

**Acute Trauma to the Knee
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
1. Niska R, Bhuiya F, Xu J. National Hospital Ambulatory Medical Care Survey: 2007 emergency department summary. <i>Natl Health Stat Report</i> . 2010(26):1-31.	Review/Other-Dx	N/A	To present data on U.S. ED visits in 2007, with statistics on hospital, patient, and visit characteristics.	In 2007, there were about 117 million ED visits in the U.S. About 25% of visits were covered by Medicaid or the State Children's Health Insurance Program. About one-fifth of ED visits by children <15 years of age were to pediatric EDs. There were 121 ED visits for asthma per 10,000 children under 5 years of age. The leading injury-related cause of ED visits was unintentional falls. 2% of visits resulted in admission to an observation unit. Electronic medical records were used in 62% of EDs.	4
2. Kluchurosky L. Pediatric & Adolescent Sports Injuries: Recognition and Appropriate Care. Nationwide Children's Hospital Sports Medicine Department. 2007.	Review/Other-Dx	N/A	Pediatric and Adolescent Sports Injuries: Recognition and Appropriate Care.	N/A	4
3. Stiell IG, Greenberg GH, Wells GA, et al. Derivation of a decision rule for the use of radiography in acute knee injuries. <i>Ann Emerg Med</i> . 1995;26(4):405-413.	Review/Other-Dx	1,047 patients; 127 patients examined by 2 physicians	Prospectively administered survey in 2 EDs to derive a sensitive decision rule for selective use of radiographs in acute knee injuries.	1 or more of the following variables would have led to a 28.0% relative reduction in the use of radiograph (68.6%–49.4%): age 55 years or older, tenderness at fibular head or patella, inability to flex to 90°, and inability to bear weight both immediately and in the ED (4 steps). Decision rule is not validated prospectively and has not undergone an implementation trial.	4

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4. Stiell IG, Wells GA, McDowell I, et al. Use of radiography in acute knee injuries: need for clinical decision rules. <i>Acad Emerg Med.</i> 1995;2(11):966-973.	Observational-Dx	1,967 retrospective review; 1,040 prospective study; 120 patients examined by 2 physicians	Two-stage study of adults with acute knee injuries to study efficiency of the current use of radiograph in acute knee injuries and to assess clinician's estimate of probability of a knee or patellar fracture and to determine the potential for decision rules to improve efficiency.	Of the 1,967 patients seen in the first stage, 74.1% underwent radiography but only 5.2% were found to have fractures. Of the 1,727 knee and patella radiographic series ordered, 92.4% were negative for fracture. In the second stage, experienced physicians predicted the probability of fracture to be 0 or 0.1 for 75.6% of the patients. The kappa value for this response was 0.51 (95% CI 0.34 to 0.68). The physicians also indicated that they would have been comfortable or very comfortable in not ordering radiography for 55.5% of the patients. The area under the receiver operating characteristics curve for the physicians' prediction of fracture was 0.87 (95% CI 0.82 to 0.91), reflecting good discrimination between fracture and nonfracture cases. Likelihood ratios for the physicians' prediction ranged from 0.09 at the 0 level to 42.9 at the 0.9-1.0 level.	3
5. Weber JE, Jackson RE, Peacock WF, Swor RA, Carley R, Larkin GL. Clinical decision rules discriminate between fractures and nonfractures in acute isolated knee trauma. <i>Ann Emerg Med.</i> 1995;26(4):429-433.	Observational-Dx	242 patients	Prospective survey of ED patients over a 7-month period to develop criteria that optimize clinical decisions making in the use of radiography in patients over age 17, with isolated injuries within previous 24 hours.	Patients able to walk without limping and patients having had a twist injury without effusion had not experienced a fracture. Sensitivity for detecting fracture was 1.0 and specificity was .337. Prospective validation needed.	3
6. Cheung TC, Tank Y, Breederveld RS, Tuinebreijer WE, de Lange-de Klerk ES, Derksen RJ. Diagnostic accuracy and reproducibility of the Ottawa Knee Rule vs the Pittsburgh Decision Rule. <i>Am J Emerg Med.</i> 2013;31(4):641-645.	Observational-Dx	90 injuries	To compare the diagnostic accuracy and reproducibility of 2 clinical decision rules (the Ottawa Knee Rules and Pittsburgh Decision Rules) developed for selective use of radiographs in the evaluation of isolated knee trauma.	90 injuries were assessed. 7 injuries concerned fractures (7.8%). For the Ottawa Knee Rules, the pooled sensitivity and specificity were 0.86 (95% CI, 0.57–0.96) and 0.27 (95% CI, 0.21–0.35), respectively. The Pittsburgh Decision Rules had a pooled sensitivity and specificity of 0.86 (95% CI, 0.57–0.96) and 0.51 (95% CI, 0.44–0.59). The Pittsburgh Decision Rules was significantly ($P=0.002$) more specific. The kappa values for the Ottawa Knee Rules and Pittsburgh Decision Rules were 0.51 (95% CI, 0.32–0.71) and 0.71 (95% CI, 0.57–0.86), respectively.	1
7. Teh J, Kambouroglou G, Newton J. Investigation of acute knee injury. <i>Bmj.</i> 2012;344:e3167.	Review/Other-Dx	1 patient	To provide an update on the best use of different imaging methods for common or important clinical presentations.	MRI confirmed an acute rupture of the ACL and also showed a lateral meniscal tear; there was no posterolateral corner injury.	4

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8. Beutel BG, Trehan SK, Shalvoy RM, Mello MJ. The Ottawa knee rule: examining use in an academic emergency department. <i>West J Emerg Med.</i> 2012;13(4):366-372.	Review/Other-Dx	260 records	To assess physician knowledge of, barriers to implementation of, and compliance with the Ottawa Knee Rule in academic EDs, and evaluate whether patient characteristics predict guideline noncompliance.	ED physicians (n = 47) correctly answered 73.2% of questions assessing knowledge of the Ottawa Knee Rule. The most commonly cited barriers to implementation were "patient expectations" and system issues, such as "orthopedics referral requirement." The authors retrospectively reviewed 838 records, with 260 eligible for study inclusion. The rate of Ottawa Knee Rule compliance was retrospectively determined to be 63.1%. The authors observed a statistically significant correlation between Ottawa Knee Rule compliance and patient age, but not gender, insurance status, or provider type, among others.	4
9. Moore BR, Hampers LC, Clark KD. Performance of a decision rule for radiographs of pediatric knee injuries. <i>J Emerg Med.</i> 2005;28(3):257-261.	Observational-Dx	146 patients	To prospectively assess the performance of a decision rule for radiographs in children presenting with acute knee injuries.	A total of 146 patients were enrolled (65% male, mean age 11.6 years). Of these, 15 (10.3%) had a fracture on their radiograph, 6 of which were related to trampoline use. 77 (53%) were negative for criterion 1 (ie, able to bear weight immediately after the accident and in the ED), none (0%) of whom had fractures. The NPV of this criterion was 1.0 (95% CI, 0.94–1.0). The PPV was 0.22 (95% CI, 0.13v0.34). The sensitivity was 1.0 (95% CI, 0.82–1.0). The specificity was 0.59 (95% CI, 0.50–0.67). 3 patients negative for criterion, 3 were found to have fractures. The proximal tibia was the most common fracture site (47%).	2
10. Yao K, Haque T. The Ottawa knee rules - a useful clinical decision tool. <i>Aust Fam Physician.</i> 2012;41(4):223-224.	Review/Other-Dx	N/A	To describe the Ottawa knee rules and outline their sensitivity, reproducibility and application in the clinical setting.	The Ottawa knee rules are a valuable tool for clinicians in the routine management of acute knee injuries. Studies show that they are highly sensitive at identifying patients with fractures of the knee and have a high degree of interobserver agreement and reproducible results. Application of the Ottawa knee rules in appropriate clinical scenarios may reduce the number of unnecessary radiographs ordered, streamlining patient throughput and allowing for significant cost savings.	4

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11. Stiell IG, Greenberg GH, Wells GA, et al. Prospective validation of a decision rule for the use of radiography in acute knee injuries. <i>JAMA</i> . 1996;275(8):611-615.	Review/Other-Dx	Convenience sample of 1,096 of 1,251 adults; 124 patients examined by 2 physicians	Prospectively administered survey in 2 EDs to validate previously derived decision rule for the use of radiography in patients with acute knee injury.	Decision rule has sensitivity in 1.0 for identifying clinically important fractures. Physicians correctly interpreted the decision rule in 96%. The potential relative reduction in the use of radiograph was estimated to be 28%. The probability of fracture, if the decision rule was “negative” was estimated to be 0%. Prospective validation shows decision rule to be 100% sensitive.	4
12. Jenny JY, Boeri C, El Amrani H, et al. Should plain X-rays be routinely performed after blunt knee trauma? A prospective analysis. <i>J Trauma</i> . 2005;58(6):1179-1182.	Observational-Dx	138 (1 st stage); 178 (2 nd stage)	Prospective analysis to determine if number of radiographs could be reduced without sacrificing diagnostic performance by applying the Ottawa rules to patients presenting with knee trauma.	Ottawa rules allowed decreasing the number of radiographs performed after a knee trauma by 35% with sensitivity for a knee fracture detection of 100%.	3
13. Bachmann LM, Haberzeth S, Steurer J, ter Riet G. The accuracy of the Ottawa knee rule to rule out knee fractures: a systematic review. <i>Ann Intern Med</i> . 2004;140(2):121-124.	Review/Other-Dx	11 studies (6 involving 4,249 adult patients were used for analysis); 2 reviewers	Articles were included if they reported enough information to determine the sensitivity and specificity of the Ottawa knee rule for detecting fractures confirmed either radiologically or in combination with follow-up.	Sensitivity was 98.5%. Specificity was 48.6%. Negative likelihood ratio was 0.05.	4
14. Seaberg DC, Jackson R. Clinical decision rule for knee radiographs. <i>Am J Emerg Med</i> . 1994;12(5):541-543.	Observational-Dx	201 retrospective; 133 prospective	Retrospective chart review and prospective validation study to develop a decision rule for ordering knee radiographs in patients with acute knee injuries.	Logistic regression analysis: Fall or blunt trauma mechanism yielded sensitivity of 92%, specificity of 57%, false-negative rate of 0.9%. The addition of inability to ambulate and age (<12 or >50 years of age) yielded a sensitivity of 92% with a specificity of 63%. Combination of a fall or blunt trauma with either inability to ambulate or age <12 years and >50 years was 100% sensitive with a specificity of 79%. Number of radiographs could be reduced by 78% with decision rule.	4

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15. Jackson JL, O'Malley PG, Kroenke K. Evaluation of acute knee pain in primary care. <i>Ann Intern Med.</i> 2003;139(7):575-588.	Review/Other-Dx	217 studies reviewed	Meta-analysis to determine the role of radiologic procedures in evaluating common causes of acute knee pain: fractures, meniscal or ligamentous injuries, osteoarthritis, and pseudogout.	Among the 5 decision rules for deciding when to use radiographs in knee fractures, the Ottawa knee rules (injury due to trauma and age >55 years, tenderness at the head of the fibula or the patella, inability to bear weight for 4 steps, or inability to flex the knee to 90°), have the strongest supporting evidence. A careful physical examination should be sufficient to decide whether to refer patients with potential meniscal and ligament injuries, and we prefer clinical criteria rather than radiographs for evaluating osteoarthritis. We do not recommend using radiographs to diagnose pseudogout.	4
16. Matteucci MJ, Roos JA. Ottawa Knee Rule: a comparison of physician and triage-nurse utilization of a decision rule for knee injury radiography. <i>J Emerg Med.</i> 2003;24(2):147-150.	Review/Other-Dx	134 patients	To compare application of the Ottawa knee rules by triage nurses and physicians.	Radiographs were ordered on all patients. 4 fractures (3%) were detected. No fractures were missed by physicians or nurses.	4
17. Neubauer T, Wagner M, Potschka T, Riedl M. Bilateral, simultaneous rupture of the quadriceps tendon: a diagnostic pitfall? Report of three cases and meta-analysis of the literature. <i>Knee Surg Sports Traumatol Arthrosc.</i> 2007;15(1):43-53.	Review/Other-Dx	28 cases analyzed from among 105 identified	To ascertain the review of the English and German literature retrieved 105 cases of bilateral, simultaneous quadriceps tendon rupture and in 32 patients (30.5%) the correct diagnosis was established with delay.	A direct association between the rate of risk factors and the rupture form was not seen ($P=0.5$). Overall diagnostic delay lasted 64.7 days on an average (traumatic ruptures 67.7 days/spontaneous ruptures 58.7 days) with this period being longer than 2 weeks in 51.9% and longer than 3 months in 33.3% of patients. The correct diagnosis of bilateral quadriceps tendon rupture was established in 60.7% ($n = 17/28$) by history and clinical examination alone.	4
18. Blum MR, Goldstein LB. Practical Pain Management. Need for More Accurate ER Diagnoses of ACL Injuries. Available at: http://www.practicalpainmanagement.com/pain/acute/sports-overuse/need-more-accurateer-diagnoses-acl-injuries . Accessed December 17, 2013.	Review/Other-Dx	N/A	A review on ACL injuries. Article reviews anatomy of the knee, mechanism of injury, signs and symptoms, physical examination and diagnostic testing, risk factors associated with ACL injury and treatment.	The Lachman test is the best physical examination test and, when followed by an MRI, is the gold standard to confirm the diagnosis. ACL injuries may be managed operatively or nonoperatively, depending on the patient's activity level, age, and concurrent injuries. Regardless of the treatment, an extensive rehabilitation program is imperative.	4

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19. Griffin JW, Miller MD. MRI of the knee with arthroscopic correlation. <i>Clin Sports Med.</i> 2013;32(3):507-523.	Review/Other-Dx	N/A	To understand how MRI and arthroscopy can enhance treatment of ligamentous and soft tissue injuries of the knee.	T2-weighted MRI is key in examining which structures have been damaged in the posterolateral corner on T2 imaging and arthroscopically manifests as a drive-through sign.	4
20. Van Dyck P, Vanhoenacker FM, Lambrecht V, et al. Prospective comparison of 1.5 and 3.0-T MRI for evaluating the knee menisci and ACL. <i>J Bone Joint Surg Am.</i> 2013;95(10):916-924.	Observational-Dx	200 patients	To assess the accuracy of 1.5 and 3.0-T MRI of the knee, in the same individuals, for diagnosing meniscal pathology and ACL tears, utilizing arthroscopy as the reference standard.	For medial meniscal tears, the mean sensitivity and specificity for the 2 readers were 93% and 90%, respectively, at 1.5 T and 96% and 88%, respectively, at 3.0 T. For lateral meniscal tears, the mean sensitivity and specificity were 77% and 99%, respectively, at 1.5 T and 82% and 98%, respectively, at 3.0 T. For ACL tears, the mean sensitivity and specificity were 78% and 100%, respectively, at 1.5 T and 80% and 100%, respectively, at 3.0 T. None of the values for either reader differed significantly between the 1.5 and 3.0-T MRI protocols. Inter-reader agreement was almost perfect to perfect (kappa = 0.82 to 1.00).	2
21. Frobell RB, Lohmander LS, Roos HP. Acute rotational trauma to the knee: poor agreement between clinical assessment and magnetic resonance imaging findings. <i>Scand J Med Sci Sports.</i> 2007;17(2):109-114.	Review/Other-Dx	159 patients	To determine the incidence of ACL injuries in the general population; the pathology associated with a knee sprain verified by MRI; and the agreement between clinical findings and MRI.	The annual incidence of MRI verified ACL injuries were 0.81/1,000 inhabitants aged 10–64 years. 56% (n=89) of those included had sustained an ACL injury of whom 38% had an associated medial meniscus tear. There was a poor agreement between initial clinical antero-posterior laxity and MRI verified presence of an ACL tear (kappa=0.281). Every second patellar dislocation was diagnosed as a ligament injury. Findings indicate that the incidence of ACL injuries is higher than previously described. Study also shows that the first clinical examination after an acute knee trauma has low diagnostic value.	4

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22. Nikken JJ, Oei EH, Ginai AZ, et al. Acute peripheral joint injury: cost and effectiveness of low-field-strength MR imaging--results of randomized controlled trial. <i>Radiology</i> . 2005;236(3):958-967.	Experimental-Dx	507	Patients were randomized to either radiography alone or radiography followed by short MRI examination. Purpose was to determine if the short MRI examination performed with low-field-strength dedicated MRI is effective and cost saving compared with radiography alone in patients with recent acute traumatic injury of the wrist, knee, or ankle.	Compared with radiography, MRI in patients with acute wrist or ankle injuries is neither cost saving nor effective in expediting diagnostic workup nor improving QoL. In patients with knee injuries, a short MRI shortens the time to completion of diagnostic workup, reduces the number of additional diagnostic procedures, improves QoL in the first 6-weeks, and may reduce costs associated with lost productivity.	3
23. Oei EH, Nikken JJ, Ginai AZ, et al. Costs and effectiveness of a brief MRI examination of patients with acute knee injury. <i>Eur Radiol</i> . 2009;19(2):409-418.	Review/Other-Dx	Model used was based on randomized trial with 208 patients	To assess the costs and effectiveness of selective short MRI in patients with acute knee injury.	QoL was lowest (EuroQoL at 6 weeks 0.61 (95% CI, 0.54-0.67)); duration of diagnostic workup, absence from work, and time to convalescence were longest; and the number of diagnostic examinations was largest with radiography only. These outcomes were more favorable for both MRI strategies (EuroQoL at 6 weeks 0.72 (95% CI, 0.67-0.77) for both). Mean total costs were 2,593 Euros (95% CI, 1,815-3,372) with radiography only, 2,116 Euros (95% CI, 1,488-2,743) with radiography plus MRI, and 1,973 Euros (95% CI, 1,401-2,543) with selective MRI. Selective use of a short MRI examination saves costs and potentially increases effectiveness in patients with acute knee injury without a fracture on radiography.	4
24. Koster IM, Oei EH, Hensen JH, et al. Predictive factors for new onset or progression of knee osteoarthritis one year after trauma: MRI follow-up in general practice. <i>Eur Radiol</i> . 2011;21(7):1509-1516.	Observational-Dx	117 patients	To prospectively evaluate prognostic factors for new onset or progression of degenerative change on follow-up MRI 1 year after knee trauma and the association with clinical outcome.	On follow-up MRI 15% of patients with pre-existing knee osteoarthritis showed progression and 26% of patients demonstrated new degenerative change. The only statistically significant prognostic variable in the multivariate analysis was bone marrow oedema on initial MRI (OR 5.29 (95% CI, 1.64-17.1), $P=0.005$). A significant association between new or progressive degenerative change and clinical outcome was found ($P=0.003$).	2

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25. Helmark IC, Neergaard K, Krogsgaard MR. Traumatic knee extension deficit (the locked knee): can MRI reduce the need for arthroscopy? <i>Knee Surg Sports Traumatol Arthrosc.</i> 2007;15(7):863-868.	Observational-Dx	50 patients	To examine the validity of MRI and arthroscopy in knees with acute, traumatic extension deficit (the "locked knee"), and evaluate whether arthroscopy of knees with no mechanical pathology could be avoided by MRI evaluation.	Assuming arthroscopy as the gold standard, the following results were calculated for the overall appearance of a lesion able to cause locking: PPV = 0.85, NPV = 0.77, sensitivity = 0.95, specificity = 0.53. Two knees were erroneously evaluated with no mechanical locking at MRI (1 bucket-handle lesion and 1 pathological synovial plica). MRI of the knee with acute, traumatic extension deficit is in the acute or subacute phase a safe method to identify the patients that have a mechanical reason for locking and therefore can benefit from arthroscopic treatment.	2
26. McNally EG, Nasser KN, Dawson S, Goh LA. Role of magnetic resonance imaging in the clinical management of the acutely locked knee. <i>Skeletal Radiol.</i> 2002;31(10):570-573.	Observational-Dx	42 patients	To explore prospectively the hypothesis that MRI of the acutely locked knee can alter surgical decision-making.	Sensitivity 96%, specificity 100%, accuracy 98%. MRI should precede arthroscopy in this clinical setting.	3
27. Bhattacharyya T, Gale D, Dewire P, et al. The clinical importance of meniscal tears demonstrated by magnetic resonance imaging in osteoarthritis of the knee. <i>J Bone Joint Surg Am.</i> 2003;85-A(1):4-9.	Review/Other-Dx	154 patients with clinical symptoms of knee osteoarthritis 49 age-matched asymptomatic controls	To examine the relationship between meniscal tears and osteoarthritis and between such tears and pain in patients with osteoarthritis. MRI and plain radiography of the knee were performed.	A medial or lateral meniscal tear was a very common finding in the asymptomatic subjects (prevalence, 76%) but was more common in the patients with symptomatic osteoarthritis (91%) ($P < 0.005$). In the group with symptomatic osteoarthritis, a higher Kellgren-Lawrence radiographic grade was correlated with a higher frequency of meniscal tears ($r = 0.26$, $P < 0.001$), and men had a higher prevalence of meniscal tears than did women ($P < 0.01$). There was no significant difference with regard to the pain or WOMAC score between the patients with and those without a medial or lateral meniscal tear in the osteoarthritis group ($P = 0.8$ to 0.9 for all comparisons). The power of the study was 80% to detect a difference in the WOMAC scores of 15 points and a difference in the scores on the visual analog scale of 16 mm. Data do not support the routine use of MRI for the evaluation and management of meniscal tears.	4

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28. Mustonen AO, Koskinen SK, Kiuru MJ. Acute knee trauma: analysis of multidetector computed tomography findings and comparison with conventional radiography. <i>Acta Radiol.</i> 2005;46(8):866-874.	Observational-Dx	415 images from 409 patients	To evaluate MDCT by comparing findings from MDCT to those from the primary knee radiographs for patients presenting with acute knee trauma.	Overall sensitivity of radiography was 83%, while NPV was 49%. In severely injured patients, diagnostically sufficient radiographs are difficult to obtain, and therefore a negative radiograph is not reliable in ruling out a fracture. MDCT is a fast and accurate exam and is recommended in patients with tibial plateau fractures or complex knee injuries in order to evaluate the fracture adequately.	3
29. Brunner A, Horisberger M, Ulmar B, Hoffmann A, Babst R. Classification systems for tibial plateau fractures; does computed tomography scanning improve their reliability? <i>Injury.</i> 2010;41(2):173-178.	Observational-Dx	45 consecutive fractures	To evaluate the impact of CT scanning on the inter- and intra-observer reliability of the OTA/AO, the Schatzker, and the Hohl classifications in the assessment of tibial plateau fractures.	The 3 classification systems showed “moderate” inter-observer reliability and “good” and “moderate” intra-observer reliability when classified solely on the basis of plain radiographs. After the addition of CT scans inter-observer reliability significantly improved to “good” in all classifications. Likewise, intra-observer reliability improved to “good” in all classifications after the addition of CT-scans. Statistical analysis showed no significant difference regarding inter- and intra-observer agreement between the 3 classifications.	3
30. Mui LW, Engelsohn E, Umans H. Comparison of CT and MRI in patients with tibial plateau fracture: can CT findings predict ligament tear or meniscal injury? <i>Skeletal Radiol.</i> 2007;36(2):145-151.	Observational-Dx	41 patients	Trained radiologist retrospectively reviewed films of patients admitted to ED to: 1) To determine the accuracy of CT in the evaluation of ligament tear and avulsion in patients with tibial plateau fracture, and, 2) to evaluate whether the presence or severity of fracture gap and articular depression can predict meniscal injury.	CT demonstrated torn ligaments with 80% sensitivity and 98% specificity. Only 2% of ligaments deemed intact on careful CT evaluation had partial or complete tears on MRI. Receiver-operator characteristic analysis demonstrated no clear threshold for gap or depression that yielded a combination of high sensitivity and specificity: In the acute setting, CT offers high sensitivity and specificity for depicting osseous avulsions, as well as high NPV for excluding ligament injury. However, MRI remains necessary for the preoperative detection of meniscal injury.	3

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31. Spiro AS, Regier M, Novo de Oliveira A, et al. The degree of articular depression as a predictor of soft-tissue injuries in tibial plateau fracture. <i>Knee Surg Sports Traumatol Arthrosc.</i> 2013;21(3):564-570.	Review/Other-Dx	54 patients	To determine whether the amount of tibial plateau fracture depression on MDCT scans correlates with the incidence of associated soft-tissue injuries on MRI.	Logistic regression revealed a significant impact of increasing tibial plateau fracture depression on the incidence of meniscus lateralis tears ($P=0.025$) and ACL lesions ($P=0.018$). Analysis of covariance demonstrated a significant correlation between the amount of articular depression and absolute number of soft-tissue injuries ($P=0.001$).	4
32. Pache G, Bulla S, Baumann T, et al. Dose reduction does not affect detection of bone marrow lesions with dual-energy CT virtual noncalcium technique. <i>Acad Radiol.</i> 2012;19(12):1539-1545.	Observational-Dx	50 patients	To evaluate if a dose-reduced, dose-neutral dual-energy CT virtual noncalcium technique can equally detect posttraumatic bone marrow lesions of the knee.	MRI depicted 170 bone marrow lesions (35 femoral, 135 tibial). Mean age, number of fractures, attenuation values and number of regions with bone marrow lesions were not significantly different between the groups. Visual rating revealed overall areas under the curves of 0.983 and 0.979 for observers 1 and 2, respectively. Visual judgment was superior to attenuation measurements for femoral regions regardless of the dose applied. Analysis of variance of all CT values revealed a significant influence for the presence of edema ($P<.001$) but no differences for the radiation dose used ($P=.424$). Interobserver agreement was excellent ($\text{kappa} = 0.944$).	2
33. Pache G, Krauss B, Strohm P, et al. Dual-energy CT virtual noncalcium technique: detecting posttraumatic bone marrow lesions--feasibility study. <i>Radiology.</i> 2010;256(2):617-624.	Observational-Dx	21 patients	To evaluate traumatized bone marrow with a dual-energy CT virtual noncalcium technique.	After exclusion of 16 regions owing to artifacts, MRI revealed 59 bone bruises in the remaining 236 regions (19/114 femoral, 40/122 tibial). Fractures were present in 8 patients. Visual rating revealed areas under the curve of 0.886 and 0.897 in the femur and 0.974 and 0.953 in the tibia for observers 1 and 2, respectively. For CT numbers, the respective areas under the curve were 0.922 and 0.974. If scores of 1 and 2 (strong or mild bone bruise) were counted as positive, sensitivities were 86.4% and 86.4% and specificities were 94.4% and 95.5% for observers 1 and 2, respectively. The kappa statistic demonstrated good to excellent agreement (femur, $\text{kappa} = 0.78$; tibia, $\text{kappa} = 0.87$).	1

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34. Grevitt MP, Taylor M, Churchill M, Allen P, Ryan PJ, Fogelman I. SPECT imaging in the diagnosis of meniscal tears. <i>J R Soc Med.</i> 1993;86(11):639-641.	Observational-Dx	60 patients	To evaluate the usefulness and accuracy of SPECT radionuclide scan to detect a meniscal tear.	A crescentic pattern of uptake on the transaxial view was 77% sensitive and 74% specific for an accuracy of 76%. When combined with increased activity in the adjacent femoral condyle, sensitivity rose to 90% for an accuracy of 84%.	2
35. Ryan PJ, Reddy K, Fleetcroft J. A prospective comparison of clinical examination, MRI, bone SPECT, and arthroscopy to detect meniscal tears. <i>Clin Nucl Med.</i> 1998;23(12):803-806.	Observational-Dx	100 patients	To prospectively compare SPECT with arthroscopy and MRI for meniscal pathology detection. MRI and SPECT findings blinded to other information.	With arthroscopy as gold standard, sensitivity, specificity, PPV, and NPV of MRI were 80%, 71%, 84%, and 71%, respectively and that of SPECT were 84%, 80%, 88%, and 76%, respectively. SPECT is a suitable alternative to MRI to detect meniscal tears.	2
36. Siegel Y, Golan H, Thein R. 99mTc-methylene diphosphonate single photon emission tomography of the knees: intensity of uptake and its correlation with arthroscopic findings. <i>Nucl Med Commun.</i> 2006;27(9):689-693.	Observational-Dx	42 patients	To examine whether SPECT can determine the severity of knee pathology, based on intensity of uptake and, therefore, possibly substituting this technique for more invasive and expensive diagnostic procedures, such as arthroscopy, in certain patient populations.	41 patients were included in the study. A positive and statistically significant correlation was found between the intensity of uptake on the SPECT and the severity of the arthroscopic findings in the menisci and medial femoral condyle.	2
37. Even-Sapir E, Arbel R, Lerman H, Flusser G, Livshitz G, Halperin N. Bone injury associated with anterior cruciate ligament and meniscal tears: assessment with bone single photon emission computed tomography. <i>Invest Radiol.</i> 2002;37(9):521-527.	Observational-Dx	94 patients	To assess the role of SPECT by comparing its results with those from arthroscopy, MRI, or both.	There was considerable concordance between SPECT results and those of other modalities so authors suggest that bone SPECT is valuable in acute knee trauma for assessment of ACL, meniscal tears, or both and for detection of associated bone injury.	3
38. Ptasznik R, Feller J, Bartlett J, Fitt G, Mitchell A, Hennessy O. The value of sonography in the diagnosis of traumatic rupture of the anterior cruciate ligament of the knee. <i>AJR Am J Roentgenol.</i> 1995;164(6):1461-1463.	Observational-Dx	37 patients	Prospective study to determine value of US in diagnosing an ACL tear in patients with recent traumatic hemarthrosis of the knee; no bone abnormalities on radiograph.	US was 91% sensitive and 100% specific, PPV was 100% and NPV was 63%. US is a useful and inexpensive method.	2
39. Bonnefoy O, Diris B, Moinard M, Aunoble S, Diard F, Hauger O. Acute knee trauma: role of ultrasound. <i>Eur Radiol.</i> 2006;16(11):2542-2548.	Observational-Dx	48 patients	Prospective review of patients with conventional radiography, US, and CT to determine the diagnostic accuracy of high spatial resolution US in the detection of lipohemarthrosis of the knee and to evaluate this sign as criteria of intra-articular fracture.	The sensitivity, specificity, PPV, NPV of US for the diagnosis of lipohemarthrosis was 97%, 100%, 100% and 94%, respectively, compared with 55%, 100%, 100% and 55% with radiographs. Using lipohemarthrosis as criterion of fracture, the sensitivity, specificity, PPV and NPV of US for early detection of intra-articular knee fractures was 94%, 94%, 97% and 89%, respectively, compared with 84%, 88%, 93% and 75% with radiographs.	2

**Acute Trauma to the Knee
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
40. Wang CY, Wang HK, Hsu CY, Shieh JY, Wang TG, Jiang CC. Role of sonographic examination in traumatic knee internal derangement. <i>Arch Phys Med Rehabil.</i> 2007;88(8):984-987.	Observational-Dx	30 consecutive patients (19 men, 11 women) with traumatic knee injury	Prospective blinded study to define the accuracy (compared with MRI) of US examination in detecting knee effusion and to determine whether the presence of knee effusions in patients with traumatic knee injury can predict knee internal derangement as assessed by MRI.	The sensitivity of US examination for detecting knee effusion was 79.1%, and specificity was 50%. PPV was 86.3% and NPV was 37.5%. The PPV of US effusion to internal derangement was 90.9%, and the NPV was 37.5%. US examination can accurately detect effusion of the knee. The detection of knee effusion in patients with traumatic knee injury by sonographic examination is highly indicative of internal knee derangement.	3
41. Wareluk P, Szopinski KT. Value of modern sonography in the assessment of meniscal lesions. <i>Eur J Radiol.</i> 2012;81(9):2366-2369.	Observational-Dx	160 menisci evaluated in 80 patients	To assess the accuracy of modern US in diagnostic imaging of meniscal tears.	The overall sensitivity, specificity, PPV and NPV of US examination in the assessment of meniscal tears amounted to 85.4%, 85.7%, 67.3% and 94.4%, respectively. The statistical parameters were not statistically different in medial and lateral menisci. Age, sex, body mass index, weight, physical activity, mechanism on injury, and time lapse from injury did not have a statistically significant impact on the usefulness of US. The highest sensitivity (>90%) was obtained in medial menisci and in patients with a body mass index >25. The highest specificity (>90%) was obtained in lateral menisci, in patients after twisting injuries, in sports injuries, and in recent injuries (time lapse from the injury <1 month). The PPV of US examination was higher than 90% only in recent injuries (<1 month), however, the NPV of US is high, being < 90% in males with lesions of lateral menisci and in sequelae of sports injuries.	3
42. Hayes CW, Coggins CA. Sports-related injuries of the knee: an approach to MRI interpretation. <i>Clin Sports Med.</i> 2006;25(4):659-679.	Review/Other-Dx	N/A	To review the evaluation of individual knee structures. The authors describe mechanism-based consolidated approach, whereby complex knee injury patterns can be recognized from the MRI patterns involving bone, ligaments, menisci, and periarticular soft tissues.	Studies indicate that MRI is a reliable and cost-effective diagnostic tool in evaluating the extent of acute knee injury.	4

**Acute Trauma to the Knee
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
43. Sanders TG, Miller MD. A systematic approach to magnetic resonance imaging interpretation of sports medicine injuries of the knee. <i>Am J Sports Med.</i> 2005;33(1):131-148.	Review/Other-Dx	N/A	To provide a systematic approach to the interpretation of a magnetic resonance examination of the knee.	No results stated in abstract.	4
44. De Smet AA, Tuite MJ. Use of the "two-slice-touch" rule for the MRI diagnosis of meniscal tears. <i>AJR Am J Roentgenol.</i> 2006;187(4):911-914.	Observational-Dx	174 patients	Review medical records of patients who had MRI and knee arthroscopy to determine if using the "two-slice-touch" rule increases PPV for diagnosing meniscal tear and to compare sensitivity and specificity using fast spin-echo imaging with previously reported studies.	The "two-slice-touch" rule increases PPV for diagnosing meniscal tear, and this was statistically significant for the lateral meniscus. Accuracy with fast spin-echo imaging was comparable to that reported in previous studies with spin-echo imaging.	3
45. Magee T, Williams D. 3.0-T MRI of meniscal tears. <i>AJR Am J Roentgenol.</i> 2006;187(2):371-375.	Observational-Dx	100 patients; 2 reviewers	Retrospective study to evaluate the sensitivity and specificity of 3.0-T MRI compared with arthroscopy in the detection of meniscal tears.	MRI of the knee at 3.0-T is sensitive (96%) and specific (97%) compared with arthroscopy in the detection of meniscal tears. Findings at 3.0-T compare favorably with results at 1.5-T or lower field strength.	3
46. Oei EH, Nikken JJ, Verstijnen AC, Ginai AZ, Myriam Hunink MG. MR imaging of the menisci and cruciate ligaments: a systematic review. <i>Radiology.</i> 2003;226(3):837-848.	Review/Other-Dx	29 articles	To systematically review and synthesize published data on the diagnostic performance of MRI of the menisci and cruciate ligaments and to assess the effect of study design characteristics and magnetic field strength on diagnostic performance.	Higher magnetic field strength modestly improves diagnostic performance, but a significant effect was demonstrated only for ACL tears.	4
47. Sanders TG, Paruchuri NB, Zlatkin MB. MRI of osteochondral defects of the lateral femoral condyle: incidence and pattern of injury after transient lateral dislocation of the patella. <i>AJR Am J Roentgenol.</i> 2006;187(5):1332-1337.	Review/Other-Dx	25	To determine the incidence and location of lateral femoral condyle osteochondral injuries after transient lateral dislocation of the patella.	Osteochondral defects of the lateral femoral condyle are common sequela injuries after transient lateral dislocation of the patella. A significant number of osteochondral injuries involve the midlateral weight-bearing portion more posterior than would be expected.	4

**Acute Trauma to the Knee
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
48. te Stroet MA, Holla M, Biert J, van Kampen A. The value of a CT scan compared to plain radiographs for the classification and treatment plan in tibial plateau fractures. <i>Emerg Radiol.</i> 2011;18(4):279-283.	Observational-Dx	15 patients	To evaluate the intra- and interobserver agreement for both fracture classification according to Schatzker and treatment plan of tibial plateau fractures using plain radiographs alone and with CT scans.	Using plain radiographs alone, the mean interobserver kappa coefficient for classification was 0.47, which decreased to 0.46 after addition of CT scans. Using plain films alone for formulating a treatment plan, the mean interobserver kappa coefficient was 0.40, which decreased to 0.30 after addition of CT scans. The mean intraobserver kappa coefficient for fracture classification using plain radiographs was 0.60, which decreased to 0.57 with addition of CT scans. The mean intraobserver kappa coefficient for treatment plan based on plain radiographs alone was 0.53, which decreased to 0.45 after addition of CT scans.	3
49. Markhardt BK, Gross JM, Monu JU. Schatzker classification of tibial plateau fractures: use of CT and MR imaging improves assessment. <i>Radiographics.</i> 2009;29(2):585-597.	Review/Other-Dx	N/A	To describe the added benefit of CT and MRI for correct characterization of tibial plateau fractures and discuss how fracture management and outcome change with each Schatzker fracture type.	CT and MRI are more accurate than plain radiography for Schatzker classification of tibial plateau fractures, and use of cross-sectional imaging can improve surgical planning.	4
50. Yang G, Zhai Q, Zhu Y, Sun H, Putnis S, Luo C. The incidence of posterior tibial plateau fracture: an investigation of 525 fractures by using a CT-based classification system. <i>Arch Orthop Trauma Surg.</i> 2013;133(7):929-934.	Review/Other-Dx	525 tibial plateau fractures	To investigate the incidence of posterior tibial plateau fracture and propose a new CT-based 3-column classification system to guide fracture treatment.	Posterior tibial plateau fractures were found in 151 cases and had an incidence of 28.8 % in this studied population. Except for type III, posterior tibial plateau fractures were observed in each type of the Schatzker classification system. The Schatzker type VI, V, and IV fractures had the 3 highest percentages of posterior tibial plateau fractures, with 76.1%, 51.2%, and 22.4 %, respectively.	4

**Acute Trauma to the Knee
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
51. Stannard JP, Lopez R, Volgas D. Soft tissue injury of the knee after tibial plateau fractures. <i>J Knee Surg.</i> 2010;23(4):187-192.	Review/Other-Dx	103 patients	To document the pattern of ligament and meniscal injuries that occurs during high-energy tibial plateau fractures.	A significant difference exists between the groups regarding the incidence of ligament injuries ($P<0.05$) and also regarding high-energy (type IV, V, VI) versus low-energy (type I, II, III) fracture patterns. The incidence of knee dislocation was 32% for AO/OTA type 41B fractures and 23% for AO/OTA type 41C fractures. Knee dislocations (dislocated on presentation, bicruciate injury, or at least 3 ligament groups torn with a dislocatable knee) were most common in Schatzker type IV fractures (46%). 50 patients sustained meniscus tears (49%), with 25 medial menisci and 35 lateral menisci injuries. Tibial plateau fractures frequently have important soft tissue injuries that are difficult to diagnose on physical examination. High-energy fracture patterns (AO/OTA type 41C or Schatzker type IV, V, VI) clearly have a significantly higher incidence of ligament injury, and these patients should be carefully evaluated to rule out a spontaneously reduced knee dislocation.	4
52. Mustonen AO, Koivikko MP, Lindahl J, Koskinen SK. MRI of acute meniscal injury associated with tibial plateau fractures: prevalence, type, and location. <i>AJR Am J Roentgenol.</i> 2008;191(4):1002-1009.	Review/Other-Dx	78 menisci evaluated in 39 patients who had knee MDCT and MRI	Retrospective study to evaluate the prevalence, type, and location of meniscal injury, particularly to assess the prevalence of unstable meniscal tears that would justify routine use of MRI in the evaluation of acute knee trauma involving tibial plateau fractures.	24/39 patients had detectable abnormal menisci, for a total of 33 abnormal menisci (42%). Among the 33 meniscal abnormalities were 11 longitudinal tears (33%), 17 contusions (52%), 4 flap tears (12%), 6 horizontal tears (18%), and 6 radial tears (18%). Among the 16 patients with meniscal tears (41% of the 39), 14 patients had an unstable tear. No significant correlation was found between degree of articular depression and site or morphologic features of the meniscal injury. Correspondingly, no statistical correlation was evident between normal menisci and degree of articular depression, nor was a significant correlation found between differing fracture groups and meniscal findings.	4

**Acute Trauma to the Knee
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
53. Lazaro LE, Wellman DS, Sauro G, et al. Outcomes after operative fixation of complete articular patellar fractures: assessment of functional impairment. <i>J Bone Joint Surg Am.</i> 2013;95(14):e96 91-98.	Review/Other-Dx	30 patients	To quantify the functional outcomes of operative treatment of patellar fractures.	All fractures healed. There were 2 complications (7%) related to the surgery (wound dehiscence and refracture), and 11 patients (37%) underwent removal of symptomatic implants. The tibial plateau-patella angle demonstrated patella baja in 17 (57%) of the patients. Anterior knee pain during activities of daily living was experienced by 24 (80%) of the patients. Clinical improvement occurred over the first 6-months. However, functional impairment persisted at 12 months, with objective testing demonstrating that the knee extensor mechanism on the injured side had deficits in strength (-41%), power (-47%), and endurance (-34%) as compared with the uninjured side.	4
54. Paakkala A, Sillanpaa P, Huhtala H, Paakkala T, Maenpaa H. Bone bruise in acute traumatic patellar dislocation: volumetric magnetic resonance imaging analysis with follow-up mean of 12 months. <i>Skeletal Radiol.</i> 2010;39(7):675-682.	Observational-Dx	23 patients	To assess volumetric analysis of bone bruises in acute primary traumatic patellar dislocation by MRI and resolving resolution of bruises in follow-up MRI.	In the acute study 100% of patients showed bruising of the lateral femoral condyle and 96% bruising of the patella. The bruise was located at the medial femoral condyle in 30% and at the patellar median ridge in 74% of patients. The median volume of the femoral bruise was 25,831 mm(3) and of the patellar bruise 2,832 mm(3). At the follow-up study 22% of patients showed bruising of the lateral femoral condyle and 39% bruising of the patella, the median volumes of the bruises being 5,062 mm(3) and 1,380 mm(3), respectively. Larger patellar bruise volume correlated with larger femur bruise volume in the acute ($r = 0.389, P=0.074$) and the follow-up ($r = 1.000, P<0.01$) studies. Other MRI findings did not correlate significantly with bone bruise volumes.	2
55. Scolaro J, Bernstein J, Ahn J. Patellar fractures. <i>Clin Orthop Relat Res.</i> 2011;469(4):1213-1215.	Review/Other-Dx	N/A	To review the structure and function, injury considerations, diagnosis and classification, and treatment of patellar fractures.	No results stated in abstract.	4

**Acute Trauma to the Knee
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
56. Kirsch MD, Fitzgerald SW, Friedman H, Rogers LF. Transient lateral patellar dislocation: diagnosis with MR imaging. <i>AJR Am J Roentgenol.</i> 1993;161(1):109-113.	Review/Other-Dx	26 patients; 1,450 MR exams; 4 reviewers	Retrospective study of MRI exams to determine if MRI is useful in establishing the diagnosis of transient lateral patellar dislocation.	Specific components of the constellation of MR findings included disruption or sprain of the medial retinaculum in 25 (96%) of 26 patients, lateral patellar tilt or subluxation in 24 patients (92%), lateral femoral condyle contusion in 21 patients (81%), osteochondral injury in 15 patients (58%), and joint effusion in all 26 patients (100%). Concomitant injury to major ligaments or menisci was present in 8 (31%). Findings suggest that patients with transient lateral patellar subluxation have a distinctive constellation of MR findings that can be used to distinguish this entity from other common knee injuries.	4
57. Lance E, Deutsch AL, Mink JH. Prior lateral patellar dislocation: MR imaging findings. <i>Radiology.</i> 1993;189(3):905-907.	Review/Other-Dx	22 patients	To illustrate the constellation of MR findings that suggests prior patellar dislocation. Study also emphasizes the usefulness of axial short-inversion time inversion-recovery imaging in the evaluation of the acutely injured knee.	18 cases (82%) demonstrated hemarthrosis, medial retinacular disruption, and contusion of the lateral femoral condyle. Because of its sensitivity to subtle intraosseous signal abnormality, axial short-inversion time inversion-recovery imaging is a valuable adjunct in the evaluation of the acutely injured knee.	4
58. Colvin AC, West RV. Patellar instability. <i>J Bone Joint Surg Am.</i> 2008;90(12):2751-2762.	Review/Other-Dx	N/A	To review the management of patellar instability.	Nonoperative treatment includes physical therapy, focusing on strengthening of the gluteal muscles and the vastus medialis obliquus, and patellar taping or bracing. Recent literature does not support the use of an isolated lateral release for the treatment of patellar instability.	4

**Acute Trauma to the Knee
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
59. Elias DA, White LM, Fithian DC. Acute lateral patellar dislocation at MR imaging: injury patterns of medial patellar soft-tissue restraints and osteochondral injuries of the inferomedial patella. <i>Radiology</i> . 2002;225(3):736-743.	Review/Other-Dx	82 exams in 81 patients with lateral patellar dislocation: Control group - 100 MRI exams performed in 47 right knees and 53 left knees in 98 patients; 2 reviewers	To assess MRI findings after acute lateral patellar dislocation with emphasis on the medial patella restraints and to describe a medial patellar impaction deformity.	76% (62/82 examinations) showed medial retinacular disruption at its patellar insertion; 30% (25/82), at its midsubstance. The medial patellofemoral ligament femoral origin was identified in 87% (71/82); of these, 49% (35/71) showed injury. 48% (39/82) showed more than 1 site of injury to the medial stabilizers; 45% (37/82) showed edema or hemorrhage at the inferior vastus medialis obliquus. Injury to the medial retinaculum, medial patellofemoral ligament, and vastus medialis obliquus may be identified at MRI after acute lateral patellar dislocation. Concave impaction deformity of the inferomedial patella is a specific sign of prior lateral patellar dislocation.	4
60. Howells NR, Brunton LR, Robinson J, Porteus AJ, Eldridge JD, Murray JR. Acute knee dislocation: an evidence based approach to the management of the multiligament injured knee. <i>Injury</i> . 2011;42(11):1198-1204.	Review/Other-Dx	N/A	A comprehensive review of the recent literature on the evaluation and management of traumatic knee dislocations.	Knee dislocation is a serious injury with significant potential for associated neurovascular compromise. A high index of suspicion, appropriate clinical examination and early investigation are key in the diagnosis of associated limb threatening injuries. Early and appropriate surgical intervention leads to improved outcomes in comparison with non-operative management. Surgical intervention is challenging with potential for significant complications and should therefore be performed by experienced surgeons with a specialist interest in knee-ligament injury.	4

**Acute Trauma to the Knee
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
61. Boisrenoult P, Lustig S, Bonneville P, et al. Vascular lesions associated with bicruciate and knee dislocation ligamentous injury. <i>Orthop Traumatol Surg Res.</i> 2009;95(8):621-626.	Review/Other-Dx	67 patients	To analyze data extracted from the prospective series of the 2008 SOFCOT Symposium (dedicated to management of bicruciate knee lesions) and from an analysis of the literature, with emphasis on developing a diagnostic strategy for vascular lesions associated with bicruciate lesions.	67 patients were included. Mean dislocation reduction time was 2 hrs 45 min (max, 21 hrs). There were 9 vascular lesions (12%). Absence of vascular lesion could be confirmed in 58/59 patients exhibiting presence of peripheral pulses at initial examination. In 1 case, a vascular lesion was found on early imaging, but with no clinical consequence. In all 8 cases with associated clinical pulse abnormality, complementary vascular check-up confirmed the presence of a vascular lesion. Angioscan induced no error of vascular assessment in this series, with no false positives or false negatives. 1 patient underwent amputation for critical ischemia. 3 patients had vascular surgical treatment, 2 not undergoing secondary ligament surgery. 4 of the 5 patients whose vascular lesion was conservatively managed by simple observation were able to undergo the scheduled treatment for their ligament lesions.	4
62. Fleiter TR, Mervis S. The role of 3D-CTA in the assessment of peripheral vascular lesions in trauma patients. <i>Eur J Radiol.</i> 2007;64(1):92-102.	Review/Other-Dx	N/A	Review roles of diagnostic angiography and CTA in a trauma center.	3D-CTA with multislice CT can be used to replace the diagnostic angiography in patients with blunt or penetrating extremity injuries.	4
63. Rieger M, Mallouhi A, Tauscher T, Lutz M, Jaschke WR. Traumatic arterial injuries of the extremities: initial evaluation with MDCT angiography. <i>AJR Am J Roentgenol.</i> 2006;186(3):656-664.	Observational-Dx	87 patients	Retrospectively assess the accuracy of MDCT angiography as the initial diagnostic technique to describe arterial injury in patients with extremity trauma. Presence of arterial involvement was examined prospectively by a radiologist and retrospectively by 2 independent radiologists.	MDCT angiography yielded high accuracy in detection and characterization of traumatic arterial injuries and in recognizing an underlying dissection. Prospective sensitivity and specificity were 95% and 87%, respectively, and retrospective sensitivity and specificity were 99% and 87%, respectively. MDCT angiography provides significant and reproducible technique for the detection and characterization of arterial injuries.	2
64. Johnson ME, Foster L, DeLee JC. Neurologic and vascular injuries associated with knee ligament injuries. <i>Am J Sports Med.</i> 2008;36(12):2448-2462.	Review/Other-Dx	N/A	To explore the types, mechanisms, and classifications of common neurovascular complications of knee ligament injuries, discusses their diagnosis, and review the therapeutic options available to optimize patient outcomes.	Popliteal artery injuries require immediate intervention to help prevent limb loss. Peroneal and tibial nerve injuries can be a significant cause of morbidity and, therefore, require an understanding of their natural history, anatomy, and pathophysiologic implications to maximize functionality.	4

**Acute Trauma to the Knee
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
65. Tocci SL, Heard WM, Fadale PD, Brody JM, Born C. Magnetic resonance angiography for the evaluation of vascular injury in knee dislocations. <i>J Knee Surg.</i> 2010;23(4):201-207.	Observational-Dx	16 patients	To determine whether it may be prudent and convenient to obtain an MR angiogram at the same time as an MRI scan, with less morbidity and discomfort than with conventional angiography.	16 patients with frank and occult knee dislocations were prospectively evaluated over 2 years. After reduction, a physical exam was performed including ankle brachial index (ABI). With ankle brachial index <0.90, emergent vascular surgery consult and angiogram was performed. Patients with ankle brachial index >0.90 were observed for 3 days with serial physical exams, and MRI/MRA was performed as soon as possible. 16 dislocations were identified. 2/16 (12.5%) had abnormal ABIs and received an angiogram and subsequent revascularization. 2 had normal exams, but refused MRA. 12 had normal exams and received MRI/MRA showing a normal popliteal artery with no adverse events. Ankle brachial index had 100% sensitivity for vascular injury; however, there remains concern among treating surgeons about missing an occult injury such as an intimal tear.	3
66. Potter HG, Weinstein M, Allen AA, Wickiewicz TL, Helfet DL. Magnetic resonance imaging of the multiple-ligament injured knee. <i>J Orthop Trauma.</i> 2002;16(5):330-339.	Review/Other-Dx	21 patients	Retrospective search was performed to evaluate MRI and MRA in detecting soft tissue, neurovascular, and bony injury after multiple ligament knee injury, including knee dislocation.	6 patients had both conventional angiograms and MRA with 100% agreement between the studies. MRI is an accurate method of assessing soft tissue, osseous, and neural damage after knee dislocation.	4
67. Verma A, Su A, Golin AM, O'Marrah B, Amorosa JK. A screening method for knee trauma. <i>Acad Radiol.</i> 2001;8(5):392-397.	Observational-Dx	214 patients	Prospectively evaluate the efficacy of a single conventional radiograph of the knee in the detection of signs of knee fractures in adults with acute knee trauma.	Single lateral view has sensitivity of 100% (95% CI = 94.3, 100) and probability of not having a fracture if lateral view is normal (NPV) was 100%. This would reduce need for additional radiographs by 67%.	1

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.

Dx = Diagnostic

Tx = Treatment

Abbreviations Key

ACL = Anterior cruciate ligament
CI = Confidence interval
CT = Computed tomography
CTA = Computed tomography angiography
ED = Emergency department
MDCT = Multidetector computed tomography
MRA = Magnetic resonance angiography
MRI = Magnetic resonance imaging
NPV = Negative predictive value
PPV = Positive predictive value
QoL = Quality-of-life
SPECT = Single-photon emission tomography
US = Ultrasound