Bibliographic Cite	PMID Link	Literature Type	AMSTAR Appraisal	Level of Evidence	Purpose	Population	Intervention and Outcome Measures	Results/ Recommendations	Study Limitiations
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	Systemic review with meta-analysis	Low	Low level of evidence	To explore the effectiveness of different imaging techniques in diagnosing chronic lateral ankle ligament injury.	Fifteen studies met our inclusion and exclusion criteria. 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 with meta-analysis	Low	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.
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	Moderate	Moderate 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.