

The “Four-Leaf Clover” Treatment Algorithm: A Practical Approach to Manage Disorders of the Distal Radioulnar Joint

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Editors

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All authors of this journal-based CME activity have no relevant conflicts of interest to disclose. In the printed or PDF version of this article, author affiliations can be found at the bottom of the first page.

Planners

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Learning Objectives

Upon completion of this CME activity, the learner should achieve an understanding of:

- Osseous constraints of the distal radio-ulnar joint (DRUJ)
- Soft tissue restraints of the DRUJ
- Interrelated multiple causes of disorders of the DRUJ
- Treatment algorithm for disorders of the DRUJ

Deadline: Each examination purchased in 2016 must be completed by January 31, 2017, to be eligible for CME. A certificate will be issued upon completion of the activity. Estimated time to complete each JHS CME activity is up to one hour.

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Most symptomatic distal radioulnar joint (DRUJ) conditions result from derangements to several structures that may include the length, shape, and/or orientation of the articulating surfaces; the cartilage of the DRUJ and/or ulnocarpal joint; the DRUJ and/or ulnocarpal joint ligaments; and the extensor carpi ulnaris and/or pronator quadratus muscle. Once a complete diagnosis is made, often only one of these components is addressed, which results in suboptimal clinical outcomes. In this article, we present a treatment algorithm (the Four-Leaf Clover

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algorithm) to guide treatment of DRUJ pathology. The Four-Leaf Clover principle is a guiding algorithm, not a document forcing the surgeon to adopt one particular treatment. Its purpose is to provide treating physicians with a checklist that helps ensure that they do not miss any of the different components that need to be addressed for a complete treatment. Using the treatment algorithm, we should achieve satisfactory resolution of patients' symptoms after addressing the particular components in a stepwise approach. (*J Hand Surg Am. 2016;41(4):551–564. Copyright © 2016 by the American Society for Surgery of the Hand. All rights reserved.*)

Key words Distal radioulnar joint, treatment, distal radioulnar joint pathology.

THE DISTAL RADIOULNAR JOINT (DRUJ) IS of vital importance for optimal functioning of the wrist and forearm during pronosupination.^{1–5} Its articulating surfaces comprise the ulnar head and sigmoid notch. There are 4 main types of sigmoid notch (Fig. 1),⁶ most of which are flat-faced. Because of this, an osteocartilaginous volar lip deepens the concavity of the notch to increase stability. Af Ekenstam and Hagert⁷ and others^{8,9} noted that the radius of curvature of the sigmoid notch was approximately 50% greater than the ulna head, permitting rotation and sliding during pronation and supination. In maximal supination, the articular contact area consists of only 2 to 3 mm at the palmar lip.

Because of the lack of osseous constraint (it accounts for 20%), stability of the DRUJ is primarily afforded by the soft tissues. Static stabilizers provide primary stability and include the palmar and dorsal radioulnar ligaments. Originating from the palmar and dorsal regions of the DRUJ, respectively, the radioulnar ligaments converge into a superficial attachment to the ulnar styloid and deep foveal attachment limb. These ligaments tighten up during pronosupination to prevent instability at the extremes of motion.^{10–12}

The DRUJ capsule, ulnotriquetral ligament (UTL) and ulnolunate ligament, interosseous membrane, and triangular fibrocartilage complex (TFCC) provide additional static stabilization of the DRUJ. Dynamic stabilizers include the pronator quadratus and extensor carpi ulnaris (ECU) tendon (Fig. 2).^{13,a}

Disorders of the DRUJ are common and yet are poorly understood. Often referred to low back pain of the wrist, there is a wide spectrum of conditions ranging from joint stiffness to gross DRUJ instability that poses many challenges to the treating physician. DRUJ instability can be hard to diagnose because its signs and symptoms can be nonspecific. Patients may describe a history of a fall with the wrist in the extended and pronated position that resulted in symptoms of a painful click with wrist motion, especially pronosupination. Chronic overuse and degenerative conditions may have a history of trauma or a change in recent activities.

Examination should start on the uninjured wrist, which can act as a control to determine what is the normal range of motion and laxity of the DRUJ, because this can vary among individuals. Patients often have pain with pronation and supination of the wrist. With dorsal instability, they may have a protuberant ulnar head at terminal pronation. In patients with palmar instability, a slight fullness may be seen within the volar DRUJ, with a depression noted on the dorsal wrist. Passive laxity should be assessed with the forearm in neutral, pronation, and supination and compared with the uninjured side. Compression across the DRUJ may cause pain or accentuate a clunk as the ulna head dislocates and reduces within the notch. A positive piano-key test may be noted with pain when the ulna head is reduced within the sigmoid notch with dorsal to palmar force and then released.¹⁴ Pain may be relieved by depressing the ulna head with the thumb while simultaneously elevating the pisiform bone in patients with carpal supination and dorsal subluxation of the ulna head.¹⁵ Adams and Berger¹⁶ described the modified press test to detect DRUJ instability. With forearms pronated, patients press both hands on a flat surface. In those with DRUJ instability, the ulnar head is proud dorsally and seems to subluxate volar with pressure, creating a dorsal hollow. Foveal tenderness, a region located between the flexor carpi ulnaris tendon and ulnar styloid, may indicate disruption of the deep fibers of the radioulnar ligament.¹⁷

The ECU should be examined for signs of tenderness and instability during pronosupination. The use of selective local anesthetic injections can aid in diagnosing ulnar wrist pain, given the myriad of differential diagnoses. These include TFCC tears, ECU tenosynovitis, ECU instability, DRUJ instability, DRUJ arthritis, ulnar impaction, ulnar styloid nonunions, lunotriquetral ligament insufficiency, and neuromas of the dorsal sensory branch of the ulnar nerve.

Standard neutral rotation posteroanterior (ECU groove lies radial to ulnar styloid),¹⁸ oblique, and lateral plain wrist x-rays should be examined for fractures, carpal malalignment, ulnar variance, and inflammatory

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