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SPECIALIST ORTHOPAEDIC SURGEON

EVIDENCE SUMMARY

DRUJ Hemiresection Arthroplasty

DRUJ Hemiresection-Interposition Arthroplasty (Bowers) — Procedure Outcomes & Post-operative Rehabilitation

Topic scope: post-operative rehabilitation after **hemiresection-interposition arthroplasty (HIT) of the distal radioulnar joint (DRUJ)** — the Bowers procedure — for painful DRUJ arthritis (degenerative, post-traumatic, or inflammatory). The arthritic portion of the **ulnar head is partially resected** and a soft-tissue spacer is interposed, **preserving the TFCC, ulnar styloid and ulnar soft-tissue attachments** so the distal ulna remains supported. This is a *joint-reshaping arthroplasty*, not a repair or reconstruction: the rehab is therefore an **early-rotation** pathway built around a short protected settling phase, then prioritised restoration of forearm pronation/supination, then graded loading — not months of construct protection.

> *Defining principle of the rehab here: the operation exists to restore **pain-free forearm rotation**, and nothing is sutured under tension that must heal protected for months. The deliberate restraint is a brief splinted phase (commonly an above-elbow / Muenster-type splint limiting forearm rotation for ~2-3 weeks in the isolated case) to let the soft-tissue interposition and capsule settle. After that, **early active pronation/supination is the explicit priority** — rotation is the function the operation restores. The single load to respect throughout is **rotational/axial loading of the distal ulna**, which provokes the characteristic failure mode: painful ulnar-stump instability and **radioulnar convergence**. The main branch point that lengthens the protected phase is a **concurrent procedure** (TFCC repair, distal radius osteotomy, extensor reconstruction).*

A. PROCEDURE OUTCOMES (hemiresection-interposition arthroplasty)

The Bowers HIT is a long-established, generally reliable salvage for the arthritic DRUJ. The evidence base is **level IV** (retrospective cohorts and case series, no randomised trials), but it is consistent across decades: most

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patients gain durable pain relief and improved, stable forearm rotation, with the principal residual concern being **ulnar-stump instability / radioulnar convergence under load**.

- **The original Bowers series established the procedure and its rationale.** Bowers' 1985 description (38 patients, mean ~2.5 yr) reported stable, painless rotation in the great majority — in rheumatoid patients ~85% achieved stable painless rotation (pronation ~84°, supination ~77°), and degenerative/post-traumatic patients achieved painless rotation averaging ~80° in each direction. The technique was explicitly designed to **preserve the functional ulnocarpal ligament complex** [Bowers, J Hand Surg Am 1985]. *Level IV (foundational case series).*
- **Long-term outcomes are durable but with a defined complication rate.** A long-term cohort (66 patients, mean follow-up **8.6 years**) reported low residual pain (median NRS 1/10), an overall **complication rate of ~14%** and **reoperation ~8%**; reported complications included stylocarpal impingement, ulnar subluxation, exostoses and tendon rupture. Inflammatory-arthritis patients had **lower pain than post-traumatic** patients (median 0 vs 5). The same series found **PIN neurectomy associated with improved pain scores** [HIT long-term outcome study, *Hand (N Y)* 2019]. *Level IV (cohort).*
- **Forearm rotation, grip and pain all improve measurably.** A capsuloretinacular HIT series (21 wrists, mean ~2 yr 10 mo) reported significant gains: **pronation 56.8°→83.0°**, **supination 60.0°→82.0°**, **grip 66.0%→87.4% of the contralateral side**, **VAS pain 62→23 mm**, **DASH 37.7→25.0**, **PRWE 48.1→24.4**, with **no post-operative DRUJ instability** reported in that series [HIT capsuloretinacular series, *J Wrist Surg* 2023]. *Level IV (cohort).*
- **HIT sits within a family of DRUJ salvage options** (Darrach distal ulna resection, Sauvé-Kapandji arthrodesis-pseudarthrosis, matched/hemiresection variants, and ulnar-head implant arthroplasty), each with its own instability/convergence profile; HIT's selling point is **preservation of the ulnar support structures** to reduce stump instability versus a formal Darrach [Bowers 1985; Glowacki, Hand Clin 2005; Chidgey, JAAOS 1995; Rekant, Hand Clin 2012; Murray, Hand Clin 2011]. *Mechanistic / narrative-review.*

B. REHABILITATION / THERAPY EVIDENCE

There is **no trial-level evidence** for any specific rehabilitation regimen after DRUJ HIT. Protocols are **surgeon- and technique-derived expert consensus**, reported as the post-operative methods of the outcome series and operative-technique articles above. The consensus is consistent on its key features.

- **A brief protected settling phase, not prolonged immobilisation.** In the isolated hemiresection (no distal radius osteotomy, no TFCC repair), a long-arm plaster splint for ~10 days followed by a removable **Muenster splint for a further 2-3 weeks** is typical; cohort series report an upper-arm cast ~3 weeks then a forearm cast 1-2 weeks. Where a distal radius osteotomy or TFCC repair is added, immobilisation is longer (e.g. a long-arm cast in ~45° supination for ~4 weeks) [Pillukat & van Schoonhoven, Oper Orthop Traumatol 2009; HIT capsuloretinacular series, *J Wrist Surg* 2023]. *Weak / expert consensus.*
- **Early forearm rotation is the explicit priority once protection ends.** The whole point of the operation is rotation, so active pronation/supination is pursued early and frequently. Some protocols **further limit**

end-range rotation by splint for ~4 more weeks after the cast comes off before unrestricted motion and load [Pillukat & van Schoonhoven 2009]. *Weak / expert consensus.*

- **Loading is added last, watching for the characteristic failure mode.** Range and load are returned to normal after the rotation-limited window; the specific thing to watch is **painful ulnar-stump instability and radioulnar convergence under axial/rotational load**, which is the biomechanically demonstrated weak point of distal-ulna procedures [Sauerbier et al., J Hand Surg Br 2002; Douglas et al., J Hand Surg Am 2014; Barret et al., Orthop Traumatol Surg Res 2020]. *Mechanistic (biomechanical) + consensus.*
- **Finger, thumb, elbow and shoulder motion from day one** is standard to prevent stiffness, as in any forearm/wrist immobilisation pathway. *Consensus.*

RECOVERY TRAJECTORY (EXPECTED, EVIDENCE-ANCHORED)

Phase	Window	Restraint	Hand use / therapy focus	Strength / load	Notes
I – Protected settling	**Week 0 to 2-3**	Splint limiting forearm rotation (Muenster / above-elbow type)	Active finger/ thumb/shoulder ROM from day 1; elbow ROM as splint allows; first gentle pain-free rotation toward end of phase	None through forearm	Longer if concurrent TFCC repair or distal radius osteotomy (cast in supination ~4 wk)
II – Early forearm rotation (priority)	**Week 2-3 to 6**	Unloaded; some protocols cap end-range rotation a few more weeks	**Active pronation/ supination as the main focus**, elbow tucked; add wrist ROM; finger/grip ROM; scar massage once healed	No resisted/ loaded rotation, no heavy grip	Target restoration toward ~80° each direction; pain-free is the rule
III – Strengthening & return	**Week 6-8+**	Restrictions lifted progressively	Resisted grip first, then graded **loaded rotation** (hammer turns); task-specific loading	Build load slowly; grip recovers toward ~85-90% contralateral	Watch for ulnar-stump instability / radioulnar convergence under load

(Phase windows mirror the precautions and phase tables in the patient protocol; they are typical expert-consensus guides, not trial-derived deadlines, and lengthen with concurrent procedures.)

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C. KEY CONTROVERSIES / EVIDENCE QUALITY

1. **HIT vs Darrach.** The Darrach (complete distal ulna resection) is simpler but sacrifices the ulnar support structures and is more prone to **painful proximal ulnar-stump instability and radioulnar convergence**, especially in younger, higher-demand or post-traumatic patients. HIT preserves the TFCC/styloid/ attachments to mitigate this — but **biomechanical work shows HIT also converges under load**, just to a different degree, so convergence is a spectrum, not a HIT-vs-Darrach binary [Sauerbier et al., J Hand Surg Br 2002; Douglas et al., J Hand Surg Am 2014]. Darrach remains reasonable in low-demand/elderly patients. *Moderate (biomechanical + cohort).*
2. **HIT vs Sauvé-Kapandji.** Sauvé-Kapandji fuses the DRUJ and creates a controlled proximal pseudarthrosis, preserving the ulnar head/buttress for the carpus; it is often favoured where ulnar translation of the carpus is a concern (e.g. rheumatoid), but it too can develop **painful proximal-stump instability**. Long-term Sauvé-Kapandji and modified-Sauvé-Kapandji series report durable function with that caveat [Reissner et al., J Hand Surg Eur 2021; Zimmermann et al., Arch Orthop Trauma Surg 2003]. Choice is patient- and pathology-specific, not evidence-mandated. *Moderate.*
3. **HIT vs ulnar-head (implant) replacement.** Implant ulnar-head arthroplasty is an alternative — particularly for **failed resection/instability salvage** — restoring a load-bearing buttress, but it adds implant-specific complications. Long-term implant series report good outcomes; it is increasingly used to rescue a painful, unstable stump after resection-type procedures [Kakar et al., J Hand Surg Am 2010; Adams, Hand Clin 2010; Watts et al., Hand Clin 2010; Rekant, Hand Clin 2012]. *Moderate.*
4. **The rehab regimen itself is consensus, not trial-derived.** No RCT compares immobilisation length, rotation timing or loading progression after HIT. The "brief protection → early rotation → graded load" structure is inferred from technique articles and the methods of level-IV outcome series. Exact phase timings are *typical*, not deadlines, and shift with concurrent procedures. *Weak / expert consensus.*
5. **Patient selection drives results.** Inflammatory-arthritis patients report lower residual pain than post-traumatic patients in long-term follow-up; **adjunct PIN neurectomy** is associated with better pain scores. Both point to outcome being substantially a selection/technique matter, not a rehab one [HIT long-term cohort, *Hand* 2019]. *Moderate (within level-IV data).*

D. EVIDENCE STRENGTH FLAGS (summary)

- **STRONG (RCT / SR):** none. There are no randomised trials of DRUJ HIT or of its rehabilitation.
- **MODERATE:** the **biomechanical basis of radioulnar convergence / ulnar-stump instability** under load across distal-ulna procedures (cadaveric studies); the comparative trade-offs among HIT / Darrach / Sauvé-Kapandji / ulnar-head replacement (consistent cohort + mechanistic data).
- **LEVEL IV (cohort / case series — the outcome evidence):** pain relief, grip recovery (~85-90% contralateral), pronation/supination gains (toward ~80° each), ~14% complication and ~8% reoperation rates, durability to ~8-9 years. Consistent but uncontrolled and surgeon-reported.

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- **WEAK / EXPERT CONSENSUS (the rehab regimen):** the specific **brief-protection → early-rotation → graded-load** programme, the Muenster/above-elbow splint choice, the ~2-3 week protected window, and all exact phase timings — derived from technique articles and the methods sections of level-IV series, lengthened by concurrent procedures. No comparative rehab evidence exists.

CITATIONS

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