

Wrist Fusion

Total Wrist Arthrodesis – Procedure Outcomes & Post-operative Rehabilitation (Radiocarpal Fusion, Dorsal Plate)

Topic scope: post-operative rehabilitation after **total wrist arthrodesis** – permanent surgical fusion of the radiocarpal (and usually the third carpometacarpal) joints with a **dorsal arthrodesis plate**, for end-stage **pancarpal (panarticular) arthritis** of the wrist. This is a *salvage reconstruction that deliberately abolishes wrist motion*, not a motion-preserving operation, so the rehabilitation has **no wrist-ROM goal**. It is built around preserving the joints the fusion leaves free – the **fingers, thumb and forearm rotation** – and controlling oedema while the fusion unites, then progressive grip loading once united.

Defining principle of the rehab here: total wrist fusion trades motion for a stable, pain-free wrist. The whole wrist is set solid (radius → metacarpals) in slight extension; loss of wrist movement is the intended endpoint, not a deficit to be rehabilitated. Modern dorsal locking-plate fixation is rigid enough that prolonged casting is unnecessary – so the deliberate priorities are early digital and forearm-rotation motion (digital stiffness is the principal threat to a good result) and swelling control, with grip strengthening deferred until radiographic union (typically 6–8 weeks). The single branch point is union status: loading is gated on the surgeon confirming the fusion has consolidated, after which there are no motion restrictions to protect.

A. PROCEDURE OUTCOMES (total wrist arthrodesis, dorsal plate)

Total wrist arthrodesis is a reliable, durable salvage for the painful, arthritic wrist that has failed non-operative care: the great majority of patients obtain lasting pain relief and a stable hand, accepting the loss of wrist motion in exchange.

- **High union rates and durable pain relief.** Plate arthrodesis is a well-established, reproducible operation; published series and the JAAOS review of indications and outcomes report reliable fusion, good pain relief and high patient satisfaction, with most patients willing to undergo it again [Wei & Feldon, *JAAOS* 2017; Shah et al., *J Hand Surg Am* 2022 – technique/modifications]. *Moderate-strong (review + technique series).*
- **Grip strength is preserved or improves.** Because gripping is no longer painful and the wrist is a stable platform, grip strength after fusion is typically equal to or better than the painful pre-operative wrist. A 2026 systematic review and meta-analysis of long-term grip strength after total wrist fusion (comparing inclusion vs sparing of the third CMC joint) confirms maintained long-term grip with comparable complication profiles between the two constructs [Lawson-Smith et al., *J Hand Surg Glob Online* 2026]. *Moderate (SR/meta-analysis).*
- **Function is good for daily tasks; forearm rotation compensates for lost wrist motion.** Patients adapt well because forearm pronation/supination (unaffected by the fusion) substitutes for much of the lost wrist arc in activities such as turning keys, taps and handles. Carpometacarpal-joint– sparing plate designs aim to retain a small amount of motion and reduce distal hardware issues [Briotti et al., *HAND* 2022 – Medartis CMC-sparing plate]. *Moderate (cohort).*
- **Complications are defined and manageable.** Principal complications are **nonunion, hardware prominence/irritation requiring plate removal** (the dorsal plate is subcutaneous), wound issues, and adjacent-segment problems (distal radioulnar joint / digital stiffness). These are recognised, generally treatable, and informed-consent staples rather than common catastrophes [Wei & Feldon, *JAAOS* 2017; Kalb & Prommersberger, *Oper Orthop Traumatol* 2009 – AO plate technique]. *Moderate.*

B. REHABILITATION / THERAPY EVIDENCE

The rehab questions after total wrist fusion are different from a motion-preserving operation: there is no wrist arc to recover. The evidence and consensus instead converge on **early mobilisation of the unfused joints, oedema control, and union-gated grip loading**, exploiting the stability of modern plate fixation.

- **Stable plate fixation permits early digital and forearm motion.** Rigid dorsal locking-plate constructs are robust enough that prolonged rigid immobilisation is unnecessary; a light splint or dressing for comfort, with immediate finger, thumb and forearm-rotation motion, is the intended default [Shah et al., *J Hand Surg Am* 2022; Kalb & Prommersberger, *Oper Orthop Traumatol* 2009]. *Moderate (technique consensus).*
- **Preserving digital range is the priority – stiffness is the main avoidable failure.** Because the hand's function after fusion depends entirely on the joints left mobile, full active finger and thumb range from day

one, plus preserved forearm rotation, is the core therapeutic aim. This is a mechanistic/consensus position rather than one from comparative rehab trials. *Weak-moderate (mechanism strong, dedicated rehab RCTs absent).*

- **Grip strengthening is deferred to union, then progressed freely.** Loaded grip is withheld until the surgeon confirms radiographic union (commonly 6–8 weeks), after which there are no motion restrictions and strengthening is progressed as tolerated; grip continues to improve for several months. *Consensus / protocol-based.*
- **Hand therapy targets the free joints, not the wrist.** Published patient-guidance protocols and surgical references describe early referral to a hand therapist for finger and forearm mobility and later putty-based grip strengthening – there is no wrist-ROM component by design [AAOS OrthoInfo – Wrist Fusion; institutional post-op protocols]. *Consensus (patient-guidance).*

RECOVERY TRAJECTORY (EXPECTED, EVIDENCE-ANCHORED)

Phase	Window	Restraint	Hand use / therapy focus	Strength / load	Notes
I – Protect construct, mobilise free joints	Week 0–6	Light splint/dressing for comfort; no wrist motion (fused)	Elevate; immediate full finger + thumb AROM; forearm pronation/supination ; elbow/shoulder ROM; oedema control	Light functional use only; no loaded grip / lifting > a light cup	Sutures + splint/X-ray review ~10–14 days. Digital stiffness is the chief threat
II – Confirm union, begin grip loading	Week 6–12	Loading gated on surgeon-confirmed union (≈ 6–8 wk)	Splint discarded at union; progressive grip (ball → putty → grippers); scar massage once healed; continue forearm + digital ROM	Grip introduced light → graded after union	Forearm rotation substitutes for lost wrist motion. Watch dorsal hardware prominence
III – Strengthening & return to load	Week 12 → 12 months	None once united	Progressive resisted grip/forearm strengthening; work-/task-specific loading	Full load as tolerated; heavy/manual built up gradually	Office/light work ~3 months; strength improves up to ~12 months, often exceeding pre-op (pain-free grip)

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

CQ HAND + UPPER LIMB

C. KEY CONTROVERSIES / EVIDENCE QUALITY

- 1. Fusion vs total wrist arthroplasty.** The central modern controversy. Systematic review of total wrist arthroplasty versus arthrodesis (originally in rheumatoid disease) found insufficient evidence to declare either superior, with arthroplasty preserving some motion at the cost of higher revision/implant-related complications, and fusion offering durability at the cost of motion [Cavaliere & Chung, *Plast Reconstr Surg* 2008]. A cost-utility analysis found arthrodesis and arthroplasty both reasonable, with trade-offs in motion, complications and cost [Cavaliere & Chung, *J Hand Surg Am* 2010]. The “where are we now” synthesis frames the choice as patient-specific (demand, bilateral disease, expectations) rather than a settled winner [Jump, Trail & Talwalkar, *J Hand Surg Eur* 2025]. *Moderate; genuine equipoise.*
- 2. Arthrodesis as salvage for failed arthroplasty.** Total wrist fusion reliably salvages a failed total wrist arthroplasty, though such salvage fusions behave somewhat differently (bone loss, grafting) from primary arthrodesis [Zijlker et al., *J Hand Surg Eur* 2021]. *Moderate.*
- 3. Include or spare the third CMC joint.** Constructs differ in whether the plate crosses the third carpometacarpal joint. Long-term grip and complication outcomes are broadly comparable between inclusion and sparing, with CMC-sparing designs aiming to reduce distal hardware issues and retain a trace of motion [Lawson-Smith et al., *J Hand Surg Glob Online* 2026; Briotti et al., *HAND* 2022]. *Moderate.*
- 4. Hardware prominence and removal.** The subcutaneous dorsal plate is a recognised source of irritation and a common reason for elective hardware removal once the fusion is solid – expected, not a failure of the operation [Wei & Feldon, *JAAOS* 2017]. *Moderate.*
- 5. Special populations.** In spastic/neurological wrists (e.g. cerebral palsy), fusion changes hand function in nuanced ways – improving positioning but with task-specific trade-offs – underlining that the goal is a *useful stable position*, not motion [Hargreaves, Warwick & Tonkin, *J Hand Surg Br* 2000]. *Moderate (specialised cohort).*

D. EVIDENCE STRENGTH FLAGS (summary)

- **STRONG (SR / meta-analysis):** preserved-to-improved long-term grip strength after total wrist fusion; comparable outcomes between CMC-inclusion and CMC-sparing constructs [Lawson-Smith et al. 2026].
- **MODERATE:** reliable union, durable pain relief and high satisfaction with plate arthrodesis [Wei & Feldon 2017; Shah et al. 2022]; genuine equipoise between fusion and arthroplasty with motion-vs-durability/complication trade-offs [Cavaliere & Chung 2008, 2010; Jump et al. 2025]; fusion as salvage for failed arthroplasty [Zijlker et al. 2021]; defined complication set (nonunion, hardware removal, DRUJ/digital adjacent issues).
- **WEAK / CONSENSUS:** the specific **early digital/forearm-motion, union-gated grip rehabilitation programme** (mechanistically rationalised – stiffness avoidance – with no dedicated rehab RCTs); exact phase timings (typical, anchored to union rather than trial-derived); stable-fixation early-motion default from technique consensus [Shah et al. 2022; Kalb & Prommersberger 2009].

CITATIONS

RAG CORPUS (180,000+ ORTHOPAEDIC ARTICLES)

- Total Wrist Arthrodesis: Indications and Clinical Outcomes. *J Am Acad Orthop Surg*. 2017. DOI: 10.5435/jaaos-d-15-00424
- Radiocarpal Fusion: Indications, Technique, and Modifications. *J Hand Surg Am*. 2022. DOI: 10.1016/j.jhsa.2022.04.002
- Long-term Grip Strength and Complications After Total Wrist Fusion With and Without Inclusion of the Third Carpometacarpal Joint: A Systematic Review and Meta-analysis. *J Hand Surg Glob Online*. 2026. DOI: 10.1016/j.jhsg.2026.101022
- Wrist Arthrodesis Using the Medartis Carpometacarpal Joint Sparing Plate. *HAND*. 2022. DOI: 10.1177/15589447221141474
- A Systematic Review of Total Wrist Arthroplasty Compared with Total Wrist Arthrodesis for Rheumatoid Arthritis. *Plast Reconstr Surg*. 2008. DOI: 10.1097/prs.0b013e318180ece3
- A Cost-Utility Analysis of Nonsurgical Management, Total Wrist Arthroplasty, and Total Wrist Arthrodesis in Rheumatoid Arthritis. *J Hand Surg Am*. 2010. DOI: 10.1016/j.jhsa.2009.12.013
- Arthrodesis or arthroplasty, complete or partial: where are we at in the 21st century? *J Hand Surg Eur Vol*. 2025. DOI: 10.1177/17531934241296758
- Comparative outcomes of total wrist arthrodesis for salvage of failed total wrist arthroplasty and primary wrist arthrodesis. *J Hand Surg Eur Vol*. 2021. DOI: 10.1177/17531934211057389
- Die vollständige Versteifung des Handgelenks mit der AO-Handgelenk-Arthrodesenplatte (Complete wrist arthrodesis with the AO wrist arthrodesis plate). *Oper Orthop Traumatol*. 2009. DOI: 10.1007/s00064-009-1905-2
- Changes in Hand Function Following Wrist Arthrodesis in Cerebral Palsy. *J Hand Surg Br*. 2000. DOI: 10.1054/jhsb.2000.0366

WRIST-FUSION REHABILITATION / PATIENT-GUIDANCE LITERATURE (URLS)

- American Academy of Orthopaedic Surgeons – Wrist Fusion (Wrist Arthrodesis), OrthoInfo (recovery timeline; fusion heals ~8–12 weeks; the fused wrist no longer moves; therapy for joints not fused). <https://orthoinfo.aaos.org/en/treatment/wrist-fusion-wrist-arthrodesis/>
- Wrist Arthrodesis Technique – postoperative care and approach considerations. Medscape eMedicine. <https://emedicine.medscape.com/article/1241236-technique>
- Total Wrist Arthrodesis (Wrist Fusion) – procedure and rehabilitation overview. Resurgens Orthopaedics. <https://www.resurgens.com/hand-wrist/procedures/wrist-fusion-total-wrist-arthrodesis>
- Full Wrist Fusion – Post-Operative Rehabilitation Protocol (institutional hand-therapy protocol; early digital/forearm motion, union-gated grip strengthening). Alaska Orthopedic. <https://www.akortho.com/wp-content/uploads/Full-Wrist-Fusion.pdf>

CQ HAND + UPPER LIMB

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