CQ HAND + UPPER LIMB
SPECIALIST ORTHOPAEDIC SURGEON

EVIDENCE SUMMARY

Elbow Instability

Elbow Instability – Rehabilitation Evidence (Lateral / Terrible Triad / LCL and Throwing / UCL)

Topic scope: Post-operative rehabilitation after surgery for elbow instability, in two distinct tracks: **(A)** complex lateral instability – "terrible triad" / fracture-dislocation and lateral (ulnar) collateral ligament [LCL/LUCL] repair & reconstruction for posterolateral rotatory instability (PLRI); and **(B)** overhead-throwing ulnar (medial) collateral ligament [UCL] reconstruction & repair ("Tommy John").

> *Defining principle: the crux of every track is **protected motion, not immobilisation.** Restore enough stability to permit early range of motion (within ~1 week), because prolonged immobilisation is the dominant cause of disabling flexion contracture and stiffness. **Dr Hirpara's stance:** he does **not** use an external hinged brace. A repair that is stable through-range at surgery is managed with a **simple sling for comfort plus early motion to comfort** within positional precautions. Where stability needs protecting, he implants an **internal joint stabiliser (an internal hinge)** that holds the elbow reduced from the inside while permitting full flexion and extension to comfort – so the patient still moves early without an external arc-limiting brace. The device is typically removed once the ligaments have healed (~4–6 months). The published external-hinged-brace extension-block arcs below are retained as reference for what they represent biomechanically, not as Dr Hirpara's management.*

(A) Terrible triad / complex fracture-dislocation / LCL (LUCL) repair & reconstruction

FOREARM-ROTATION RULE (THE KEY PRECAUTION)

- **Lateral-sided (LCL/LUCL) injury → keep the forearm PRONATED.** Pronation tightens the lateral structures and seats the radiocapitellar joint, protecting the lateral repair. Terminal extension is performed pronated; supination near full extension reproduces the pivot-shift and is avoided.

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- **Medial-sided (MCL/UCL) injury → keep the forearm SUPINATED** (Rockwood & Green; Green's Operative Hand Surgery).
- If **both columns** are repaired (many terrible triads), the forearm is held **neutral**.
- Early supination, when allowed, is done **only with the elbow flexed to ~90°** (flexion stabilises the ulnohumeral joint and protects the lateral reconstruction).

PHASED TIMELINE

- **Week 0–2 — Immediate post-op / early motion.** Posterior splint at ~90° flexion in injury-appropriate forearm rotation for 7–14 days in the published protocols; the practical aim is early motion. Begin digit/wrist/shoulder AROM immediately and gentle elbow AROM/AAROM in the surgeon-defined stable arc within days (Brigham fracture-dislocation guideline starts elbow/forearm AROM at day 2–3). A supine/overhead protocol is an option where the lateral repair is tenuous — gravity compresses and stabilises the ulnohumeral joint (Green's; Lee 2013).
- **Week 2–6 — Protected motion / restore the arc.** Published external-hinged-brace protocols open an extension block ~10°/week, forearm pronated (Denver/Eichinger: 30° at wk2 → 20° wk3 → 10° wk4 → 0° wk5), reaching full extension by ~week 5–6. **Dr Hirpara replaces this external brace** with a simple sling (through-range stable repair) or an internal joint stabiliser permitting extension to comfort. Precautions: avoid varus stress and shoulder abduction; avoid combined full-extension-with-supination for up to ~16 weeks; no weight-bearing/closed-chain for 8–16 weeks.
- **Week 6–12 — Intermediate / strengthening.** Full PROM, joint mobilisations. **Strengthening starts ~week 6** once clinical and radiographic healing is confirmed (Brigham PRE 6–8 wk; Rockwood & Green). Static-progressive splinting if a contracture is developing (Müller 2013).
- **Week 12–20+ — Advanced / return.** Progressive resistance; avoid varus-loaded strengthening. Contact/overhead sport often delayed to ~6–9 months for reconstruction (Green's: unrestricted use ≥ 6 months for graft incorporation; Eichinger: up to 9 months).

Nonoperative (stable terrible triad) caveat: if the joint is concentrically reduced with a stable arc to ≥ 30° of extension (no radial-head block, small coronoid), nonoperative early-motion management is reasonable (Rockwood & Green / Chan criteria; Najd Mazhar 2017).

(B) UCL reconstruction / repair — throwing athlete ("Tommy John")

Rehabilitation is uniformly described in **4 phases** (Brotzman-Wilk lineage; ASMI/Andrews; Mass General). The forearm is biased toward **supination/neutral** (medial-sided injury); **no shoulder external-rotation loading early** (it valgus-loads the graft).

- **Phase I — Week 0–3.** Posterior splint at 90° week 1, then progressive ROM. Wrist AROM, gripping, submax shoulder isometrics (no ER), submax biceps isometrics from week 1–2.

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- **Phase II – Week 4–6/8.** Progress to full ROM by ~week 6. Light wrist/forearm strengthening, rotator-cuff isotonics; **resisted shoulder ER avoided until ~week 6** to protect the graft.
- **Phase III – Week 6/9–12/13.** Progressive elbow/forearm strengthening, eccentrics from ~wk9, **Thrower's Ten**, plyometrics ~wk9 if appropriate.
- **Phase IV – Week 14–26+. Interval throwing program ~week 14–16**; long-toss ramp 45→60 ft, +30 ft increments to 180 ft; **mound throwing ≥ 6 months**; return to competitive throwing ~6 months for return-to-throw, but full competitive **RTS typically 9–16 months** (≥ 12 months a common criterion). ~83–97% RTS in throwers.

INTERNAL-BRACE–AUGMENTED UCL REPAIR (ACCELERATED TRACK) — THE RECENT SHIFT

For acute/avulsion tears with good tissue, **UCL repair with internal brace** allows a markedly accelerated protocol (Dugas/ASMI; SLU/JOSPT 2019):

- Mobilise early to comfort; full/unrestricted ROM by ~wk4, brace off by wk6.
- Thrower's Ten from ~wk3; plyometrics from ~wk6.
- **Interval throwing as early as ~wk11; return to sport ~5–7 months** (vs ≥ 9–12+ for reconstruction). Dugas 2025 (AJSM) head-to-head: repair ~2–3 weeks accelerated for ROM/strengthening and **~5–9 weeks accelerated for starting the interval throwing program**, with comparable outcomes in appropriately selected athletes.

Phased-timeline summary

Phase / window	Track A — lateral (terrible triad / LCL)	Track B — throwing (UCL, internal-brace repair)
Weeks 0–2	Sling for comfort; elbow AROM/AAROM to comfort from day 2–3, forearm pronated, arm supported in front / supine-overhead	Early protected motion to comfort; submax shoulder (no ER) + biceps isometrics; grip/ wrist work
Weeks 2–6	Restore full comfortable arc; extension to comfort (internal stabiliser permits); maintain pronation, avoid varus	Progress to full arc by ~wk6; Thrower's Ten from ~wk3
Weeks 6–12	Strengthening once healed (~wk6); static-progressive splint if contracture	Plyometrics from ~wk6; progressive strengthening
Weeks 12–20+	Progressive resistance; contact/overhead sport ~6–9 mo	Interval throwing ~wk11; RTS ~5–7 mo (reconstruction: 9–16 mo)

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Key controversies

1. **Early vs protected motion (complex instability).** Strong consensus favours early motion (≤ 7 days), BUT the two 2024 systematic reviews (Ahmed Kamel, JSES; Larwa, Shoulder & Elbow) found **no RCT** and high heterogeneity (immobilisation 1–76 days, weighted mean ~42–47). "Early" is biomechanically favoured, not Level-I proven; over-aggressive motion risks re-subluxation in a marginally stable repair.
2. **Brace necessity & utility.** A hinged orthosis is the published standard, but Manocha/King (JHS 2018) showed it adds little stability with the arm overhead (gravity already compresses the joint), supporting overhead/supine rehab over brace reliance for lateral injuries (Lee 2013). This underpins Dr Hirpara's no-external-brace approach.
3. **Forearm-rotation dogma.** Pronation-for-lateral / supination-for-medial is biomechanically grounded and widely taught, but Selley 2025 found forearm rotation at graft tensioning did not change postoperative medial gapping — questioning how rigidly rotation must be controlled in UCL cases.
4. **Accelerated vs conservative UCL return-to-throw.** Time-to-RTS varies 4–16 months with no consensus threshold; Erickson 2017 found earlier RTS did not raise revision risk in MLB pitchers, undercutting strict "wait ≥ 12 months" dogma.
5. **Internal brace enabling faster rehab.** The biggest recent shift: suture-tape/internal-brace augmentation gives superior time-zero biomechanics and supports repair (not reconstruction) in selected throwers with a 5–9-week-faster throwing timeline. Durability in elite pitchers and mid-substance tears is still maturing (Level III–IV).

Evidence strength flags

- **(A) Complex instability / LCL: LOW–MODERATE.** No RCTs; guidance is biomechanical + expert-consensus + Level III/IV case series and two 2024 systematic reviews. Internal-joint-stabiliser data (Orbay/Mighell lineage; Dunning/Morrey biomechanics) are device-specific case series — *Consensus / Moderate*.
- **(B) UCL throwing: MODERATE.** Large case series, multiple systematic reviews, and concordant institution-standard protocols (Brigham/Brotzman-Wilk, Mass General, ASMI/Andrews) for the phased arc and interval-throwing timeline. Internal-brace augmentation is newer (Level III–IV, growing).
- **Rehabilitation protocols themselves: CONSENSUS / WEAK** — phase timings derive from published institutional protocols, not rehab RCTs.

Citations

RAG CORPUS (180,000+ ORTHOPAEDIC ARTICLES)

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- *Rockwood and Green's Fractures in Adults.* 2019. — long-arm splint 7–10 d; lateral injury → forearm pronated, medial → supinated; avoid shoulder abduction/varus for lateral injury; strengthening ~6 wk.
- *Green's Operative Hand Surgery.* 2021. — supination only with elbow maximally flexed; overhead/supine protocol option; isometric strengthening 8–10 wk; unrestricted use ≥ 6 mo.

PUBLISHED PROTOCOLS (LITERATURE URLS)

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