

**Chronic Wrist Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Strength of Evidence
1. Forman TA, Forman SK, Rose NE. A clinical approach to diagnosing wrist pain. <i>Am Fam Physician</i> 2005; 72(9):1753-1758.	12	N/A	To review clinical approaches to diagnosis of wrist pain.	Posterior-anterior and lateral views are necessary to evaluate the bony architecture and alignment, the width and symmetry of the joint spaces, and the soft tissues when radiography is indicated. When the diagnosis remains unclear further imaging modalities like US, technetium bone scan, CT, and MRI are indicated.	4
2. Coggins CA. Imaging of ulnar-sided wrist pain. <i>Clin Sports Med</i> 2006; 25(3):505-526, vii.	12	N/A	To review imaging and treatment of ulnar-sided wrist pain.	Conventional radiographs, conventional arthrography, CT, MRI, and MR arthrography are useful for the diagnosis and treatment of ulnar-sided wrist pain.	4
3. Ryley JP, Langstaff RJ, Barton NJ. The natural history of undiagnosed wrist pain in young women. A long-term follow-up. <i>J Hand Surg [Br]</i> 1992; 17(1):51-54.	15	43	Long term (3-19 years) follow-up of women with undiagnosed wrist pain.	26% of women were pain free , 35% improved, 30% unchanged, 9% worse, 40% still troubled.	3
4. Theumann NH, Etehami G, Duvoisin B, et al. Association between extrinsic and intrinsic carpal ligament injuries at MR arthrography and carpal instability at radiography: initial observations. <i>Radiology</i> 2006; 238(3):950-957.	9	72 patients 2 observers	Retrospective, comparison of presence or absence of carpal instability by static/dynamic radiography with intrinsic and extrinsic ligament tears by MR arthrography and arthrography in patients with chronic pain.	Isolated lesions of the intrinsic ligaments by MR arthrography do not correlate significantly with carpal instability on radiographs, but when combined with tears of an extrinsic ligament, they do correlate positively with findings of instability on radiographs; partial tears of either intrinsic or extrinsic ligaments are inconsistently associated with instability, even in full thickness intrinsic ligament tears (limits – retro, only 28 of 72 underwent arthroscopy, delay between tests could have led to healing of extrinsic capsular lesions).	2
5. Haims AH, Schweitzer ME, Morrison WB, et al. Limitations of MR imaging in the diagnosis of peripheral tears of the triangular fibrocartilage of the wrist. <i>AJR</i> 2002; 178(2):419-422.	10	86 patients 3 observers	To examine the accuracy of MRI (indirect MR arthrograms (41) and unenhanced MR (45)) for presence of peripheral triangular fibrocartilage complex (TFCC) tears with surgery as gold standard.	Sensitivity for evaluation of the peripheral TFCC tear was 17%, specificity 79% and accuracy of 64%. High signal intensity at the ulnar insertion of the TFCC as a marker for tear showed a sensitivity of 42%, specificity of 63%, and accuracy of 55%. Indirect MR and unenhanced MR do not adequately assess the peripheral attachment of the TFCC.	2
6. Ozcelik A, Gunal I, Kose N. Stress views in the radiography of scapholunate instability. <i>Eur J Radiol</i> 2005; 56(3):358-361.	9	22	Stress radiographs wrists compared with scaphoid shift test and standard and positional views to evaluate reliability of dorsal and volar stress radiographs on post-traumatic pain patients.	Static scapholunate (SL) instability diagnosed in four patients, three of whom had positive scaphoid shift tests; however, 18 patients with dynamic SL instability had normal radiographs with abnormality only demonstrated on dorsal stress radiographs.	3

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7. Cerezal L, del Pinal F, Abascal F, Garcia-Valtuille R, Pereda T, Canga A. Imaging findings in ulnar-sided wrist impaction syndromes. <i>Radiographics</i> 2002; 22(1):105-121.	12	N/A	Review imaging findings, differential diagnoses and multiple causes of ulnar-sided impaction syndromes.	Radiography is essential for precise measurement of ulnar variance, but MR and MR arthrography are superior to radiographs for early diagnosis and late complications of other impaction syndromes, impingement, and ulnar styloid impaction.	4
8. Lawand A, Foulkes GD. The "clenched pencil" view: a modified clenched fist scapholunate stress view. <i>J Hand Surg [Am]</i> 2003; 28(3):414-418; discussion 419-420.	13	30 patients 60 wrists	Describe the clenched pencil scapholunate view method of imaging the scapholunate joint. Technique was used over 2 years in patients.	Films showed a nonparallel view of the scapholunate interval in 6/30 comparison wrists and 1/30 affected wrists. Technique produces a precise self-labeling view of the scapholunate joint.	3
9. Braunstein EM, Vydareny KH, Louis DS, Hankin FM. Cost effectiveness of wrist fluoroscopy and arthrography in the evaluation of obscure wrist pain. <i>Orthopedics</i> 1986; 9(11):1504-1506.	15	91	To assess the cost effectiveness of fluoroscopy and arthrography in patients with obscure wrist pain.	Cost per positive examination for fluoroscopy is \$126. The cost per positive exam by arthrography alone is \$377. The cost per positive exam (fluoroscopy plus arthrography) decreases when arthrography is done only when fluoroscopy is equivocal or negative. Wrist arthrography is only cost effective if done after dynamic fluoroscopy fails to answer the clinical questions. The two procedures are most cost effective than arthrography alone.	2
10. Vanden Eynde S, De Smet L, Fabry G. Diagnostic value of arthrography and arthroscopy of the radiocarpal joint. <i>Arthroscopy</i> 1994; 10(1):50-53.	9	49	To compare the diagnostic value of arthrography and arthroscopy of the radiocarpal joint.	Arthrography had sensitivity of 52%, specificity 50%, PPV 92%, and NPV 8% compared with arthroscopy. Arthrography is recommended for confirming a clinical suspected lesion, but is of limited value when negative.	2
11. Weiss AP, Akelman E, Lambiase R. Comparison of the findings of triple-injection cinerthrography of the wrist with those of arthroscopy. <i>J Bone Joint Surg Am</i> 1996; 78(3):348-356.	9	50	Prospective study to compare the findings of triple-injection arthrography with those of arthroscopy of the wrist using three portals.	When compared with arthroscopy of the wrist, the sensitivity, specificity, and accuracy of triple-injection cinerthrography in detecting tears of the SL ligament, lunotriquetral (LT) ligament, and triangular fibrocartilage, as a group, were 56%, 83%, and 60%. Although arthrography of the wrist is a well accepted study, suggests that normal arthrographic findings do not necessarily rule out the possibility of internal derangement of the wrist.	2

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12. Cantor RM, Stern PJ, Wyrick JD, Michaels SE. The relevance of ligament tears or perforations in the diagnosis of wrist pain: an arthrographic study. <i>J Hand Surg [Am]</i> 1994; 19(6):945-953.	10	56	To examine the value of arthrographic abnormalities in the ligaments of a painful wrist.	The prevalence of bilaterally symmetric lesions was high. In patients with ligament defects in the symptomatic wrist, 88% of defects near the radial attachment of TFCC, 59% of LT defects, and 57% of scapholunate defects were bilateral. Physical exam did not predict specific ligament defects.	2
13. Vo P, Wright T, Hayden F, Dell P, Chidgey L. Evaluating dorsal wrist pain: MRI diagnosis of occult dorsal wrist ganglion. <i>J Hand Surg [Am]</i> 1995; 20(4):667-670.	10	14	To examine the value of MRI in the diagnosis of occult dorsal wrist in patients with chronic dorsal wrist pain.	10 had MRI evidence that was diagnostic for an occult dorsal wrist ganglion. 8 of 10 had the diagnosis confirmed. PPV of a positive MRI finding for occult dorsal wrist ganglion was 100%.	3
14. Peh WC, Gilula LA, Wilson AJ. Detection of occult wrist fractures by magnetic resonance imaging. <i>Clin Radiol</i> 1996; 51(4):285-292.	14	5	To review cases in which MRI demonstrated radiographically-occult fractures.	MRI is helpful in confirming the presence of a fracture, defining its exact shape and location, and in the follow-up of these injuries during and after treatment.	4
15. Bordalo-Rodrigues M, Schweitzer M, Bergin D, Culp R, Barakat MS. Lunate chondromalacia: evaluation of routine MRI sequences. <i>AJR</i> 2005; 184(5):1464-1469.	9	34 (24 patients: indirect MR arthrography) 2 observers	Retrospective review to determine MRI detection of chondromalacia compared with tears visualized at arthroscopy.	MRI performs acceptably for diagnosis of chondromalacia and bone marrow edema in different portions of the lunate.	2
16. Zanetti M, Saupe N, Nagy L. Role of MR imaging in chronic wrist pain. <i>Eur Radiol</i> 2007; 17(4):927-938.	12	N/A	To review potential and limitations of MRI and direct and indirect MR arthrography in chronic wrist pain.	MRI correlates well with surgery for internal derangement of the wrist (excellent accuracy) with consistently better results for SL vs LT ligaments, and more variable results depending on TFCC tear location (central vs partial); enhanced MRI best for avascularity and other marrow abnormalities; MRI vs CT for detection of occult fractures remains controversial and of questionable clinical import.	4
17. Parellada AJ, Gopez AG, Morrison WB, et al. Distal intersection tenosynovitis of the wrist: a lesser-known extensor tendinopathy with characteristic MR imaging features. <i>Skeletal Radiol</i> 2007; 36(3):203-208.	14	5	Presents MRI findings of extensor tenosynovitis at distal intersection of 2 nd /3 rd compartment tendons, and anatomic details involved in pathogenesis of condition.	All patients had signs of tenosynovitis; tendinosis follows tenosynovitis; one patient had reactive edema at Lister's tubercle.	4

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18. Potter HG, Asnis-Ernberg L, Weiland AJ, Hotchkiss RN, Peterson MG, McCormack RR, Jr. The utility of high-resolution magnetic resonance imaging in the evaluation of the triangular fibrocartilage complex of the wrist. <i>J Bone Joint Surg Am</i> 1997; 79(11):1675-1684.	9	77	Prospective study of wide age range of patients, mostly with prior histories of trauma, to evaluate MRI performance vs arthroscopic examination for TFCC and other structures.	MRI performs very well, with 100% sensitivity, 90% specificity, and 97% accuracy in diagnosis of TFCC tears, with specificity and accuracy deradiographs easing to 69% and 90% if errors in interpretation of extent of tear are considered (worse performance in partial tears) and 75% and 92% if errors in tear localization are considered; MRI less successful in diagnosing partial TFCC tears than arthroscopy.	2
19. Cimmino MA, Innocenti S, Livrone F, Magnaguagno F, Silvestri E, Garlaschi G. Dynamic gadolinium-enhanced magnetic resonance imaging of the wrist in patients with rheumatoid arthritis can disradiographs iminate active from inactive disease. <i>Arthritis Rheum</i> 2003; 48(5):1207-1213.	10	36 patients with RA 5 controls	To determine the efficacy of dynamic gadolinium-enhanced MRI of the wrist in the evaluation of disease activity in patients with rheumatoid arthritis (RA).	Data support use of dynamic MRI for discriminating active from inactive RA.	2
20. Zheng S, Robinson E, Yeoman S, et al. MRI bone oedema predicts eight year tendon function at the wrist but not the requirement for orthopaedic surgery in rheumatoid arthritis. <i>Ann Rheum Dis</i> 2006; 65(5):607-611.	13	42	MRI of dominant wrist scored over 8 years for synovitis, tendon inflammation, edema, erosion to evaluate role of early MRI in predicting functional outcome in RA.	Extensive edema and erosions in early RA predict tendon dysfunction and impaired hand function in medium term follow-up but not the requirement for joint or tendon surgery.	3
21. Berna-Serna JD, Martinez F, Reus M, Alonso J, Domenech G, Campos M. Evaluation of the triangular fibrocartilage in cadaveric wrists by means of arthrography, magnetic resonance (MR) imaging, and MR arthrography. <i>Acta Radiol</i> 2007; 48(1):96-103.	9	24 cadaver wrists	Comparison of MRI, MR arthrography, and conventional arthrography for diagnosis of TFCC lesions vs immediate arthroscopy and direct anatomic examination.	Arthroscopy confirms same TFCC tears found at arthrography, with close correlation in types of defects (sensitivity 94%, specificity 100%, accuracy 95%, statistically significant); arthroscopy vs MRI, sensitivity 86%, specificity 85%, accuracy 70%; and arthroscopy vs MR arthrography, sensitivity of 100%, specificity 85%, and accuracy 95%, also statistically significant.	2
22. Zlatkin MB, Rosner J. MR imaging of ligaments and triangular fibrocartilage complex of the wrist. <i>Magn Reson Imaging Clin N Am</i> 2004; 12(2):301-331, vi-vii.	12	N/A	Review article addressing MRI in evaluation of TFCC and ligaments of wrist.	Study by Hobby and coworkers reveals MRI of the wrist has an impact on diagnoses and management.	4

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23. Haims AH, Schweitzer ME, Morrison WB, et al. Internal derangement of the wrist: indirect MR arthrography versus unenhanced MR imaging. <i>Radiology</i> 2003; 227(3):701-707.	9	86 wrists 3 observers	Compare indirect MR arthrography with unenhanced MRI of the wrist for evaluation of the central disk of the TFCC and the SL and LT interosseous ligaments.	<ul style="list-style-type: none"> For evaluation of the central disk of the TFCC sensitivities and specificities were 54%-73% and 83%-91%, respectively with no significant difference between indirect MR arthrography (P=.666) and unenhanced MRI (P=.559). For SL ligament, sensitivities and specificities were 38%-69% and 75%-99%, respectively, with improvement in sensitivity at indirect MR arthrography (P=.017) and no significant difference in specificity (P=.876). For LT ligament, sensitivities were 0%-22%, specificities were 88%-99%, with no significant difference between indirect MR arthrography and unenhanced MRI (P=.592 and P=.354, respectively, for sensitivity and specificity). 	2
24. Ruegger C, Schmid MR, Pfirrmann CW, Nagy L, Gilula LA, Zanetti M. Peripheral tear of the triangular fibrocartilage: depiction with MR arthrography of the distal radioulnar joint. <i>AJR</i> 2007; 188(1):187-192.	9	41	Retrospective evaluation of MR arthrography (distal radioulnar joint +/- midcarpal injections) vs arthroscopy for detection of peripheral TFCC tears.	For MR arthrography, sensitivity is 85% and specificity is 76%, with accuracy of 80% for peripheral tears, which are the most difficult to identify.	2
25. Joshy S, Lee K, Deshmukh SC. Accuracy of direct magnetic resonance arthrography in the diagnosis of triangular fibrocartilage complex tears of the wrist. <i>Int Orthop</i> 2007.	11	24	Comparison of MR arthrography with arthroscopy in diagnosis of complete TFCC tears in chronic ulnar wrist pain.	For MR arthrography, PPV of 95%, low NPV of 50%, sensitivity of 74%, specificity of 80%, and accuracy of 79%; the combination of MRI with MR arthrography is recommended to in radiographs ease diagnostic accuracy.	2
26. Saupe N, Prussmann KP, Luechinger R, Bosiger P, Marincek B, Weishaupt D. MR imaging of the wrist: comparison between 1.5- and 3-T MR imaging--preliminary experience. <i>Radiology</i> 2005; 234(1):256-264.	9	40 (25 healthy, 15 chronic pain)	Compare two approaches in imaging chronic pain (or suspected carpal masses) in matched populations of healthy and painful wrists.	3-T imaging yields significantly higher signal-to-noise ratios (SNR) for all sequences, subjects and tissues and better contrast-to-noise ratio (CNR) for bone: muscle and bone: cartilage for all subjects and sequences; qualitative analysis reveals significantly higher visibility scores for all anatomic regions, including nerves, on 3-T imaging except for 3D fast field-echo (FFE) sequences; longer acquisition times and rare, mild side effects probably not clinically relevant.	2

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27. Zanetti M, Bram J, Hodler J. Triangular fibrocartilage and intercarpal ligaments of the wrist: does MR arthrography improve standard MRI? <i>J Magn Reson Imaging</i> 1997; 7(3):590-594.	9	30	Comparative study to assess the value of adding MR arthrography to standard MRI for patients with chronic wrist disorders.	Diagnostic performance of MRI in suspected lesions of the TFCC and the SL and LT ligaments is improved by adding MR arthrography to the standard examination.	2
28. Dorsay TA, Major NM, Helms CA. Cost-effectiveness of immediate MR imaging versus traditional follow-up for revealing radiographically occult scaphoid fractures. <i>AJR</i> 2001; 177(6):1257-1263.	14	4	Review advantages and comparative costs of MRI of the wrist vs traditional protocol for revealing radiographically occult scaphoid fractures.	Comparing costs, the two protocols are nearly equal. Screening MRI of the wrist is becoming accepted.	4
29. Herneth AM, Siegmeth A, Bader TR, et al. Scaphoid fractures: evaluation with high-spatial-resolution US initial results. <i>Radiology</i> 2001; 220(1):231-235.	10	15	To evaluate the diagnostic accuracy of high-spatial-resolution US in the diagnosis of scaphoid fractures.	High-spatial-resolution US is a reliable diagnostic tool for the evaluation of occult scaphoid fractures and should be considered an adequate alternative diagnostic tool prior to CT or MRI.	3
30. Theumann N, Favarger N, Schnyder P, Meuli R. Wrist ligament injuries: value of post-arthrography computed tomography. <i>Skeletal Radiol</i> 2001; 30(2):88-93.	9	36	Prospective study to evaluate the value of post-arthrography high-resolution CT in wrist ligament injuries.	Sensitivity and specificity of standard arthrography and arthrography -CT are similar, but arthrography -CT shows the site of tears or perforation with greater precision, while conventional arthrography demonstrates them indirectly.	2
31. Moser T, Dosch JC, Moussaoui A, Dietemann JL. Wrist ligament tears: evaluation of MRI and combined MDCT and MR arthrography. <i>AJR</i> 2007; 188(5):1278-1286.	9	45 patients, 12 phantom for contrast selection 2 observers	In vitro and in vivo study to evaluate MRI and combination of MDCT arthrography and MR arthrography (one injection) for diagnosis of wrist ligament tears and cartilage abnormalities, with clinical and operative follow-up.	Sensitivity and specificity calculated for multiple anatomic sites (SL, LT, TFCC) and observers, with SL and LT ligaments evaluated equally well by all three techniques; however, CT arthrography best for partial tears (SL, LT), TFCC tears, and cartilage abnormalities, and statistically significantly better than MRI; MR arthrography more sensitive than MRI but not statistically significant.	2
32. Schmid MR, Schertler T, Pfirrmann CW, et al. Interosseous ligament tears of the wrist: comparison of multi-detector row CT arthrography and MR imaging. <i>Radiology</i> 2005; 237(3):1008-1013.	14	8 patients 9 cadaver	Comparison of CT arthrography vs unenhanced MRI for LT tears (three segments of SL and LT ligaments) in cadavers, with subsequent direct anatomic correlation.	CT arthrography is superior to (more sensitive than) MRI for dorsal segment tears, with more equivalent performance for palmar and central tears; for all segments of both ligaments, interobserver agreement is much better for CT arthrography than MRI.	3

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33. Rempel D, Evanoff B, Amadio PC, et al. Consensus criteria for the classification of carpal tunnel syndrome in epidemiologic studies. <i>Am J Public Health</i> 1998; 88(10):1447-1451.	15	12 researchers	Group of research physicians met with a goal of defining and ranking consensus criteria for the classification of carpal tunnel syndrome in epidemiologic studies.	Agreement reached by group: <ul style="list-style-type: none"> • First, no perfect gold standard exists for carpal tunnel syndrome. Combination of electrodiagnostic study findings and symptom characteristics will provide the most accurate information for classification of carpal tunnel syndrome. • Second, use of only electrodiagnostic study findings is not recommended. Finally, in the absence of electrodiagnostic studies, specific combinations of symptom characteristics and physical examination findings may be useful in some settings but are likely to result in greater misclassification of disease status.	4
34. Wu HT, Schweitzer ME, Culp RW. Potential MR signs of recurrent carpal tunnel syndrome: initial experience. <i>J Comput Assist Tomogr</i> 2004; 28(6):860-864.	10	41 wrists in 37 patients 2 observers	To evaluate potential MR signs of recurrent carpal tunnel syndrome. Electromyography, operative findings, and clinical follow-up were used to determine the presence of recurrent carpal tunnel syndrome.	15/41 wrists had recurrent carpal tunnel syndrome. Proximal enlargement, tenosynovitis, and the rare mass may help to diagnose recurrent carpal tunnel syndrome by MR.	3
35. Jarvik JG, Comstock BA, Heagerty PJ, et al. Magnetic resonance imaging compared with electrodiagnostic studies in patients with suspected carpal tunnel syndrome: predicting symptoms, function, and surgical benefit at 1 year. <i>J Neurosurg</i> 2008; 108(3):541-550.	9	120	Prospective enrollment of patients with carpal tunnel syndrome to compare the value of MRI with electrodiagnostic studies for: 1) prediction of 1-year outcomes and 2) identification of patients who are likely to benefit from surgical treatment.	The length of the abnormal T2-weighted nerve signal on MRI and median-ulnar sensory latency difference were the strongest predictors of surgical benefit. Findings obtained with MRI of the carpal tunnel predict surgical benefit independently of nerve conduction studies.	2
36. Lenk S, Ludescher B, Martirosan P, Schick F, Claussen CD, Schlemmer HP. 3.0 T high-resolution MR imaging of carpal ligaments and TFCC. <i>Rofo</i> 2004; 176(5):664-667.	9	10	Comparison of 3.0 T vs 1.5 T magnets and new dedicated wrist coil for TFCC and carpal ligament imaging.	Several sequences obtained at 3.0 T (eg, 2D T2* MEDIC) yield high SNR and CNR with reasonable acquisition times and few artifacts for evaluation of ligaments and TFCC in healthy volunteers, while some 1.5 T sequences yield unacceptable SNR and CNR for visualization of anatomy and diagnostic purposes.	3
37. Anderson SE, Steinbach LS, Stauffer E, Voegelin E. MRI for differentiating ganglion and synovitis in the chronic painful wrist. <i>AJR</i> 2006; 186(3):812-818.	10	34 2 blinded observers	Retrospective study to determine if preoperative MRI can distinguish between occult ganglion and synovitis in chronic wrist pain.	MRI accurate in preoperative differentiation of ganglion vs synovitis in chronic dorsal wrist pain; four main radiographs criteria useful—margin, shape, internal structure, and enhancement, with shape and internal structure most helpful.	2

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38. Teefey SA, Dahiya N, Middleton WD, Gelberman RH, Boyer MI. Ganglia of the hand and wrist: a sonographic analysis. <i>AJR</i> 2008; 191(3):716-720.	11	55 patients 60 ganglia	Retrospective study to analyze the US appearance of ganglia of the hand and wrist.	34/60 ganglia were complex: 91% were located within the dorsal or volar wrist; 97% had well-defined margins; 76%, locules; 68% acoustic enhancement; 47% a thick wall; 15% internal reflectors; and 12% blood flow. Of the 23 simple ganglia, 11 involved the extensor or flexor tendon sheath, 73% of which were simple. Study showed that most ganglia are complex rather than simple on US.	2
39. Keogh CF, Wong AD, Wells NJ, Barbarie JE, Cooperberg PL. High-resolution sonography of the triangular fibrocartilage: initial experience and correlation with MRI and arthroscopic findings. <i>AJR</i> 2004; 182(2):333-336.	9	13	Prospective study to evaluate young patients with subacute ulnar wrist pain and suspected TFCC tears, comparing US and MRI (8 also underwent subsequent arthroscopy).	Calculated correlations: 87.5% between US and arthroscopy for presence or absence of tear, 84.6% for US and MRI.	3
40. De Maeseneer M, Marcelis S, Osteaux M, Jager T, Machiels F, Van Roy P. Sonography of a rupture of the tendon of the extensor pollicis longus muscle: initial clinical experience and correlation with findings at cadaveric dissection. <i>AJR</i> 2005; 184(1):175-179.	14	5	Retrospective review to report initial clinical experience with US of the wrist for diagnosing a proximal rupture of the tendon of the extensor pollicis longus (EPL) muscle and to perform sonographic-anatomic correlation of the EPL tendon.	US may be helpful in diagnosing a rupture of the EPL tendon and in the preoperative assessment of gap size and position of the retracted tendon ends.	4
41. Santiago FR, Plazas PG, Fernandez JM. Sonography findings in tears of the extensor pollicis longus tendon and correlation with CT, MRI and surgical findings. <i>Eur J Radiol</i> 2008; 66(1):112-116.	9	12	Prospective, 2-year study of US findings in tears of the EPL tendon compared with CT, MRI and surgical findings.	US is recommended for the diagnosis of EPL tendon tear for preoperative planning.	3
42. Klauser AS, Halpern EJ, De Zordo T, et al. Carpal tunnel syndrome assessment with US: value of additional radiographs cross-sectional area measurements of the median nerve in patients versus healthy volunteers. <i>Radiology</i> 2009; 250(1):171-177.	9	68 patients 100 wrists with CTS 58 patients 93 wrists – healthy volunteers	Compare cross-sectional area (CSA) measurements of the median nerve obtained at the level of the carpal tunnel (CSAc) with those from more proximally (CSAp), at the level of the pronator quadratus muscle to improve diagnosis of carpal tunnel syndrome (CTS).	Delta CSA threshold of 2 mm (2) had the greatest sensitivity (99%) and specificity (100%) for the diagnosis of CTS. Delta CSA was more accurate than CSAc.	2

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43. Sernik RA, Abicalaf CA, Pimentel BF, Braga-Baiak A, Braga L, Cerri GG. Ultrasound features of carpal tunnel syndrome: a prospective case-control study. <i>Skeletal Radiol</i> 2008; 37(1):49-53.	10	31 patients 40 wrists with CTS 37 asymptomatic 63 wrists	Prospective case-control study to examine the US features supporting the diagnosis of CTS.	Median nerve CSA of 10 mm (2) (DT) and 9 mm (2) (IT) had high sensitivity (85% and 88.5%, respectively), specificity (92.1% and 82.5%) and accuracy (89.3% and 82.5%) in the diagnosis of CTS. US is useful in the diagnosis of CTS with the median nerve diameter cut-off point of 10 mm (2) (DT) and 9 mm (2) (IT) and several additional findings.	2
44. Taljanovic MS, Sheppard JE, Jones MD, Switlick DN, Hunter TB, Rogers LF. Sonography and sonoarthrography of the scapholunate and lunotriquetral ligaments and triangular fibrocartilage disk: initial experience and correlation with arthrography and magnetic resonance arthrography. <i>J Ultrasound Med</i> 2008; 27(2):179-191.	9	16	Prospective study to determine the value of US and sonoarthrography in evaluation of dorsal bands of the SL ligament, LT ligament, and TFCC disk in correlation with arthrography and MR arthrography.	<ul style="list-style-type: none"> For SLL, results were concordant for all imaging modalities in 15 patients (93.75%) and partially concordant in 1 (6.25%). For LTL, results were concordant for all imaging modalities in 12 patients (75%), partially concordant in 3 (18.75%), and discordant in 1 (6.25%). For TFCC, the results were concordant for all imaging modalities in 13 patients (81.25%), partially concordant in 2 (12.5%), and discordant in 1 (6.25%). The arthroscopic and imaging findings were concordant for 3 SLL, 3 LTL, and 3 TFCC disks. 	3
45. Chiou HJ, Chang CY, Chou YH, et al. Triangular fibrocartilage of wrist: presentation on high resolution ultrasonography. <i>J Ultrasound Med</i> 1998; 17(1):41-48.	13 9	1) 35 patients 2) 47 (26 patients)	Two part study: Part 1 evaluated normal anatomy in healthy volunteers with US and multicompart ment arthrography; part 2 evaluated 47 wrists in 26 patients with chronic pain with US and arthrography.	US successfully defines normal anatomy and changes in echogenicity associated with TFCC tears, with sensitivity 68.4%, specificity 96.4%, PPV 92.9%, NPV 81.8%, and accuracy 85.1%; relatively low sensitivity makes US a good initial staging modality in some cases, and it is recommended routinely in all suspected TFCC tears.	3
46. Lohman M, Vasenius J, Nieminen O. Ultrasound guidance for puncture and injection in the radiocarpal joint. <i>Acta Radiol</i> 2007; 48(7):744-747.	13	108	Retrospective study to determine the value of US guidance of the contrast injection in radiocarpal MR arthrograms.	Injection was intra-articular in 93.5% of 108. US guidance of the contrast injection in radiocarpal MR arthrograms is a cost-effective and safe alternative to fluoroscopically guided procedures.	2
47. Luz KR, Furtado RN, Nunes CC, Rosenfeld A, Fernandes AR, Natour J. Ultrasound-guided intra-articular injections in the wrist in patients with rheumatoid arthritis: a double-blind, randomised controlled study. <i>Ann Rheum Dis</i> 2008; 67(8):1198-1200.	8	60	Prospective, double-blind, randomized controlled study to compare the accuracy of blind and US-guided IA injections in patients with RA with wrist synovitis.	US did not increase the accuracy of wrist injections. Further studies are recommended.	1

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48. Teh J, Vlychou M. Ultrasound-guided interventional procedures of the wrist and hand. <i>Eur Radiol</i> 2008.	12	N/A	Review rationale, indications, techniques, complications of US-guided interventional procedures of the hand and wrist.	Study recommends US-guided interventional procedures since they are effective, safe and can be easily performed with the appropriate training.	3
49. Quinn SF, Belsole RJ, Greene TL, Rayhack JM. CT of the wrist for the evaluation of traumatic injuries. <i>Radiographs it Rev Diagn Imaging</i> 1989; 29(4):357-380.	12	N/A	Review of CT of the wrist for the evaluation of traumatic injuries.	Thin section CT with multiplanar reformats is recommended for trauma because of ability to characterize complex fractures and bony union, but suboptimal when patients have osteopenia, metallic hardware, or casts; CT supplements radiography and physical examination for identification of foreign bodies.	4
50. Moser T, Dosch JC, Moussaoui A, Buy X, Gangi A, Dietemann JL. Multidetector CT arthrography of the wrist joint: how to do it. <i>Radiographics</i> 2008; 28(3):787-800; quiz 911.	12	N/A	Review use of MDCT arthrography of the wrist joint.	MDCT arthrography is useful in the diagnosis and evaluation of different articular disorders. Main limitation is in evaluation of soft-tissue abnormalities; addition of US or MRI might help.	4
51. Manaster BJ, Mann RJ, Rubenstein S. Wrist pain: correlation of clinical and plain film findings with arthrographic results. <i>J Hand Surg [Am]</i> 1989; 14(3):466-473.	13	72	To correlate clinical and radiographic findings with arthrographic results in patients with wrist pain.	Patients with ulnar-sided pain had perforations (88%). Radial-sided pain is a poor indicator of a radial site of perforation. SL dissociation does not correlate highly with SL perforation (26%).	2
52. Metz VM, Mann FA, Gilula LA. Three-compartment wrist arthrography: correlation of pain site with location of uni- and bidirectional communications. <i>AJR</i> 1993; 160(4):819-822.	13	191	Retrospective study to determine if pain site correlates with abnormal findings on three-compartment wrist arthrograms and whether the directional nature (unidirectional vs bidirectional) of communication(s) between adjacent wrist joint compartments shown on three-compartment wrist arthrograms correlates with the presence and site of pain.	No association between sites and/or side symptoms and communications.	2
53. Wilson AJ, Mann FA, Gilula LA. Imaging the hand and wrist. <i>J Hand Surg [Br]</i> 1990; 15(2):153-167.	12	N/A	Review imaging techniques currently available for the hand and wrist.	Radiograph is still the single most important modality for the hand and wrist. Many surgical lesions have some morphological abnormalities shown by one or more of the following imaging techniques: conventional radiography, fluoroscopy, conventional tomography, CT, arthrography, angiography, digital radiography, scintigraphy, and MRI. Role of angiography in imaging the hand and wrist is limited.	4

**Chronic Wrist Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Strength of Evidence
54. Sahin G, Dogan BE, Demirtas M. Virtual MR arthroscopy of the wrist joint: a new intraarticular perspective. <i>Skeletal Radiol</i> 2004; 33(1):9-14.	10	19	Evaluate if virtual MR arthroscopy can be used to visualize internal architecture of radiocarpal compartment.	Virtual MR arthroscopy shows the TFCC in 12 of 19 patients; preliminary investigation shows that although this technique has several limitations, virtual MR arthroscopy shows promise in evaluating the TFCC from an intra-articular perspective.	3
55. Mitsuyoshi G, Naito N, Kawai A, et al. Accurate diagnosis of musculoskeletal lesions by core needle biopsy. <i>J Surg Oncol</i> 2006; 94(1):21-27.	9	157 patients 163 needle biopsies	To examine the accuracy and limitations of core needle biopsy for diagnosis of musculoskeletal lesions by comparing with final diagnoses by open biopsy and/or a definitive operation.	143 specimens (88%) were determined to be adequate for histological examination. Differentiate malignant tumors from benign lesions in 97% of the cases (bone 100%; soft-tissue 94%) and specific diagnosis in 88% (bone 96%; soft-tissue 78%). Accuracy was 77% (bone 85%; soft-tissue 68%). Needle biopsy is safe and accurate for diagnosing musculoskeletal lesions.	2
56. American College of Radiology. <i>Manual on Contrast Media</i> . Available at: http://www.acr.org/SecondaryMainMenuCategories/quality_safety/contrast_manua.aspx .	15	N/A	Guidance document on contrast media to assist radiologists in recognizing and managing risks associated with the use of contrast media.	N/A	3

Evidence Table Key

Study Type Key

Numbers 1-7 are for studies of therapies while numbers 8-15 are used to describe studies of diagnostics.

1. Randomized Controlled Trial — Treatment
2. Controlled Trial
3. Observation Study
 - a. Cohort
 - b. Cross-sectional
 - c. Case-control
4. Clinical Series
5. Case reviews
6. Anecdotes
7. Reviews

8. Randomized Controlled Trial — Diagnostic
9. Comparative Assessment
10. Clinical Assessment
11. Quantitative Review
12. Qualitative Review
13. Descriptive Study
14. Case Report
15. Other (Described in text)

Strength of Evidence Key

- Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.
- Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.
- Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.
- Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.