – Early return to sport	5-6 months	None	Full	Full	ER/IR at 90 deg, plyometrics (med-ball chest pass, ball drops, 90/90 throws)	Begin return-to-sport program when criteria met
VII – Unrestricted RTS	6+ months	None	Full	Full	Bench press resumed at 50% 1-RM, progress	Heavy lifting / bench press /

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Phase	Window	Sling / position	ROM allowed + RESTRICTIONS	Active ROM	Strengthening	RTS / lifting
					slowly with physician; full return to strenuous work, recreation, contact sport NOT before 6 months	contact sport: 6+ months, criterion-based

KEY NUMERIC CONSENSUS POINTS

- **Sling:** ~4-6 weeks (4 wk bone-tendon may wean earlier; 6 wk common; UnivOrtho keeps immobiliser a full 6 wk), arm in **adduction/internal rotation**.
- **ER early limit: 0 deg at the side, advance ~5 deg/week** – because ER tensions the anterior repair.
- **ABD/flexion early limit:** ABD ~30 deg and flexion ~45 deg initially, advancing ~5-10 deg/week.
- **Active ROM:** ~6 weeks.
- **Isometrics:** scapular wk 3; submaximal shoulder (ABD/ext/ER, **no IR**) wk 4-6; **pec/IR isometrics ~wk 9 (Phase IV)**.
- **Pec isotonic / push-ups:** ~14 weeks (Phase V).
- **Bench press / heavy lifting / contact sport: deferred to ~4-6 months** (MGH: 50% 1-RM bench at 6+ mo; UnivOrtho: light bench from ~4 mo with very light resistance, no contact until 6 mo).

The **rationale** for restricting ER and ABD is biomechanical: the PM is a strong **adductor, internal rotator and flexor**; abduction + external rotation is the position of maximal stretch on the anterior insertion (this is the injuring mechanism – eccentric load in abduction/ER, e.g. bench press), so it maximally tensions the repair (Maier 2021; Schepsis 2000; Provencher 2010). Biomechanical work shows transosseous sutures, suture anchors and cortical buttons confer similar repair strength, and early activity should stay below identified failure loads until soft-tissue- to-bone healing is reliable (Sherman 2012; Edgar 2017) – the biomechanical basis for the slow progression.

OUTCOMES / RETURN TO SPORT EVIDENCE

- **Surgical > non-operative** for restoring strength/function: objective strength testing shows repair recovers significantly more peak torque and work than conservative care (Hanna 2001 – comparative cohort); literature “strongly supports early operative treatment” of complete tears in active patients/athletes (Kircher 2010 review; Schepsis 2000). **Acute repair > chronic/delayed repair** (Schepsis 2000).

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- **Return to sport** in repaired athletes is generally **good, with most returning by ~6 months** to a year; Cordasco (HSS, 2017, n=40 acutely repaired athletes) reported high RTS and functional scores with low re-operation. Faster individual returns (5-7 mo) are reported in single cases but 6 months is the consensus floor for heavy/contact loading.

KEY CONTROVERSIES / VARIABLES

1. **Sling duration & wean point.** 4 wk vs 6 wk; MGH ties it to repair type (bone-tendon later); UnivOrtho fixes 6 wk for all. No RCT defines the optimum. *Weak/consensus.*
2. **How fast to advance ER/ABD.** ~5 deg/week is widely used but arbitrary; tissue quality, tear size and fixation method modify it – larger tears / poor tissue / chronic repairs progress slower. *Expert opinion.*
3. **Repair construct.** Cortical button vs suture anchor vs transosseous – biomechanically similar (Sherman 2012; Edgar 2017), so construct should not, in principle, change the rehab timeline, but surgeons individualise. *Strong biomechanical, weak clinical.*
4. **RTS timing for bench press / contact sport.** Range 4-6 months across protocols; no high-level evidence sets the safe threshold – driven by re-rupture fear and biomechanical failure-load data, not RCTs. *Weak/consensus.*
5. **Acute vs chronic / augmentation.** Chronic or retracted tears may need allograft or autograft (semitendinosus) augmentation and a more conservative timeline (Neumann 2018 dermal allograft: 6 wk full immobilisation then 4-phase PT from wk 6; Garofalo 2025 semitendinosus technique). *Weak (technique notes/small series).*
6. **Overall evidence base.** Almost entirely retrospective cohorts, technique notes and biomechanical studies – **no RCTs** of one rehab protocol vs another for PM repair. The whole timeline is **consensus/expert**, anchored by biomechanical failure-load data. *Flag: WEAK.*

EVIDENCE STRENGTH FLAGS (summary)

- **STRONG:** biomechanical failure-load / repair-construct comparisons (Sherman 2012; Edgar 2017 – cadaveric, controlled) – these justify the load restrictions.
- **MODERATE:** surgical vs conservative superiority (Hanna 2001 comparative; Schepsis 2000; Cordasco 2017 n=40 outcome series; Campbell's / Pochini 2014 prospective 60-case series).
- **WEAK / CONSENSUS ONLY:** every specific rehab parameter – sling duration, ER/ABD degree-per-week limits, AROM/strengthening start weeks, 4-6 month RTS/bench-press timing. Derived from institutional PT protocols (MGH, University Orthopedics) and narrative reviews (Manske/Prohaska 2007; Haley/Zacchilli 2014; Maier 2021), **not RCTs.**

CITATIONS

RAG CORPUS (180,000+ ORTHOPAEDIC ARTICLES)

- Cordasco FA, Mahony GT, Tsouris N, et al. Pectoralis major tendon tears: functional outcomes and return to sport in a consecutive series of 40 athletes. *J Shoulder Elbow Surg.* 2017;26(3):458-463.
- Kang RW, Mahony GT, Cordasco FA. Pectoralis major repair with cortical button technique. *Arthroscopy Techniques.* 2014.
- Haley CA, Zacchilli MA. Pectoralis major injuries. *Clin Sports Med.* 2014.
- Schepsis AA, Grafe MW, Jones HP, et al. Rupture of the pectoralis major muscle. *Am J Sports Med.* 2000;28(1):9-15.
- Sherman SL, Lin EC, Verma NN, et al. Biomechanical analysis of the pectoralis major tendon and comparison of techniques for tendo-osseous repair. *Am J Sports Med.* 2012.
- Hanna CM, Glenny AB, Stanley SN, et al. Pectoralis major tears: comparison of surgical and conservative treatment. *Br J Sports Med.* 2001.
- Kircher J. Surgical and nonsurgical treatment of total rupture of the pectoralis major muscle in athletes: update and critical appraisal. *Open Access J Sports Med.* 2010.
- Maier J, Oak SR, Soloff L, et al. Management of common upper extremity injuries in throwing athletes: a critical review of current outcomes. *JSES Rev Rep Tech.* 2021;1(4).
- Neumann JA, Klein CM, van Eck CF, et al. Outcomes after dermal allograft reconstruction of chronic or subacute pectoralis major tendon ruptures. *Orthop J Sports Med.* 2018. (6 wk full immobilisation; PT from wk 6, 4 phases)
- Garofo AGP, Medina G, Schor B. Acute pectoralis major tendon tear reconstruction with semitendinosus augmentation: a technique note. *JSES Rev Rep Tech.* 2025;5(4).
- Azar FM, Canale ST, Beaty JH. *Campbell's Operative Orthopaedics* (cites Pochini 2014 prospective 60-case series; Edgar 2017 repair-configuration biomechanics; ElMaraghy classification). 2020.
- (Provencher MT, Handfield K, Boniquit NT, et al. Injuries to the pectoralis major muscle: diagnosis and management. *Am J Sports Med.* 2010;38(8):1693-1705 – cited within MGH protocol.)
- (Manske RC, Prohaska D. Pectoralis major tendon repair post-surgical rehabilitation. *N Am J Sports Phys Ther.* 2007;2(1):22-33 – cited within MGH protocol.)

PUBLISHED REHAB PROTOCOLS (URLS)

- **Mass General Brigham (MGH) Sports Medicine – Rehabilitation Protocol for Pectoralis Major Repair** (rev. 7/2023): <https://www.massgeneral.org/assets/MGH/pdf/orthopaedics/sports-medicine/physical-therapy/rehabilitation-protocol-for-pectoralis-major-repair.pdf> (source for the degree-by-degree ER 0 deg +5/wk, flex 45 deg, ABD 30 deg limits; sling neutral/IR; bone-tendon vs tendon-tendon wean; pec isometrics wk 9, pec isotonic wk 14; bench 50% 1-RM at 6+ mo).

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- **University Orthopedics, Inc. – Pectoralis Major Repair Rehabilitation Protocol:** <https://universityorthopedics.com/assets/shoulder/PECTORALIS-MAJOR-REPAIR.pdf> (immobiliser x6 wk; AROM ~6 wk; phased push-up progression; light bench from ~4 mo; no contact sport until 6 mo).
- Additional concordant institutional protocols: Melbourne Orthopaedic Group <https://mgorthopaedics.com.au/wp-content/uploads/2021/04/PECTORALIS-MAJOR-REPAIR-PROTOCOL.pdf> ; Summit Orthopedics https://www.summitortho.com/wp-content/uploads/2022/08/6575_SURGICAL-Pect-Major-Repair-Protocol_6.22_MB.pdf