Bibliographic Cite	PMID Link	Literature Type	Level of Evidence	Purpose	Population	Intervention and Outcome Measures	Results/ Recommendations	Study Limitiations
Barini M, Zagaria D, Licandro D, et al. Magnetic resonance accuracy in the diagnosis of anterior talo-fibular ligament acute injury: A systematic review and meta-analysis. Diagnostics (Basel). 2021; 11(10):1782.	34679480	Systematic review and meta-analysis	Low level of evidence	To analyze the diagnostic accuracy of MRI on acute anterior talo-fibular ligament (ATFL) injjury.	The following criteria were used to include qualified studies: (1) cohort-type or cross sectional studies; (2) evaluated MRI for the diagnosis of acute ATFL, with MRI performed within three months of the injury; (3) compared imaging results with arthroscopic or surgical findings as reference standards; and (4) reported data that enabled the calculation of the respective numbers of true positive (TP), true negative (TN), false positive (FP), and false negative (FN). The studies that met the following criteria were excluded: (1) chronic injury patients; (2) patients with confounding factors like ankle fracture or a history of previous foot and/or ankle surgeries; (3) did not clearly describe arthroscopic or surgical findings as their reference standards; (4) cadaveric studies or studies utilizing animal models; and (5) non-English articles.	Relative studies were retrieved after searching three databases (MEDLINE, SCOPUS, and Cochrane Central Register of Controlled Trails). Eligible studies were summarized. Two authors independently extracted data and compiled a custom checklist for this review. The results of the two authors were cross validated and the discrepancies were mediated by a third author. The quality of the included articles was assessed using the revised Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2) tool, through which the risk of bias was assessed in terms of patient selection, index test and reference standard. Pooled estimates of sensitivity, specificity, and positive/negative likelihood (with corresponding 95% confidence intervals [CIs]) were analyzed based on the bivariate model.	Seven studies met the inclusion and exclusion criteria. For MRI, the pooled sensitivities and specificity in diagnosing acute ATFL injury were respectively 1.0 (95% CI: 0.58–1) and 0.9 (95% CI: 0.79–0.96). Pooled LR+ and LR- were respectively 10.4 (95% CI: 4.6–23) and 0 (95% CI: 0–0.82). The authors conclude that results demonstrated that MRI shows high diagnostic accuracy in the diagnosis of acute ATFL lesions. These results suggest that routine MRI in the case of suspected ATFL acute injury may be clinically useful, although this is not done in clinical practice due probably to high cost.	The authors believe that their reliability may be limited by some bias. For example, great heterogeneity was present among the included studies in terms of timing of MRI after the traumatic event; further research is needed to identify any differences in the diagnostic performance of MRI as its timing varies. Furthermore, while some of the studies did not report precise selection criteria for patients operated on and/or undergoing arthroscopy, others considered for these procedures only patients with particularly severe clinical pictures or with other clinical or instrumental findings suggestive of ATFL lesions, such as Talar Tilt > 15 on stress X rays or a positive Drawer test on physical examination. This may have biased our results, since MRI was performed on a patient population with a high pretest probability of ATFL injury.
Cao S, Wang C, Ma X, Wang X, Huang J, Zhang C. Imaging diagnosis for chronic lateral ankle ligament injury: A systemic review with meta-analysis. J Orthop Surg Res.	29788978	Systematic review and meta-analysis	Low level of evidence	To explore the effectiveness of different imaging techniques in diagnosing chronic lateral ankle ligament injury.	Fifteen studies met inclusion and exclusion criteria and a total of 695 participants were included. The studies that met the following criteria were included: (1) cohort-type or cross-sectional studies; (2) evaluated MRI and/or US and/or stress radiography and/or arthrography for the diagnosis of chronic ATFL and/or CFL injury; (3) comparing imaging results with arthroscopic or surgical findings as reference standards, and (4) reported data that enabled the calculation of the number of true positive (TP), true negative (TN), false positive (FP), and false negative (FN). The following criteria were used to exclude underqualified studies: (1) acute injury patients; (2) patients with confounding factors like ankle fracture, history of previous foot, and ankle surgeries; (3) without clearly described arthroscopic or surgical findings as their reference standards; (4) cadaveric studies or studies utilizing animal models; and (5) non-English articles.	Relative studies were retrieved after searching 3 databases (MEDLINE, EMBASE, and Cochrane Central Register of Controlled Trails). Eligible studies were summarized. Data were extracted to calculate pooled sensitivity and specificity of magnetic resonance imaging (MRI), ultrasonography (US), stress radiography, and arthrography. Retrieved articles from each database were at first screened for duplication. Then, after titles and abstracts screening, relevant studies for this systemic review underwent full-text screening. Eligible studies were included according to the aforementioned inclusion and exclusion criteria. The extracted data include authors, publication years, demographic features of participants, study design, index tests, gold standards, and the numbers of true positive, false negative, false positive, and true negative subjects. Two authors independently extracted these data and filled previously drafted forms for this review. Results of the two authors were cross-validated, and discrepancies were mediated by the third author. The quality of the included articles was assessed through revised Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2) tool. According to QUADAS-2 tool, risk of bias was assessed in terms of patient selection, index test, and reference standard. Sensitivity and specificity of each index test in individual study were calculated in Meta-DiSc, version 1.4.0, using the extracted data of TP, FN, FP, and TN. Pooled sensitivity and specificity were calculated using the total number of TP, FN, FP, and TN subjects in all relevant studies.	The pooled sensitivities in diagnosing chronic ATFL injury were 0.83 [0.78, 0.87] for MRI, 0.99 [0.96, 1.00] for US, and 0.81 [0.68, 0.90] for stress radiography. The pooled specificities in diagnosing chronic ATFL injury were 0.79 [0.69, 0.87] for MRI, 0.91 [0.82, 0.97] for US, and 0.92 [0.79, 0.98] for stress radiography. The pooled sensitivities in diagnosing chronic CFL injury were 0.56 [0.46, 0.66] for MRI, 0.94 [0.85, 0.98] for US, and 0.90 [0.73, 0.98] for arthrography. The pooled specificities in diagnosing chronic CFL injury were 0.88 [0.82, 0.93] for MRI, 0.91 [0.80, 0.97] for US, and 0.90 [0.77, 0.97] for arthrography. The authors conclude that this systematic review with meta-analysis investigated the accuracy of imaging for the diagnosis of chronic lateral ankle ligament injury. Ultrasound manifested high diagnostic accuracy in diagnosing chronic lateral ankle ligament injury. Clinicians should be aware of the limitations of MRI in detecting chronic CFL injuries.	There are several limitations in the current review. First, 6 of the 15 included studies graded as high risk of bias due to patient selection. Unlike meta-analysis of clinical intervention, in meta-analysis of diagnostic tests, it is common to include case-control studies considered as high risk of bias. Case-control studies create a preselected patient population and should be interpreted with caution. Second, associated lesions of chronic lateral ankle ligament injury were not discussed in the current review; however, these associated lesions spotted on images would certainly affect the judgment of clinicians. Third, some studies compared diagnostic accuracy of identical imaging technique with different parameters and/or configurations on diagnosing chronic lateral ankle ligament injury. Strength of the MRI machines varied among different studies. This diversity in configuration may cause the heterogeneity within each subgroup. Moreover, the size of the included studies was relatively small. Of the 15 included studies, only a total of 695 participants were included.
Chun DI, Cho JH, Min TH, Park SY, Kim KH, Kim JH, Won SH. Diagnostic accuracy of radiologic methods for ankle syndesmosis injury: A systematic review and meta-analysis. J Clin Med. 2019; 8(7). Pii: E968. doi: 10.3390/jcm8070968.	31277316	Systematic review and meta-analysis	Low level of evidence	To determine whether radiologic tests accurately and reliably diagnose ankle syndesmosis injury.	A total of 8 studies were included for the qualitative synthesis, with 6 of them used for meta-analysis. Exclusion criteria included lateral ankle sprain, cadaver studies, and review articles. Research duration ranged from 1995 to 2017.	The authors conducted a cross-search of all related literature in MEDLINE through March 2017 and used an optimally sensitive Cochrane Collaboration search strategy using MeSH headings for both anatomic and radiologic terms. They also searched EMBASE from 1978 to March 2017 and the Cochrane Library for studies that met the following criteria: (1) All adult patients who had results of radiologic evaluation for syndemosis regardless of the method and (2) studies that reported accurate measurements. The exclusion criteria were: (1) Studies on lateral ankle sprains, (2) animal or cadaver studies, and (3) review articles. The initial screening test of the electronic databases for study selection was based on information in the title and abstract. Two of the authors independently selected all articles by following the above criteria while assessing their quality, and all authors discussed the studies before final selection, including to resolve any disagreements. Two authors independently assessed the methodological quality of the studies and the data extraction, and discrepancies were resolved by consensus. We assessed risk of bias using the Quality in Prognosis Studies (QUIPS) tool. The authors calculated sensitivity, specificity, diagnostic odds ratios, likelihood ratios, and positive and negative prediction values with 95% CIs. They performed subgroup meta-analyses by test and compared each diagnostic test.	In subgroup meta-analysis, the sensitivity analysis showed significant differences only in MRI, and specificity was not statistically significant. In diagnostic meta-analysis, the pooled sensitivity and specificity were 0.528 and 0.984 for X-rays, 0.669 and 0.87 for CT, and 0.929 and 0.865 for MRI, respectively. For sensitivity, MRI showed significantly sensitivity as higher than the other methods, and authors detected no significance for specificity. Syndesmosis injuries differed significantly in the accuracy of radiological methods according to the presence of accompanied ankle fractures. In patients with fractures, simple radiography has good specificity, and CT and MRI have high sensitivity and specificity irrespective of fracture; in particular, MRI has similar accuracy to gold standard arthroscopic findings.	First, the authors only included a few studies, primarily because inclusion criteria required only studies that reported accuracy measurements, and thus excluded many clinical studies on the diagnosis of syndemosis injury. Second, they did not include prospective studies on the diagnosis of syndesmosis injury because there were too few related studies. Third, they did meta-analysis involving syndesmosis injury with ankle fractures, not only without fracture type. Fourth, they could not involve the weight bearing CT scan. Fifth, although they used the random-effects model for the meta-analysis to overcome the heterogeneity of each of the studies, they could not overcome it completely. This is thought to be due to the use of various tools in the diagnosis of an ankle syndesmosis injury, and a more delicate future study will be needed.

Drake C, Whittaker GA, Kaminski MR, et al. Medical imaging for plantar heel pain: A systematic review and meta-analysis. J Foot Ankle Res. 2022; 15(1):4.	35065676	Systematic review and meta-analysis	Moderate level of evidence	To synthesize medical imaging features associated with plantar heel pain.	Eligible articles were peer-reviewed studies published in the English language. Studies had to be cross-sectional observational studies that compared medical imaging findings from a group of adult participants with PHP to an independent control group of adult participants without PHP. Studies were excluded if they exclusively compared a symptomatic foot with the contralateral asymptomatic foot of the same participant (e.g. no independent control group comparison) – this was done to avoid confounding where the condition may have been developing in the contralateral foot but was still asymptomatic. Studies were also excluded if they included participants who had any self-reported inflammatory arthritis (e.g. seronegative arthropathy), endocrine/neurological condition (e.g. diabetic peripheral neuropathy), surgery (e.g. joint fusion), or trauma (e.g. major fractures) that had affected lower limb sensation or their ability to walk/run and if relevant to the imaging modality of interest.	The study conducted searches in MEDLINE, CINAHL, SPORTDiscus, Embase and the Cochrane Library from inception to 12th February 2021. Peer-reviewed articles of cross-sectional observational studies written in English that compared medical imaging findings in adult participants with plantar heel pain to control participants without plantar heel pain were included. Study quality and risk of bias was assessed using the National Institutes of Health quality assessment tool for observational cohort and cross-sectional studies. Sensitivity analyses were conducted where appropriate to account for studies that used unblinded assessors.	Forty-two studies (2928 participants) were identified and included in analyses. Only 21% of studies were rated 'good' on quality assessment. Imaging features associated with plantar heel pain included a thickened plantar fascia (on ultrasound and MRI), abnormalities of the plantar fascia (on ultrasound and MRI), abnormalities of adjacent tissue such as a thickened loaded plantar heel fat pad (on ultrasound), and a plantar calcaneal spur (on xray). In addition, there is some evidence from more than one study that there is increased hyperaemia within the fascia (on power Doppler ultrasound) and abnormalities of bone in the calcaneus (increased uptake on technetium-99m bone scan and bone marrow oedema on MRI). The authors conclude that people with plantar heel pain are more likely to have a thickened plantar fascia, abnormal plantar fascia tissue, a thicker loaded plantar heel fat pad, and a plantar calcaneal spur. In addition, there is some evidence of hyperaemia within the plantar fascia and abnormalities of the calcaneus. Whilst these medical imaging features may aid with diagnosis, additional high-quality studies investigating medical imaging findings for some of these imaging features would be worthwhile to improve the precision of these findings and determine their clinical relevance.	Firstly, it is possible that some appropriate studies may not have been identified and included. Studies were only included if they reported medical imaging findings in adult participants with PHP and compared these findings with those from independent control participants who were asymptomatic of PHP. In doing so, 15 studies that did not meet these criteria were excluded and therefore, all imaging features associated with PHP may not have been included in this review. Secondly, there was substantial heterogeneity in most of the meta-analyses and only one-fifth of studies were rated 'good' on quality assessment. The majority of studies also did not report inter- and intra assessor reliability for imaging observations, which may have affected the accuracy of the imaging observations made. Lastly, some of the meta-analyses included only two studies, and relatively small sample sizes, so the precision of the estimates of the associations for these analyses may be less than ideal.
Krahenbuhl N, Weinberg MW, Davidson NP, Mills MK, Hintermann B, Saltzman CL, Barg A. Imaging in syndesmotic injury: A systematic literature review. Skeletal Radiol. 2018; 47(8):631-648.	29188345	Systematic review	Low level of evidence	To give a systematic overview of current diagnostic imaging options for assessment of the distal tibio-fibular syndesmosis.	Studies were included if they were original research studies (incl. cadaver studies) that assessed the distal tibio-fibular syndesmosis using conventional radiographs/ fluoroscopy, CT scans, or MRI. Exclusion criteria consisted of studies that used incomplete data (i.e. intraoperative assessment without preoperative evaluation), studies that were published as either case reports or review articles, finite-element modeling studies, studies including less than five participants and studies written in another language than English, German, French, or Russian. Furthermore, studies that did not have their full text available were excluded. Overall, the average patient age was 42.4 years in group one, 42.7 in group two, and 32.9 in group three. A total of 3,246 patients (3,441 ankles) were assessed.	A systematic literature search across the following sources was performed: PubMed, ScienceDirect, Google Scholar, and SpringerLink. Forty-two articles were included and subdivided into three groups: group one consists of studies using conventional radiographs (22 articles), group two includes studies using computed tomography (CT) scans (15 articles), and group three comprises studies using magnet resonance imaging (MRI, 9 articles).The following data were extracted: imaging modality, measurement method, number of participants and ankles included, average age of participants, sensitivity, specificity, and accuracy of the measurement technique. The Quality Assessment of Diagnostic Accuracy Studies 2 (QUADAS-2) tool was used to assess the methodological quality. The study selection process was conducted independently by three reviewers. The decision to include or exclude the study was made based on a group consensus agreement. Disagreements were discussed and a group consensus was reached. The Quality Assessment of Diagnostic Accuracy Studies 2 (QUADAS-2) tool was used to assess the methodological quality.	The three most common techniques used for assessment of the syndesmosis in conventional radiographs are the tibiofibular clear space (TFCS), the tibio-fibular overlap (TFO), and the medial clear space (MCS). Regarding CT scans, the tibiofibular width (axial images) was most commonly used. Most of the MRI studies used direct assessment of syndesmotic integrity. Overall, the included studies show low probability of bias and are applicable in daily practice. The authors conclude that conventional radiographs cannot predict syndesmotic injuries reliably. CT scans outperform plain radiographs in detecting syndesmotic malreduction. Additionally, the syndesmotic interval can be assessed in greater detail by CT. MRI measurements achieve a sensitivity and specificity of nearly 100%; however, correlating MRI findings with patients' complaints is difficult, and utility with subtle syndesmotic instability needs further investigation. Overall, the methodological quality of these studies was satisfactory.	Many studies using MRI failed to note how long had passed between when the MRI was obtained and when the surgery was performed. Too much time between the index test and the reference standard could cause bias. Correlating MRI findings with patients' complaints can be difficult, and utility with subtle syndesmotic instability needs further investigation.
Llewellyn A, Jones-Diette J, Kraft J, et al. Imaging tests for the detection of osteomyelitis: A systematic review. Health Technol Assess. 2019; 23(61):1-128.	31670644	Systematic review	High level of evidence	To systematically review the evidence on the diagnostic accuracy, inter-rater reliability and implementation of imaging tests to diagnose osteomyelitis.	Participants were any patients with suspected osteomyelitis (based on symptoms, surgical samples or blood tests). No restrictions were made for age or disease etiology.	The authors conducted a systematic review of imaging tests to diagnose osteomyelitis. They searched MEDLINE and other databases from inception to July 2018. Titles and abstracts and the full texts of studies were independently assessed for inclusion by two reviewers. Disagreements were resolved through discussion and, where necessary, consultation with a third reviewer. Risk of bias was assessed with QUADAS-2 [quality assessment of diagnostic accuracy studies (version 2)]. Diagnostic accuracy was assessed using bivariate regression models. Imaging tests were compared. Subgroup analyses were performed based on the location and nature of the suspected osteomyelitis. Studies of children, inter-rater reliability and implementation outcomes were synthesized narratively.	Eighty-one studies were included (diagnostic accuracy: 77 studies; inter-rater reliability: 11 studies; implementation: one study; some studies were included in two reviews). One-quarter of diagnostic accuracy studies were rated as being at a high risk of bias. In adults, MRI had high diagnostic accuracy [95.6% sensitivity, 95% confidence interval (CI) 92.4% to 97.5%; 80.7% specificity, 95% CI 70.8% to 87.8%]. PET also had high accuracy (85.1% sensitivity, 95% CI 71.5% to 92.9%; 92.8% specificity, 95% CI 83.0% to 97.1%), as did SPECT (95.1% sensitivity, 95% CI 87.8% to 98.1%; 82.0% specificity, 95% CI 61.5% to 92.8%). There was similar diagnostic performance with MRI, PET and SPECT. Scintigraphy (83.6%sensitivity, 95% CI 71.8% to 91.1%; 70.6% specificity, 57.7% to 80.8%), computed tomography (69.7% sensitivity, 95% CI 40.1% to 88.7%; 90.2% specificity, 95% CI 57.6% to 98.4%) and radiography (70.4% sensitivity, 95% CI 61.6% to 77.8%; 81.5% specificity, 95% CI 69.6% to 89.5%) all had generally inferior diagnostic accuracy. Technetium-99m hexamethylpropyleneamine oxime white blood cell scintigraphy (87.3% sensitivity, 95% CI 75.1% to 94.0%; 94.7% specificity, 95% CI 84.9% to 98.3%) had higher diagnostic accuracy, similar to that of PET or MRI. There was no evidence that diagnostic accuracy varied by scan location or cause of osteomyelitis, although data on many scan locations were limited. Diagnostic accuracy in diabetic foot patients was similar to the overall results.	Most studies included < 50 participants and were poorly reported. There was limited evidence for children, ultrasonography and on clinical factors other than diagnostic accuracy.

Llewellyn A, Kraft J, Holton C, et al. Imaging for detection of osteomyelitis in people with diabetic foot ulcers: A systematic review and meta-analysis. Eur J Radiol. 2020; 131:109215.	32862106	Systematic review and meta-analysis	Moderate level of evidence	To review the evidence on the diagnostic accuracy of imaging tests to diagnose osteomyelitis in people with diabetic foot ulcers.	Participants were any patient with diabetic foot ulcers with suspected osteomyelitis. All diagnostic imaging technique that could potentially identify osteomyelitis, either alone or in combination with other relevant tests, were eligible, including: X-rays, magnetic resonance imaging (MRI), computed tomography (CT), positron emission tomography (PET), planar scintigraphy, single-positron emission computed tomography (SPECT), and ultrasound. The preferred reference standard was histopathology or microbiology from bone biopsy or pus aspiration. Surgery was also accepted as reference standard. As biopsies are invasive, clinical follow-up of at least six months was accepted as confirmation of absence of disease. Studies were excluded if a positive osteomyelitis diagnosis was made by clinical follow-up alone or by using a second imaging test.	Searches were performed in August 2017 and updated in July 2018. The following databases were searched: MEDLINE, EMBASE, CENTRAL, Cochrane Database of Systematic Reviews (CDSR), CINAHL Plus, PubMed, Database of Abstracts of Reviews of Effects (DARE), Health Technology Assessment (HTA) Database. Titles and abstracts and full text of studies were independently assessed for inclusion by two reviewers. The main review outcome was diagnostic accuracy of the imaging test compared to the reference standard expressed as sensitivity (percentage of people with osteomyelitis with a positive diagnostic test result) and specificity (percentage of people without osteomyelitis with a negative test result). Studies reporting sensitivity and specificity, or sufficient data to calculate both measures, were included. Data were extracted for patient and study characteristics, details of diagnostic tests, and reference standard tests. Risk of bias of the included studies was assessed using the QUADAS-2 tool. Diagnostic tests were compared by examining summary diagnostic odds ratios derived from the logistic regression models and by comparing summary ROC curves.	Thirty-six studies were included in the meta-analysis. Eight studies were at high risk of bias. MRI had high diagnostic accuracy (22 studies: 96.4% sensitivity (95% CI 90.7 to 98.7); 83.8% specificity (76.0 to 89.5)). PET scans also had high accuracy (6 studies: 84.3% sensitivity (52.8 to 96.3); 92.8% specificity (75.7 to 98.2)), and possibly also SPECT, but with few studies (3 studies: 95.6% sensitivity (76.0 to 99.3); 55.1% specificity (19.3 to 86.3)). Scintigraphy (17 studies: 84.2% sensitivity (76.8 to 89.6); 67.7% specificity (56.2 to 77.4)), and X-rays (16 studies: 61.9% sensitivity (50.5 to 72.1); 78.3% specificity (62.9 to 88.5)) had generally inferior diagnostic accuracy. The authors conclude that MRI and PET both reliably diagnose osteomyelitis in diabetic foot ulcer patients. SPECT may also have good diagnostic accuracy, although evidence is limited. This review confirms most current guidelines, showing that MRI may be the preferable test in most cases, given its wider availability and the lack of potentially harmful ionizing radiation.	The limitations of this review are largely a consequence of the limitations in the identified studies. There were numerous concerns about the potential for bias in the included studies. Most studies were small, with fewer than 50 participants, and were conducted retrospectively. Risk of bias assessment suggested potential bias due to unclear methods of patient selection and lack of blinding between index tests and references standards. However, sensitivity statistical analyses found no evidence that these concerns led to actual biases in the results. Some imaging tests were reported in few studies, particularly ultrasound and SPECT scans, so authors were not able to fully assess their diagnostic accuracy.