

# Partial Wrist Fusion

## Partial Wrist Fusion – Procedure Outcomes & Post-operative Rehabilitation (Capitolunate / Four-Corner Arthrodesis with Scaphoid Excision)

**Topic scope:** post-operative rehabilitation after **midcarpal partial wrist arthrodesis** for **scapholunate advanced collapse (SLAC)** or **scaphoid nonunion advanced collapse (SNAC)**. The index procedure here is a **capitolunate fusion** (the capitate fused to the lunate, usually with **excision of the worn scaphoid**); the closely related **four-corner fusion** (lunate–capitate–triquetrum–hamate) follows the same rehabilitation principles. This is a **bony arthrodesis**, so the rehabilitation is a **union-gated** pathway: the mid-wrist is immobilised until the fusion consolidates, after which a **deliberately reduced** wrist arc and grip are restored.

*Defining principle of the rehab here: a partial wrist fusion is a motion-preserving salvage. The arthritic midcarpal surfaces are fused to abolish pain, while the radiolunate joint is intentionally preserved to retain movement. The construct that needs protecting is healing bone (plate, headless screws, staples or K-wires across the fusion), not a soft-tissue repair – so progression is gated by radiographic union, not a calendar. Counselling the patient that the planned end-point is a pain-free, functional wrist with a reduced arc (~50–65% of normal flexion–extension, ~70–80% grip) is itself part of the treatment: the reduced motion is the intended trade-off, not a failure. The two principal branch points are the fixation method (which sets the immobilisation window and union risk) and whether scaphoid excision was performed (standard in the SLAC/SNAC setting).*

## A. PROCEDURE OUTCOMES (capitolunate / four-corner fusion for SLAC–SNAC)

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Partial wrist fusion is a well-established, durable salvage for the SLAC/SNAC wrist. The dominant debate is **which motion-preserving salvage** (four-corner / capitolunate fusion vs proximal row carpectomy), not whether to operate; both reliably relieve pain at the cost of some motion.

- **Reliable pain relief with a useful but reduced arc.** Across series, midcarpal fusion abolishes the painful midcarpal arthritis while preserving radiolunate motion. Typical results are roughly **50–65% of contralateral flexion–extension** and **~70–80% of contralateral grip strength**, with high rates of pain relief and return to work – the expected, planned trade-off of a partial fusion [Enna *Hand Clin* 2005; Strauch *J Hand Surg Am* 2011; Merrell *J Hand Surg Am* 2008; long-term series *J Wrist Surg* 2015]. *Moderate (cohort/consensus)*.
- **Capitolunate fusion (± scaphoid excision) performs comparably to full four-corner fusion** while fusing fewer joints, simplifying the construct. A systematic review of capitolunate arthrodesis and comparative work report comparable motion, grip and union to four-corner fusion, supporting it as a sound index choice [Dunn *J Hand Surg Am* 2020 (systematic review); lunocapitate series *J Hand Surg Eur* 2009; *J Chin Med Assoc* 2017]. *Moderate*.
- **A meta-analysis of two-, three- and four-corner constructs** finds the number of fused columns does **not** materially change motion, grip, union or complications – biomechanically consistent with the radiolunate joint being the motion-determining segment [Hundepool *J Hand Surg Am* 2025 (SR/meta-analysis); Hernandez-Soria *J Hand Surg Am* 2016 (capitate-position biomechanics)]. *Moderate (SR) + mechanistic*.
- **Modern fixation is forgiving but union is not guaranteed.** Circular dorsal plates, headless compression screws and nitinol staples all achieve consolidation in the great majority, with nonunion and dorsal impingement the characteristic failures to watch for [Merrell *J Hand Surg Am* 2008 (circular plate); Ahmady *J Hand Surg Glob Online* 2025 (nitinol staples)]. *Moderate*.

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## B. REHABILITATION / THERAPY EVIDENCE

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The rehab questions are (1) **how long to immobilise**, (2) **what gates the start of wrist motion**, and (3) **how to set the patient's expectation of reduced motion**. The evidence and published surgeon protocols converge on a **union-gated** sequence: immobilise the wrist (mobilise the hand and forearm) for ~6–8 weeks, then restore a **reduced arc**, then strengthen.

- **Immobilise until radiographic union, not by the calendar.** Because the construct is bony, wrist motion is withheld until the surgeon confirms consolidation – typically **6–8 weeks**, longer with some screw/staple fixations. Published institutional protocols use a bulky dressing/splint for ~10–14 days, a short-arm cast to ~4–6 weeks, then a removable splint as motion begins. *Moderate (consensus protocols)*.

- **Keep the hand and forearm fully mobile from day one.** Immediate active finger, thumb and forearm rotation prevents stiffness and tendon adhesion without disturbing the fusion – the same glide-preserving logic used across hand rehab. *Consensus.*
- **Restore motion gradually after union, against a realistic ceiling.** Once united, active and active-assisted wrist ROM is introduced; patients should be counselled that the fused midcarpal segment will not move and the achievable arc is **smaller than pre-operatively** (the radiolunate joint alone supplies wrist motion). *Consensus + mechanistic (capitate-position biomechanics, Hernandez-Soria 2016).*
- **Strengthen and load only once the fusion is solid.** Grip and loaded/weight-bearing work begins after union and is built up gradually; heavy manual demands are deferred to ~4–6 months. *Consensus.*

### RECOVERY TRAJECTORY (EXPECTED, EVIDENCE-ANCHORED)

Phase	Window	Restraint	Hand use / therapy focus	Strength / load	Notes
<b>I – Immobilisation (union)</b>	<b>Week 0 to ~6–8</b>	Wrist immobilised (cast/splint)	Full active <b>finger, thumb &amp; forearm</b> motion; oedema control, elevation; <b>no wrist motion</b>	None through the wrist	Fusion knits like a fracture; <b>progress is gated by radiographic union</b> , not the calendar
<b>II – Restoring wrist motion</b>	<b>From union (~wk 6–8) to 12</b>	Heavy-load avoidance; removable splint	Begin active/active-assisted <b>wrist flexion/extension &amp; deviation</b> ; scar massage once healed	No loaded grip yet	Counsel the <b>reduced-arc expectation</b> (~50–65% of normal flexion–extension)
<b>III – Strengthening &amp; return</b>	<b>From ~12 weeks (post-union)</b>	Restrictions lifted progressively	Progressive grip/wrist strengthening; graded job simulation	Grip recovers toward <b>~70–80%</b> of the other side	Desk work ~3 months; heavy manual ~4–6 months. Watch for dorsal impingement / nonunion

(Phase windows mirror the precautions in the patient protocol and published surgeon protocols; they are typical guides anchored to union, not trial-derived deadlines.)

## C. KEY CONTROVERSIES / EVIDENCE QUALITY

1. **Capitolunate vs four-corner vs proximal row carpectomy (PRC).** All three are accepted motion-preserving salvages for SLAC/SNAC. **PRC** tends to give a slightly **larger arc** and avoids fusion-specific complications (nonunion, dorsal impingement, hardware), while **fusion** may give marginally **better grip**

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and is preferred where capitate-head or proximal-capitate cartilage is compromised. Systematic reviews and a meta-analysis find **no consistent superiority** of one over the other; choice is individualised [Mulford *J Hand Surg Eur* 2009; *J Hand Surg Am* 2024 meta-analysis; Strauch *J Hand Surg Am* 2011]. *Moderate (SR/meta-analysis of mostly observational data).*

- 2. Capitulate vs full four-corner construct.** Fusing fewer columns (capitulate) simplifies the construct without clearly compromising motion, grip or union versus four-corner – consistent with the radiolunate joint being the motion-determining segment [Dunn 2020 SR; Hundepool 2025 meta-analysis; Hernandez-Soria 2016]. *Moderate.*
- 3. When can wrist motion safely start?** Union timing varies with fixation, and protocols differ on exact cast duration. The defensible position is **surgeon-confirmed radiographic union gates wrist ROM** rather than a fixed week number. *Weak-moderate (consensus; protocol variation).*
- 4. Reduced motion is the plan, not a complication.** The preserved radiolunate joint supplies a smaller arc by design; mislabelling the expected ~50–65% range as a poor result drives unnecessary dissatisfaction. *Strong mechanistically; cohort-supported.*
- 5. Characteristic failures: nonunion and dorsal impingement.** Both are recognised, fixation-related complications; persistent dorsal wrist pain on extension or a non-progressing fusion warrants surgical review rather than more therapy [Merrell 2008; Ahmady 2025; long-term series 2015]. *Moderate.*

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## D. EVIDENCE STRENGTH FLAGS (summary)

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- **STRONG (mechanistic / well-supported):** the reduced final arc is the **planned** consequence of preserving the radiolunate joint while fusing the midcarpal segment (capitate-position biomechanics); reliable pain relief from the fusion.
- **MODERATE:** typical outcome envelope (~50–65% flexion–extension, ~70–80% grip); equivalence of capitulate and four-corner constructs; no consistent superiority of fusion vs PRC (SR/meta-analysis of largely observational data); modern fixation achieves high union with defined nonunion / dorsal impingement risk.
- **WEAK / CONSENSUS:** the specific **union-gated immobilise → restore-motion → strengthen** therapy sequence and exact phase timings (institutional/surgeon protocols, anchored to radiographic union rather than trial-derived).

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## CITATIONS

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### RAG CORPUS (180,000+ ORTHOPAEDIC ARTICLES)

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## **PARTIAL WRIST FUSION REHABILITATION LITERATURE (PROTOCOLS & GUIDANCE – BASIS FOR THE UNION-GATED PHASE STRUCTURE)**

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