CQ HAND + UPPER LIMB
SPECIALIST ORTHOPAEDIC SURGEON

EVIDENCE SUMMARY

Wrist Ligament Injuries

title: “Wrist Ligament Injuries” slug: wrist-ligament-injuries region: wrist audience: patient mesh_terms: [“Wrist Injuries”, “Ligaments, Articular”, “Wrist Joint”, “Lunate Bone”, “Carpal Joints”, “Scaphoid Bone”, “Carpal Bones”, “Radius Fractures”] article_count: 689 model_used: Qwen3.6-35B-A3B-Q8_0.gguf generated_at: ‘2026-06-13T11:39:22+00:00’ key_articles: - title: “Arthrography of the wrist. Assessment of the integrity of the ligaments in young asymptomatic adults.” ref_num: 1 evidence_tier: paper evidence_level: 4 doi: 10.2106/00004623-199508000-00010 year: 1995 - title: “Influence of associated lesions of the intrinsic ligaments on distal radius fractures outcome” ref_num: 2 evidence_tier: paper evidence_level: 3 doi: 10.1007/s00402-015-2203-0 year: 2015 - title: “Acute Proximal Row Carpectomy to Treat a Transscaphoid, Transtriquetral Perilunate Fracture Dislocation: Case Report and Review of the Literature” ref_num: 4 evidence_tier: case_report evidence_level: 4 doi: 10.1007/s11552-012-9462-9 year: 2012 - title: “Lunotriquetral Ligament Tears” ref_num: 6 evidence_tier: paper evidence_level: 4 doi: 10.1016/j.jhsa.2012.04.007 year: 2012 - title: “Intercarpal Ligament Injuries Associated With Distal Radius Fractures” ref_num: 7 evidence_tier: paper evidence_level: 4 doi: 10.5435/jaaos-d-18-00503 year: 2019 - title: “Three-ligament tenodesis for chronic scapholunate injuries: short-term outcomes in 203 patients” ref_num: 8 evidence_tier: paper evidence_level: 3 doi: 10.1177/1753193419885063 year: 2019 - title: “Radio-scapho-capitate ligament reconstruction during proximal row carpectomy” ref_num: 9 evidence_tier: paper evidence_level: 4 doi: 10.1177/1753193417752319 year: 2018 - title: “Three-Dimensional Imaging of the Carpal Ligaments” ref_num: 10 evidence_tier: paper evidence_level: 5 doi: 10.1016/j.hcl.2006.08.003 year: 2006 - title: “Carpal Ligament Injuries, Pathomechanics, and Classification” ref_num: 12 evidence_tier: paper evidence_level: 5 doi: 10.1016/j.hcl.2015.04.011 year: 2015 - title: “Management of Carpal Instability in Athletes” ref_num: 14 evidence_tier: paper evidence_level: 5 doi: 10.1016/j.hcl.2009.05.002 year: 2009 - title: “Carpal Coalitions on Radiographs: Prevalence and Association With Ordering Indication” ref_num: 15 evidence_tier: paper evidence_level: 3 doi: 10.1016/j.jhsa.2017.02.002 year: 2017 - title: “Etiology and Diagnostic Challenges of Ulnar Wrist Pain in Pediatric and Adolescent Patients” ref_num: 16 evidence_tier: paper evidence_level: 2 doi: 10.1016/j.jhsa.2024.04.015 year: 2024 - title: “High-energy injuries of the wrist” ref_num: 17 evidence_tier: paper evidence_level: 4 doi: 10.1016/j.otsr.2015.05.009 year: 2016 - title: “Return to Play After Hand and Wrist Fractures” ref_num: 18 evidence_tier: paper evidence_level: 5 doi: 10.1016/j.csm.2016.05.005 year: 2016 - title: “Efficacy of Magnetic Resonance Imaging and Clinical Tests in Diagnostics of Wrist Ligament Injuries: A Systematic Review” ref_num: 19 evidence_tier: paper evidence_level: 2 doi: 10.1016/j.arthro.2015.04.090 year: 2015 - title: “*Editorial Commentary* : Magnetic Resonance Imaging Is Not Inferior to the Gold Standard of Diagnostic Arthroscopy for Identification of Wrist Ligamentous

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Overview

- Arthrography should not be considered a definitive study for diagnosing clinically important ligament injuries in the wrist [1].
- Patients with distal radius fractures and associated intrinsic ligament injuries have worse outcomes than those without such injuries [2].
- In carefully selected cases of severe carpal trauma, acute salvage procedures may be a viable alternative to open reduction internal fixation (ORIF) and ligament repair or reconstruction [4].
- Motion-preserving wrist procedures can yield good long-term results if indications are accurately respected and techniques are well performed to prevent complications [22].
- For lunotriquetral (LT) ligament injuries, ligament repair or reconstruction is preferred over arthrodesis to preserve motion and restore normal carpal kinematics [24].
- There is no strong evidence currently supporting any single treatment for scapholunate ligament injuries [27].
- Management of hand and wrist injuries in polytrauma patients requires a multidisciplinary team approach based on ATLS protocols, as a 'one lesion-one solution' approach is not possible due to case variability [30].
- Proximal row carpectomy is considered the most reliable procedure for the concurrence of Kienbock's disease and scapholunate dissociation after acute wrist trauma [67].
- Adherence to basic principles including adequate exposure, early intervention, stable fracture fixation, obtaining adequate carpal alignment, and restoring ligament integrity can provide functional range of motion, decreased incidence of early arthritis, and improved quality of life in trans-scaphoid perilunate avulsion fracture dislocations [83].
- The palmar intra-articular extended window approach may be suitable for treating intra-articular distal radius fractures without causing carpal instability, provided there is no suspicion of dorsal wrist ligament injury [84].
- A modified dorsal capsulotomy allows excellent exposure of the wrist and carpus, particularly for accessing the most radial aspect of the wrist or mid-carpal joint, while following established principles for safe and reliable repair [86].
- Both versions of scapholunate intercarpal ligamentoplasty yield satisfactory clinical and radiological results in the short to mid-term [87].

Anatomy & Pathophysiology

- Carpal instability is a complex array of maladaptive and posttraumatic conditions that lead to the inability of the wrist to maintain anatomic relationships under normal loads [12].
- Understanding carpal dysfunctions and instabilities hinges on understanding carpal anatomy and normal biomechanics [44].

- The wrist behaves kinematically consistent but kinetically variable, implying that mechanical behavior is predominantly determined by articular geometry rather than ligament constraints [35].
- The combination of experimentally determined data on length change and carpal bone movements is necessary to explain observed kinematic phenomena [11].
- Advances in 3-dimensional and 4-dimensional imaging have established that the distal carpal row has negligible intercarpal motion while the proximal row drives motion [47].
- Lunate morphology affects 3-dimensional carpal kinematics during wrist flexion and extension [36].
- Computed fiber elongations of the dorsal carpal ligaments vary linearly with wrist position despite complex carpal bone anatomy and kinematics [37].
- During simple unresisted wrist motions, the force in the scapholunate interosseous ligament does not exceed 20 N [40].
- Scaphoid nonunions have a dramatic impact on carpal kinematics, partially uncoupling the proximal and distal carpal rows [46].
- A fracture of the distal radius interferes with the biomechanical integrity of the wrist, limiting range of motion and affecting hand muscle strength [41].
- Both surgical groups demonstrated decreased wrist kinematic motion and functional performance compared with individuals with normal wrists [34].
- Kinematic changes in scapholunate instability may predict the development of radioscaphoid arthritis and help identify a kinematically abnormal wrist [42].
- Four-dimensional computed tomography (4DCT) is a promising, non-invasive, and affordable method to assess and quantify wrist kinematics, extending conventional CT by incorporating the temporal dimension [38].
- Four-dimensional CT complements conventional imaging and arthroscopy by providing functional information on wrist biomechanics and should be used selectively when dynamic instability is suspected and conventional imaging is inconclusive [43].
- With increased focus on dynamic imaging for wrist motion, it may be possible to derive a standardized protocol for mapping the carpal motion that is clinically applicable and reproducible [49].
- Clinically, a dart-throwing motion at approximately 30° to 45° from the sagittal plane allows continued functional wrist motion while minimizing radiocarpal motion [39].

Classification

- Arthrography is not a definitive study for diagnosing clinically important ligament injuries in the wrist [1].
- Distal radius fractures associated with intrinsic ligament injuries result in worse patient outcomes compared to those without such injuries [2].
- Restoration of ulnolunate ligament function is important to prevent further deterioration of wrist function after injury [3].

- Lunotriquetral ligament tears are uncommon, variably diagnosed, and often diagnosed in association with other wrist pathology [6].
- Three-dimensional imaging provides understanding of wrist kinematics, individual ligament function, and their roles in joint motion, stability, and injuries [10].
- Carpal instability is a complex array of maladaptive and posttraumatic conditions leading to the inability of the wrist to maintain anatomic relationships under normal loads [12].
- High-energy wrist injuries comprise several bone–ligament lesions that orthopaedists must identify [17].
- A revised classification system for scapholunate ligament injuries should integrate both ligament and cartilage pathology to enable tailored treatment strategies [51].
- There is an association between scapholunate dissociation and two-part articular fractures of the distal radius, requiring a higher index of suspicion for dissociation in these fracture subtypes [66].
- Radiographic classification of scapholunate advanced collapse (SLAC) wrist has moderate reliability and reproducibility [73].
- Radiographic classification of scaphoid nonunion advanced collapse (SNAC) wrist has limited reliability [73].
- Specific palpable landmarks on the dorsal wrist allow for reliable estimation of the locations and courses of the dorsal radiocarpal and intercarpal ligaments [81].
- In intra-articular distal radius fractures, the ligamentous attachments of the distal radius to the volar carpus are relatively well preserved [82].
- The row theory more clearly accounts for wrist function than the column theory in the context of carpal instability diagnosis and treatment [88].
- A novel ligament-based treatment algorithm for scapholunate dissociation is proposed based on injury stage and arthritic changes [90].

Clinical Presentation

- Arthrogram is not a definitive study for diagnosing clinically important ligament injuries in the wrist [1].
- Distal radius fractures associated with intrinsic ligament injuries result in worse outcomes than those without such injuries [2].
- Restoration of ulnolunate ligament function is important to prevent further deterioration of wrist function after injury [3].
- Lunotriquetral ligament tears are uncommon, variably diagnosed, and often diagnosed in association with other wrist pathology [6].
- Injuries to the scapholunate and lunotriquetral interosseous ligaments occur in approximately one third of distal radius fractures [7].
- Plain radiographs are not reliably diagnostic for scapholunate and lunotriquetral interosseous ligament injuries associated with distal radius fractures [7].

- Arthroscopy enables new diagnostic possibilities in rare but difficult cases of posttraumatic wrist pain when clinical and radiological examinations fail to provide a diagnosis [13].
- Carpal fractures, ligament injury, and resulting carpal instability represent a spectrum of injuries in athletic patients, occurring in both acute traumatic settings and chronic overuse syndromes [14].
- Clinicians should be careful ascribing symptoms to anatomical variations on radiographs in patients with nonspecific wrist pain [15].
- MRI findings for ulnar wrist pathologies are often discordant when compared with diagnostic arthroscopy [16].
- High-energy injuries to the wrist comprise several bone–ligament lesions that must be identified [17].
- Early diagnosis and appropriate treatment allow athletes to return to play quickly after sustaining fractures or dislocations of the hand or wrist [18].
- A negative MRI result is unable to rule out clinically relevant injury to the TFCC, SL ligament, or LT ligament of the wrist [19].
- Diagnostic wrist arthroscopy remains the gold standard for diagnosis of wrist ligamentous pathology, particularly if involvement of the SLIL or LTIL is suspected based on history and physical examination, even in the face of negative MRI findings [20].
- Diagnostic arthroscopy is a useful adjunct in the diagnosis and treatment of intra-articular wrist pathology after careful history and physical examination [45].
- Ulnar-sided wrist pain is a common cause of upper-extremity disability with a complex differential diagnosis [48].
- Ulnar-sided wrist pain is a common cause of upper extremity disability with a complex differential diagnosis [50].
- Wrist arthroscopy remains the gold standard for the diagnosis and treatment of longitudinal split tears of the ulnotriquetral ligament [52].
- Arthroscopy is particularly well suited to directly visualize and treat multiple causes of ulnar-sided wrist pain simultaneously [53].
- Scapholunate instability is identified through history, physical examination, and imaging [54].

Investigations

- Arthrography should not be considered a definitive study for the diagnosis of a clinically important ligament injury in the wrist [1].
- Plain radiographs are not reliably diagnostic for scapholunate and lunotriquetral interosseous ligament injuries associated with distal radius fractures [7].
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- Diagnostic wrist arthroscopy remains the gold standard for diagnosis of wrist ligamentous pathology, particularly if involvement of the SLIL or LTIL is suspected based on history and physical examination, even in the face of negative MRI findings [20].
- MRI is not recommended for the diagnosis of scapholunate ligament injury [61].
- A tailored MRI protocol can help establish a diagnosis for isolated short radiolunate ligament injury, which is rare and easily missed [62].
- It is not clear whether diagnosis of subtle injuries only demonstrated on MRI improves outcomes in patients with posttraumatic radial wrist tenderness [63].
- Traction radiography might not be sufficient to reliably diagnose an acute, complete scapholunate interosseous ligament tear [72].
- High-resolution magnetic resonance imaging permits accurate depiction and localization of tears of the triangular fibrocartilage complex [75].
- CT or MR imaging is recommended for the detection of carpal collapse in Kienböck's disease as its presence or absence is important for surgical decision-making [76].
- Measurements in the middle of the scapholunate joint in neutral and 30° of ulnar deviation under fluoroscopic imaging best capture all stages of ligamentous disruptions [78].
- Negative results of MRI or clinical provocative tests are still unable to safely rule out the possibility of clinically relevant tears to the TFCC and other wrist ligaments, making further diagnostic evaluation with wrist arthroscopy necessary [79].

Treatment

DIAGNOSTIC CONSIDERATIONS

- Arthrography should not be considered a definitive study for the diagnosis of a clinically important ligament injury in the wrist [1].
- No strong evidence currently supports any one specific treatment for scapholunate ligament injuries [27].

NON-OPERATIVE MANAGEMENT

- Nonoperative treatment of acute scaphoid fractures in children results in a high rate of union with few posttreatment wrist symptoms [55].

- When trans-scaphoid perilunate dislocation is diagnosed late, nonoperative treatment may achieve an enduring functional result [92].
- Conservative management may fail in cases of palmar carpal subluxation [74].

OPERATIVE MANAGEMENT: LIGAMENT REPAIR AND RECONSTRUCTION

- Restoration of ulnolunate ligament function is important to prevent further deterioration of wrist function after injury [3].
- Treatment of lunotriquetral (LT) ligament injuries remains controversial, but ligament repair or reconstruction is preferred over arthrodesis to preserve motion and restore normal carpal kinematics [24].
- Three-ligament tenodesis for chronic scapholunate injuries yields generally good short-term outcomes regarding function, satisfaction, and pain relief, although approximately 20% of operated wrists did not improve [8].
- Anatomical anterior and posterior reconstruction (ANAFAB) for scapholunate dissociation improves radiographic and patient-reported outcome parameters at an average follow-up of 17.9 months [25].
- Preliminary outcomes for anatomical anterior and posterior reconstruction in ten patients with scapholunate dissociation showed no patients required secondary surgery or treatment related to carpal stabilization [85].
- Radiofrequency energy for capsular shrinkage in the wrist is safe but ineffective [59].
- Concomitant scaphoid fracture and scapholunate (SL) ligament injury may represent a relative contraindication to certain procedures, such as scapholunate screw fixation, due to risks like avascular necrosis [58].

OPERATIVE MANAGEMENT: SALVAGE AND ARTHRODESIS

- In carefully selected cases of severe carpal trauma, acute salvage procedures may be a viable alternative to open reduction internal fixation (ORIF) and ligament repair/reconstruction [4].
- Radio-scapho-capitate ligament reconstruction during proximal row carpectomy is a technique to consider in similar cases, though it has short-term follow-up limitations [9].
- Motion-preserving procedures of the wrist can yield good long-term results if indications are accurately respected and the technique is well performed to prevent complications [22].
- Lunate-capitate arthrodesis (LCF) is not less efficient than four-corner fusion (4CF) in the treatment of SNAC II and III wrist injuries [56].
- Midcarpal arthrodesis with complete scaphoid excision and interposition bone graft is an option for advanced carpal collapse (SNAC/SLAC wrist), whereas total wrist fusion should be reserved for exceptional circumstances [65].
- Radiocarpal fusion aims to alleviate pain and improve range of motion in patients with isolated radiolunate or radioscapholunate arthritis who have failed non-surgical treatment [80].

OPERATIVE MANAGEMENT: FRACTURE-DISLOCATIONS AND COMPLEX TRAUMA

- Acute treatment of radiocarpal fracture-dislocations with a dorsal wrist spanning plate results in outcomes comparable to previously reported literature [23].
- Satisfactory outcomes for radiocarpal fracture-dislocations are achieved by following principles of concentric reduction, treatment of intercarpal injuries, and sound repair of osseous-ligamentous injury [57].
- Prompt recognition and surgical treatment with anatomic reduction of carpal malalignment in perilunate dislocations and fracture-dislocations improve the likelihood of optimal, long-term clinical success and patient satisfaction [60].
- Radial perilunar dislocation, an unusual injury, can be successfully managed with closed reduction, resulting in satisfactory long-term function despite radiographic findings of lunate density changes and ulnar styloid non-union [69].
- Adult patients with acceptably reduced intra-articular distal radial fractures have better functional outcomes for 12 months when treated operatively (volar plate fixation) instead of nonoperatively (cast immobilization) [93].
- Surgeons should retain a flexible approach to treatment choice for distal radial fractures, mastering non-operative management as well as external and internal skeletal fixation techniques due to fracture complexity [64].
- Management of hand and wrist complex injuries in polytrauma patients requires a multidisciplinary team approach based on ATLS protocols, as a 'one lesion-one solution' approach is not possible due to case variability [30].

ATHLETIC POPULATIONS

- Carpal fractures, ligament injury, and resulting carpal instability in athletes represent a spectrum of injuries occurring in both acute traumatic settings and chronic overuse syndromes [14].

Complications

- Arthrogram is not a definitive study for diagnosing clinically important wrist ligament injuries [1].
- Associated intrinsic ligament injury in distal radius fractures leads to worse outcomes compared to fractures without such injury [2].
- Failure to restore ulnolunate ligament function can lead to further deterioration of wrist function [3].
- Acute salvage procedures are a viable alternative to ORIF and ligament repair/reconstruction in carefully selected cases of severe carpal trauma [4].
- Three-ligament tenodesis for chronic scapholunate injuries has generally good short-term outcomes regarding function, satisfaction, and pain relief, but approximately 20% of operated wrists did not improve [8].

- Long-term follow-up of 4-corner fusion for SLAC and SNAC wrist shows good functional results despite radiographic changes in the radiolunate joint in 73% of patients [21].
- Dorsal intercarpal ligament capsulodesis for chronic scapholunate instability results in ongoing scapholunate instability and early arthritic degeneration, though most patients maintain acceptable long-term wrist function [26].
- No recurrence of radiocarpal translation was observed at long-term follow-up after treatment of traumatic radiocarpal translocation [28].
- Further data with larger cohorts and longer follow-up is required to determine the effect on SLAC-wrist deterioration [31].
- Three-ligament tenodesis for chronic scapholunate instability is challenged by ligamentous loosening, rapid recurrence of radiological anomalies, and frequent complications [70].
- Scapholunate ligament reconstruction using a part of the extensor carpi radialis brevis tendon through a dorsal approach resulted in long-term improved outcomes compared with other techniques, even in scapholunate advanced collapse type I wrists [32].

Recovery

- Restoration of ulnolunate ligament function is important to prevent further deterioration of wrist function after injury [3].
- Acute salvage procedures may be a viable alternative to ORIF and ligament repair/reconstruction in carefully selected cases of severe carpal trauma [4].
- Early diagnosis and appropriate treatment can allow athletes to return to play quickly after sustaining fractures or dislocations of the hand or wrist [18].
- Functional results of 4-corner fusion were good at long-term follow-up despite radiographic changes in the radiolunate joint in 73% of patients [21].
- Acute treatment with a dorsal wrist spanning plate for radiocarpal fracture-dislocations resulted in outcomes comparable to previously reported literature [23].
- Radiographic and patient-reported outcome parameters improved after reconstruction of the critical dorsal and volar ligament stabilizers of the proximal carpal row with the ANAFAB technique at an average follow-up of 17.9 months [25].
- Most patients had acceptable long-term function of the wrist despite ongoing scapholunate instability resulting in early arthritic degeneration following dorsal intercarpal ligament capsulodesis [26].
- No recurrence of radiocarpal translation was observed at long-term follow-up following treatment of traumatic radiocarpal translocation [28].
- There was a notable increase in the incidence of wrist ligament surgeries, particularly in traumatic cases, over a 25-year period in Finland, with a peak in 2014 followed by a decline [29].
- Further data in a larger cohort with longer follow-up is required to determine the effect on SLAC-wrist deterioration [31].

- Scapholunate ligament reconstruction using a part of the extensor carpi radialis brevis tendon through a dorsal approach resulted in long-term, improved outcomes compared with other techniques, even in scapholunate advanced collapse type I wrists [32].
- Delayed diagnosis and late reconstructive surgery were associated with no improvement in radiolunate angle in traumatic nondissociative carpal instability [33].
- Although the reconstruction technique is technically demanding, the clinical outcome was promising both functionally and radiographically with no recurrence of ulnar translocation at 13 years of follow-up [68].
- Following reoperation, long-term follow-up demonstrates reasonable long-term durability in some cases [71].
- The reduction and association of the scaphoid and lunate procedure should be abandoned due to early radiographic failure in the short term, despite relatively low outcomes measures scores [97].
- A patient returned to work 2 years after injury, although the wrist remained stiff with only a few degrees of volar and dorsiflexion [98].

Key Evidence

- [L4] The report strongly suggests that the arthrogram should not be considered a definitive study for the diagnosis of a clinically important injury of a ligament in the wrist. (10.2106/00004623-199508000-00010)
- [L3] Patients with distal radius fracture with associated intrinsic ligament injury had worse outcomes than those without associated injury. (10.1007/s00402-015-2203-0)
- [Case_report] In carefully selected cases of severe carpal trauma, acute salvage procedures may be a viable alternative to ORIF and ligament repair/reconstruction. (10.1007/s11552-012-9462-9)
- [L4] Lunotriquetral ligament tears are uncommon, variably diagnosed, and often diagnosed in association with other wrist pathology. (10.1016/j.jhsa.2012.04.007)
- [L4] Injuries to the scapholunate and lunotriquetral interosseous ligaments occur in approximately one third of distal radius fractures, but their diagnosis is challenging as plain radiographs are not reliably diagnostic. (10.5435/jaaos-d-18-00503)
- [L3] The short-term outcomes of three-ligament tenodesis are generally good in terms of patients' function, satisfaction, and pain relief, but about 20% of the operated wrists did not improve. (10.1177/1753193419885063)
- [L4] Although one has to take into account the short-term follow-up of 1 year, and the fact that the patient had rather low demands to his wrist, it is a technique to consider in similar cases. (10.1177/1753193417752319)
- [L5] This additional knowledge helps provide further understanding of wrist kinematics, the function of individual ligaments, and their roles in joint motion, stability, and injuries. (10.1016/j.hcl.2006.08.003)
- [L5] Carpal instability is a complex array of maladaptive and posttraumatic conditions that lead to the inability of the wrist to maintain anatomic relationships under normal loads. (10.1016/j.hcl.2015.04.011)

- [L5] Carpal fractures, ligament injury, and resulting carpal instability represent a spectrum of injuries to the wrist in the athletic patient, both in the acute traumatic setting and in the more chronic overuse syndromes. (10.1016/j.hcl.2009.05.002)
- [L3] Clinicians should be careful ascribing symptoms to anatomical variations on radiographs in patients with nonspecific wrist pain. (10.1016/j.jhsa.2017.02.002)
- [L2] While MRI is a useful adjunct for determining the cause of ulnar wrist pathologies, findings are often discordant when compared with diagnostic arthroscopy. (10.1016/j.jhsa.2024.04.015)
- [L4] High-energy injuries to the wrist comprise several bone–ligament lesions that the orthopaedist must know how to identify. (10.1016/j.otsr.2015.05.009)
- [L5] Early diagnosis and appropriate treatment can allow athletes to return to play quickly after they sustain fractures or dislocations of the hand or wrist. (10.1016/j.csm.2016.05.005)
- [L2] A negative result from MRI is unable to rule out the possibility of a clinically relevant injury to the TFCC, SL ligament, or LT ligament of the wrist. (10.1016/j.arthro.2015.04.090)
- [L5] Until further advances and refinements are made with noninvasive MRI techniques, the gold standard for diagnosis of wrist ligamentous pathology remains diagnostic wrist arthroscopy and should be considered particularly if involvement of the SLIL or LTIL is suspected on the basis of history and physical examination, even in the face of negative MRI findings. (10.1016/j.arthro.2024.05.014)
- [L4] Functional results were good at long-term follow-up despite radiographic changes in the radiolunate joint in 73% of patients. (10.1177/1558944716681949)
- [L4] Acute treatment with a dorsal wrist spanning plate in this series resulted in comparable outcomes to what have been previously reported in the literature. (10.1177/1558944719893068)
- [L4] Treatment of LT ligament injuries remains controversial, but the authors prefer ligament repair or reconstruction over arthrodesis as it preserves motion and offers the greatest likelihood of restoring normal carpal kinematics. (10.5435/00124635-200005000-00004)
- [L4] At 17.9-month average follow-up, radiographic and patient-reported outcome parameters improved after reconstruction of the critical dorsal and volar ligament stabilizers of the proximal carpal row with the ANAFAB technique. (10.1016/j.jhsa.2023.12.012)
- [L3] Although the consequent ongoing scapholunate instability resulted in early arthritic degeneration, most patients had acceptable long-term function of the wrist. (10.1302/0301-620x.94b12.30007)
- [L5] No strong evidence currently supports any one treatment for scapholunate ligament injuries. (10.5435/jaaos-d-14-00254)
- [L4] No recurrence of radiocarpal translation was observed at long term follow-up. (10.1016/j.jhsg.2024.01.001)
- [L4] The study uncovered a notable increase in the incidence of wrist ligament surgeries, particularly in traumatic cases, over a 25-year period in Finland, with a peak in 2014 followed by a decline. (10.1016/j.jhsg.2025.02.006)
- [L5] This paper describes a spectrum of indications and techniques for managing hand and wrist injuries in polytraumatised patients, emphasizing that a ‘one lesion-one solution’ approach is not possible due to the

variability of cases and the need for a multidisciplinary team approach based on ATLS protocols. (10.1016/j.injury.2013.09.016)

- [L4] This technique, even in scapholunate advanced collapse type I wrists, resulted in long-term, improved outcomes compared with other techniques. (10.1177/17531934221143679)
- [L4] Delayed diagnosis and late reconstructive surgery were associated with no improvement in radiolunate angle. (10.1016/j.jhsa.2021.04.024)
- [L2] Both surgical groups demonstrated decreased wrist kinematic motion and functional performance compared with individuals with normal wrists. (10.1016/j.jhsa.2015.04.035)
- [L5] This study describes the effect of lunate morphology on 3-dimensional carpal kinematics during wrist flexion and extension. (10.1016/j.jhsa.2014.09.019)
- [L5] Despite complex carpal bone anatomy and kinematics, computed fiber elongations were found to vary linearly with wrist position. (10.1016/j.jhsa.2012.04.025)
- [L5] Four-dimensional computed tomography (4DCT) is a promising, non-invasive, and affordable method to assess and quantify wrist kinematics, extending conventional CT by incorporating the temporal dimension. (10.1177/17531934251326028)
- [L5] Clinically, a DTM at approximately 30° to 45° from the sagittal plane allows continued functional wrist motion while minimizing radiocarpal motion. (10.1016/j.jhsa.2007.08.014)
- [L5] However, during simple unresisted wrist motions, the force did not exceed 20 N. (10.1016/j.jhsa.2015.04.007)
- [L3] These results supported the initial hypothesis that a fracture of the distal radius interferes with the biomechanical integrity of the wrist, limiting range of motion and affecting hand muscle strength. (10.1177/1758998315574352)
- [L3] These kinematic changes may predict the development of radioscaphoid arthritis and help identify a kinematically abnormal wrist. (10.1177/17531934241242676)
- [L5] Four-dimensional CT complements conventional imaging and arthroscopy by providing functional information on wrist biomechanics and should be used selectively when dynamic instability is suspected and conventional imaging is inconclusive. (10.1530/eor-2026-0051)
- [L4] Comprehending carpal dysfunctions and instabilities hinges on understanding carpal anatomy and normal biomechanics. (10.1016/j.jht.2023.09.011)
- [L5] Diagnostic arthroscopy is a useful adjunct in the diagnosis and treatment of intra-articular wrist pathology after careful history and physical examination. (10.1016/j.hcl.2017.06.004)
- [L4] Scaphoid nonunions have a dramatic impact on carpal kinematics, partially uncoupling the proximal and distal carpal rows. (10.1016/j.jhsa.2008.03.008)
- [L5] Advances in 3-dimensional and 4-dimensional imaging have provided clearer insight into carpal kinematics, establishing that the distal carpal row has negligible intercarpal motion while the proximal row drives motion. (10.1016/j.jhsa.2016.07.105)
- [L5] Ulnar-sided wrist pain is a common cause of upper-extremity disability with a complex differential diagnosis. (10.1016/j.jhsa.2008.08.026)

- [L4] With the increased focus on dynamic imaging for wrist motion, it may be possible to derive a standardized protocol for mapping the carpal motion that is clinically applicable and reproducible. (10.1016/j.jhsg.2022.10.001)
- [L5] Ulnar-sided wrist pain is a common cause of upper extremity disability with a complex differential diagnosis. (10.1016/j.jhsa.2012.04.036)
- [L3] These results support the need for a revised classification system that integrates both ligament and cartilage pathology to enable more tailored treatment strategies for scapholunate ligament injuries. (10.1177/17531934251407799)
- [L4] Wrist arthroscopy remains the gold standard for the diagnosis and treatment of this condition. (10.1016/j.hcl.2010.07.004)
- [L5] Arthroscopy is particularly well suited to both directly visualize and treat multiple causes of ulnar-sided wrist pain simultaneously. (10.1016/j.hcl.2013.09.001)
- [Paper] This article reviews the pathophysiology of scapholunate instability, its identification through history, physical examination, and imaging, and the spectrum of treatment options ranging from nonoperative management to various surgical techniques including ligament repair, reconstruction, and arthrodesis. (10.1016/j.hcl.2009.08.006)
- [L1] Nonoperative treatment results in a high rate of union with few posttreatment wrist symptoms. (10.1177/1558944717735948)
- [L4] The LCF is not less efficient than the 4CF in the treatment of SNAC II and III wrist injuries. (10.1186/s12891-024-07755-w)
- [L4] Satisfactory outcomes are achieved by following treatment principles of concentric reduction, treatment of intercarpal injuries, and sound repair of osseous-ligamentous injury. (10.5435/00124635-200811000-00005)
- [Case_report] The authors suggest that concomitant scaphoid fracture and SL ligament injury may represent a relative contraindication to this procedure. (10.1007/s11552-012-9463-8)
- [L5] The study suggests that radiofrequency energy for capsular shrinkage in the wrist is safe but ineffective. (10.1016/j.jhsa.2014.10.030)
- [L4] Prompt recognition and surgical treatment with anatomic reduction of carpal malalignment improve the likelihood of optimal, long-term clinical success and patient satisfaction. (10.1016/j.jhsa.2012.07.034)
- [L3] MRI is not recommended for the diagnosis of scapholunate ligament injury. (10.1054/jhsb.2000.0450)
- [Case_report] Isolated short radiolunate ligament injury is rare and can easily be missed; a tailored MRI protocol can help establish a diagnosis. (10.1016/j.jhsa.2020.11.002)
- [L2] A scaphoid fracture was by far the most common injury, but it is not clear whether diagnosis of subtle injuries only demonstrated on MRI improves outcomes. (10.1016/j.jhsa.2012.09.034)
- [L5] Surgeons should retain a flexible approach to treatment choice and master non-operative management, as well as both external and internal skeletal fixation techniques, due to the complexity of distal radial fractures. (10.1054/jhsb.2000.0516)

- [L4] Total wrist fusion should only be used for exceptional circumstances. (10.1054/jhsb.2000.0434)
- [L3] These findings support the need for a higher index of suspicion for scapholunate dissociation in these distal radial fracture subtypes. (10.1177/1753193419826490)
- [L4] Proximal row carpectomy was selected as the most reliable procedure for this concurrence, and surgeons should remain vigilant for these conditions after wrist trauma. (10.1007/s11552-012-9477-2)
- [L3] The study challenges the long-term benefit of the procedure due to ligamentous loosening, rapid recurrence of radiological anomalies, and frequent complications. (10.1177/1753193413475753)
- [L5] The findings suggest that traction radiography might not be sufficient to reliably diagnose an acute, complete scapholunate interosseous ligament tear. (10.1177/1753193411434038)
- [L4] Radiographic classification of SLAC wrist has moderate reliability and reproducibility, whereas classification of SNAC wrist has limited reliability. (10.1177/1753193413484629)
- [L4] These two cases show the results of the failure of conservative management in two extremes of palmar carpal subluxation. (10.2106/00004623-198365070-00016)
- [L2] High-resolution magnetic resonance imaging permits accurate depiction and localization of tears of the triangular fibrocartilage complex. (10.2106/00004623-199711000-00009)
- [L3] CT or MR imaging is recommended as the presence or absence of carpal collapse is important for surgical decision-making. (10.1177/17531934231153966)
- [L5] Measurements in the middle of the scapholunate joint in neutral and 30° of ulnar deviation under fluoroscopic imaging best capture all stages of ligamentous disruptions. (10.1177/1558944717729219)
- [Letter] Negative results of MRI or clinical provocative tests are still unable to safely rule out the possibility of clinically relevant tears to the TFCC and other wrist ligaments, which makes further diagnostic evaluation with wrist arthroscopy necessary. (10.1016/j.arthro.2015.08.001)
- [L5] The procedure aims to alleviate pain and improve range of motion in patients with isolated radiolunate or radioscapholunate arthritis who have failed non-surgical treatment. (10.1016/j.jhsa.2022.04.002)
- [L4] Using specific, palpable landmarks on the dorsal wrist, an accurate estimation of the locations and courses of the dorsal radiocarpal and intercarpal ligaments can be reliably made. (10.1016/j.jhsa.2007.07.023)
- [L3] The ligamentous attachments of the distal radius to the volar carpus in an intra-articular distal radius fracture are relatively well preserved. (10.1016/j.jhsa.2011.07.014)
- [Case_report] Adherence to basic principles including adequate exposure, early intervention, stable fracture fixation, obtaining adequate carpal alignment, and restoring the integrity of the ligaments can provide functional ROM to the wrist, decreased incidence of early arthritis, and improved quality of life. (10.1007/s11552-014-9634-x)
- [L5] The palmar intra-articular extended window approach may be suitable for the treatment of intra-articular fractures of the distal radius without causing carpal instability, provided there is no suspicion of dorsal wrist ligament injury. (10.1177/17531934251332565)

- [L4] No patient required secondary surgery or treatment related to the carpal stabilization. (10.1177/1753193419886536)
- [L4] The modified capsulotomy allows excellent exposure of the wrist and carpus, particularly for access to the most radial aspect of the wrist or mid-carpal joint, while following established principles for safe and reliable repair. (10.1177/1753193412453414)
- [L3] Both versions of the scapholunate intercarpal ligamentoplasty yield satisfactory clinical and radiological results in the short to mid-term. (10.1177/1753193420940498)
- [L5] The article summarizes current thinking regarding the diagnosis and treatment of clinically important carpal instabilities, emphasizing that the row theory more clearly accounts for the function of the wrist than the column theory. (10.2106/00004623-199503000-00019)
- [L5] This review provides an update on the anatomy of the scapholunate ligament complex, the importance of critical ligament stabilizers, and pathoanatomy to inform treatment of scapholunate dissociation, proposing a novel ligament-based treatment algorithm based on injury stage and arthritic changes. (10.1016/j.jhsa.2023.05.013)
- [L4] The authors conclude that when this injury is diagnosed late, an enduring functional result may be achieved by nonoperative treatment. (10.1016/j.jhsa.2007.05.003)
- [L1] Adult patients with an acceptably reduced intra-articular distal radial fracture have better functional outcomes for 12 months when treated operatively instead of nonoperatively. (10.2106/jbjs.20.01344)
- [L4] With a majority of patients experiencing early radiographic failure of the procedure in the short term, our experience suggests that the reduction and association of the scaphoid and lunate procedure should be abandoned despite the relatively low outcomes measures scores. (10.1016/j.jhsa.2014.07.014)

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