

Distal Radioulnar Joint Surgery

Overview

- Salvage of failed distal radioulnar joint reconstruction requires a thorough understanding of normal anatomy, biomechanics, and the modes of failure of the primary procedure to develop effective strategies [1].
- Most ulnar-sided wrist problems associated with distal radial fractures can be treated non-operatively initially, typically for over a year, in anticipation of substantial improvement with time [2].
- Distal radioulnar joint instability is often an underestimated lesion requiring systematic clinical examination and imaging for detection [4].
- Surgeons recommended distal radioulnar joint treatment in 67% (404 of 607) of the scenarios in a survey of treatment variation after plate fixation of distal radial fractures [5].
- The most common recommended treatment for distal radioulnar joint issues after plate fixation of distal radial fractures was cast immobilization, cited in 41% (247 of 607) of scenarios [5].
- Distal radioulnar joint instability management covers anatomic and biomechanical advances, categorization of instability, and treatment strategies including percutaneous, arthroscopic, soft-tissue, osteotomy and arthroplasty techniques [6].
- Ulnar shortening osteotomy is a good option to treat patients with ulnar impaction syndrome regardless of the distal radioulnar joint angle [7].
- Distal radioulnar joint ligament reconstruction is indicated when native ligaments are not reparable, provided there is no radius or ulna bony deformity or arthritis of the distal radioulnar joint [8].
- Severely damaged and painful distal radioulnar joints can be reconstructed by resection arthroplasty or by hemi- or total arthroplasty [9].
- There is presently no evidence that ulnar head and total radio-ulnar joint prostheses produce long-lasting results [10].
- When appropriate patient selection criteria are met, partial and total ulnar head replacement typically produce reliable results [20].

Anatomy & Pathophysiology

- Stability of the distal radioulnar joint is maintained by two factors: compression between the articulating surfaces and tension in the ligament in the direction of its fibers [33].
- The flexor carpi ulnaris and extensor carpi ulnaris muscles serve as dynamic stabilizers of the distal radioulnar joint [15].
- Anatomical variations in the sigmoid notch and ulnar head significantly influence joint mechanics and treatment outcomes [34].
- The interaction between ligaments, muscles, and bones is essential for distal radioulnar joint stability [16].
- Closed treatment is frequently successful for isolated acute distal radioulnar joint dislocations due to the healing potential of the peripheral triangular fibrocartilage complex [18].
- Radial lengthening did not demonstrate a benefit in improving distal radioulnar joint stability in a triangular fibrocartilage complex injury model [36].
- Pressures within the distal radioulnar joint change with forearm rotations, with the highest intra-articular pressure recorded in supination under no disruption-no load, no disruption-loaded, and disrupted triangular fibrocartilage complex conditions [37].
- The Aptis distal radioulnar joint arthroplasty considerably alters forearm kinematics, which can have clinical implications [29].
- Distal radioulnar joint kinematics during handstanding vary with school age in female gymnasts, with high school students showing a significantly larger increase in distal radioulnar joint separation compared to elementary school students [30].

Classification

- Salvage of failed distal radioulnar joint reconstruction requires understanding normal anatomy, biomechanics, and modes of failure of the primary procedure [1].
- Thorough knowledge of the anatomy and kinematics of the distal radioulnar joint is necessary to manage pathologic conditions [3].
- Surgeons recommended distal radioulnar joint treatment in 67% (404 of 607) of scenarios, most commonly cast immobilization in 41% (247 of 607) [5].
- The functional anatomy and pathomechanics of the distal radioulnar joint emphasize the interaction between ligaments, muscles, and bones for stability [16].
- Advances in minimally invasive surgical techniques have transformed the management of distal radioulnar joint instability [24].
- Coronal shift should be added to classic measures of distal radius fracture reduction because of its fundamental role in distal radioulnar joint stability [27].

Clinical Presentation

- Salvage of failed distal radioulnar joint reconstruction requires a thorough understanding of normal anatomy, biomechanics, and the modes of failure of the primary procedure [1].
- A thorough knowledge of the anatomy and kinematics of the distal radioulnar joint is necessary to manage pathologic conditions [3].
- Surgeons recommended distal radioulnar joint treatment in 67% (404 of 607) of scenarios involving plate fixation of distal radial fractures, most commonly cast immobilization in 41% (247 of 607) [5].
- Distal radioulnar joint instability and its management involve anatomic and biomechanical advances, categorization of instability, and treatment strategies including percutaneous, arthroscopic, soft-tissue, osteotomy and arthroplasty techniques [6].
- DRUJ ligament reconstruction is indicated when native ligaments are not reparable, provided there is no radius or ulna bony deformity or arthritis of the DRUJ [8].
- Chronic distal radioulnar joint instability results from various traumatic injuries and can lead to chronic functional impairment, pain, and arthritis if left untreated [11].
- Stabilization of the ulnar stump seems to alleviate pain and improve forearm rotation and functional outcomes, although no direct correlation exists between radioulnar convergence and patient outcomes [12].
- Standard and alternative exposures of the wrist joint and DRUJ are discussed, with case examples illustrating their use [13].
- The occurrence of osteoarthritis of the scaphotrapeziotrapezoid and distal radioulnar joints was affected by the presence of osteoarthritis of the adjacent joint [14].
- There is substantial surgeon-to-surgeon variation in interpreting MRI signal changes and arthroscopic findings in the distal radioulnar ligaments and central disc, raising concerns about overdiagnosis and overtreatment versus underdiagnosis [17].
- Treatment goals in the acute setting for distal radius fracture should be to prevent future instability or incongruity of the distal radioulnar joint, while goals in the chronic setting should be to restore stability and congruency to allow for painless, full motion [19].
- Surgical outcomes for the management of the distal radioulnar joint in rheumatoid arthritis are best when performed before the patient displays severe joint destruction, fixed contractures, subluxation, or dislocation [21].
- The etiology, clinical presentation, and treatment strategies for unique problems affecting the pediatric and adolescent distal radioulnar joint include Madelung deformity, physeal arrest, and osteochondromatosis [35].

Investigations

- Coronal shift should be added to the classic measures of distal radius fracture reduction because of its fundamental role in distal radioulnar joint stability [27].

- Conventional radiography should be the first imaging modality to exclude or diagnose wrist pathology [32].
- When conventional radiography is inconclusive, high resolution 3 Tesla MRI is advised [32].
- A nuanced understanding of 3D relationships can enhance preoperative planning when correcting ulnar-side pathology [39].
- Imaging the DRUJ requires knowledge of the complex bony, muscular, and ligamentous anatomy [40].
- Standard well-positioned radiography is the appropriate first step for imaging the DRUJ [40].
- High-resolution MRI helps delineate ligamentous structures in the DRUJ [40].
- Dynamic CT is indicated for clinical instability of the DRUJ [40].

Treatment

- Treatment strategies for distal radioulnar joint instability include percutaneous, arthroscopic, soft-tissue, osteotomy, and arthroplasty techniques [6].
- Treatment goals in the acute setting should be to prevent future instability or incongruity of the distal radioulnar joint [19].
- Treatment goals in the chronic setting should be to restore stability and congruency to allow for painless, full motion [19].
- Indirect ulnar shortening by distraction through the distal radius fracture site provides a simple and novel strategy for the management of persistent distal radioulnar joint instability during volar plating, obviating the need for prolonged immobilization or to alter standard postoperative protocols [23].
- The Aptis total distal radioulnar joint prosthesis is a good rescue option for patients with previous failed surgical procedures, providing significant improvements in range of motion, grip strength, and pain scores with a mean follow-up of 9.7 years [25].
- Combined extensor retinaculum capsulorrhaphy and suture repair effectively restores stability to both the distal radioulnar joint and ulnocarpal joint in patients with triangular fibrocartilage complex-related ulnocarpal instability, considerably reducing pain and preserving range of motion [38].

Complications

- Most ulnar-sided wrist problems associated with distal radial fractures can be treated non-operatively initially for over a year in anticipation of substantial improvement with time [2].
- Anatomic distal radioulnar joint reconstruction represents an important evolutionary step in the history of surgical treatment for distal radioulnar joint instability [22].
- Indirect ulnar shortening by distraction through the distal radius fracture site provides a simple and novel strategy for managing persistent distal radioulnar joint instability during volar plating, obviating the need for prolonged immobilization or altering standard postoperative protocols [23].

- Both APTIS distal radioulnar joint arthroplasty and ulnar head replacement yield substantial functional improvements and good long-term survivorship [26].
- Adding a distally based longitudinal extensor carpi ulnaris strip to ulnar shortening osteotomy seems to be an effective treatment in patients with irreparable degenerative triangular fibrocartilage complex injuries due to ulnar impaction syndrome [28].

Recovery

- The original anatomic distal radioulnar joint reconstruction technique described by Sanders and its procedure modifications represent an important evolutionary step in the history of surgical treatment for distal radioulnar joint instability [22].
- Adding a distally based longitudinal extensor carpi ulnaris strip to ulnar shortening osteotomy for restoring distal radioulnar joint stability seems to be an effective treatment in patients with irreparable degenerative triangular fibrocartilage complex injuries due to ulnar impaction syndrome [28].

Key Evidence

- [L5] Salvage of failed distal radioulnar joint reconstruction requires a thorough understanding of normal anatomy, biomechanics, and the modes of failure of the primary procedure to develop effective strategies. [1] ([10.1016/j.hcl.2010.05.004](#))
- [L5] Most ulnar-sided wrist problems associated with distal radial fractures can be treated non-operatively initially, typically for over a year, in anticipation of substantial improvement with time. [2] ([10.1177/17531934221140238](#))
- [L5] A thorough knowledge of the anatomy and kinematics of the distal radioulnar joint is necessary to manage pathologic conditions. [3] ([10.1016/j.hcl.2005.08.002](#))
- [L5] Distal radioulnar joint instability is often an underestimated lesion requiring systematic clinical examination and imaging for detection. [4] ([10.1007/s00402-020-03371-0](#))
- [L4] Surgeons recommended distal radioulnar joint treatment in 67% (404 of 607) of the scenarios, most commonly cast immobilization in 41% (247 of 607). [5] ([10.1177/17531934261449057](#))
- [L5] The purpose of this article is to review distal radioulnar joint instability and its management, covering anatomic and biomechanical advances, categorization of instability, and treatment strategies including percutaneous, arthroscopic, soft-tissue, osteotomy and arthroplasty techniques. [6] ([10.1177/1753193414527052](#))
- [L4] Ulnar shortening osteotomy is a good option to treat patients with ulnar impaction syndrome regardless of the distal radioulnar joint angle. [7] ([10.1177/17531934241262931](#))
- [L5] DRUJ ligament reconstruction is indicated when native ligaments are not repairable, provided there is no radius or ulna bony deformity or arthritis of the DRUJ. [8] ([10.1016/j.hcl.2020.07.004](#))

- [L5] Severely damaged and painful distal radioulnar joints can be reconstructed by resection arthroplasty or by hemi- or total arthroplasty. [9] ([10.1016/j.hcl.2020.07.008](https://doi.org/10.1016/j.hcl.2020.07.008))
- [L5] The introduction of ulnar head and total radio-ulnar joint prostheses has provided a new method, but there is presently no evidence that these implants produce long-lasting results. [10] ([10.1054/jhsb.2002.0815](https://doi.org/10.1054/jhsb.2002.0815))
- [L5] Chronic distal radioulnar joint instability results from various traumatic injuries and can lead to chronic functional impairment, pain, and arthritis if left untreated. [11] ([10.1016/j.hcl.2010.05.010](https://doi.org/10.1016/j.hcl.2010.05.010))
- [L5] Stabilization of the ulnar stump seems to alleviate pain and improve forearm rotation and functional outcomes, although no direct correlation exists between radioulnar convergence and patient outcomes. [12] ([10.1016/j.hcl.2014.12.003](https://doi.org/10.1016/j.hcl.2014.12.003))
- [L5] Standard and alternative exposures of the wrist joint and DRUJ are discussed, with case examples illustrating their use. [13] ([10.1016/j.hcl.2014.07.003](https://doi.org/10.1016/j.hcl.2014.07.003))
- [L4] The occurrence of osteoarthritis of the scaphotrapeziotrapezoid and distal radioulnar joints was affected by the presence of osteoarthritis of the adjacent joint. [14] ([10.1016/j.jhsa.2023.05.009](https://doi.org/10.1016/j.jhsa.2023.05.009))
- [L4] The flexor carpi ulnaris and extensor carpi ulnaris muscles serve as dynamic stabilizers of the distal radioulnar joint. [15] ([10.1177/17531934231168299](https://doi.org/10.1177/17531934231168299))
- [L5] The purpose of this review article is to present and illustrate the current understanding of the functional anatomy and pathomechanics of the distal radioulnar joint, emphasizing the interaction between ligaments, muscles, and bones for stability. [16] ([10.1177/1753193417693170](https://doi.org/10.1177/1753193417693170))
- [L5] There is substantial surgeon-to-surgeon variation in interpreting MRI signal changes and arthroscopic findings in the distal radioulnar ligaments and central disc, raising concerns about overdiagnosis and overtreatment versus underdiagnosis. [17] ([10.1177/17531934241254705](https://doi.org/10.1177/17531934241254705))
- [L5] This article reviews the anatomy, biomechanics, and treatment of acute dislocations of the distal radioulnar joint and distal ulna fractures, emphasizing that closed treatment is frequently successful for isolated dislocations due to the healing potential of the peripheral TFCC. [18] ([10.1016/j.hcl.2010.05.009](https://doi.org/10.1016/j.hcl.2010.05.009))
- [L5] Treatment goals in the acute setting should be to prevent future instability or incongruity of the distal radioulnar joint, while goals in the chronic setting should be to restore stability and congruency to allow for painless, full motion. [19] ([10.1016/j.hcl.2021.02.011](https://doi.org/10.1016/j.hcl.2021.02.011))
- [L4] When appropriate patient selection criteria are met, partial and total ulnar head replacement typically produce reliable results. [20] ([10.1177/1753193417693177](https://doi.org/10.1177/1753193417693177))
- [L5] Surgical outcomes are best when performed before the patient displays severe joint destruction, fixed contractures, subluxation, or dislocation. [21] ([10.1016/j.hcl.2005.08.009](https://doi.org/10.1016/j.hcl.2005.08.009))
- [L4] This report documents the original anatomic DRUJ reconstruction technique described by Sanders and our procedure modifications, representing an important evolutionary step in the history of surgical treatment for DRUJ instability. [22] ([10.1016/j.jhsa.2020.08.001](https://doi.org/10.1016/j.jhsa.2020.08.001))
- [L4] Indirect ulnar shortening by distraction through the distal radius fracture site provides a simple and novel strategy for the management of persistent DRUJ instability during volar plating, obviating the need for prolonged immobilization or to alter standard postoperative protocols. [23] ([10.1016/j.jhsa.2018.02.030](https://doi.org/10.1016/j.jhsa.2018.02.030))

- [L5] Advances in minimally invasive surgical techniques have transformed the management of DRUJ instability. [24] ([10.1177/17531934261417561](https://doi.org/10.1177/17531934261417561))
- [L4] The Aptis total distal radioulnar joint prosthesis is a good rescue option for patients with previous failed surgical procedures, providing significant improvements in range of motion, grip strength, and pain scores with a mean follow-up of 9.7 years. [25] ([10.1177/17531934231192375](https://doi.org/10.1177/17531934231192375))
- [L2] Both APTIS DRUJ arthroplasty and ulnar head replacement yield substantial functional improvements and good long-term survivorship. [26] ([10.1177/17531934261415827](https://doi.org/10.1177/17531934261415827))
- [L5] Coronal shift should be added to the classic measures of distal radius fracture reduction because of its fundamental role in distal radioulnar joint stability. [27] ([10.1016/j.jhsa.2014.08.022](https://doi.org/10.1016/j.jhsa.2014.08.022))
- [L4] Adding a distally based longitudinal extensor carpi ulnaris strip to ulnar shortening osteotomy for restoring distal radioulnar joint stability seems to be an effective treatment in patients with irreparable degenerative triangular fibrocartilage complex injuries due to ulnar impaction syndrome. [28] ([10.1177/17531934231197942](https://doi.org/10.1177/17531934231197942))
- [L4] The Aptis distal radioulnar joint arthroplasty considerably alters forearm kinematics, which can have clinical implications. [29] ([10.1177/17531934241274142](https://doi.org/10.1177/17531934241274142))
- [L4] The DRUJ kinematics during handstanding vary with school age in female gymnasts, with high school students showing a significantly larger increase in DRUJ separation compared to elementary school students. [30] ([10.1177/23259671251368997](https://doi.org/10.1177/23259671251368997))
- [L2] Conventional radiography should be the first imaging modality to exclude or diagnose wrist pathology; when inconclusive, high resolution 3 Tesla MRI is advised. [32] ([10.1177/1753193416683876](https://doi.org/10.1177/1753193416683876))
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- [L5] Anatomical variations in the sigmoid notch and ulnar head significantly influence joint mechanics and treatment outcomes. [34] ([10.1016/j.hcl.2012.03.002](https://doi.org/10.1016/j.hcl.2012.03.002))
- [L5] The purpose of this article is to review the etiology, clinical presentation, and treatment strategies for the management of unique problems affecting the pediatric and adolescent distal radioulnar joint, including Madelung deformity, physeal arrest, and osteochondromatosis. [35] ([10.1016/j.hcl.2010.06.001](https://doi.org/10.1016/j.hcl.2010.06.001))
- [L5] Radial lengthening did not demonstrate a benefit in improving DRUJ stability in a triangular fibrocartilage complex injury model. [36] ([10.1016/j.jhsa.2025.06.013](https://doi.org/10.1016/j.jhsa.2025.06.013))
- [L5] Pressures within the DRUJ changed with forearm rotations, with the highest intra-articular pressure recorded in supination under no disruption-no load, no disruption-loaded, and disrupted TFCC conditions. [37] ([10.1016/j.jhsa.2023.11.015](https://doi.org/10.1016/j.jhsa.2023.11.015))
- [L4] The combined HS and suture repair effectively restores stability to both the DRUJ and UCJ in patients with TFCC-related ulnocarpal instability, considerably reducing pain and preserving range of motion. [38] ([10.1016/j.jhsg.2025.100806](https://doi.org/10.1016/j.jhsg.2025.100806))
- [L4] A nuanced understanding of these 3D relationships can enhance preoperative planning when correcting ulnar-side pathology. [39] ([10.1016/j.jhsg.2023.12.006](https://doi.org/10.1016/j.jhsg.2023.12.006))

- [L5] Imaging the DRUJ requires knowledge of the complex bony, muscular, and ligamentous anatomy; standard well-positioned radiography is the appropriate first step, while high-resolution MRI helps delineate ligamentous structures and dynamic CT is indicated for clinical instability. [40] ([10.1016/j.hcl.2010.07.001](https://doi.org/10.1016/j.hcl.2010.07.001))

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