

**Chronic Ankle Pain
EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|------------------|--------------------------------------|--|--|------------------|
| 1. Cho JH, Lee DH, Song HK, Bang JY, Lee KT, Park YU. Value of stress ultrasound for the diagnosis of chronic ankle instability compared to manual anterior drawer test, stress radiography, magnetic resonance imaging, and arthroscopy. <i>Knee Surg Sports Traumatol Arthrosc.</i> 2016;24(4):1022-1028. | Observational-Dx | 28 patients. | To assess the diagnostic value of stress ultrasound for chronic ankle instability compared to the manual anterior drawer test, stress radiography, magnetic resonance imaging (MRI), and arthroscopy. | Grade 3 lateral instability was verified arthroscopically in all 28 cases with a clinical diagnosis (100%). Twenty-two cases showed grade III instability on the manual anterior drawer test (78.6%). Twenty-four cases displayed anterior translation exceeding 5 mm on stress radiography (86%), and talar tilt angle exceeded 15 degrees in three cases (11%). Nineteen cases displayed a partial chronic tear (change in thickness or signal intensity), and nine cases displayed complete tear on MRI (100%). Lax and wavy anterior talofibular ligament (ATFL) was evident on stress ultrasound in all cases (100%). The mean value of the ATFL length was 2.8 +/- 0.3 cm for the stressed condition and 2.1 +/- 0.2 cm for the resting condition (p < 0.001). | 3 |
| 2. Dowling LB, Giakoumis M, Ryan JD. Narrowing the normal range for lateral ankle ligament stability with stress radiography. <i>J Foot Ankle Surg.</i> 2014;53(3):269-273. | Experimental-Dx | 46 patients. | To narrow the threshold for the diagnosis of ankle ligament injury using stress radiographs by refining the values seen in the normal ankle. | The results of the present study suggest that stress radiographs for lateral ankle stability can be performed in a simple and reliable manner. These results also support a much lower threshold for the diagnosis of lateral ankle injury than previously reported. | 3 |
| 3. Hoffman E, Paller D, Koruprolu S, et al. Accuracy of plain radiographs versus 3D analysis of ankle stress test. <i>Foot Ankle Int.</i> 2011;32(10):994-999. | Observational-Dx | 20 lower extremity cadaver specimens | To investigate the accuracy of plain film radiography in measuring translation of the talus during the AD test and the rotation of the talus during TT stress testing. In addition to determining the true accuracy of radiologic assessment in two planes, our goal was to further define instability in the sagittal, coronal and transverse planes. | Mean positional changes determined by plain film radiographs were found to be significantly lower than those calculated by the three-dimensional system in both AD and TT tests in the intact and sectioned states (p < 0.001). | 3 |
| 4. Tourne Y, Besse JL, Mabit C. Chronic ankle instability. Which tests to assess the lesions? Which therapeutic options? <i>Orthop Traumatol Surg Res.</i> 2010;96(4):433-446. | Review/Other-Dx | N/A | To suggest an in-depth approach to diagnose the causes and lesions associated with and consecutive to chronic ankle instability due to ankle collateral ligament laxity. | No results stated in abstract. | 4 |

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| 5. Verhagen RA, Maas M, Dijkgraaf MG, Tol JL, Krips R, van Dijk CN. Prospective study on diagnostic strategies in osteochondral lesions of the talus. Is MRI superior to helical CT? J Bone Joint Surg Br. 2005;87(1):41-46. | Observational-Dx | 103 patients (104 ankles) | Prospective study to determine the best diagnostic method for discriminating between patients with and without osteochondral lesions of the talus, with special relevance to the value of MRI compared with the new technique of multidetector helical CT. Authors compared the diagnostic value of history, physical examination and standard radiography, a 4 cm heel-rise view, helical CT, MRI, and diagnostic arthroscopy for simultaneous detection or exclusion of osteochondral lesions of the talus. | Helical CT, MRI and diagnostic arthroscopy were significantly better than history, physical examination and standard radiography. MRI and diagnostic arthroscopy performed better than a mortise view with a 4 cm heel-rise. No statistically significant difference between helical CT and MRI. Diagnostic arthroscopy did not perform better than helical CT and MRI. | 2 |
| 6. Schmid MR, Pfirrmann CW, Hodler J, Vienne P, Zanetti M. Cartilage lesions in the ankle joint: comparison of MR arthrography and CT arthrography. Skeletal Radiol. 2003;32(5):259-265. | Observational-Dx | 36 consecutive patients | To compare MR arthrography and CT arthrography for the evaluation of cartilage lesions in the ankle joint. | For reader 1 accuracy of MR arthrography in the talus/tibia/fibula (88%/88%/94%) was slightly inferior to CT arthrography (90%/94%/92%). For reader 2, the accuracy was 76%/78%/83% for MR arthrography, and 92%/93%/92% for CT arthrography, respectively. Interobserver agreement for MR arthrography was 79%/74%/89% (kappa 0.47/0.34/0.27), while interobserver agreement for CT arthrography was 89%/90%/89% (kappa 0.69/0.54/0.54). CT arthrography appears to be more reliable than MR arthrography for the detection of cartilage lesions in the ankle joint. | 2 |
| 7. Chicklore S, Gnanasegaran G, Vijayanathan S, Fogelman I. Potential role of multislice SPECT/CT in impingement syndrome and soft-tissue pathology of the ankle and foot.[Erratum appears in Nucl Med Commun. 2013 Apr;34(4):412 Note: Chicklore, Sugam [corrected to Chicklore, Sugama]]. Nucl Med Commun. 34(2):130-9, 2013 Feb. | Observational-Dx | 209 patients | To assess the potential role of multislice SPECT/CT in diagnosing impingement syndrome and soft-tissue pathology of the ankle and foot. | Out of the 209 patients, 43 (21%) were diagnosed with impingement syndrome or soft-tissue pathology. Clinical diagnosis versus bone SPECT/CT: in 24/43 (56%) patients, SPECT/CT provided information not suspected on clinical diagnosis. In 19/43 (44%) patients, SPECT/CT confirmed the clinical diagnosis. Two-phase bone scan versus SPECT/CT: in 31/43 (72%) patients, SPECT/CT provided additional information, which was not diagnosed on the conventional two-phase bone scan. The findings of the two-phase bone scan and SPECT/CT were concordant in 12/43 (28%) patients. | 3 |

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| 8. Wiewiorski M, Pagenstert G, Rasch H, Jacob AL, Valderrabano V. Pain in osteochondral lesions. Foot Ankle Spec. 2011;4(2):92-99. | Observational-Dx | 15 patients | To evaluate the correlation between pathological uptake within an OCL and pain experienced by patients suffering from this condition; 15 patients were assessed in the orthopaedic ambulatory clinic for unilateral OCL of the ankle joint. Pain status was measured with the Visual Analogue Scale (VAS) | The VAS score assessed immediately post-infiltration was compared with the preinterventional VAS score obtained in the outpatient clinic. Pain relief was defined as a reduction of the VAS score to \leq 50% of the preinterventional score, if expected immediately after infiltration. Pain relief was found in all 15 patients. | 3 |
| 9. Micu MC, Nestorova R, Petranova T, et al. Ultrasound of the ankle and foot in rheumatology. Med Ultrason. 2012;14(1):34-41. | Review/Other-Dx | N/A | To review the US technique of scanning and the indications of US in the analysis of the ankle and foot in rheumatic diseases. | No results stated in abstract. | 4 |
| 10. Lee SJ, Jacobson JA, Kim SM, et al. Ultrasound and MRI of the peroneal tendons and associated pathology. Skeletal Radiol. 2013;42(9):1191-1200. | Review/Other-Dx | N/A | To review of the common causes of peroneal tendon pathology with particular reference to anatomy, US, and MRI features. | No results stated in abstract. | 4 |
| 11. Yablon CM. Ultrasound-guided interventions of the foot and ankle. Semin Musculoskelet Radiol. 2013;17(1):60-68. | Review/Other-Dx | N/A | To discuss an array of US-guided interventions of the foot and ankle, with special focus on preprocedural and technical considerations, and potential complications. | No results stated in abstract. | 4 |
| 12. Nazarenko A, Beltran LS, Bencardino JT. Imaging evaluation of traumatic ligamentous injuries of the ankle and foot. Radiol Clin North Am. 2013;51(3):455-478. | Review/Other-Dx | N/A | To discuss imaging evaluation of traumatic ligamentous injuries of the ankle and foot. | No results stated in abstract. | 4 |
| 13. Weishaupt D, Schweitzer ME. MR imaging of the foot and ankle: patterns of bone marrow signal abnormalities. Eur Radiol. 2002;12(2):416-426. | Review/Other-Dx | N/A | To review MRI of the foot and ankle responses of bone marrow to trauma, stress, or disease. | Specific diagnosis can be achieved if there is evaluation of normal and abnormal bone marrow with regard to pattern, distribution, and signal characteristics on different sequences. | 4 |

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| 14. Joshy S, Abdulkadir U, Chaganti S, Sullivan B, Hariharan K. Accuracy of MRI scan in the diagnosis of ligamentous and chondral pathology in the ankle. <i>Foot Ankle Surg.</i> 2010;16(2):78-80. | Observational-Dx | 24 patients | To determine the accuracy of MRI scan in relation to arthroscopic findings in patients presenting with chronic ankle pain and/or instability. Arthroscopic findings were considered as a gold standard. | MRI showed 100% specificity for the diagnosis of anterior talofibular ligament (ATFL) and CFL tears and osteochondral lesions. However sensitivity was low particularly for calcaneofibular ligament (CFL) tears. Accuracy of MRI in detecting ATFL tear was 91.7%, CFL tear was 87.5% and osteochondral lesion was 83.3%. MRI scan has very high specificity and PPV in diagnosing tears of ATFL, CFL and osteochondral lesions. However sensitivity was low with MRI. In a symptomatic patient negative results on MRI must be viewed with caution and an arthroscopy may still be required for a definitive diagnosis and treatment. However high resolution scans may differ in their ability to pick up these lesions and further research is required to assess their efficiency as evidence is not currently available. | 3 |
| 15. Oae K, Takao M, Uchio Y, Ochi M. Evaluation of anterior talofibular ligament injury with stress radiography, ultrasonography and MR imaging. <i>Skeletal Radiol.</i> 2010;39(1):41-47. | Observational-Dx | 34 patients | To clarify the efficacy of stress radiography (stress X-P), US, and MRI in the detection of the anterior talofibular ligament (ATFL) injury. | Arthroscopic findings showed ATFL injury in 30 out of 34 cases. The diagnosis of ATFL injury with stress X-P, US, MR imaging were made with an accuracy of 67, 91 and 97%. US and MR imaging demonstrated the same location of the injury as arthroscopy in 63 and 93%. | 3 |
| 16. Rosenberg ZS, Cheung Y, Jahss MH, Noto AM, Norman A, Leeds NE. Rupture of posterior tibial tendon: CT and MR imaging with surgical correlation. <i>Radiology.</i> 1988;169(1):229-235. | Observational-Dx | 27 patients with 32 clinically suspected posterior tibial tendon ruptures 23 controls ; 46 CT and MRI studies reviewed. | To compare accuracy of CT and MRI for posterior tibial tendon (PTT) rupture using surgery as the gold standard. | For CT: Sensitivity 90%, specificity 100%. For MRI: Sensitivity 95%, specificity 100%. The accuracy in detecting ruptures was 91% for CT and 96% for MRI. The overall accuracy, which reflected the percentage of cases correctly diagnosed as well as those correctly classified, was 59% for CT and 73% for MRI. MRI is the method of choice for detecting ruptures of the PPT. It provided greater definition of tendon outline, vertical splits, synovial fluid, edema, and degenerated tissue. CT was superior to MRI in showing associated bone abnormalities. | 3 |

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| 17. Cha SD, Kim HS, Chung ST, et al. Intra-articular lesions in chronic lateral ankle instability: comparison of arthroscopy with magnetic resonance imaging findings. Clin Orthop Surg. 2012;4(4):293-299. | Observational-Dx | 65 patients | To report the clinical results with a review of the literature. | Abnormalities of the anterior talofibular ligament (ATFL) were found in all 65 (100%) cases. In arthroscopy examinations, 33 (51%) cases had talar cartilage lesions, and 3 (5%) cases had 'tram-track' cartilage lesion. Additionally, 39 (60%) cases of synovitis, 9 (14%) cases of anterior impingement syndrome caused by osteophyte, 14 (22%) cases of impingement syndrome caused by fibrotic band and tissue were found. Sensitivity of MRI examination for each abnormality was: ATFL, 60%; osteochondral lesion of talus (OLT), 46%; syndesmosis injury, 21%; synovitis, 21%; anterior impingement syndrome caused by osteophyte, 22%. Paired intra-observer reliability was measured by a kappa statistic of 0.787 (95% confidence interval [CI], 0.641 to 0.864) for ATFL injury, 0.818 (95% CI, 0.743 to 0.908) for OLT, 0.713 (95% CI, 0.605 to 0.821) for synovitis, and 0.739 (95% CI, 0.642 to 0.817) for impingement. Paired inter-observer reliability was measured by a kappa statistic of 0.381 (95% CI, 0.241 to 0.463) for ATFL injury, 0.613 (95% CI, 0.541 to 0.721) for OLT, 0.324 (95% CI, 0.217 to 0.441) for synovitis, and 0.394 (95% CI, 0.249 to 0.471) for impingement. Mean AOFAS score increased from 64.5 to 87.92 (p < 0.001) when there was no intra-articular lesion, from 61.07 to 89.04 (p < 0.001) in patients who had one intra-articular lesion, and from 61.12 to 87.6 (p < 0.001) in patients who had more than two intra-articular lesions. | 2 |
| 18. Singleton TJ, Hutchinson B, Ford L. Arthroscopic treatment of ankle osteochondral lesions. Clin Podiatr Med Surg. 2011;28(3):481-490. | Review/Other-Tx | N/A | To evaluate the management of osteochondral lesions with arthroscopy. | No results stated in abstract. | 4 |

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| 19. Karchevsky M, Schweitzer ME. Accuracy of plain films, and the effect of experience, in the assessment of ankle effusions. <i>Skeletal Radiol.</i> 2004;33(12):719-724. | Observational-Dx | 39 patients | To examine the accuracy of radiographs, and the effect of observer experience, in the assessment of ankle effusions. MRI is used as the gold standard. | Lateral radiographs: Variable sensitivity (range 17%-63%), specificity (81%-94%), PPV (75%-86%), NPV (50%-67%), and accuracy (53%-74%). Anteroposterior radiographs: Variable sensitivity (15%-55%), specificity (63%-75%), PPV (38%-61%), NPV (47%-58%), and accuracy (45%-59%). Concludes that overall accuracy of radiographs is low. | 2 |
| 20. Ketz JP, Maceroli M, Shields E, Sanders RW. Peroneal Tendon Instability in Intra-Articular Calcaneus Fractures: A Retrospective Comparative Study and a New Surgical Technique. <i>J Orthop Trauma.</i> 2016;30(3):e82-87. | Observational-Dx | 254 patients. | To compare the prevalence of peroneal tendon instability as determined by intraoperative evaluation versus preoperative computed tomography (CT) scans, and to identify specific risk factors that correlate with tendon instability. | There was significantly higher prevalence of peroneal tendon instability as determined by preoperative imaging (30%; n = 47/155) compared with intraoperative retinaculum testing (11.6%; n = 18/155) (P < 0.001). Intraoperative tendon instability was significantly associated with increased fracture classification severity, fibular fracture/"fleck" sign, and fracture-dislocation. | 3 |
| 21. Khoury NJ, el-Khoury GY, Saltzman CL, Brandser EA. Intraarticular foot and ankle injections to identify source of pain before arthrodesis. <i>AJR.</i> 1996;167(3):669-673. | Observational-Dx | 22 patients 24 joints | Retrospective review to evaluate the value of diagnostic joint injections in patients with foot and ankle pain when the radiologist attempts to identify the source of pain before arthrodesis. | In 20 patients (22 joints), long-term follow-up showed that injections allowed us to correctly identify the source of pain and successfully guide arthrodesis. Of these 20 patients, 17 had significant pain relief after injection and fusion, whereas three patients had mild or no response. With one of these patients, authors injected other joints and changed surgical plans. One of the two remaining patients had more pain relief after injection than after arthrodesis. The other patient had no relief after injection, but subsequent fusion because of persistent pain was successful. Imaging studies were found to be less useful than diagnostic injections when attempting to identify the source of pain. Intraarticular injection of anesthetic in painful foot and ankle joints helped confirm the source of pain in 20 of 22 patients, which in turn led to successful arthrodesis and good outcomes for these patients. | 4 |

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| 22. Lucas PE, Hurwitz SR, Kaplan PA, Dussault RG, Maurer EJ. Fluoroscopically guided injections into the foot and ankle: localization of the source of pain as a guide to treatment--prospective study. <i>Radiology</i> . 1997;204(2):411-415. | Observational-Dx | 47 patients | Prospective study to determine the value of injections of local anesthetic and steroids in the foot and ankle in localizing the source of pain as a guide to treatment. | 43 (91%) patients reported pain relief after injections. The level of confidence that the site injected was the source of pain increased in 68 (64%) sites, decreased in 19 (18%) sites, and remained unaltered in 19 (18%) sites (P < .01). The treatment plan was changed from nonsurgical initially to surgical in three (8%) of 36 patients and was changed from surgical to nonsurgical in three (27%) of 11 patients after injections. Of the remaining eight patients, treatment was altered in three (37%) as a result of pain relief after the injections. Fluoroscopically guided injections of local anesthetic and steroid in the foot and ankle can improve clinical confidence with regard to the site of pain and may be valuable in clinical decision making and patient treatment. | 4 |
| 23. Henning PT. Ultrasound-Guided Foot and Ankle Procedures. <i>Phys Med Rehabil Clin N Am</i> . 2016;27(3):649-671. | Review/Other-Dx | N/A | To review commonly performed injections about the foot and ankle region. | No results stated in abstract. | 4 |
| 24. Reach JS, Easley ME, Chuckpaiwong B, Nunley JA, 2nd. Accuracy of ultrasound guided injections in the foot and ankle. <i>Foot Ankle Int</i> . 2009;30(3):239-242. | Experimental-Dx | 10 cadaver. | To evaluate the accuracy of ultrasound guided injections for common injection sites in the foot and ankle. | Ultrasound guidance allowed the avoidance of intervening neurovascular and tendinous structures. Ultrasound guided metatarsophalangeal (MTP), ankle, Achilles, posterior tibial tendon (PTT) and flexor hallucis longus (FHL) peritendinous injections were 100% accurate. Ultrasound guided subtalar injection was 90% accurate. | 3 |
| 25. Smith J, Maida E, Murthy NS, Kissin EY, Jacobson JA. Sonographically guided posterior subtalar joint injections via the sinus tarsi approach. <i>J Ultrasound Med</i> . 2015;34(1):83-93. | Experimental-Dx | 10 cadavers. | To determine the feasibility and accuracy of sonographically guided posterior subtalar joint (PSTJ) injections performed through the sinus tarsi. | All 10 sonographically guided PSTJ tap water injections were accurate, distending both the posterior and lateral PSTJ recesses. In addition, all 10 specimens showed posterior recess distension by 2 mL, whereas only 2 specimens (20%) showed lateral recess distension at this volume. By 4 mL, both recesses were clearly distended in all specimens. Both contrast agent injections produced similar PSTJ computed tomographic arthrograms and patterns of recess distension similar to the sonographically guided tap water injections. No sonographically guided PSTJ injection placed fluid in the peroneal tendon sheath. | 3 |

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| 26. Bui-Mansfield LT, Kline M, Chew FS, Rogers LF, Lenchik L. Osteochondritis dissecans of the tibial plafond: imaging characteristics and a review of the literature. <i>AJR</i> . 2000;175(5):1305-1308. | Review/Other-Dx | 3 patients | Retrospective review of the medical records of patients with osteochondral injury in the tibial plafond to report imaging characteristics and a review of literature. | Osteochondritis dissecans of the tibial plafond may not be detectable on radiography and its radiologic findings are similar to those of osteochondritis dissecans located elsewhere in the body. | 4 |
| 27. Bui-Mansfield LT, Lenchik L, Rogers LF, Chew FS, Boles CA, Kline M. Osteochondritis dissecans of the tarsal navicular bone: imaging findings in four patients. <i>J Comput Assist Tomogr</i> . 2000;24(5):744-747. | Review/Other-Dx | 4 patients | A report on the imaging characteristics of osteochondritis dissecans of the tarsal navicular bone in four cases and a review of current literature. | Its radiological findings are similar to osteochondritis dissecans found in other sites: focal lucency that disrupts the sharp cortical line, the presence of sclerosis, and cortical depression. | 4 |
| 28. De Smet AA, Ilahi OA, Graf BK. Reassessment of the MR criteria for stability of osteochondritis dissecans in the knee and ankle. <i>Skeletal Radiol</i> . 1996;25(2):159-163. | Observational-Dx | 40 patients | To determine the accuracy of T2-weighted MRI for assessing osteochondritis dissecans. The value of each of four MRI signs of instability was also assessed. | The original MR interpretations correctly identified 35 of the 36 unstable lesions and all 4 stable lesions, giving a sensitivity of 0.97 and specificity of 1.0. There was a 98% agreement between the original and retrospective diagnoses. A high-signal-intensity line was seen beneath 72% of the 36 unstable lesions. The other three signs were noted in 22-31% of the unstable lesions. 56% of the unstable lesions showed only one sign of instability. MR imaging is a highly sensitive method for detection of unstable osteochondritis dissecans. The presence of any one sign indicates instability, the most frequent sign being an underlying high-signal-intensity line. Because only four stable lesions were examined, the 95% confidence interval of 0.40-1.0 for a specificity of 1.0 gives only a limited estimate of the specificity of MR. | 3 |

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| 29. Lee KB, Bai LB, Park JG, Yoon TR. A comparison of arthroscopic and MRI findings in staging of osteochondral lesions of the talus. <i>Knee Surg Sports Traumatol Arthrosc.</i> 2008;16(11):1047-1051. | Observational-Dx | 50 patients (52 cases) | To evaluate the accuracy of MRI compared with arthroscopy in staging of osteochondral lesions of the talus (OLTs). The authors prospectively investigated 50 patients (52 cases) who had undergone both MRI and ankle arthroscopy for OLTs. | A comparison of MRI and arthroscopic stagings revealed that MRI had an accuracy of 81% (42 of 52) for staging of OLTs. MRI correctly staged 3 of 7 stage I lesions, 5 of 11 stage II, 25 of 25 stage III, and 9 of 9 stage IV lesions. Ten mismatched cases were of arthroscopic stage III lesions, which MRI classified as four stage I lesions and six stage II lesions. Thus, MRI staging tended to understate lesion severity. The authors re-reviewed the ten MR images of the mismatching cases to identify reasons for these mismatches, and subchondral edema was found in six cases. MRI has accuracy of 81% in staging of OLTs, however, MRI had some limitation in correct staging isolated cartilage lesions of OLTs, especially combined with subchondral edema. | 3 |
| 30. Choi YS, Potter HG, Chun TJ. MR imaging of cartilage repair in the knee and ankle. <i>Radiographics.</i> 2008;28(4):1043-1059. | Review/Other-Dx | N/A | To review MRI of cartilage repair in the knee and ankle. | MRI and arthroscopy provide complementary information and are useful for follow-up evaluation of cartilage repair in the knee and ankle. Standard MRI techniques may be used postoperatively to evaluate the success of implantation and the state of cartilage healing. | 4 |

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| 31. Griffith JF, Lau DT, Yeung DK, Wong MW. High-resolution MR imaging of talar osteochondral lesions with new classification. Skeletal Radiol. 2012; 41(4):387-399. | Observational-Dx | 70 osteochondral lesions from 70 patients | Retrospective review of high-resolution MR imaging features of talar dome osteochondral lesions and development of new classification system based on these features. | Microscopy coil imaging at 1.5 T yielded 20% better signal-to-noise characteristics than ankle coil imaging at 3 T. High-resolution MR revealed that osteochondral junction separation, due to focal collapse of the subchondral bone, was a common feature, being present in 28 (45%) of 61 medial central osteochondral lesions. Reparative cartilage hypertrophy and bone:bone separation in the absence of cartilage fracture were also common findings. Complete osteochondral separation was uncommon. A new five-part grading system incorporating features revealed by high-resolution MR imaging was developed. High-resolution MRI reveals clinically pertinent features of talar osteochondral lesions, which should help comprehension of symptomatology and enhance clinical decision-making. These features were incorporated in a new MR-based grading system. Whenever possible, symptomatic talar osteochondral lesions should be assessed by high-resolution MR imaging. | 4 |

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| 32. Leumann A, Valderrabano V, Plaass C, et al. A novel imaging method for osteochondral lesions of the talus-- comparison of SPECT-CT with MRI. Am J Sports Med. 2011;39(5):1095-1101. | Observational- Dx | 25 consecutive patients | To evaluate SPECT-CT in comparison with MRI for image interpretation and decision making in osteochondral lesions (OCLs) of the talus. | In comparison with MRI alone, treatment decision making changed in 48% of the cases with SPECT-CT alone and 52% with SPECT-CT and MRI combined. While cartilage showed good correlation for interpretation between MRI and SPECT-CT, the subchondral bone plate and subchondral bone showed substantial differences. Poor intrarater correlation highlighted the different information provided by the 2 imaging techniques. Poor interrater correlation showed a high heterogeneity in the treatment decision making of OCLs. Compared with MRI, SPECT-CT provides additional information and influences the decision making of OCL treatment. For thorough diagnostic evaluation in OCLs, performing both MRI and SPECT-CT is recommended. Further clinical investigation is needed to see if SPECT-CT in addition to MRI results in improved treatment outcomes. | 3 |
| 33. Meftah M, Katchis SD, Scharf SC, Mintz DN, Klein DA, Weiner LS. SPECT/CT in the management of osteochondral lesions of the talus. Foot Ankle Int. 2011;32(3):233-238. | Observational- Tx | 22 patients. | To assess the value of single-photon emission comuted tomography (SPECT)/ comuted tomography (CT) in the management of osteochondral lesion of the talus (OLT). | Twelve patients underwent ankle arthroscopy for debridement or drilling of the osteochondral lesion. The mean American Orthopaedic Foot and Ankle Society (AOFAS) score in these 12 patients was 83.6. SPECT/CT helped preoperative planning by identifying the exact location of the active lesion, especially in multifocal disease or revision surgeries while showing the depth of the active lesion. Ten patients had conservative management due to minimal or no activity over the lesion on SPECT/CT images. The mean AOFAS score in these ten patients was 78.8 which was comparable to the operative group. | 2 |

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| 34. Tamam C, Tamam MO, Yildirim D, Mulazimoglu M. Diagnostic value of single-photon emission computed tomography combined with computed tomography in relation to MRI on osteochondral lesions of the talus. Nucl Med Commun. 2015;36(8):808-814. | Observational-Dx | 21 patients. | To compare single photon emission computed tomography (SPECT) / computed tomography (CT) with magnetic resonance imaging (MRI) for image interpretation and treatment decision making in talar osteochondral lesions. | A total of 25 lesions were identified. Seventeen lesions were located on the medial third of the talar dome, eight on the lateral third, and seven on the central third. Four patients revealed diffuse uptake on more than one zone on SPECT/CT. SPECT/CT identified two subchondral lesions, which were not visualized on MRI. | 3 |
| 35. Ng JM, Rosenberg ZS, Bencardino JT, Restrepo-Velez Z, Ciavarra GA, Adler RS. US and MR imaging of the extensor compartment of the ankle. Radiographics. 2013;33(7):2047-2064. | Review/Other-Dx | N/A | To discuss the normal anatomy and pathologic conditions of the ankle extensor compartment. US and MR imaging features as well as potential imaging pitfalls are presented. | No results stated in abstract. | 4 |
| 36. Waitches GM, Rockett M, Brage M, Sudakoff G. Ultrasonographic-surgical correlation of ankle tendon tears. J Ultrasound Med. 1998;17(4):249-256. | Observational-Dx | 33 patients | Prospective study to evaluate the accuracy of US in diagnosing ankle tendon tears of the peroneal, posterior tibial, and flexor digitorum longus tendons based on operative findings and clinical follow-up. | US had sensitivity 100%, specificity 88%, accuracy 93%, PPV 83%, NPV 100%. The combined accuracy, sensitivity, and specificity for US in detecting tendon tears in all patients evaluated both surgically and by clinical follow-up were 94%, 100%, and 90%, respectively. | 3 |

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| 37. Nallamshetty L, Nazarian LN, Schweitzer ME, et al. Evaluation of posterior tibial pathology: comparison of sonography and MR imaging. <i>Skeletal Radiol.</i> 2005;34(7):375-380. | Observational-Dx | 18 women; 22 ankles evaluated with US and MRI | To compare the results of US and MRI in detecting pathology of the PTT in patients with PTT dysfunction. | Based on a commonly accepted staging system for PTT dysfunction, 6 ankles were classified as stage I, 11 ankles as stage II, and 5 ankles as stage III. All stage I ankles were interpreted as having an intact PTT by both MR imaging and US. In the stage II and III tendons, MR imaging demonstrated PTT tears in 12 of 22 examinations, including 11 partial tears and 1 complete tear. US demonstrated PTT tears in 8 of 22 examinations, including 8 partial tears and no complete tears. The findings of US and MR imaging were consistent in 17 of 22 cases (77%). The five inconsistencies were as follows: in 4 cases, US reported tendinosis when MR imaging interpreted partial tears (no change in management); in one case, US diagnosed a partial tear when MR reported a complete tear of the PTT (no change in management because the clinical findings were more consistent with a partial tear). In this study, US and MR imaging of the PTT were concordant in the majority of cases. US was slightly less sensitive than MR imaging for PTT pathology, but these discrepancies did not affect clinical management. | 3 |
| 38. Grant TH, Kelikian AS, Jereb SE, McCarthy RJ. Ultrasound diagnosis of peroneal tendon tears. A surgical correlation. <i>J Bone Joint Surg Am.</i> 2005;87(8):1788-1794. | Observational-Dx | 58 patients | Prospectively evaluate patients to determine whether US is effective for evaluating peroneal tendon injuries, with surgical findings used as the standard of reference. | Of 60 tendons evaluated operatively, 25 were torn. The sensitivity, specificity, and accuracy of US were 100%, 85%, and 90%, respectively. Dynamic US should be considered a first-line diagnostic tool. The use of dynamic US is effective for determining the presence or absence of a peroneal tendon tear and should be considered a first-line diagnostic tool. | 3 |

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EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|---------------------|---|---|------------------|
| 39. Astrom M, Gentz CF, Nilsson P, Rausing A, Sjoberg S, Westlin N. Imaging in chronic achilles tendinopathy: a comparison of ultrasonography, magnetic resonance imaging and surgical findings in 27 histologically verified cases. <i>Skeletal Radiol.</i> 1996;25(7):615-620. | Observational-Dx | 27 patients | To compare US and MRI in chronic achilles tendinopathy with regard to the nature and severity of the lesion. Both perative findings and histological biopsies were used as reference. | Surgical findings included 4 partial ruptures, 21 degenerative lesions and 2 macroscopically normal cases. Microscopy revealed tendinosis (degeneration) in all tendon biopsies, including cases with a partial rupture, but only slight changes in the paratendinous tissues (paratenon). US was positive in 21 of 26 and MRI in 26 of 27 cases. Severe intratendinous abnormalities and a sagittal tendon diameter > 10 mm suggested a partial rupture. In tendons with a false negative result histopathological changes were mild and a tendency towards a better clinical outcome was noted in the sonographic cases. Assessment of the paratenon was unreliable with both methods. US and MRI give similar information and may have their greatest potential as prognostic instruments. | 3 |
| 40. Hartgerink P, Fessell DP, Jacobson JA, van Holsbeeck MT. Full- versus partial-thickness Achilles tendon tears: sonographic accuracy and characterization in 26 cases with surgical correlation. <i>Radiology.</i> 2001;220(2):406-412. | Observational-Dx | 26 patients | To determine the accuracy of the use of sonography for differentiation of full- from partial-thickness tears or tendinosis of the Achilles tendon by using surgical findings as the standard of reference and to identify sonographic characteristics of full-thickness tears that can be used to differentiate the two types of tears. | In part A, statistical data regarding the use of sonographic findings to distinguish full- from partial-thickness tears were as follows: sensitivity, 100%; specificity, 83%; accuracy, 92%; PPV, 88%; and NPV, 100%. In part B, tendon thickness (P <.001), posterior acoustic shadowing (P =.007), and tendon retraction (P <.001) were correlated with full-thickness tears. Visualization of fat herniation (P =.051) and of the plantaris tendon (P =.098) demonstrated marginal correlation with full-thickness tears. Echogenicity at the site of the pathologic finding in the tendon showed no significant correlation. Sonography can be used to differentiate full- from partial-thickness tears or tendinosis of the Achilles tendon with 92% accuracy. Undetectable tendon at the site of injury, tendon retraction, and posterior acoustic shadowing demonstrate statistically significant correlation with full-thickness tears. | 3 |

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EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|------------------|---------------------|--|---|------------------|
| 41. Guelfi M, Pantalone A, Vanni D, Abate M, Guelfi MG, Salini V. Long-term beneficial effects of platelet-rich plasma for non-insertional Achilles tendinopathy. <i>Foot Ankle Surg.</i> 2015;21(3):178-181. | Observational-Tx | 73 patients. | To evaluate the long-term clinical outcome in patients affected by mid-portion Chronic Recalcitrant Achilles Tendinopathies (CRAT) treated with administration of single platelet-rich plasma (PRP). | Baseline VISA-A was 45+/-15. Results relative to the final follow-up improved significantly to a mean of 88+/-8 (p<00.1). Blazina was used for patients practicing sports (54 tendons out of 46 different patients): 37 tendons were grade IIIa, 11 II, and 6 IIIbis. Final follow-up Blazina scores improved for 45 grade 0, 5 I, 4 II (p<00.5). Seventy-six tendons (91.6%) were rated as satisfactory and patients would repeat the treatment. Seven tendons (8.4%) were classified as unsatisfactory at the 6 months follow-up and underwent a second PRP injection. In addition to this, patients reported no Achilles tendon rupture. | 2 |
| 42. Owens RF, Jr., Ginnett J, Conti SF, Latona C. Clinical and magnetic resonance imaging outcomes following platelet rich plasma injection for chronic midsubstance Achilles tendinopathy. <i>Foot Ankle Int.</i> 2011;32(11):1032-1039. | Observational-Dx | 14 patients. | To study the clinical and magnetic resonance imaging outcomes following platelet rich plasma injection for chronic midsubstance achilles tendinopathy. | Ten patients were identified for this study. Pre- and postinjection functional outcome scores were available for eight of ten patients. The average SF-8 score improved from 24.9 to 30.0, the average FAAM score improved from 55.4 to 65.8, and the average FAAMS score improved from 14.8 to 17.4. Complete MRI data was available for six patients. Only one in six Achilles tendons demonstrated qualitative MRI improvement post-injection. | 2 |
| 43. Yeo A, Kendall N, Jayaraman S. Ultrasound-guided dry needling with percutaneous paratenon decompression for chronic Achilles tendinopathy. <i>Knee Surg Sports Traumatol Arthrosc.</i> 2016;24(7):2112-2118. | Observational-Tx | 19 patients. | To target both pathological sites by combining dry needling with percutaneous hydrostatic decompression as a novel treatment. | Twenty-four tendons (in 19 patients) were successfully treated. The mean treatment session was 2. There was no significant change in neovascularity or tendon thickness. Therapeutic intervention led to a significant improvement in visual analogue scores (VAS) at rest (42.4 +/- 24.4 vs. 18.4 +/- 26.0, p = 0.0005) and during activity (72.8 +/- 16.0 vs. 33.7 +/- 23.2, p < 0.0001). At 12 and 24 months, >75 % of patients were highly satisfied with their outcome with nearly half reporting complete resolution of their symptoms. >85 % were also able to return to their sporting interests. | 2 |

**Chronic Ankle Pain
EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|------------------|---|--|--|------------------|
| 44. Neustadter J, Raikin SM, Nazarian LN. Dynamic sonographic evaluation of peroneal tendon subluxation. AJR. 2004;183(4):985-988. | Observational-Dx | 12 patients had sonographic and underwent surgical exploration 10 asymptomatic volunteers | To evaluate the effectiveness of US in revealing peroneal tendon subluxation in patients performing stress maneuvers. | All 12 patients with sonographic findings of peroneal tendon subluxation were subsequently found to have subluxation at surgery. The PPV of dynamic sonography for peroneal tendon subluxation was therefore 100%. Sonography revealed peroneus brevis tendon tears in five patients and a peroneus longus tear in one; all findings were confirmed at surgery, with no false-positive sonograms. Only four of the 20 asymptomatic ankles showed subluxation, and none had any other tendon abnormalities. Sonography is an effective technique for diagnosing peroneal tendon subluxation, as well as associated tears of the peroneal tendons. | 3 |
| 45. Roth JA, Taylor WC, Whalen J. Peroneal tendon subluxation: the other lateral ankle injury. Br J Sports Med. 2010;44(14):1047-1053. | Review/Other-Dx | N/A | Review current literature on peroneal tendon subluxation and propose a clinical algorithm to help guide diagnosis and treatment. Study goal was to heighten clinical awareness to improve earlier detection and treatment of disease. | MRI is the best imaging modality to view the peroneal tendons at the retrofibular groove. Currently, point-of-care ultrasound is gaining clinical ground, especially for the dynamic viewing capability to capture an episodic subluxation. | 4 |
| 46. Muir JJ, Curtiss HM, Hollman J, Smith J, Finnoff JT. The accuracy of ultrasound-guided and palpation-guided peroneal tendon sheath injections. Am J Phys Med Rehabil. 2011;90(7):564-571. | Experimental-Dx | 20 cadavers. | To describe and to validate an ultrasound-guided peroneal tendon sheath (PTS) injection technique and to compare the accuracy of ultrasound-guided vs. palpation-guided PTS injections in a cadaveric model. | Ultrasound-guided injections were 100% (20 of 20) accurate whereas palpation-guided injections were 60% (12 of 20) accurate (P = 0.008). Six palpation-guided injections were partially accurate, and two were inaccurate. Two of the partially accurate and both of the inaccurate injections were intratendinous. | 3 |
| 47. Wilkinson VH, Rowbotham EL, Grainger AJ. Imaging in Foot and Ankle Arthritis. Semin Musculoskelet Radiol. 2016;20(2):167-174. | Review/Other-Dx | N/A | To discuss the advantages and disadvantages of the imaging techniques of radiography, multidetector computed tomography, ultrasound, and magnetic resonance imaging (MRI) for the assessment of the anatomically complex joints of the foot and ankle. | No results stated in abstract. | 4 |

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EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|---------------------|--|---|------------------|
| 48. Park HJ, Cha SD, Kim HS, et al. Reliability of MRI findings of peroneal tendinopathy in patients with lateral chronic ankle instability. Clin Orthop Surg. 2010;2(4):237-243. | Observational-Dx | 82 patients | To assess the reliability of MRI by comparing MRI findings and operative findings of peroneal tendinopathy in patients with chronic lateral ankle instability. | Of the 82 cases, 26 were true positives, 38 true negatives, 13 false positives and 5 false negatives. Of 39 cases of peroneal tendinopathy diagnosed from MRI, 14 had peroneal tendon partial tears, 15 tenosynovitis, 3 dislocations, 17 low-lying muscle bellies, and 6 peroneus quartus muscles. Of 31 cases of peroneal tendinopathy observed in surgery 11 had peroneal tendon partial tears, 4 tenosynovitis, 5 dislocations, 12 low-lying muscle bellies, and 1 peroneus quartus muscle. Sensitivity and specificity of peroneal tendinopathy were 83.9% and 74.5%, respectively. PPV was 66.7%. NPV was 88.4%. Accuracy rate was 78.0%. MRI is a useful diagnostic tool for detecting peroneal tendinopathy in patients with chronic lateral ankle instability. However, MRI is vague in many cases. Therefore, a thorough delicate physical examination and careful observation is needed. | 3 |
| 49. Saxena A, Luhadiya A, Ewen B, Goumas C. Magnetic resonance imaging and incidental findings of lateral ankle pathologic features with asymptomatic ankles. J Foot Ankle Surg. 2011;50(4):413-415. | Review/Other-Dx | 100 patients | To study the incidence of lateral ankle pathologic features visualized in asymptomatic individuals. | Of the 100 patients, 67 (66%) had no history of a lateral ankle sprain, and 35 (34%) had sustained 1 or more sprains in the remote past. Also, 72 had an intact anterior talofibular ligament (71%), 90 had an intact calcaneofibular ligament (89%), 67 had intact peroneus brevis tendons (66%), and 68 (67%) had intact peroneus longus tendons. One accessory peroneal tendon was noted. Approximately 30% of asymptomatic patients undergoing MRI had abnormal anterior talofibular ligaments and peronei. | 4 |
| 50. Giza E, Mak W, Wong SE, Roper G, Campanelli V, Hunter JC. A clinical and radiological study of peroneal tendon pathology. Foot Ankle Spec. 2013;6(6):417-421. | Observational-Dx | 56 patients | To determine the relationship between peroneal tendon pathology as diagnosed by MRI and clinical findings of peroneal tendon pathology. | Of the 56 patients with positive findings on MRI, 27 patients had an associated positive clinical exam and 29 patients had a negative clinical exam. The positive predictive value of MRI for peroneal tendon tears with positive clinical findings was 48% (95% confidence interval = 35% to 61%). | 3 |

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| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|---------------------|---|---|------------------|
| 51. Jaffee NW, Gilula LA, Wissman RD, Johnson JE. Diagnostic and therapeutic ankle tenography: outcomes and complications. AJR. 2001;176(2):365-371. | Observational-Dx | 111 tenograms | To evaluate outcomes of the current tenographic technique in a large series and evaluate complications. | Of 65 patients undergoing posterior tibial tenography, 31 (48%) had complete or near-complete symptom resolution; 17 (26%) had no relief. Seventeen patients (26%) had initial relief with the subsequent return of pain to the pretenography level. Of 39 patients undergoing peroneal tenography, 18 (46%) had complete or near-complete symptom resolution; 10 (26%) had no and 11 (28%) had initial relief with subsequent pretenography pain return. Of three patients undergoing flexor digitorum longus tenography, one had complete, one had no, and one had initial relief with complete pretenography pain return. One of two patients who underwent flexor hallucis longus tenography had no relief; the other had initial relief with complete pain return. Two patients who underwent anterior tibial tenography had complete pain relief. We found no correlation between degree of tenosynovitis shown radiographically and therapeutic improvement with anesthetic and steroid injection. Tenography complications included one posterior tibial tendon rupture (0.89%) and 14 patients with skin discoloration at the tendon sheath injection site. Forty-seven percent of surgical candidates whose condition was refractory to conservative therapy had complete or near-complete prolonged symptom relief after tenography. In appropriate patients, tenography is excellent therapy for tenosynovitis. | 4 |

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| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|---------------------|---|--|------------------|
| 52. Park HJ, Cha SD, Kim SS, et al. Accuracy of MRI findings in chronic lateral ankle ligament injury: comparison with surgical findings. Clin Radiol. 2012;67(4):313-318. | Observational-Dx | 48 patients | To evaluate the accuracy of magnetic resonance imaging (MRI) findings in chronic lateral ankle ligament injury in comparison with that of surgical findings. | The MRI findings of ATFL injury showed a sensitivity of detection of complete tears of 75% and specificity of 86%. The sensitivity of detection of partial tears was 75% and the specificity was 78%. The sensitivity of detection of sprains was 44% and the specificity was 88%. Regarding the MRI findings of CFL injury, the sensitivity of detection of complete tears was 50% and the specificity was 98%. The sensitivity of detection of partial tear was 83% and the specificity was 93%. The sensitivity of detection of sprains was 100% and the specificity was 90%. Regarding the ATFL, the accuracies of detection were 88, 58, 77, and 85% for no injury, sprain, partial tear, and complete tear, respectively, and for the CFL the accuracies of detection were 90, 90, 92, and 96% for no injury, sprain, partial tear, and complete tear, respectively. | 3 |
| 53. Crim J, Longenecker LG. MRI and surgical findings in deltoid ligament tears. AJR Am J Roentgenol. 2015;204(1):W63-69. | Observational-Dx | 88 cases | To determine the accuracy of new MRI criteria in detecting tears of the superficial deltoid ligament of the ankle, the accuracy of established criteria for detecting deep deltoid ligament tears, the most common location of superficial deltoid ligament tears, and the frequency of other injuries associated with deltoid tears. | MRI findings of focal detachment of the superficial deltoid origin or detachment of the fascial sleeve of the medial malleolus yielded a sensitivity for superficial deltoid ligament tears of 83.3% (45/54) and specificity of 93.9% (31/33). Eight of nine prospectively missed tears were visible on retrospective review. All superficial deltoid tears involved the origin of the ligament from the medial malleolus, and six involved mid or distal bundles of the superficial deltoid as well. MRI findings of discontinuity or nonvisualization of discrete fibers yielded a sensitivity for deep deltoid ligament tears of 96.3% (26/27) and specificity of 97.9% (46/47). | 3 |

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| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|------------------|---------------------|---|--|------------------|
| 54. Oae K, Takao M, Naito K, et al. Injury of the tibiofibular syndesmosis: value of MR imaging for diagnosis. Radiology. 2003;227(1):155-161. | Observational-Dx | 58 patients | To evaluate the use of MR imaging, as compared with the use of arthroscopy, for the diagnosis of tibiofibular syndesmotoc injury. | Arthroscopic findings showed anteroinferior tibiofibular ligament (AITFL) disruption in 28 patients and posteroinferior tibiofibular ligament (PITFL) disruption in five patients. When an MR imaging diagnosis was based on criterion 1 only, the diagnosis of AITFL disruption was made with a sensitivity of 100%, a specificity of 70%, and an accuracy of 84%, and the diagnosis of PITFL disruption was made with a sensitivity of 100%, a specificity of 94%, and an accuracy of 95%. When an MR imaging diagnosis was based on criteria 1 and 2, the diagnosis of AITFL disruption was made with a sensitivity of 100%, a specificity of 93%, and an accuracy of 97%, whereas the diagnosis of PITFL disruption was made with a sensitivity of 100%, a specificity of 100%, and an accuracy of 100%. MR imaging with use of both criteria is highly accurate for the diagnosis of tibiofibular syndesmotoc disruption. | 3 |
| 55. Nielson JH, Sallis JG, Potter HG, Helfet DL, Lorich DG. Correlation of interosseous membrane tears to the level of the fibular fracture. J Orthop Trauma. 2004;18(2):68-74. | Observational-Dx | 73 patients | Prospective clinical trial to correlate interosseous membrane (IOM) tears of the ankle to the height of fibular fractures in operative ankle fractures. Open reduction and internal fixation of each ankle fracture was performed after preoperative MRI evaluation of the IOM. | Of the 73 ankle fractures with adequate MRI evaluation, 30 had identifiable complete IOM tears on MRI. Ten of the 30 IOM tears did not correlate with the level of the fractured fibula. Seven cases had IOM tears proximal to the fibular fracture as detected by MRI. Five of these cases were Weber B type fractures, and two were Weber C type fracture patterns. Conversely, three cases of Weber C type fractures had IOM tears that remained distal to the level of the fibular fracture. The level of the fibular fracture does not correlate reliably with the integrity or extent of the interosseous membrane tears identified on MRI in operative ankle fractures. | 3 |

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| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|---------------------|--|--|------------------|
| 56. DiGiovanni BF, Fraga CJ, Cohen BE, Shereff MJ. Associated injuries found in chronic lateral ankle instability. <i>Foot Ankle Int.</i> 2000;21(10):809-815. | Observational-Dx | 61 patients | Retrospective review of clinical history, physical examination, MRI, and intraoperative findings to determine the type and frequency of associated injuries found at surgery and during the preoperative evaluation. | The injuries found most often by direct inspection included: Peroneal tenosynovitis, 47/61 patients (77%); anterolateral impingement (ALI) lesion, 41/61 (67%); attenuated peroneal retinaculum, 33/61 (54%); and ankle synovitis, 30/61 (49%). Other less common but significant associated injuries included: intra-articular loose body, 16/61 (26%); peroneus brevis tear, 15/61 (25%); talus osteochondral lesion, 14/61 (23%); medial ankle tendon tenosynovitis, 3/61 (5%). Study findings indicate there is a high frequency of associated injuries in patients with chronic lateral ankle instability. Peroneal tendon and retinacular pathology, as well as anterolateral impingement lesions, occur most often. A high index of suspicion for possible associated injuries may result in more consistent outcomes with nonoperative and operative treatment of patients with chronic lateral ankle instability. | 4 |
| 57. Chien AJ, Jacobson JA, Jamadar DA, Brigido MK, Femino JE, Hayes CW. Imaging appearances of lateral ankle ligament reconstruction. <i>Radiographics.</i> 2004;24(4):999-1008. | Review/Other-Dx | 6 patients | To review lateral ankle ligament reconstruction and their imaging appearances at radiography (anteroposterior, lateral, oblique), US, and MRI. | At radiography and MRI, the presence of one or more suture anchors in the region of the ATFL indicates direct ligament repair, whereas a fibular tunnel indicates peroneus brevis tendon rerouting or loop. US and MRI demonstrate rerouted tendons as part of lateral ankle reconstruction; however, MRI can also depict the rerouted tendon within an osseous tunnel if present (T1-weighted sequences are used). | 4 |
| 58. Guillodo Y, Varache S, Saraux A. Value of ultrasonography for detecting ligament damage in athletes with chronic ankle instability compared to computed arthrotomography. <i>Foot Ankle Spec.</i> 2010;3(6):331-334. | Observational-Dx | 56 patients | To assess the performance of ultrasonography in assessing damage to the anterior talofibular ligament (ATFL) in athletes with chronic ankle instability after a sprain. | ATFL damage was found by US in 34 (61%) of 56 patients and by CT in 39 of 55 patients (71%; kappa = 0.76). Cartilage damage was visualized by computed arthrotomography in 14 (25%) patients, all of whom had ATFL damage. Agreement was substantial (kappa = 0.76) between ultrasonography and computed arthrotomography for assessing the ATFL. The data support the use of ultra-sonography as the second-line investigation after a standard radiographic assessment in athletes with chronic ankle instability after a sprain. | 3 |

* See Last Page for Key

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| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|------------------|---------------------|--|---|------------------|
| 59. Lee KT, Park YU, Jegal H, Park JW, Choi JP, Kim JS. New method of diagnosis for chronic ankle instability: comparison of manual anterior drawer test, stress radiography and stress ultrasound. <i>Knee Surg Sports Traumatol Arthrosc.</i> 2014;22(7):1701-1707. | Observational-Dx | 73 patients. | To diagnose chronic ankle instability, clinicians frequently use manual anterior drawer test and stress radiography. However, both exams can yield incorrect results and do not reveal the extent of ankle instability. The use of stress ultrasound during a manual anterior drawer stress procedure might enable the diagnosis of chronic ankle instability. | There was a significant difference for anterior talofibular ligament (ATFL) length (ATFL stress) and ATFL ratio (ATFL stress/ATFL resting) among the three groups (both $p < 0.001$). However, there was no significant difference for anterior translation of stress radiography among three groups according to manual anterior drawer test ($p = 0.159$). There was a significant difference for ATFL length (ATFL stress) and ATFL ratio between two groups with 5-mm anterior translation of stress radiography ($p = 0.002$ and $p = 0.011$, respectively). The mean value of grade of manual anterior drawer test between the two groups also differed ($p = 0.021$). There was a moderately positive linear relationship between stress ultrasound and manual anterior drawer test. Also, there was a positive linear relationship between stress ultrasound and stress radiography. | 3 |

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| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|------------------|---|--|--|------------------|
| 60. Christodoulou G, Korovessis P, Giarmenitis S, Dimopoulos P, Sdougos G. The use of sonography for evaluation of the integrity and healing process of the tibiofibular interosseous membrane in ankle fractures. J Orthop Trauma. 1995;9(2):98-106. | Observational-Dx | 6 patients - experimental study; 90 consecutive patients - clinical study | To evaluate the value of US in the diagnosis of the rupture and healing process of the IOM in Weber type B and C ankle fractures. | All Weber type C fractures showed a rupture of the interosseous membrane, while only 23% of the Weber type B fractures were associated with a rupture of the interosseous membrane ($p < 0.001$). In the vast majority of the cases (77%), particularly in all Weber type B fractures ($p < 0.01$), the rupture of the interosseous membrane extended above the proximal fracture line of the fibula. By means of sonography, in the acute posttrauma period a rupture of the interosseous membrane was found in 37.4% of the cases. In this series, the results of sonography and the operative findings coincided in 88.6% of the cases concerning location, type, and extent. The sensitivity of the sonography in the diagnosis of the rupture of the interosseous membrane was 88.8%, the diagnostic value of the method 92.2%, and specificity 94.5%. The sonographic findings of the healing process of the interosseous membrane were in absolute (100%) agreement with the intraoperative observations at the time of removal of the osteosynthesis material. Complete healing occurred within 3-5 months after trauma in 70% of the cases of ruptured interosseous membrane. | 2 |
| 61. Lee BH, Choi KH, Seo DY, Choi SM, Kim GL. Diagnostic validity of alternative manual stress radiographic technique detecting subtalar instability with concomitant ankle instability. Knee Surg Sports Traumatol Arthrosc. 2016;24(4):1029-1039. | Observational-Dx | 120 patients. | To incorporate a diagnostic technique for measuring subtalar motion, namely "talar rotation", into the manual supination-anterior drawer stress radiographs for evaluation of the severity of rotational instability, and to determine its clinical relevance. | Ankle stress radiographic intraobserver and interobserver agreement was ICC = 0.91 and 0.82 for talar rotation (%), ICC = 0.64 and 0.51 for anterior talar translation, and ICC = 0.78 and 0.71 for talar tilt angle, respectively. In group 2 including patients with combined injuries of the ATFL and CFL along with additional cervical ligament insufficiency, a significantly higher increment of talar rotation, mean 6.4% (SD 3.4%), was observed compared to that of talar rotation, mean 4.1% (SD 2.7), in the other group (group 1) with an intact cervical ligament ($p < 0.001$). | 2 |

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| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|---|---|---|------------------|
| 62. Bureau NJ, Cardinal E, Hobden R, Aubin B. Posterior ankle impingement syndrome: MR imaging findings in seven patients. <i>Radiology</i> . 2000;215(2):497-503. | Review/Other-Dx | 7 patients | MRI findings in patients with posterior ankle impingement (PAI) syndrome are reported. | MRI clearly depicts the osseous and soft-tissue abnormalities associated with PAI syndrome and is useful in the assessment of this condition. | 4 |
| 63. Farooki S, Yao L, Seeger LL. Anterolateral impingement of the ankle: effectiveness of MR imaging. <i>Radiology</i> . 1998;207(2):357-360. | Observational-Dx | 12 patients (12 ankles); 19 control subjects (20 ankles) | To determine the effectiveness of MRI in the diagnosis of ALI of the ankle. | For the consensus reading, the sensitivity, specificity, and accuracy of MR imaging for the diagnosis of impingement were 42%, 85%, and 69%, respectively. The frequency of lateral gutter fullness and anterior talofibular ligament thickening on MR images was higher in the 12 ankles with impingement (seven [58%] and seven [58%] ankles, respectively) than in the 20 control ankles (seven [35%] and five [25%] ankles, respectively), but these trends did not reach statistical significance. Interobserver agreement for anterior talofibular ligament thickening was high, whereas that for lateral gutter fullness was fair. Conventional MR imaging of the ankle is insensitive for anterolateral impingement. Anterior talofibular ligament thickening and soft-tissue fullness in the lateral gutter may be suggestive of the diagnosis, but the reliability of the latter finding is questionable. | 3 |
| 64. Fiorella D, Helms CA, Nunley JA, 2nd. The MR imaging features of the posterior intermalleolar ligament in patients with posterior impingement syndrome of the ankle. <i>Skeletal Radiol</i> . 1999;28(10):573-576. | Review/Other-Dx | 3 patients | To describe MRI features of the posterior intermalleolar ligament (IML) in patients with posterior impingement syndrome (PIS) of the ankle. | MRI is an effective means of investigating the IML as a potential cause of PIS. | 4 |

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EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|------------------|---------------------|---|---|------------------|
| 65. Hauger O, Moinard M, Lasalarie JC, Chauveaux D, Diard F. Anterolateral compartment of the ankle in the lateral impingement syndrome: appearance on CT arthrography. AJR. 1999;173(3):685-690. | Observational-Dx | 44 patients | Retrospective study to describe the appearance of the anterolateral recess of the post-traumatic ankle on CT arthrography and show its value in the diagnosis of soft-tissue impingement. | Four CT patterns were identified: type 0, uniform filling of the recess with clear limits; type I, intraarticular linear structure outlined by contrast agent; type II, nodular formation in the lateral groove; and type III, irregular appearance of the edges of the lateral groove. Ninety-one percent (10/11) of type II patterns were characterized as meniscoid lesions by arthroscopic examination, 100% (14/14) of type III patterns corresponded to an abundant fibrous reaction, and arthroscopic findings were normal for 100% (2/2) of type 0 patterns and 88% (15/17) of type I patterns. The latter was thus considered as a normal variant outlining the accessory anterior inferior tibiofibular ligament. Type II and III lesions were statistically associated ($p = .001$) with a chondropathy when time from initial trauma was greater than 22 months. CT arthrography provides evidence of anterolateral soft-tissue impingement--in particular, in type II or III patterns. These lesions are statistically associated with a chondropathy. | 3 |

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| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|------------------|--|---|--|------------------|
| 66. Jordan LK, 3rd, Helms CA, Cooperman AE, Speer KP. Magnetic resonance imaging findings in anterolateral impingement of the ankle. <i>Skeletal Radiol.</i> 2000;29(1):34-39. | Observational-Dx | 12 patients; 20 controls | To demonstrate the MRI findings of ALI of the ankle. | MR imaging findings in the patients with ALI included a soft tissue signal mass in the anterolateral gutter of the ankle in 12 of 12 (100%) cases, corresponding to the synovial hypertrophy and soft tissue mass found at arthroscopy in the nine patients who underwent arthroscopy. Disruption, attenuation, or marked thickening of the anterior talofibular ligament was seen in all cases. Additional findings included signs of synovial hypertrophy elsewhere in the tibiotalar joint in seven of 12 patients (58%) and bony and cartilaginous injuries to the tibiotalar joint in five of 12 (42%). None of the control patients demonstrated MR imaging evidence of a soft tissue mass in the anterolateral gutter. ALI of the ankle is a common cause for chronic lateral ankle pain. It has been well described in the orthopedic literature but its imaging findings have not been clearly elucidated. The MR imaging findings, along with the appropriate clinical history, can be used to direct arthroscopic examination and subsequent debridement. | 4 |
| 67. Peace KA, Hillier JC, Hulme A, Healy JC. MRI features of posterior ankle impingement syndrome in ballet dancers: a review of 25 cases. <i>Clin Radiol.</i> 2004;59(11):1025-1033. | Observational-Dx | 25 MRI exams of the ankle performed on 23 ballet dancers | Retrospective review to describe MRI features of posterior ankle impingement syndrome (PAIS) in ballet dancers. | High T2 signal posterior to the talocalcaneal joint indicating synovitis (n=25). Thickening of the posterior capsule (n=13) and tenosynovitis of flexor hallucis longus (n=17) were also common. An os trigonum was an infrequent finding (n=7). MRI is a useful diagnostic tool in PAI syndrome. | 4 |
| 68. Robinson P, White LM, Salonen D, Ogilvie-Harris D. Anteromedial impingement of the ankle: using MR arthrography to assess the anteromedial recess. <i>AJR.</i> 2002;178(3):601-604. | Review/Other-Dx | 4 patients | To describe the appearance of the anteromedial tibiotalar joint on MR arthrography in patients with clinically and arthroscopically confirmed anteromedial impingement. | MR arthrographic findings of anteromedial impingement include capsular and synovial soft-tissue thickening anterior to the tibiotalar ligaments and any associated osseous abnormality. | 4 |

**Chronic Ankle Pain
EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|----------------------------------|--|--|------------------|
| 69. Robinson P, White LM, Salonen DC, Daniels TR, Ogilvie-Harris D. Anterolateral ankle impingement: mr arthrographic assessment of the anterolateral recess. Radiology. 2001;221(1):186-190. | Observational-Dx | 32 patients | Prospective study to determine the accuracy of MR arthrography in assessing the anterolateral recess of the ankle. | MR arthrographic assessment of the anterolateral soft tissues had an accuracy of 97%, sensitivity of 96%, specificity of 100%, NPV of 89%, and PPV of 100%. Accuracy was 100% with clinical ALI, with an arthroscopically confirmed abnormality in 12 cases and a normal appearance in one. Anterolateral soft-tissue thickening was identified at MR arthrography in 11 control cases, with arthroscopic confirmation in all. The remaining cases had normal appearances, with an arthroscopic soft-tissue abnormality in one case and a normal appearance in seven. MR arthrography of the tibiotalar joint is accurate in assessing the anterolateral recess of the ankle. | 2 |
| 70. Rubin DA, Tishkoff NW, Britton CA, Conti SF, Towers JD. Anterolateral soft-tissue impingement in the ankle: diagnosis using MR imaging. AJR. 1997;169(3):829-835. | Observational-Dx | 18 patients 18 controls | Retrospective review to explain MRI findings and pitfalls for the diagnosis of anterolateral soft-tissue impingement in the ankle. | On the MR imaging studies, nine patients had an ankle effusion, eight of whom showed an abnormal soft-tissue structure in the anterolateral gutter, 2-15 mm in maximal diameter. No soft-tissue mass was seen in the patients without joint fluid. Four control subjects with instability had a similar soft-tissue structure in the anterolateral gutter, but in the control subjects the finding represented a portion of the torn anterior talofibular ligament. Anterolateral soft-tissue impingement of the ankle can be suggested by MR imaging when fluid in the lateral gutter outlines an abnormal soft-tissue structure separate from the anterior talofibular ligament. | 3 |
| 71. Schaffler GJ, Tirman PF, Stoller DW, Genant HK, Ceballos C, Dillingham MF. Impingement syndrome of the ankle following supination external rotation trauma: MR imaging findings with arthroscopic correlation. Eur Radiol. 2003;13(6):1357-1362. | Observational-Dx | 21 ankles; 19 ankles as controls | To identify MR findings in patients with syndesmotic soft tissue impingement of the ankle and determine the reliability of findings to predict syndesmotic soft tissue impingement syndromes of the ankle. | Compared with arthroscopy, MRI revealed a sensitivity of 89%, a specificity of 100%, and a diagnostic accuracy of 93% for scarred syndesmotic ligaments. Conventional MRI is insensitive for the diagnosis of syndesmotic soft tissue impingement of the ankle. | 3 |

**Chronic Ankle Pain
EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|--|---|---|------------------|
| 72. McCarthy CL, Wilson DJ, Coltman TP. Anterolateral ankle impingement: findings and diagnostic accuracy with ultrasound imaging. <i>Skeletal Radio</i> . 2008;37(3):209-216. | Observational-Dx | 17 footballers ; clinical diagnosis of ALI (n = 8) or control condition (n = 9) | To evaluate the findings and diagnostic accuracy of US in ALI. US findings were correlated with subsequent arthroscopic appearance. | US detected a synovitic mass in the antero-lateral gutter in all 8 footballers with clinical ALI (100%) and in 2 patients with a control diagnosis (22%). US is accurate in detecting synovitic lesions within the antero-lateral gutter, demonstrating associated ligamentous injuries and in differentiating soft tissue from osseous impingement. | 3 |
| 73. Duncan D, Mologne T, Hildebrand H, Stanley M, Schreckengast R, Sitler D. The usefulness of magnetic resonance imaging in the diagnosis of anterolateral impingement of the ankle. <i>J Foot Ankle Surg</i> . 2006;45(5):304-307. | Observational-Dx | 24 patents; 12 had arthroscopically documented anterolateral impingement and 12 controls | To assess the sensitivity and specificity of MRI in the diagnosis of anterolateral impingement of the ankle and to assess the most helpful sequence in making the diagnosis. | Sensitivities varied from 0.75 to 0.83, whereas specificities varied from 0.75 to 1.00. Using the Fisher exact test of contingency, the sensitivities and specificities showed that all reviewers' interpretations were statistically significant with P = .039, .001, and .012, respectively. The axial images were felt to be most helpful in making the diagnosis. The physicians felt that the sagittal images were helpful in 67%, 83%, and 100%, respectively. MRI is a useful tool that can aid the clinician in the diagnosis of anterolateral impingement of the ankle. T1 sagittal images demonstrating displacement of the normal fat signal anterior to the fibula by scar can be useful and help to confirm the diagnosis. | 3 |
| 74. Ferkel RD, Tyorkin M, Applegate GR, Heinen GT. MRI evaluation of anterolateral soft tissue impingement of the ankle. <i>Foot Ankle Int</i> . 2010;31(8):655-661. | Observational-Dx | 24 patients | To determine the effectiveness and reliability of routine MR imaging in the diagnosis of anterolateral soft tissue impingement. | Using this technique, we report a 78.9% accuracy in diagnosis, a sensitivity of 83.3% and a specificity of 78.6%. Fifty-eight percent of patients had an associated diagnosis, which in 33% of patients altered our surgical plan. | 3 |
| 75. Huh YM, Suh JS, Lee JW, Song HT. Synovitis and soft tissue impingement of the ankle: assessment with enhanced three-dimensional FSPGR MR imaging. <i>J Magn Reson Imaging</i> . 2004;19(1):108-116. | Observational-Dx | 20 patients. | To assess soft tissue impingement as well as synovitis of the ankle associated with trauma by using contrast-enhanced (CE), fat-suppressed, three-dimensional, fast gradient-recalled acquisition in the steady state with radiofrequency spoiling (FSPGR) magnetic resonance (MR) imaging. | For the assessment of synovitis, fat-suppressed CE three-dimensional FSPGR MR imaging had an accuracy of 72.9%, sensitivity of 91.5%, and specificity of 63.9%; whereas for that of soft tissue impingement it had an accuracy of 94.4%, sensitivity of 76.5%, and specificity of 96.9%. All of the asymptomatic subjects showed grade I (81%) or II (19%) synovial enhancement. | 2 |

**Chronic Ankle Pain
EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|------------------|-------------------------|---|--|------------------|
| 76. Donovan A, Rosenberg ZS. MRI of ankle and lateral hindfoot impingement syndromes. AJR. 2010;195(3):595-604. | Review/Other-Dx | N/A | To review the pathophysiology and clinical presentation of impingement syndromes at the ankle joint (anterolateral, anterior, anteromedial, posteromedial, and posterior) and the role of MRI in evaluating impingement at the ankle joint and at extraarticular locations, lateral to the ankle joint (talocalcaneal and calcaneofibular). | MRI is valuable in assessing both osseous and soft-tissue abnormalities associated with impingement syndromes. | 4 |
| 77. Cochet H, Pele E, Amoretti N, Brunot S, Lafenetre O, Hauger O. Anterolateral ankle impingement: diagnostic performance of MDCT arthrography and sonography. AJR. 2010;194(6):1575-1580. | Observational-Dx | 51 consecutive patients | Prospective study to compare the diagnostic performance of CT arthrography and sonography in the diagnosis of anterolateral ankle impingement. | The sensitivity and specificity of sonography were respectively 77% and 57% before joint injection and 85% and 71% after joint injection. Positive Doppler masses were found to be anterolateral impingements at arthroscopy in all cases (10/10), and masses of hyperechoic appearance were found not to be anterolateral impingements in all cases (3/3). The sensitivity and specificity of CT arthrography in the diagnosis of anterolateral impingement were respectively 97% and 71%. The performances of CT arthrography and ankle sonography in the diagnosis of anterolateral ankle impingement were significantly different (p = 0.006). CT arthrography is quite accurate and superior to ankle sonography in the diagnosis of anterolateral impingement. The diagnostic performance of sonography is limited, but positive Doppler appearance and hyperechogenicity, when present, could help to exclude or confirm the diagnosis. | 2 |

**Chronic Ankle Pain
EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|------------------|------------------------|---|--|------------------|
| 78. Messiou C, Robinson P, O'Connor PJ, Grainger A. Subacute posteromedial impingement of the ankle in athletes: MR imaging evaluation and ultrasound guided therapy. <i>Skeletal Radiol</i> 2006; 35(2):88-94. | Observational-Dx | 9 patients; 6 controls | Retrospective analysis to describe the use of MRI and efficacy of US-guided steroid injection in the diagnosis and management of athletes with clinical posteromedial impingement of the ankle. | Posteromedial capsular thickening was seen only in athletes with posteromedial impingement (7/9). Posteromedial synovitis was present in all athletes with posteromedial impingement; however, posterior and posterolateral synovitis was also seen in these athletes. Mild posteromedial synovitis was present in two control athletes. US identified abnormal posteromedial soft tissue thickening deep to tibialis posterior between the medial malleolus and talus in all nine athletes. After injection all athletes returned to their previous level of sport, with eight of the nine not experiencing any residual or recurrent symptoms. If MR imaging excludes significant coexistent abnormality, US can localise posteromedial soft tissue abnormality and guide injection therapy, allowing return to athletic activity without surgical intervention. | 4 |
| 79. Jones DM, Saltzman CL, El-Khoury G. The diagnosis of the os trigonum syndrome with a fluoroscopically controlled injection of local anesthetic. <i>Iowa Orthop J.</i> 1999;19:122-126. | Experimental-Dx | 4 patients. | To report the results of excision of the os trigonum using a fluoroscopically controlled injection of local anesthetic to diagnose the os trigonum syndrome. | All four patients underwent excision of the os trigonum with complete resolution of symptoms and return to full activity. | 3 |
| 80. Rodop O, Mahirogullari M, Akyuz M, Sonmez G, Turgut H, Kuskucu M. Missed talar neck fractures in ankle distortions. <i>Acta Orthop Traumatol Turc.</i> 2010;44(5):392-396. | Review/Other-Dx | 8 patients | To evaluate the follow-up and treatment outcomes of subjects with missed fractures, which were not diagnosed with radiographs obtained for ankle distortion, but with advanced imaging studies. | The talar neck fracture was diagnosed with CT in 1 patient and with MRI in the remaining 7 patients. Mean follow-up time was 6 months (range 3-8 months), and mean American Orthopedic Foot and Ankle Society score at last follow-up was 93.7 (range 80-100). | 4 |

**Chronic Ankle Pain
EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|------------------|--|--|--|------------------|
| 81. Niva MH, Sormaala MJ, Kiuru MJ, Haataja R, Ahovuo JA, Pihlajamaki HK. Bone stress injuries of the ankle and foot: an 86-month magnetic resonance imaging-based study of physically active young adults. <i>Am J Sports Med.</i> 2007;35(4):643-649. | Review/Other-Dx | 378 bone stress injuries in 142 ankles and feet imaged | To assess incidence, location, and type of bone stress injuries of the ankle and foot in military conscripts with ankle and/or foot pain using MRI. | Incidence is 126 per 100,000 person-years. This incidence represents the stress injuries not diagnosable with radiographs and requiring magnetic resonance images. Of injuries, 57.7% occurred in the tarsal and 35.7% in the metatarsal bones. Multiple bone stress injuries in one foot were found in 63% of the cases. The calcaneus and fifth metatarsal bone were usually affected alone. Injuries to the other bones of the foot were usually associated with at least one other stress injury. The talus and calcaneus were the most commonly affected single bones. High-grade bone stress injury (grade IV-V) with a fracture line on magnetic resonance images occurred in 12% (talus, calcaneus), and low-grade injury (grade I-III) presented only as edema in 88% of the cases. | 4 |
| 82. Sormaala MJ, Niva MH, Kiuru MJ, Mattila VM, Pihlajamaki HK. Stress injuries of the calcaneus detected with magnetic resonance imaging in military recruits. <i>J Bone Joint Surg Am.</i> 2006;88(10):2237-2242. | Observational-Dx | 30 recruits displayed calcaneal stress injuries | Retrospective study to assess the anatomic distribution, nature, and healing of calcaneal stress injuries in a group of military recruits based on MRI. | MRI yielded an incidence of 2.6 (95% CI, 1.6 to 3.4) per 10,000 person-years. Most stress injuries of the calcaneus occur in the posterior part of the bone, but a considerable proportion can also be found in the middle and anterior parts. To obtain a diagnosis, MRI is warranted if plain radiography does not show abnormalities in a physically active patient with exercise-induced pain in the ankle or heel. | 3 |
| 83. Khoury V, Cardinal E, Bureau NJ. Musculoskeletal sonography: a dynamic tool for usual and unusual disorders. <i>AJR.</i> 2007;188(1):W63-73. | Review/Other-Dx | N/A | To review the use of dynamic US in the diagnosis of musculoskeletal disorders. | US is a valuable tool for diagnosing musculoskeletal disorders. | 4 |
| 84. Raikin SM, Elias I, Nazarian LN. Intrasheath subluxation of the peroneal tendons. <i>J Bone Joint Surg Am.</i> 2008;90(5):992-999. | Observational-Dx | 57 patients | To examine cases of patients with painful snapping of the peroneal tendons posterior to the fibula. 14 patients who could not subluxate the tendons out of the groove had US exam. | Patients with retrofibular pain and clicking of the peroneal tendons may not have demonstrable subluxation on physical examination and may have an intact superior peroneal retinaculum. They may have an intrasheath subluxation of the peroneal tendons, which can be confirmed with use of a dynamic US. An effective procedure for this condition is surgical repair of tendon tears combined with a peroneal groove-deepening procedure with retinacular reefing. | 4 |

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| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|------------------|---------------------|--|--|------------------|
| 85. Haapamaki VV, Kiuru MJ, Koskinen SK. Ankle and foot injuries: analysis of MDCT findings. AJR Am J Roentgenol. 2004;183(3):615-622. | Observational-Dx | 388 patients | Retrospective study to assess MDCT findings and the advantages of MDCT compared with radiography in patients referred to a level 1 trauma center for diagnostic evaluation of acute ankle and foot trauma. | 344 (89%) of the 388 patients had one or more fractures in the ankle or foot. Calcaneus was the most commonly fractured bone, and the sensitivity of radiography in the detection of calcaneal fractures was 87%. The sensitivity of radiography in the detection of talar fractures was 78%, whereas it was only 25%-33% in the detection of midfoot fractures. A Lisfranc fracture-dislocation was not detected on primary radiography in 5 (24%) of 21 cases. The 3 main injury mechanisms were falling from a height (164 patients [48%]), a simple fall (68 patients [20%]), and a traffic accident (47 patients [14%]). In patients with injuries from high-energy polytrauma and in those with complex ankle and foot fractures, the sensitivity of radiography is only moderate to poor; in these cases, MDCT is recommended as the primary imaging technique. | 3 |
| 86. Hirschmann MT, Davda K, Rasch H, Arnold MP, Friederich NF. Clinical value of combined single photon emission computerized tomography and conventional computer tomography (SPECT/CT) in sports medicine. Sports Med Arthrosc. 2011;19(2):174-181. | Review/Other-Dx | N/A | To illustrate the clinical value and future perspectives of SPECT/CT in sports medicine. | No results stated in abstract. | 4 |

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| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|---------------------|--|---|---------------|
| 87. Chin KJ, Wong NW, Macfarlane AJ, Chan VW. Ultrasound-guided versus anatomic landmark-guided ankle blocks: a 6-year retrospective review. <i>Reg Anesth Pain Med.</i> 2011;36(6):611-618. | Observational-Dx | 713 patients. | To test the hypothesis that the ultrasound-guided (USG) technique will increase surgical block success compared with the anatomic landmark-guided (ALG) technique by performing a retrospective cohort study of patients who received an ankle block for foot surgery. | We identified 655 patients who received unilateral ankle block and 58 patients who received bilateral ankle block; we analyzed these separately. Trainees performed most blocks (approximately 80%). In patients receiving unilateral ankle block, successful surgical anesthesia was more likely in the USG group (84% versus 66%, $P < 0.001$). Patients in the ALG group were more likely to require supplemental local anesthesia (10% versus 5%, $P = 0.04$), unplanned general anesthesia (17% versus 7%, $P = 0.001$), or supplemental fentanyl (18% versus 9%, $P = 0.002$). Postanesthetic care unit pain scores were similar between groups. However, patients in the ALG group were more likely to receive intravenous opioids (21% versus 12%, $P = 0.01$), and they received a higher mean opioid dose (10.6 versus 8.7 mg intravenous morphine, ALG versus USG, $P = 0.022$). In patients receiving bilateral ankle block, successful surgical anesthesia was also more likely in the USG group (84% versus 57%); however, this was not statistically significant because of the small sample size. | 3 |
| 88. Redborg KE, Antonakakis JG, Beach ML, Chinn CD, Sites BD. Ultrasound improves the success rate of a tibial nerve block at the ankle. <i>Reg Anesth Pain Med.</i> 2009;34(3):256-260. | Experimental-Tx | 18 patients. | To compare a conventional, landmark-based approach to an image-based technique involving high-frequency ultrasound (US).. | At 30 mins, the block was complete in 72% of participants in group US as compared with 22% in group LM. At all times, the proportion of complete blocks was higher in group US. Ultrasound-guided blocks took longer on average to perform than traditional blocks (159 vs 79 secs; $P < 0.001$). There were more needle redirects in group US, with 8 subjects requiring 3 or more redirects versus none in group lumbar multifidus (LM). Subjects preferred the US block 78% of the time (95% confidence interval, 52%-95%). | 1 |

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| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|-----------------|---------------------|---|--|------------------|
| 89. Redborg KE, Sites BD, Chinn CD, et al. Ultrasound improves the success rate of a sural nerve block at the ankle. Reg Anesth Pain Med. 2009;34(1):24-28. | Experimental-Dx | 18 patients. | To hypothesize that an ultrasound-guided perivascular approach, utilizing the lesser saphenous vein as a reference, would prove more successful than a conventional approach based on surface landmarks. | At the midfoot position, testing at 10 minutes after block placement revealed a loss of sensation to ice in 94% (complete in 78% and partial in 16%) in the ultrasound technique (US) group versus 56% in the traditional approach (TRAD) group (complete in 28%, partial in 28%) (P <.01). Complete loss of sensation to ice persisted in 33% of the US group as compared with 6% in the TRAD group at 60 minutes (P <.05). A similar pattern was observed when the blocks were tested with pinprick. Ultrasound-guided blocks took longer to perform on average than the traditional blocks (mean difference of 102 seconds, P <.001). The ultrasound block was subjectively felt to be denser by 88% of the subjects (P =.001). | 1 |
| 90. American College of Radiology. ACR Appropriateness Criteria®: Chronic Foot Pain. Available at: https://acsearch.acr.org/docs/69424/Narrative/ . | Review/Other-Dx | N/A | Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for chronic foot pain. | N/A | 4 |
| 91. Bencardino JT, Stone TJ, Roberts CC, et al. ACR Appropriateness Criteria(R) Stress (Fatigue/Insufficiency) Fracture, Including Sacrum, Excluding Other Vertebrae. J Am Coll Radiol. 2017;14(5S):S293-S306. | Review/Other-Dx | N/A | Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for stress (fatigue/insufficiency) fracture, including sacrum, excluding other vertebrae. | N/A | 4 |
| 92. American College of Radiology. ACR Appropriateness Criteria®: Primary Bone Tumors. Available at: https://acsearch.acr.org/docs/69421/Narrative/ . | Review/Other-Dx | N/A | Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for primary bone tumors. | N/A | 4 |
| 93. American College of Radiology. ACR Appropriateness Criteria®: Metastatic Bone Disease. Available at: https://acsearch.acr.org/docs/69431/Narrative/ . | Review/Other-Dx | N/A | Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for metastatic bone disease. | N/A | 4 |
| 94. American College of Radiology. ACR Appropriateness Criteria®: Soft-Tissue Masses. Available at: https://acsearch.acr.org/docs/69434/Narrative/ . | Review/Other-Dx | N/A | Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for soft-tissue masses. | N/A | 4 |

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EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|-----------------|---------------------|---|--------------------------------|------------------|
| 95. Jacobson JA, Roberts CC, Bencardino JT, et al. ACR Appropriateness Criteria(R) Chronic Extremity Joint Pain-Suspected Inflammatory Arthritis. J Am Coll Radiol. 2017;14(5S):S81-S89. | Review/Other-Dx | N/A | Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for chronic extremity joint pain. | No results stated in abstract. | 4 |
| 96. American College of Radiology. ACR Appropriateness Criteria® Radiation Dose Assessment Introduction. Available at: http://www.acr.org/~media/ACR/Documents/AppCriteria/RadiationDoseAssessmentIntro.pdf . | Review/Other-Dx | N/A | Guidance document on exposure of patients to ionizing radiation. | N/A | 4 |

Evidence Table Key

Study Quality Category Definitions

- *Category 1*: The study is well-designed and accounts for common biases.
- *Category 2*: The study is moderately well-designed and accounts for most common biases.
- *Category 3*: There are important study design limitations.
- *Category 4*: The study is not useful as primary evidence. The article may not be a clinical study or the study design is invalid, or conclusions are based on expert consensus. For example:
 - a) the study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);
 - b) the study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence;
 - c) the study is an expert opinion or consensus document.
- M = Meta-analysis

Dx = Diagnostic

Tx = Treatment