Rehabilitation of scapholunate instability

Educational article - English edition

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Source article

Geoffroy C, Mesplié G. Rééducation des instabilités scapho-lunaires. Kinésithérapie, la Revue. 2018.

Background

Scapholunate instability results from injury to the scapholunate ligament complex, a major stabiliser of the proximal carpal row. It is among the commonest intracarpal ligament injuries. Disrupted scaphoid-lunate biomechanics may progressively disorganise the carpus and, in advanced cases, produce scapholunate advanced collapse (SLAC wrist).

Rehabilitation therefore addresses more than range and strength: its primary aims are protection of injured ligament structures and restoration of dynamic carpal stability.

Scapholunate biomechanics

The scaphoid and lunate experience different forces but normally function together in the proximal row. Loading from the distal row tends to flex and pronate the scaphoid. The lunate receives opposing influences: flexion transmitted particularly through the scaphoid, and extension associated with the triquetrum and capitate loading.

The scapholunate ligament maintains cohesion and balances these forces. With ligament insufficiency, the scaphoid tends to flex while the lunate may extend, progressively producing dorsal intercalated segment instability (DISI). Scapholunate widening may also occur. These changes alter carpal load transmission and may favour long-term degeneration.

Injury mechanism

The classic injury involves loading an extended, radially deviated wrist, sometimes with supination or axial loading. Forces exceeding ligament capacity may cause partial or complete injury.

Instability severity depends not only on the scapholunate ligament but also on secondary carpal ligament stabilisers.

Muscles and dynamic stability

Scapholunate stability is not exclusively passive. Muscles actively control intracarpal movement. Depending on orientation, tendon path and biomechanics, some may stabilise the complex while others increase destabilising forces. This distinction is central to rehabilitation reasoning.

Muscles with stabilising potential

Abductor pollicis longus (APL): its orientation and relationship to the radial carpus may help limit some pathological scaphoid displacement. It may therefore be recruited early during active stabilisation.

Extensor carpi radialis longus and brevis (ECRL, ECRB): activation promotes intracarpal movement considered favourable to scapholunate stability, particularly a tendency towards carpal supination. Selective recruitment is a major component of the proposed programme.

Flexor carpi radialis (FCR): its biomechanical position is distinctive. Although its overall action may pronate the distal row, the tendon contacts the scaphoid and can act favourably on it locally, helping limit excessive scaphoid flexion-pronation. It may therefore act as a dynamic stabiliser.

General strengthening principle

The aim is not indiscriminate strengthening of every wrist muscle, but selective recruitment of muscles whose mechanics may protect the scapholunate complex.

Contractions initially are isometric, low-to-moderate intensity, pain-free and performed in protective positions. Load and complexity then increase according to healing and neuromuscular control.

Potentially destabilising muscles and exercises

Extensor carpi ulnaris (ECU) requires particular attention. It may generate intracarpal pronation, accentuate scaphoid flexion-pronation and increase scapholunate loading. Isolated strengthening is therefore not pursued early in ligament healing. This does not permanently exclude ECU from wrist function: recruitment must match healing stage and biomechanics.

Ball squeezing and general grip strengthening may also be problematic early. Strong finger-flexor contraction increases compression through the carpus; the capitate then applies greater axial loading to the proximal row and potentially the scapholunate complex. The authors recommend avoiding intense or repetitive gripping during ligament healing.

General rehabilitation principles

Two broad periods are proposed: ligament protection and healing, followed by functional recovery and dynamic stabilisation.

Phase 1: protection and healing

This approximately covers the first 45-60 days, depending on injury, treatment and medical or surgical instructions.

Goals are to protect the healing ligament, reduce pain and inflammation, limit harmful loading, maintain permitted mobility, prevent stiffness, initiate proprioceptive control and recruit appropriate muscle stabilisers early.

Orthosis: a wrist orthosis can control movement and protect the complex. Position is generally near neutral, possibly with slight ulnar deviation according to the clinical context and mechanical goals.

Mobilisation: gradual, pain-free and within controlled ranges, respecting healing and avoiding mechanisms that may increase instability.

Muscle work: mainly moderate isometrics of APL, ECRL, ECRB and FCR. Initially, specific controlled recruitment matters more than maximum strength.

Phase 2: dynamic stabilisation and functional recovery

Once tissue healing is sufficiently advanced, goals progress towards restoring range, strength, endurance, neuromuscular coordination, dynamic stability and functional ability, followed by return to work and sport.

Difficulty increases gradually, progressing from relatively isolated voluntary recruitment towards more complex functional situations.

Proprioceptive rehabilitation

1. Conscious proprioception: first improve recognition of wrist position through joint-position reproduction, identifying positions without vision, detecting passive movement and comparing affected and unaffected sides. The aim is better afferent information and conscious joint-position representation.

2. Neuromuscular control: progress towards active stabiliser recruitment, combining static contractions, concentric and eccentric work, progressive resistance, different wrist and forearm positions and increasingly complex functional tasks. The aim is an appropriate muscular response to carpal loading.

3. Reflex stabilisation: restore automatic dynamic stability using external perturbations and controlled destabilisation to elicit rapid reflex responses. Options include unstable supports, balls, elastic resistance, manual perturbations, kinetic-chain exercises and progressively unpredictable functional tasks.

At an advanced stage, plyometrics may improve response speed and sensorimotor adaptation for demanding sporting or occupational activities.

Conclusion

Scapholunate rehabilitation requires precise understanding of carpal biomechanics. The goal is not simply mobility or global strengthening, but dynamic stability that can at least partly compensate for ligament insufficiency.

Management combines healing protection, load control, gradual range recovery, proprioception, selective stabiliser recruitment and progressive restoration of neuromuscular and reflex responses. Principal target muscles are APL, ECRL, ECRB and FCR.

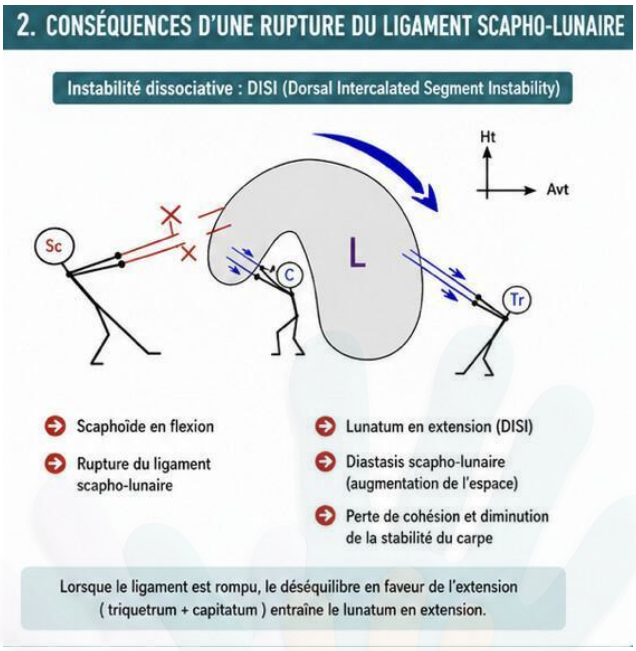
Early limitations concern strong isolated ECU recruitment, intense ball squeezing, axial loading and exercises likely to accentuate scaphoid flexion-pronation.

Main clinical message

Rehabilitation must be specific and biomechanically directed: wrist muscles do not all have the same effect on stability. Progression moves from ligament protection to voluntary motor control, then dynamic and reflex stabilisation that allows the wrist to respond effectively to functional demands.

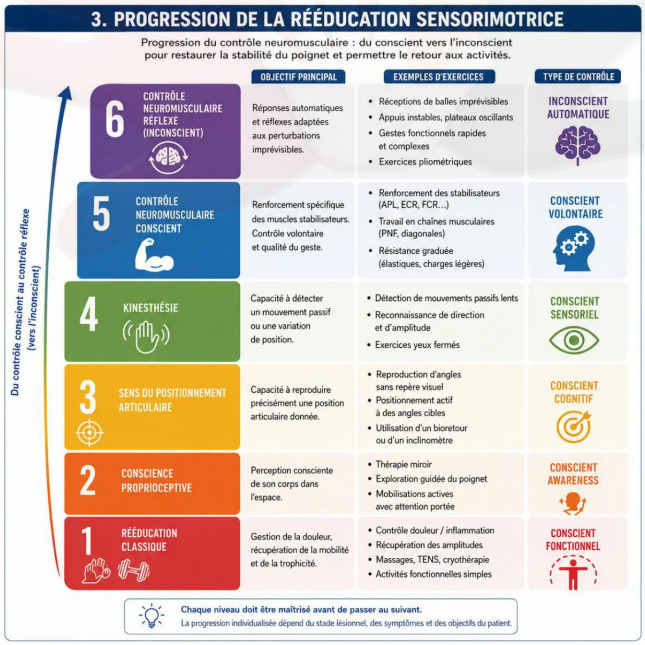
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