

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
1. Blankenbaker DG, Tuite MJ. The painful hip: new concepts. <i>Skeletal Radiol.</i> 2006;35(6):352-370.	Review/Other-Dx	N/A	To review the normal MR anatomy of the hip and the imaging findings of internal derangements, snapping hip, and femoral acetabular impingement; to describe the role of MR arthrography in evaluating the patient with suspected labral and articular cartilage abnormalities, as well as the pitfalls in interpretation; to review the causes of a snapping hip, and the role of US in evaluating and guiding treatment of the snapping iliopsoas tendon; and, to review the radiographic and MRI signs of FAI, a cause of early degenerative joint disease and hip pain.	No results stated in abstract.	4
2. Byrd JW. Evaluation of the hip: history and physical examination. <i>N Am J Sports Phys Ther.</i> 2007;2(4):231-240.	Review/Other-Dx	N/A	To present a systematic examination process that outlines important components in each of the evaluation areas of history and physical examination (including inspection, measurements, symptom localization, muscle strength, and special tests).	Using a thoughtful approach and methodical examination techniques, most hip joint problems can be detected. A proper treatment strategy can then be implemented including the role of conservative measures and interventional methods based on an accurate diagnosis.	4
3. Suarez JC, Ely EE, Mutnal AB, et al. Comprehensive approach to the evaluation of groin pain. <i>J Am Acad Orthop Surg.</i> 2013;21(9):558-570.	Review/Other-Dx	N/A	To review a comprehensive approach to the evaluation of groin pain.	A comprehensive history and physical examination can guide the evaluation of groin pain.	4
4. Saito J, Ohtori S, Kishida S, et al. Difficulty of diagnosing the origin of lower leg pain in patients with both lumbar spinal stenosis and hip joint osteoarthritis. <i>Spine (Phila Pa 1976).</i> 2012;37(25):2089-2093.	Review/Other-Dx	420 patients	To present the difficulty of diagnosing the origin of lower leg pain in patients with lumbar spinal stenosis and hip joint arthritis.	Leg pain did not resolve after lumbar surgery in all patients. Conservative treatment was not effective from 6 to 12 months, so ultimately we performed ipsilateral total hip replacement for all patients and they became symptom-free.	4

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5. Karrasch C, Lynch S. Practical approach to hip pain. <i>Med Clin North Am.</i> 2014;98(4):737-754, xi.	Review/Other-Dx	N/A	To discuss practical approaches to hip pain.	Hip pain is a common complaint among patients presenting to outpatient clinics. Stratifying patients based on age, acuity, and location of pain (extra-articular vs intra-articular) can help to aid in appropriate imaging and timely referral to an orthopedic surgeon. A thorough history and an organized physical examination combined with radiographs are usually sufficient to diagnose most hip complaints. If the diagnosis remains uncertain, MRI, usually with intra-articular gadolinium, is the imaging modality of choice in diagnosing both intra-articular and extra-articular pathologies.	4
6. Alvarez C, Chicheportiche V, Lequesne M, Vicaut E, Laredo JD. Contribution of helical computed tomography to the evaluation of early hip osteoarthritis: a study in 18 patients. <i>Joint Bone Spine.</i> 2005;72(6):578-584.	Observational-Dx	18 patients, 2 observers	A retrospective study to demonstrate that helical CT arthrography with multiplanar reformations can document cartilage lesions and their characteristics in patients with suspected hip OA and normal or inconclusive hip radiographs.	In patients with hip pain and normal radiographs, helical CT arthrography can provide a diagnosis of hip OA by showing cartilage lesions, which are usually located in the anterosuperior part of the acetabulum. Interobserver reproducibility was excellent for the helical CT arthrography diagnosis of cartilage lesions.	3
7. Perdikakis E, Karachalios T, Katonis P, Karantanas A. Comparison of MR-arthrography and MDCT-arthrography for detection of labral and articular cartilage hip pathology. <i>Skeletal Radiol.</i> 2011;40(11):1441-1447.	Experimental-Dx	14 hips of 10 patients	To compare the diagnostic ability of MR arthrography and MDCT arthrography in depicting surgically proven hip labral tears and articular cartilage degradation.	Disagreement between the senior observer and the fellow observer was recorded in 3 cases of labral tearing with MR arthrography and 6 with MDCT arthrography. Disagreement was also found in 4 cases of cartilage erosion with both MR arthrography and MDCT arthrography. The percent sensitivity, specificity, accuracy, and PPV for correctly assessing the labral tear were as follows for MR arthrography/MDCT arthrography, respectively: 100/15, 50/13, 90/14, and 90/13 ($P<0.05$). The same values for cartilage assessment were 63/66, 33/40, 50/57 and 55/66 ($P>0.05$).	2

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8. Troelsen A, Mechlenburg I, Gelineck J, Bolvig L, Jacobsen S, Soballe K. What is the role of clinical tests and ultrasound in acetabular labral tear diagnostics? <i>Acta Orthop.</i> 2009;80(3):314-318.	Observational-Dx	18 patients (18) hips	Prospective blinded study to examine the diagnostic validity of clinical tests and US as compared with MR arthrography (gold standard).	MR arthrography identified labral tears in 17 of the 18 hips. US had sensitivity of 94%, PPV of 94%, and was false negative in only 1 case compared to MR arthrography. The impingement test had the best diagnostic ability of the clinical tests, with a sensitivity of 59% and a specificity of 100%. PPV was 100% while the NPV was 13%. The impingement test is helpful in identifying acetabular labral tears. If this test is negative and if a labral tear is still suspected, US can reliably diagnose most tears of the acetabular labrum. MR arthrography is indicated in cases where US is negative, but the patient suffers continued, specific symptoms.	1
9. Jung JY, Kim GU, Lee HJ, Jang EC, Song IS, Ha YC. Diagnostic value of ultrasound and computed tomographic arthrography in diagnosing anterosuperior acetabular labral tears. <i>Arthroscopy.</i> 2013;29(11):1769-1776.	Observational-Dx	36 hips; 34 patients	To investigate the sensitivity, specificity, and accuracy of US as well as the CT arthrography findings and arthroscopic findings for the diagnosis of anterosuperior acetabular tear and correlated tear types using the Lage classification system on US and CT arthrography compared with the arthroscopic findings.	The sensitivity, specificity, and accuracy for US detection of labral tear before injection/after injection were 58%/79%, 67%/58%, and 61%/72%, respectively, for observer 1 and 75%/92%, 25%/42%, and 58%/75%, respectively, for observer 2. The sensitivity, specificity, and accuracy for CT arthrography detection of labral tears were 96%, 92%, and 94%, respectively, for observer 1 and 88%, 92%, and 89%, respectively, for observer 2. When the US classification was compared with the arthroscopic findings of observer 1 and observer 2, the accuracy before injection/after injection was only 53%/67% and 58%/75%, respectively. The accuracy of morphologic classification of CT arthrography and arthroscopic findings of observer 1 and observer 2 was 83% and 75%, respectively. Interobserver correlation before injection and at CT arthrography was poor (kappa = 0.056) and moderate (kappa = 0.642), respectively.	2
10. Segall G, Delbeke D, Stabin MG, et al. SNM practice guideline for sodium 18F-fluoride PET/CT bone scans 1.0. <i>J Nucl Med.</i> 2010;51(11):1813-1820.	Review/Other-Dx	N/A	To assist health care professionals in performing, interpreting, and reporting the results of PET/CT bone scans performed with 18F-fluoride.	No results stated in abstract.	4

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11. Taljanovic MS, Hunter TB, Fitzpatrick KA, Krupinski EA, Pope TL. Musculoskeletal magnetic resonance imaging: importance of radiography. <i>Skeletal Radiol.</i> 2003;32(7):403-411.	Review/Other-Dx	1,002 patients, 1,030 MSK MRI studies	To determine the usefulness of radiography for interpretation of MSK MRI studies.	Radiographs are important, and sometimes essential, initial complementary study for reading of MSK MRI examinations. Recommended that radiographs are available when MSK MRI studies are interpreted.	4
12. Kinds MB, Welsing PM, Vignon EP, et al. A systematic review of the association between radiographic and clinical osteoarthritis of hip and knee. <i>Osteoarthritis Cartilage.</i> 2011;19(7):768-778.	Review/Other-Dx	45 studies	To evaluate which methodological criteria are important to detect an association between radiographic and clinical OA of hip and knee.	The literature search resulted in 39 studies describing an association between radiographic and clinical OA. The frequency of an association between radiographic and clinical OA outcome measures diminished when less quality criteria were fulfilled. Specifically the criterion for standardized outcome measures appeared important in the detection of an association. The association was not influenced by patient characteristics. Only 4 studies were identified that fulfilled all quality criteria and in these studies an association was found for the knee joint and an inconsistent association was found for the hip joint.	4

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13. Clohisy JC, Carlisle JC, Beaulé PE, et al. A systematic approach to the plain radiographic evaluation of the young adult hip. <i>J Bone Joint Surg Am.</i> 2008;90 Suppl 4:47-66.	Review/Other-Dx	N/A	To summarize the recommendations of the ANCHOR (Academic Network for Conservational Hip Outcomes Research) study group regarding the most important aspects of radiographic technique and image interpretation to evaluate the symptomatic, skeletally mature hip.	We have outlined a systematic approach to radiographic evaluation for the adult patient who has clinical signs and symptoms of hip dysfunction. It is our opinion that such a structured review of plain radiographs should help to facilitate a more reliable diagnostic and surgical decision-making process. However, it should be emphasized that an accurate diagnosis can only be obtained by interpreting radiographic findings in conjunction with a detailed history and physical examination. Advanced imaging studies, such as a MR arthrogram and/or a CT scan, can also be helpful to confirm a suspected diagnosis, identify mild impingement abnormalities, or act as a supplement in the treatment planning process. Nevertheless, many patients with prearthritic or early arthritic hip dysfunction have developmental dysplasia of the hip and/or FAI that is readily apparent on properly made radiographs, making it important to be able to adequately and reliably recognize the structural features of these disorders.	4
14. Newberg AH, Newman JS. Imaging the painful hip. <i>Clin Orthop Relat Res.</i> 2003(406):19-28.	Review/Other-Dx	N/A	A review of the changes in the imaging algorithm for hip pain that have resulted from the advent of MRI and MR arthrography.	By combining conventional MRI with capsular distention afforded by arthrography, MR arthrography has become the imaging examination of choice for disorders of the acetabular labrum and for the evaluation of articular cartilage at the hip.	4
15. Jacobson JA, Bedi A, Sekiya JK, Blankenbaker DG. Evaluation of the painful athletic hip: imaging options and imaging-guided injections. <i>AJR Am J Roentgenol.</i> 2012;199(3):516-524.	Review/Other-Dx	N/A	To review diagnostic imaging tests and injections that provides important information for clinical management of patients with sports-related hip pain.	In the evaluation of sports-related hip symptoms, MR arthrography is often used to evaluate intra-articular pathology of the hip. The addition of short- and long-acting anesthetic agents with the MR arthrography injection adds additional information that can distinguish between symptomatic and asymptomatic imaging findings. Osseous abnormalities can be characterized with radiography, MRI, or CT. US is important in the assessment of iliopsoas abnormalities, including tendon snapping, and to guide diagnostic anesthetic injection.	4

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16. Peat G, Croft P, Hay E. Clinical assessment of the osteoarthritis patient. <i>Best Pract Res Clin Rheumatol</i> . 2001;15(4):527-544.	Review/Other-Dx	N/A	To explore some of the practical implications of assessing the clinical syndrome of OA as a chronic regional pain disorder and to examine some of the evidence available to judge its usefulness.	The usefulness of assessing clinical OA as a regional pain disorder is uncertain. Even if this were demonstrated, the concept of OA as a structural disease should be retained as an integral part.	4
17. Chong T, Don DW, Kao MC, Wong D, Mitra R. The value of physical examination in the diagnosis of hip osteoarthritis. <i>J Back Musculoskelet Rehabil</i> . 2013;26(4):397-400.	Observational-Dx	10 patients	To compare the sensitivity of physical examination (internal rotation of the hip) with radiographs (using the Kellgren-Lawrence grading scale) in the diagnosis of clinically significant hip OA.	Based on Fisher's exact test, there was no association between severity of radiographic hip arthritis and pain relief with intra-articular anesthetic/steroid injection ($P=0.45$). Physical examination (provocative hip internal rotation) however was associated with a significant decrease in VAS pain score after intra-articular lidocaine and corticosteroid hip injection ($P=0.022$).	3
18. Menashe L, Hirko K, Losina E, et al. The diagnostic performance of MRI in osteoarthritis: a systematic review and meta-analysis. <i>Osteoarthritis Cartilage</i> . 2012;20(1):13-21.	Meta-analysis	16 studies; 1,220 patients	To determine the diagnostic utility of MRI in OA through a meta-analysis of published studies.	Of 20 relevant studies identified from the literature, 16 reported complete data and were included in the meta-analysis, with a total of 1220 patients (1071 with OA and 149 without). Overall sensitivity from pooling data of all the included studies was 61% [95% CI, 53–68], specificity was 82% (95% CI, 77–87), PPV was 85% (95% CI, 80–88), and NPV was 57% (95% CI, 43–70). The ROC showed an AUC of 0.804. There was significant heterogeneity in the above parameters ($I(2)>83\%$). With histology as the reference standard, sensitivity increased to 74% and specificity decreased to 76% compared with all reference standards combined. When arthroscopy was used as the reference standard, sensitivity increased to 69% and specificity to 93% compared with all reference standards combined.	M

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19. Xu L, Hayashi D, Guermazi A, et al. The diagnostic performance of radiography for detection of osteoarthritis-associated features compared with MRI in hip joints with chronic pain. <i>Skeletal Radiol.</i> 2013;42(10):1421-1428.	Observational-Dx	44 patients	To evaluate the diagnostic performance of radiography for the detection of MRI-detected OA-associated features in various articular subregions of the hip joint.	Compared with MRI, radiography provided high specificity (0.76–0.90) but variable sensitivity (0.44–0.78) for diffuse cartilage damage (using JSN as an indirect marker), femoral osteophytes, acetabular subchondral cysts and bone attrition of the femoral head, and a low specificity (0.42 and 0.58) for acetabular osteophytes. The AUC of radiography for detecting overall diffuse cartilage damage, marginal osteophytes, subchondral cysts and bone attrition was 0.76, 0.78, 0.67, and 0.82, respectively.	3
20. Westacott DJ, Minns JJ, Foguet P. The diagnostic accuracy of magnetic resonance imaging and ultrasonography in gluteal tendon tears--a systematic review. <i>Hip Int.</i> 2011;21(6):637-645.	Meta-analysis	7 studies	To systematically review the peer-reviewed literature to establish the accuracy of MRI and US in the diagnosis of gluteal tendon tears in patients with persistent lateral hip pain or Greater Trochanteric Pain Syndrome (GTPS).	MRI had sensitivity of 33%–100%, specificity of 92%–100%, PPV of 71%–100% and NPV of 50%. False-positives were common. High signal located superior to the trochanter had a stronger association with tears. US had a sensitivity of 79%–100% and PPV of 95%–100%.	M
21. Bancroft LW, Peterson JJ, Kransdorf MJ. MR imaging of tumors and tumor-like lesions of the hip. <i>Magn Reson Imaging Clin N Am.</i> 2005;13(4):757-774.	Review/Other-Dx	N/A	To review the role of MRI in the diagnosis of tumors and tumor-like lesions of the hip.	Radiographs can depict the extent of disease; any characteristic calcifications; and osseous changes. MRI is now the preferred imaging modality of choice for evaluating osseous and soft-tissue masses of the hip by providing information for diagnosis and staging. The MRI signal characteristics and enhancement patterns of malignant and benign hip tumors permit specific diagnoses in some cases. Synovial-based tumor-like processes of the hip can be characterized by MR signal characteristics. MRI can also serve to exclude underlying osseous or soft-tissue tumors when radiographs display aggressive features of tumor-like processes.	4
22. Beltran J, Opsha O. MR imaging of the hip: osseous lesions. <i>Magn Reson Imaging Clin N Am.</i> 2005;13(4):665-676, vi.	Review/Other-Dx	N/A	To review role of MRI in the diagnosis of hip osseous lesions.	Hip trauma and AVN are the most frequent indications for MRI. Other entities for which MRI has proven its usefulness include subchondral fractures, osteochondritis dissecans, transient osteoporosis, bone tumors, inflammatory and infectious processes, and a variety of bone marrow disorders.	4

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23. Bencardino JT, Mellado JM. Hamstring injuries of the hip. <i>Magn Reson Imaging Clin N Am.</i> 2005;13(4):677-690, vi.	Review/Other-Dx	N/A	To review role of MRI in the diagnosis of hamstring injuries of the hip.	MRI may provide accurate information with regard to the site, grade, and prognosis of hamstring lesions.	4
24. Bordalo-Rodrigues M, Rosenberg ZS. MR imaging of the proximal rectus femoris musculotendinous unit. <i>Magn Reson Imaging Clin N Am.</i> 2005;13(4):717-725.	Review/Other-Dx	N/A	To discuss the role of MRI in the diagnosis of the proximal rectus femoris musculotendinous unit.	MRI is a helpful for diagnosing and grading proximal rectus femoris injuries. MRI is also valuable in predicting the length of recovery and rehabilitation time of musculotendinous strains and in presurgical planning when resection of a chronic hematoma, deep scar tissue, or a pseudocyst is contemplated.	4
25. Bredella MA, Stoller DW. MR imaging of femoroacetabular impingement. <i>Magn Reson Imaging Clin N Am.</i> 2005;13(4):653-664.	Review/Other-Dx	N/A	To discuss the role of MRI in the diagnosis of FAI, a common cause of OA in the hip.	MRI and MR arthrography are accurate modalities to demonstrate acetabular labral disease and adjacent cartilage damage as well as the subchondral cysts and synovial herniation pits associated with impingement. MRI is also able to detect underlying subtle anatomic variations of the femoral head-neck junction and acetabulum associated with FAI.	4
26. Dillon JE, Connolly SA, Connolly LP, Kim YJ, Jaramillo D. MR imaging of congenital/developmental and acquired disorders of the pediatric hip and pelvis. <i>Magn Reson Imaging Clin N Am.</i> 2005;13(4):783-797.	Review/Other-Dx	N/A	To review the role of MRI in the diagnosis of congenital/developmental and acquired disorders of the pediatric hip and pelvis.	MRI provides an accurate method of evaluating the hip and pelvis. The soft-tissue resolution of MRI is superior to CT and is vital for purposes of imaging cartilage.	4
27. Dwek J, Pfirrmann C, Stanley A, Pathria M, Chung CB. MR imaging of the hip abductors: normal anatomy and commonly encountered pathology at the greater trochanter. <i>Magn Reson Imaging Clin N Am.</i> 2005;13(4):691-704, vii.	Review/Other-Dx	N/A	To review the anatomy and pathologic findings of the osseous and soft-tissue anatomy of the greater trochanter.	A detailed knowledge of anatomy is useful in MRI interpretation.	4
28. Koulouris G, Morrison WB. MR imaging of hip infection and inflammation. <i>Magn Reson Imaging Clin N Am.</i> 2005;13(4):743-755.	Review/Other-Dx	N/A	To discuss the role of MRI in the diagnosis of hip infection and inflammation.	MRI is recommended for demonstrating the manifestations and sequelae of the infective and inflammatory conditions common to the hip. Combining the clinical history and results and other imaging modalities yields a higher degree of specificity.	4

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29. Malizos KN, Zibis AH, Dailiana Z, Hantes M, Karachalios T, Karantanas AH. MR imaging findings in transient osteoporosis of the hip. <i>Eur J Radiol</i> . 2004;50(3):238-244.	Observational-Dx	42 patients	A prospective study of patients with acute hip pain whose clinical and radiographic findings were not relevant to AVN. Authors described the MRI findings including perfusion imaging, in association with the course of acute bone marrow oedema syndrome, in a group of patients with acute hip pain and a final diagnosis of transient osteoporosis of the hip.	The acute bone marrow oedema syndrome MRI pattern varies and is most commonly appearing on radiographs as osteopenia. Absence of subcondral lesions, delayed peak enhancement of the abnormal marrow on perfusion images, and sparing of subchondral zone from marrow oedema are MRI findings highly correlated to transient osteoporosis of the hip.	3
30. Mellado JM, Bencardino JT. Morel-Lavallee lesion: review with emphasis on MR imaging. <i>Magn Reson Imaging Clin N Am</i> . 2005;13(4):775-782.	Review/Other-Dx	N/A	To discuss the role of MRI in the diagnosis of Morel-Lavallee lesion.	MRI is recommended in the assessment of Morel-Lavallee lesions in the hip region.	4
31. Nelson EN, Kassarian A, Palmer WE. MR imaging of sports-related groin pain. <i>Magn Reson Imaging Clin N Am</i> . 2005;13(4):727-742.	Review/Other-Dx	N/A	To discuss the role of MRI in the diagnosis of sports-related groin pain.	MRI of the hip and pelvis can provide a prompt and specific diagnosis, enabling early treatment.	4
32. Shabshin N, Rosenberg ZS, Cavalcanti CF. MR imaging of iliopsoas musculotendinous injuries. <i>Magn Reson Imaging Clin N Am</i> . 2005;13(4):705-716.	Review/Other-Dx	N/A	To discuss the role of MRI in the diagnosis of the iliopsoas musculotendinous injuries.	MRI is most accurate for diagnosing nondynamic diseases of the iliopsoas compartment as well as for ruling out other abnormalities of the hip joint and surrounding structures. When a snapping hip is being investigated or corticosteroid injection is warranted, US can be of help in providing a dynamic study and by guiding the injection.	4
33. Song WS, Yoo JJ, Koo KH, Yoon KS, Kim YM, Kim HJ. Subchondral fatigue fracture of the femoral head in military recruits. <i>J Bone Joint Surg Am</i> . 2004;86-A(9):1917-1924.	Review/Other-Dx	5 patients, 7 hips	To ascertain the characteristics of the rare condition of subchondral stress fracture of the femoral head by assessing the clinical course as well as radiographs, bone scintigrams, and MRI.	Definite abnormal findings were observed on the initial radiographs of 4 hips in 3 patients, and the femoral head was markedly collapsed in 2/4 hips. Bone scintigrams were made of 5 hips in 4 patients. In all affected hips, MRI demonstrated a localized or diffuse bone-marrow-edema pattern in the femoral head and/or neck. A subchondral fracture line (a MR crescent sign) was identified in all hips.	4
34. Vande Berg BC, Malghem J, Goffin EJ, Duprez TP, Maldague BE. Transient epiphyseal lesions in renal transplant recipients: presumed insufficiency stress fractures. <i>Radiology</i> . 1994;191(2):403-407.	Review/Other-Dx	16 patients 47 joints, 2 observers reviewed radiographs, 3 observers reviewed MR	To determine epiphyseal abnormalities in renal transplant recipients. Conventional radiographs and MRI were determined and correlated.	In 42/47 joints, T1-weighted MRI depicted 106 ill-delimited areas of low signal intensity. Stress fractures may have an MR appearance similar to ON but are noted to disappear in one year's time.	4

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35. Yamamoto T, Schneider R, Bullough PG. Subchondral insufficiency fracture of the femoral head: histopathologic correlation with MRI. <i>Skeletal Radiol.</i> 2001;30(5):247-254.	Observational-Dx	7 patients	Retrospective review to correlate MR appearance of insufficiency fractures of the femoral head with histology.	Fractures demonstrate a subcortical, low signal band on T1-weighted images but diffuse bright signal on T2-weighted images (differs from ON double-line sign).	4
36. Zoga AC, Morrison WB. Technical considerations in MR imaging of the hip. <i>Magn Reson Imaging Clin N Am.</i> 2005;13(4):617-634, v.	Review/Other-Dx	N/A	To discuss technical considerations in MRI of the hip.	MRI has become an integral tool in diagnosis of hip disease including osseous, articular and periarticular soft-tissue structures.	4
37. Hodnett PA, Shelly MJ, MacMahon PJ, Kavanagh EC, Eustace SJ. MR imaging of overuse injuries of the hip. <i>Magn Reson Imaging Clin N Am.</i> 2009;17(4):667-679, vi.	Review/Other-Dx	N/A	To review the importance of MRI in the evaluation of chronic hip pain and overuse injuries.	Image interpretation of the hip can be difficult because of the complex anatomy and the varied pathology that athletes can present with. The differential diagnosis in adults is diverse and includes such common entities as stress fracture, avulsive injuries, snapping-hip syndrome, iliopsoas bursitis, FAI syndrome, tendinosis, and tears of the gluteal musculature.	4
38. Lee KS, Rosas HG, Phancoo JP. Snapping hip: imaging and treatment. <i>Semin Musculoskelet Radiol.</i> 2013;17(3):286-294.	Review/Other-Dx	N/A	To discuss the common and uncommon causes of snapping hip, the advanced imaging techniques that now give us a better understanding of the underlying mechanism, and an image-guided diagnostic and therapeutic algorithm that helps to identify surgical candidates.	No results stated in abstract.	4
39. De Smet AA, Best TM. MR imaging of the distribution and location of acute hamstring injuries in athletes. <i>AJR Am J Roentgenol.</i> 2000;174(2):393-399.	Review/Other-Dx	15 consecutive patients	To describe the MR appearance and location of acute hamstring muscle injuries.	Biceps femoris most commonly involved. One-third of patients injured more than 1 muscle. 40% of injuries were located distally.	4
40. Kingzett-Taylor A, Tirman PF, Feller J, et al. Tendinosis and tears of gluteus medius and minimus muscles as a cause of hip pain: MR imaging findings. <i>AJR Am J Roentgenol.</i> 1999;173(4):1123-1126.	Review/Other-Dx	35 MR exams	To describe the MR appearance of degeneration and tears of the gluteus muscles.	Degeneration and tears seen as high signal foci similar to tendon abnormalities elsewhere. Trochanteric bursitis frequently accompanies gluteal tendon tears/degeneration.	4
41. Boutry N, Khalil C, Jaspert M, Marie-Helene V, Demondion X, Cotten A. Imaging of the hip in patients with rheumatic disorders. <i>Eur J Radiol.</i> 2007;63(1):49-58.	Review/Other-Dx	N/A	To discuss imaging of the hip in patients with rheumatic disorders.	IV gadolinium-chelate agents are used to differentiate between joint fluid and synovitis.	4

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42. Panicek DM, Gatsonis C, Rosenthal DI, et al. CT and MR imaging in the local staging of primary malignant musculoskeletal neoplasms: Report of the Radiology Diagnostic Oncology Group. <i>Radiology</i> . 1997;202(1):237-246.	Observational-Dx	367 eligible patients: CT scans 2 reviewers, MRI 2 reviewers	Multicenter trial to determine relative accuracy of CT and MRI for evaluation of primary malignant bone and soft-tissue tumor. 183 patients had primary bone tumors; 133 had primary soft-tissue tumors.	In determining tumor involvement of muscle, bone, joints, or neurovascular structures, CT and MRI were not statistically different. Concludes that CT and MRI are equally accurate in the local staging of malignant bone and soft-tissue neoplasms in the specific anatomic sites studied.	2
43. Sundaram M, McGuire MH, Herbold DR. Magnetic resonance imaging of soft tissue masses: an evaluation of fifty-three histologically proven tumors. <i>Magn Reson Imaging</i> . 1988;6(3):237-248.	Observational-Dx	48 patients, 53 tumors	Comparative study to evaluate histologically proven soft-tissue masses with MRI and CT.	MRI is superior for detection, but has limited value in characterizing soft-tissue sarcomas.	3
44. Zimmer WD, Berquist TH, McLeod RA, et al. Bone tumors: magnetic resonance imaging versus computed tomography. <i>Radiology</i> . 1985;155(3):709-718.	Review/Other-Dx	52 patients, 3 reviewers	To examine the value of MRI in the evaluation of bone tumors, attempt to identify criteria useful in distinguishing various types of tumors, and compare MR with CT. 45 patients had CT scans available for comparison.	For extent of tumor in marrow, MR was superior to CT in 33% of cases, about equal to CT in 64%, and inferior to CT in 2%. For delineating the extent of tumor in soft-tissue, MR was superior to CT in 38% of cases and about equal to CT in 62%. CT was superior in all cases for demonstrating calcific deposits and pathologic fractures.	4
45. Kursunoglu-Brahme S, Riccio T, Weisman MH, et al. Rheumatoid knee: role of gadopentetate-enhanced MR imaging. <i>Radiology</i> . 1990;176(3):831-835.	Review/Other-Dx	14 patients	Prospective study to determine the ability of gadopentetate-enhanced MRI to distinguish between joint effusion and inflamed synovium in the knee joints of patients with rheumatoid arthritis.	Gadopentetate allows differentiation between synovial thickening and joint effusion in the knee, which may impact treatment decisions.	4
46. Choudur HN, Ellins ML. Ultrasound-guided gadolinium joint injections for magnetic resonance arthrography. <i>J Clin Ultrasound</i> . 2011;39(1):6-11.	Review/Other-Dx	100 consecutive patients	To determine the feasibility and accuracy of US-guided gadolinium injection for MR arthrography of shoulders, wrists, hips, and knee joints as an alternate technique to fluoroscopy.	99 of the 100 patients were successfully injected with gadolinium under US guidance. One patient had a vasovagal reaction after local anesthetic injection and the procedure was aborted. US is an effective alternate guidance technique for the injection of gadolinium into shoulder, hip, knee, and wrist joints for MR arthrography. Its advantages are cost effectiveness, ease of performance, and lack of radiation.	4

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47. Migliore A, Granata M, Tormenta S, et al. Hip viscosupplementation under ultrasound guidance reduces NSAID consumption in symptomatic hip osteoarthritis patients in a long follow-up. Data from Italian registry. <i>Eur Rev Med Pharmacol Sci.</i> 2011;15(1):25-34.	Observational-Dx	2343 patients	Multicentre, open and retrospective study to investigate if non-steroidal anti-inflammatory drug consumption may be reduced by the use of US-guided intra-articular injection of several hyaluronic acid products in hip joint administered in patients affected by symptomatic hip OA.	Regarding primary endpoint, the consumption of non-steroidal anti-inflammatory drug was reduced by 48.2% at the third month when compared with baseline values. This sparing effect increased at 12th and 24th month with a reduction respectively of 50% and 61% in comparison to baseline values. These differences were statistically significant. These data point out that intra-articular hyaluronan preparations provide OA pain relief and reduce non-steroidal anti-inflammatory drug consumption in a large cohort of patients for a long period of follow-up. Multiple courses of viscosupplementation are required to maintain low dose of non-steroidal anti-inflammatory drug consumption over time. Nonsteroidal anti-inflammatory drug consumption is strictly related to a high gastrointestinal and cardiovascular mortality and morbidity rate, instead hyaluronic acid intra-articular treatment is well tolerated and is associated with a low incidence of adverse effects.	3
48. Cardinal E, Buckwalter KA, Capello WN, Duval N. US of the snapping iliopsoas tendon. <i>Radiology.</i> 1996;198(2):521-522.	Review/Other-Dx	3 patients	Case report to determine the value of US in the diagnosis of snapping iliopsoas tendon.	US is a useful dynamic noninvasive technique for diagnosing snapping iliopsoas tendon.	4
49. Deslandes M, Guillin R, Cardinal E, Hobden R, Bureau NJ. The snapping iliopsoas tendon: new mechanisms using dynamic sonography. <i>AJR Am J Roentgenol.</i> 2008;190(3):576-581.	Review/Other-Dx	14 patients; 18 hips	To describe new mechanisms responsible for the snapping iliopsoas tendon using dynamic US.	In 14/18 hips, the snapping was provoked by the sudden flipping of the iliopsoas tendon around the iliac muscle, allowing abrupt contact of the tendon against the pubic bone and producing an audible snap. Other causes of snapping iliopsoas tendon were bifid tendon heads flipping over one another (n = 3) and iliopsoas tendon impinging over an anterior paralabral cyst (n = 1).	4
50. Berquist TH. Diagnostic and therapeutic injections as an aid to musculoskeletal diagnosis. <i>Semin intervent Radiol.</i> 1993;10(4):326-343.	Review/Other-Dx	N/A	Describes use of diagnostic and therapeutic injections in MSK diagnosis.	Injections allow pain localization and short term diagnosis.	4

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
51. Byrd JW, Jones KS. Diagnostic accuracy of clinical assessment, magnetic resonance imaging, magnetic resonance arthrography, and intra-articular injection in hip arthroscopy patients. <i>Am J Sports Med.</i> 2004;32(7):1668-1674.	Review/Other-Dx	40 patients	A retrospective review of prospectively collected data to evaluate the accuracy of clinical assessment, high-resolution MRI, MRI with gadolinium arthrography and intra-articular bupivacaine injection, using arthroscopy as the definitive diagnosis.	Clinical assessment accurately determined the existence of intra-articular abnormality but was poor at defining its nature. MR arthrography was much more sensitive than MRI at detecting various lesions but had twice as many false-positive interpretations. Response to an intra-articular injection of anesthetic was a 90% reliable indicator of intra-articular abnormality.	4
52. Migliore A, Tormenta S, Lagana B, et al. Safety of intra-articular hip injection of hyaluronic acid products by ultrasound guidance: an open study from ANTIAGE register. <i>Eur Rev Med Pharmacol Sci.</i> 2013;17(13):1752-1759.	Observational-Tx	1,906 patients	To report in an extended series of patients the safety of developed a standardized technique for US guided intra-articular injection of the hip joint with the purpose of extending routine intra-articular injection of hyaluronans and steroids to the hip, as commonly used in the knee.	The standardized technique was used to inject 1906 patients with 4002 injections of hyaluronan products over a 4-year period. The treatment was well tolerated with few, and exclusively local, side effects.	2
53. Adler RS, Buly R, Ambrose R, Sculco T. Diagnostic and therapeutic use of sonography-guided iliopsoas peritendinous injections. <i>AJR Am J Roentgenol.</i> 2005;185(4):940-943.	Review/Other-Dx	39 patients	To review authors experience performing US-guided iliopsoas bursal/peritendinous injections as a diagnostic and therapeutic tool in the workup and treatment of patients with hip pain.	US-guided iliopsoas bursal/peritendinous injections are useful in determining the cause of hip pain. They can provide relief to most patients with iliopsoas tendinosis/bursitis after hip replacement. The results of injection alone are not as successful in cases of idiopathic iliopsoas tendinosis/bursitis, but the technique can help determine which patients may benefit from a surgical tendon release.	4
54. Pierannunzii L, Tramontana F, Gallazzi M. Case report: calcific tendinitis of the rectus femoris: a rare cause of snapping hip. <i>Clin Orthop Relat Res.</i> 2010;468(10):2814-2818.	Review/Other-Dx	1 patient	To report an unusual case in which a calcific tendinitis of the rectus femoris direct head impinged against the overlying iliacus muscle, resulting in a painful coxa saltans.	The exclusive involvement of the direct head hid the calcium deposit on standard radiographs, whereas MRI suggested but poorly showed the tendon disease. Dynamic US and CT scanning allowed a precise diagnosis and subsequent treatment with CT-guided steroid injection.	4
55. Luk WH, Au-Yeung AW, Yang MK. Diagnostic value of SPECT versus SPECT/CT in femoral avascular necrosis: preliminary results. <i>Nucl Med Commun.</i> 2010;31(11):958-961.	Observational-Dx	22 patients	To investigate the clinical value of conventional Tc99m-MDP SPECT against SPECT/CT in diagnosing hip AVN.	A total of 22 patients and 24 symptomatic hips were analyzed. 7 hips (29%) were confirmed to have AVN. The AUCs obtained from ROC for trainee radiologist for SPECT vs SPECT/CT were 0.828 and 0.916, respectively. The AUC for specialist radiologist increased from 0.916 to 0.941 with CT.	2

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
56. Nishii T, Tanaka H, Nakanishi K, Sugano N, Miki H, Yoshikawa H. Fat-suppressed 3D spoiled gradient-echo MRI and MDCT arthrography of articular cartilage in patients with hip dysplasia. <i>AJR Am J Roentgenol.</i> 2005;185(2):379-385.	Observational-Dx	18 patients, 20 hips, 2 observers	A prospective study to assess the diagnostic ability of MDCT arthrography for acetabular and femoral cartilage lesions in patients with hip dysplasia. Articular cartilage disorder was assessed with both MRI and CT arthrography in patients with acetabular dysplasia who did not have OA or only had early stage OA.	CT arthrography provided significantly higher sensitivity in the detection of grade II or higher lesions than MRI for both observers. Interobserver agreement in the detection of grade II or higher cartilage lesions was moderate (kappa = 0.53) on MRI and substantial (kappa = 0.78) on CT. MDCT arthrography is a sensitive and reproducible method for assessing articular cartilage lesions with substance loss in patients with hip dysplasia.	1
57. Nishii T, Tanaka H, Sugano N, Miki H, Takao M, Yoshikawa H. Disorders of acetabular labrum and articular cartilage in hip dysplasia: evaluation using isotropic high-resolution CT arthrography with sequential radial reformation. <i>Osteoarthritis Cartilage.</i> 2007;15(3):251-257.	Observational-Dx	29 patients, 41 hips	To evaluate the diagnostic ability of isotropic CT arthrography with radial reformation technique for detection of acetabular labral and articular cartilage disorders, and evaluate those interactions in hip dysplasia.	Sensitivity, specificity and accuracy of CT arthrography were 97%, 87%, 92% for labral tear and 88%, 82%, 85% for acetabular cartilage disorder, respectively. Isotropic CT arthrography with radial reformation technique allowed simultaneous, accurate assessment of labral and cartilage disorders in the whole acetabular circumference.	2
58. Gazaille RE, 3rd, Flynn MJ, Page W, 3rd, Finley S, van Holsbeeck M. Technical innovation: digital tomosynthesis of the hip following intra-articular administration of contrast. <i>Skeletal Radiol.</i> 2011;40(11):1467-1471.	Review/Other-Dx	1 patient	To demonstrate the clinical use of digital tomosynthesis in the depiction of labral and chondral pathology in the setting of postoperative CAM-type impingement of the hip following intra-articular administration of dilute iodinated contrast.	A partial tear of the labrum and clinically significant acetabular chondral abnormalities were demonstrated with the use of digital tomosynthesis with superb anatomic detail.	4
59. Jacobsen S, Romer L, Soballe K. Degeneration in dysplastic hips. A computer tomography study. <i>Skeletal Radiol.</i> 2005;34(12):778-784.	Observational-Dx	193 patients, 386 hips	To determine the pattern of degenerative change in moderate to severely dysplastic hips in young patients through CT radiography.	Degeneration was most often found in the anterolateral part of the dysplastic hip joints. Most cysts were located above the transition zone between the bony and the fibrocartilaginous acetabulum, and we found a significantly-increased number of cases with avulsed bony fragments at the antero-lateral labral insertion in dysplastic hips compared to normal hips. It seems likely that the early degenerative process in dysplastic hips originates at the watershed zone between the acetabular labrum and the acetabular cartilage in response to subluxation and FAI.	3

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
60. Jacobsen S, Romer L, Soballe K. The other hip in unilateral hip dysplasia. <i>Clin Orthop Relat Res.</i> 2006;446:239-246.	Observational-Dx	197 patients, 41 control	A retrospective review of the transverse pelvic CT scans of consecutive patients at a single center with hip pain thought to be secondary to developmental dysplasia and a comparison to the scans of a healthy control group.	The joint anatomy of patients with developmental dysplasia differed from that of control subjects in almost all aspects. The data suggest that patients referred with seemingly unilateral developmental dysplasia also are at risk of having contralateral dysplastic malformation.	2
61. Lee CB, Millis MB. Patient selection for rotational pelvic osteotomy. <i>Instr Course Lect.</i> 2013;62:265-277.	Review/Other-Dx	N/A	To review a systematic approach to evaluation of the variables in selecting an optimal treatment program for the patient with symptomatic acetabular dysplasia.	Preserving the native hip is the first choice in young, active patients with minimal arthrosis. Techniques in rotational pelvic osteotomy have evolved to offer long-term benefits, but appropriate patient selection is an important determinant of success. Applying a stepwise approach when evaluating adult patients with acetabular dysplasia and understanding current outcomes and predictive data will allow the orthopedic surgeon to choose appropriate candidates for pelvic osteotomy.	4
62. Beaulé PE, Zaragoza E, Motamedi K, Copelan N, Dorey FJ. Three-dimensional computed tomography of the hip in the assessment of femoroacetabular impingement. <i>J Orthop Res.</i> 2005;23(6):1286-1292.	Observational-Dx	42 patients (12 controls), 56 hips (20 controls)	To assess the anterior and posterior concavity of the femoral head-neck junction in painful, nondysplastic hips. MR gadolinium arthrography was performed to assess for labral and cartilage lesions. Alpha and beta angles measuring the anterior and posterior femoral head-neck junction concavities were also determined in 20 asymptomatic hips using 3D CT.	The mean alpha angle for the symptomatic and the control group were: 66.4 vs 43.8 ($P=0.001$), and for the beta angle 40.2 vs 43.8 ($P=0.011$), respectively. All but 1 of the symptomatic hips had a labral tear with 61% of these hips having associated cartilage damage. 3D CT represents an accurate tool to quantify the femoral head-neck concavity providing a non-invasive assessment of hips at risk of FAI.	3
63. Hetsroni I, Larson CM, Dela Torre K, Zbeda RM, Magennis E, Kelly BT. Anterior inferior iliac spine deformity as an extra-articular source for hip impingement: a series of 10 patients treated with arthroscopic decompression. <i>Arthroscopy.</i> 2012;28(11):1644-1653.	Observational-Tx	10 patients	To describe an arthroscopic technique for decompression of a prominent anterior inferior iliac spine leading to extra-articular hip impingement and to provide short-term outcome after this procedure.	The mean age was 24.9 years, with 8/10 patients aged younger than 30 years. In 9 patients, an anterior cam lesion was identified and decompressed before the anterior inferior iliac spine decompression. The mean follow-up time was 14.7 months (range, 6 to 26 months). Hip flexion range of motion improved from 99 degrees +/- 7 degrees before surgery to 117 degrees +/- 8 degrees after surgery ($P<.001$). The modified Harris Hip Score improved from 64 +/- 18 before surgery to 98 +/- 2 at latest follow-up after surgery ($P<.001$).	2

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
64. Tannast M, Hanke M, Ecker TM, Murphy SB, Albers CE, Puls M. LCPD: reduced range of motion resulting from extra- and intraarticular impingement. <i>Clin Orthop Relat Res.</i> 2012;470(9):2431-2440.	Observational-Dx	13 hips with Legg-Calve-Perthes disease, 22 hips with FAI, 27 normal hips	To review whether the location of impingement zones, the presence of additional extra-articular impingement, and the resulting ROM differ between hips with Legg-Calve-Perthes disease and normal hips or hips with FAI.	The location of impingement zones in hips with Legg-Calve-Perthes disease differed compared with the FAI/normal groups. Intra- and extra-articular impingement was more frequent in Legg-Calve-Perthes disease (79% and 86%, respectively) compared with normal (15%, 15%) and FAI hips (36%, 14%). Hips with Legg-Calve-Perthes disease had decreased amplitude for all hip motions (flexion, extension, abduction, adduction, internal and external rotation) compared with FAI or normal.	4
65. Czerny C, Hofmann S, Urban M, et al. MR arthrography of the adult acetabular capsular-labral complex: correlation with surgery and anatomy. <i>AJR Am J Roentgenol.</i> 1999;173(2):345-349.	Observational-Dx	40 patients, 6 cadavers, 2 observers	Prospectively review of MRI to determine the accuracy of MR arthrography for the assessment of labral tears.	MR arthrography has a sensitivity of 91%, a specificity of 71% and an accuracy of 88% for the detection of labral tears.	2
66. Neumann G, Mendicuti AD, Zou KH, et al. Prevalence of labral tears and cartilage loss in patients with mechanical symptoms of the hip: evaluation using MR arthrography. <i>Osteoarthritis Cartilage.</i> 2007;15(8):909-917.	Observational-Dx	100 patients	To determine the prevalence of labral tears and cartilage lesions in patients with mechanical symptoms of the hip using MR arthrography.	On MR arthrography, labral tears were found in 66 patients (66% prevalence) with 13 having more than 1 location involved. Labral tears and cartilage loss are common in patients with mechanical symptoms in the hip. Cartilage loss, labral tears and BME appear interrelated and may represent important risk factors that may affect the development and progression of OA in the hip joint.	3
67. Petersilge CA. MR arthrography for evaluation of the acetabular labrum. <i>Skeletal Radiol.</i> 2001;30(8):423-430.	Review/Other-Dx	N/A	To review the normal anatomy of the hip, the clinical presentation of internal derangement and the technique for performing MR arthrography. The variations in morphology and signal of the asymptomatic labrum are reviewed as well as the appearance of the abnormal labrum.	With the joint distention provided by MR arthrography, labral detachments and intrasubstance tears can be identified and differentiated from the many varied appearances of the asymptomatic labrum.	4

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
68. Yoon LS, Palmer WE, Kassirjian A. Evaluation of radial-sequence imaging in detecting acetabular labral tears at hip MR arthrography. <i>Skeletal Radiol.</i> 2007;36(11):1029-1033.	Review/Other-Dx	54 consecutive MR arthrograms, 2 reviewers	Retrospective study to determine whether radial imaging demonstrates labral tears not visible on standard imaging planes.	Using standard imaging planes, 50 anterosuperior, 31 posterosuperior, 10 anteroinferior, and 9 posteroinferior labral tears were detected in 54 MR arthrograms of the hip. Using radial sequences alone, 44 anterosuperior, 25 posterosuperior, 9 anteroinferior, and 5 posteroinferior labral tears were detected. In MR arthrography of the hip, radial imaging did not reveal any additional labral tears. Standard imaging planes sufficiently demonstrate all acetabular labral tears.	4
69. Banks DB, Boden RA, Mehan R, Fehily MJ. Magnetic resonance arthrography for labral tears and chondral wear in femoroacetabular impingement. <i>Hip Int.</i> 2012;22(4):387-390.	Experimental-Dx	69 hips	To assess the efficacy of MR arthrography in diagnosing labral tears and chondral damage in patients with FAI in our institution.	The findings at MR arthrography were compared to those found intraoperatively. For labral tears, sensitivity, specificity and accuracy were 81%, 51% and 58% respectively. For chondral wear these figures were 17%, 100%, and 55% respectively.	2
70. Ziegert AJ, Blankenbaker DG, De Smet AA, Keene JS, Shinki K, Fine JP. Comparison of standard hip MR arthrographic imaging planes and sequences for detection of arthroscopically proven labral tear. <i>AJR Am J Roentgenol.</i> 2009;192(5):1397-1400.	Review/Other-Dx	189 patients: 144 patients had MR arthrography, 3 reviewers	Retrospective study to compare multiple imaging planes and 2 pulse sequences for detection of arthroscopically proven labral tears.	Among the 144 tears, 97.2% were identified as definitely present on images obtained with at least 1 of the sequences. The axial oblique sequence had the highest individual detection rate (85.0%). The detection rates for the sagittal T1-weighted (74.6%), coronal T1-weighted (67.4%), and coronal T2-weighted (63.6%) sequences were intermediate. Detection rates with the axial T1-weighted (29.9%) and sagittal oblique (18.2%) sequences were low. With the combination of 3 sequences (coronal T2-weighted with fat saturation, axial oblique T1-weighted with fat saturation, and sagittal T1-weighted with fat saturation), 95.8% of the 144 tears were identified as definitely present. 28% of tears had signal intensity less than that of gadolinium or fluid. Imaging in the axial oblique plane has the highest rate of detection of acetabular labral tears. More than 95% of tears were identified with the use of 3 imaging planes. Signal intensity within a tear does not have to be equal to that of gadolinium or fluid to confirm the diagnosis of labral tear.	4

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
71. Kassarian A, Yoon LS, Belzile E, Connolly SA, Millis MB, Palmer WE. Triad of MR arthrographic findings in patients with cam-type femoroacetabular impingement. <i>Radiology</i> . 2005;236(2):588-592.	Observational-Dx	40 patients	To retrospectively analyze MR arthrographic findings in patients with clinical cam-type FAI.	MR arthrographic demonstrated a triad of abnormal head-neck morphology, anterosuperior cartilage abnormality, and anterosuperior labral abnormality in 37/42 patients with cam-type FAI.	2
72. Pfirrmann CW, Mengiardi B, Dora C, Kalberer F, Zanetti M, Hodler J. Cam and pincer femoroacetabular impingement: characteristic MR arthrographic findings in 50 patients. <i>Radiology</i> . 2006;240(3):778-785.	Observational-Dx	50 patients	To retrospectively characterize MR arthrographic findings in patients with cam FAI and in those with pincer FAI.	Characteristic MR arthrographic findings of cam FAI include large alpha angles and cartilage lesions at the anterosuperior position and osseous bump formation at the femoral neck; characteristic findings of pincer FAI include a deep acetabulum and posteroinferior cartilage lesions.	3
73. Zaragoza E, Lattanzio PJ, Beaulé PE. Magnetic resonance imaging with gadolinium arthrography to assess acetabular cartilage delamination. <i>Hip Int</i> . 2009;19(1):18-23.	Observational-Dx	46 patients (48 hips)	To evaluate the diagnostic performance of MRI with gadolinium arthrography in detecting acetabular cartilage delamination in patients with pre-arthritis hip pain.	Sensitivity and specificity of MR arthrography detection of cartilage delamination confirmed at surgery were 97% and 84%, respectively. The PPV and NPV of the MR arthrography finding were 90% and 94%, respectively. The presence of the acetabular cartilage delamination represents an early stage of articular cartilage degeneration. When evaluating a young adult with hip pain, labral tears in association with cartilage delamination should be considered. MR arthrography represents an effective diagnostic tool.	3
74. Mosher TJ. Musculoskeletal imaging at 3T: current techniques and future applications. <i>Magn Reson Imaging Clin N Am</i> . 2006;14(1):63-76.	Review/Other-Dx	N/A	To review the current techniques and future applications at 3T MRI.	Initial experience with 3T MRI in the evaluation of the hip joint has been positive.	4
75. Ramnath RR. 3T MR imaging of the musculoskeletal system (Part II): clinical applications. <i>Magn Reson Imaging Clin N Am</i> . 2006;14(1):41-62.	Review/Other-Dx	N/A	To point the utility/advantages of 3T MRI and its clinical applications in the MSK system.	Because of the enhanced signal-to-noise ratio, the higher spatial resolution, and the greater contrast-to-noise of intrinsic joint structures at higher field strengths, 3T MRI has the potential to improve diagnostic abilities in the MSK system vastly, which translates into better patient care and management.	4

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
76. Sundberg TP, Toomayan GA, Major NM. Evaluation of the acetabular labrum at 3.0-T MR imaging compared with 1.5-T MR arthrography: preliminary experience. <i>Radiology</i> . 2006;238(2):706-711.	Review/Other-Dx	8 patients	A prospective study to compare imaging of the acetabular labrum with 3.0-T MRI and 1.5-T MR arthrography in patients with hip pain and suspicion of labral disease.	MRI depicted 4 surgically confirmed labral tears that were identified at MR arthrography, as well as 1 that was not visualized at MR arthrography. MRI helped identify all other pathologic conditions that were diagnosed at MR arthrography and helped identify 1 additional surgically confirmed focal articular cartilage lesion. These results provide encouraging support for evaluation with 3.0-T MRI over 1.5-T MR arthrography.	4
77. Kim SD, Jessel R, Zurakowski D, Millis MB, Kim YJ. Anterior delayed gadolinium-enhanced MRI of cartilage values predict joint failure after periacetabular osteotomy. <i>Clin Orthop Relat Res</i> . 2012;470(12):3332-3341.	Observational-Dx	43 hips from 41 patients	To assess whether the dGEMRIC index of the anterior joint would better predict premature joint failure after periacetabular osteotomies than the coronal dGEMRIC index as previously reported.	The 2 cohorts were similar in age and sex distribution. Severity of dysplasia was similar as measured by lateral center-edge, anterior center-edge, and Tonnis angles. Preoperative pain, joint space width, Tonnis grade, and coronal and sagittal dGEMRIC indexes differed between groups. The dGEMRIC index in the anterior weightbearing region of the hip was lower in the prematurely failed group and was the best predictor.	2
78. Rakhra KS, Lattanzio PJ, Cardenas-Blanco A, Cameron IG, Beaulé PE. Can T1-rho MRI detect acetabular cartilage degeneration in femoroacetabular impingement?: a pilot study. <i>J Bone Joint Surg Br</i> . 2012;94(9):1187-1192.	Experimental-Dx	10 patients with cam-type FAI and 10 control patients	To determine the normal T1rho profile of cartilage within the hip and to identify any differences in T1rho profile between the normal and symptomatic FAI hip.	The mean T1rho relaxation times for full cartilage thickness of control and FAI hips were similar (37.17 ms (SD 9.95) and 36.71 ms (SD 6.72), respectively). The control group demonstrated a T1rho value trend, increasing from deep to superficial cartilage layers, with the middle third having significantly greater T1rho relaxation values than the deepest third ($P=0.008$). The FAI group demonstrated loss of this trend. The deepest third in the FAI group demonstrated greater T1rho relaxation values than controls ($P=0.028$).	3

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
79. Bittersohl B, Hosalkar HS, Kim YJ, et al. T1 assessment of hip joint cartilage following intra-articular gadolinium injection: a pilot study. <i>Magn Reson Med.</i> 2010;64(4):1200-1207.	Experimental-Dx	9 patients to study contrast infiltration process; 27 patients scanned with intra-articular delayed gadolinium-enhanced MRI of cartilage	To define the feasibility of cartilage assessment in symptomatic FAI patients using intra-articular delayed gadolinium-enhanced MRI of cartilage.	This pilot study demonstrates a significant difference between the pre- and postcontrast T(1) values ($P<0.001$) remaining constant for 45 min. We noted higher mean T(1) values in morphologically normal-appearing cartilage than in damaged cartilage, which was statistically significant for all zones except the anterior-superior zone. Intraobserver (0.972) and interobserver correlation coefficients (0.933) were statistically significant.	2
80. Pollard TC, McNally EG, Wilson DC, et al. Localized cartilage assessment with three-dimensional dGEMRIC in asymptomatic hips with normal morphology and cam deformity. <i>J Bone Joint Surg Am.</i> 2010;92(15):2557-2569.	Experimental-Dx	32 subjects	To investigate the potential of delayed gadolinium-enhanced MRI of cartilage to detect cartilage disease in asymptomatic hips with cam deformities compared with morphologically normal hips, establish whether delayed gadolinium-enhanced MRI of cartilage could identify advanced disease in hips with positive clinical findings, and establish whether cartilage damage correlated with the severity of the cam deformity.	Of 32 subjects (mean age, 52 years), 19 had cam deformities. Hips with a cam deformity had reduced acetabular glycosaminoglycan content compared with normal hips (mean T1(acet)/T1(total), 0.949 and 1.093, respectively; $P=0.0008$). Hips with a positive impingement test result had global depletion of glycosaminoglycan compared with hips with a negative result (mean T1(total), 625 ms vs 710 ms; $P=0.0152$). T1(acet) inversely correlated with the magnitude of the alpha angle ($r = -0.483$, $P=0.0038$), suggesting that the severity of cartilage damage correlates with the magnitude of the cam deformity. All of these differences occurred irrespective of genetic predisposition.	2
81. James SL, Ali K, Malara F, Young D, O'Donnell J, Connell DA. MRI findings of femoroacetabular impingement. <i>AJR Am J Roentgenol.</i> 2006;187(6):1412-1419.	Review/Other-Dx	46 patients, 2 observers	To evaluate 1.5 T MRI in the identification of labral and articular cartilage lesions in patients with a clinical suspicion of FAI.	MRI provides a useful assessment of patients in whom a FAI is clinically suspected. A high-resolution, nonarthrographic technique can provide preoperative information regarding the presence and anatomic site of labral and cartilage abnormalities.	4
82. Mintz DN, Hooper T, Connell D, Buly R, Padgett DE, Potter HG. Magnetic resonance imaging of the hip: detection of labral and chondral abnormalities using noncontrast imaging. <i>Arthroscopy.</i> 2005;21(4):385-393.	Observational-Dx	92 patients, 2 observers	Retrospective review of 92 hip MRI studies for the presence of acetabular labral and hyaline cartilage abnormality with arthroscopic correlation.	Noncontrast MRI of the hip, using an optimized protocol, can noninvasively identify labral and chondral pathology. Good interobserver agreement.	2

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
83. Vahlensieck M, Peterfy CG, Wischer T, et al. Indirect MR arthrography: optimization and clinical applications. <i>Radiology</i> . 1996;200(1):249-254.	Observational-Dx	14 healthy volunteers MRI 17 patients with joint disorders on MR arthrography	To evaluate and optimize a method for producing MRI similar to MR arthrograms of multiple synovial joints with IV gadopentetate dimeglumine injection.	Indirect MR arthrography of an exercised joint provides homogeneous enhancement and improved delineation of soft-tissue structures.	3
84. Winalski CS, Aliabadi P, Wright RJ, Shortkroff S, Sledge CB, Weissman BN. Enhancement of joint fluid with intravenously administered gadopentetate dimeglumine: technique, rationale, and implications. <i>Radiology</i> . 1993;187(1):179-185.	Review/Other-Dx	10 patients (2 asymptomatic volunteers and 8 patients with suspected meniscal tears)	To determine the feasibility of enhancing the joint fluid with IV injection of gadopentetate dimeglumine.	The arthrographic effect may provide a more convenient alternative to intra-articular injection of gadopentetate dimeglumine for MR arthrography.	4
85. Zoga AC, Schweitzer ME. Indirect magnetic resonance arthrography: applications in sports imaging. <i>Top Magn Reson Imaging</i> . 2003;14(1):25-33.	Review/Other-Dx	N/A	To review indirect MR arthrography as an imaging tool with several advantages and disadvantages over both direct MR arthrography and unenhanced MSK MRI.	Advantages of indirect MR arthrography include enhancement of both intra-articular and extra-articular pathology without the need for an invasive, fluoroscopically guided arthrogram, as well as high sensitivity for re-injury in postoperative patients. Some potential disadvantages of this technique are enhancement of normal vascular tissues and difficulty in making a diagnosis dependent upon joint space distension in the absence of an effusion.	4
86. Smith TO, Hilton G, Toms AP, Donell ST, Hing CB. The diagnostic accuracy of acetabular labral tears using magnetic resonance imaging and magnetic resonance arthrography: a meta-analysis. <i>Eur Radiol</i> . 2011;21(4):863-874.	Meta-analysis	19 studies; 881 hips	To determine the sensitivity and specificity of MRI and MR arthrography in diagnosing acetabular labral tears using meta-analysis.	19 papers assessing 881 hips were reviewed. Conventional MRI was assessed in 13 studies and MR arthrography was assessed in 16 studies. Whilst both MRI (0.5-3T) and MR arthrography (0.5-3T) presented with a moderate sensitivity and specificity (sensitivity 66%, 87%; specificity 79%, 64%), diagnostic accuracy of MR arthrography appeared to be superior to MRI in detecting acetabular labral tears on ROC curve interpretation. The literature poorly described population characteristics, assessor blinding, with limited sample sizes.	M

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
87. Christie-Large M, Tapp MJ, Theivendran K, James SL. The role of multidetector CT arthrography in the investigation of suspected intra-articular hip pathology. <i>Br J Radiol.</i> 2010;83(994):861-867.	Observational-Dx	96 patients	To evaluate the role of MDCT arthrography in the diagnosis of intra-articular hip pathology.	We detected 28 labral tears (24 anterior, 2 anterolateral, 1 lateral and 1 posterolateral). An abnormal labral-chondral transitional zone was seen in 9 patients and 4 patients had surface labral fraying. We identified 3 paralabral cysts. Acetabular cartilage loss was detected in 45 and femoral cartilage loss in 9 patients. An abnormal anterior femoral head and neck junction was present in 18 hips and fibrocystic change in 8. Acetabular retroversion was present in 11 hips. 63 sets of patient notes were reviewed, of which 49 were in-patients with abnormal MDCT arthrogram findings. Surgical correlation was available in 27 patients. There was a discrepancy between the findings of a labral tear in 1 patient (false negative, 90% sensitivity and 100% specificity) and the presence of acetabular cartilage loss (88% sensitivity and 100% specificity) and femoral cartilage loss (94% sensitivity and 100% specificity) in 3 patients	3
88. Ha YC, Choi JA, Lee YK, et al. The diagnostic value of direct CT arthrography using MDCT in the evaluation of acetabular labral tear: with arthroscopic correlation. <i>Skeletal Radiol.</i> 2013;42(5):681-688.	Observational-Dx	58 hips	To determine the sensitivity, specificity, and accuracy of MDCT arthrography for the diagnosis of acetabular labral tear and sulcus; to correlate tear types using the Lage classification system on MDCT arthrography compared with the arthroscopic classification; and, to correlate MDCT arthrography localization with arthroscopic localization.	41/58 hips were diagnosed as labral tears on CT arthrography. 43/58 hips were shown to have a labral tear on arthroscopy. Sensitivity, specificity, and accuracy for detecting labral tear and sulcus by MDCT arthrography were 90.7%, 86.7%, and 89.7%, and 93.8%, 97.6% and 96.6% respectively for observer 1, and 90.7% and 80.0%, 87.9% and 87.5%, 95.2%, and 93.1 % respectively for observer 2. 35/41 hips (85%) that were diagnosed with labral tear on MDCT arthrography correlated substantially with arthroscopic Lage classification (kappa coefficient = 0.65). MDCT arthrography and arthroscopic findings showed similar distribution patterns of the tears with most lesions located in antero- and postero-superior areas ($P=0.013$).	2

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
89. Reurink G, Jansen SP, Bisselink JM, Vincken PW, Weir A, Moen MH. Reliability and validity of diagnosing acetabular labral lesions with magnetic resonance arthrography. <i>J Bone Joint Surg Am.</i> 2012;94(18):1643-1648.	Observational-Dx	95 hips	To establish the interobserver reliability and the validity of MR arthrography for detecting lesions of the acetabular labrum in a retrospective case series.	At arthroscopy, 91 labral lesions were identified in the 95 hips. The interobserver reliability of detecting labral lesions with MR arthrography was fair ($\kappa=0.268$). MR arthrography, as interpreted by observers A and B, showed a sensitivity of 86% and 86%, specificity of 75% and 50%, NPV of 19% and 13%, and PPV of 99% and 98%, respectively.	2
90. Harris-Hayes M, Commean PK, Patterson JD, Clohisy JC, Hillen TJ. Bony abnormalities of the hip joint: a new comprehensive, reliable and radiation-free measurement method using magnetic resonance imaging. <i>J Hip Preserv Surg.</i> 2014;1(2):62-70.	Observational-Dx	32 hips	To develop comprehensive and reliable radiation-free methods to quantify femoral and acetabular morphology using MRI.	Interrater reliability was good to excellent for all raters for acetabular version, femoral version, femoral neck angle, and lateral center edge angle (ICCs: 0.82–0.98); good to excellent between experienced raters (ICCs: 0.78–0.86) and poor to good between novice and experienced raters (ICCs: 0.23–0.78) for alpha angle. Intrarater reliability was good to excellent for all raters for acetabular version, femoral version and femoral neck angle (ICCs: 0.93–0.99); for 1 experienced and novice rater for lateral center edge angle (ICCs: 0.84–0.89); moderate to excellent for the experienced raters for alpha angle (ICCs: 0.72–0.89). Intrarater reliability was poor for the second experienced rater for lateral center edge angle (ICC: 0.56), due to a single measurement error and for the novice rater for alpha angle (ICCs: 0.17–0.38).	3
91. Bruce W, Van Der Wall H, Storey G, Loneragan R, Pitsis G, Kannangara S. Bone scintigraphy in acetabular labral tears. <i>Clin Nucl Med.</i> 2004;29(8):465-468.	Review/Other-Dx	57 patients	A retrospective study of bone scintigraphy in patients with acetabular labral tears diagnosed by MRI/arthroscopy compared to bone scintigraphy in patients without labral tears being investigated for other causes of hip pain.	Patients with labral tears had hyperemia of the superior or superomedial aspect of the acetabulum and increased delayed uptake in either a focal superior pattern or in an “eyebrow” pattern of a superomedial tear. This pattern was not seen in any other sources of hip pathology. Absence of this pattern carries a high NPV for the diagnosis.	4

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
92. Matar WY, May O, Raymond F, Beaulieu PE. Bone scintigraphy in femoroacetabular impingement: a preliminary report. <i>Clin Orthop Relat Res.</i> 2009;467(3):676-681.	Observational-Dx	25 consecutive patients	Prospective study to determine the sensitivity and specificity of bone scans in diagnosing FAI and describe its findings on nuclear imaging.	46/50 hips had bony abnormalities on radiographs and 26 hips were diagnosed with FAI according to our criteria. 22 of these 26 hips showed an increased uptake on SPECT representing true-positives. There were 4 false-positives, 9 false-negatives, and 15 true-negatives. Sensitivity of bone SPECT was 84.7%, specificity 62.5%, PPV 71%, and NPV 78.9%. Focal uptake was localized to the superolateral acetabular rim and/or anterolateral femoral head-neck junction consistent with the reported intra-articular cartilage hip damage seen in FAI.	3
93. Eagle S, Potter HG, Koff MF. Morphologic and quantitative magnetic resonance imaging of knee articular cartilage for the assessment of post-traumatic osteoarthritis. <i>J Orthop Res.</i> 2016.	Review/Other-Dx	N/A	To provide background information about MRI signal generation and decay (T1 and T2 values), the utility of morphologic MRI, and the quantitative MRI techniques of T1rho, T2, and T2* mapping, to evaluate subjects with traumatic knee injuries, such as articular cartilage lesion rupture.	No results stated in abstract.	4

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
94. Sahin M, Calisir C, Omeroglu H, Inan U, Mutlu F, Kaya T. Evaluation of Labral Pathology and Hip Articular Cartilage in Patients with Femoroacetabular Impingement (FAI): Comparison of Multidetector CT Arthrography and MR Arthrography. <i>Pol J Radiol.</i> 2014;79:374-380.	Observational-Dx	14 patients	To compare the MDCT, CT arthrography and MR arthrography findings with surgical findings in patients with femoroacetabular impingement and to evaluate the diagnostic performance of these methods.	While the disagreement between observers was recorded in 2 cases of labral tearing with MR arthrography, there was a complete consensus with CT arthrography. Disagreement between observers was found in 4 cases of femoral cartilage loss with both MR arthrography and CT arthrography. Disagreement was also recorded in only 1 case of acetabular cartilage loss with both methods. The percent sensitivity, specificity, and accuracy for correctly assessing the labral tearing were as follows for MR arthrography/CT arthrography, respectively: 100/100, 50/100, 86/100 ($P<0.05$). The same values for acetabular cartilage assessment were 89/56, 40/60, 71/71 ($P>0.05$) and for femoral cartilage assessment were 100/75, 90/70, 86/71 ($P>0.05$). Inter-observer reliability value showed excellent agreement for labral tearing with CT arthrography ($\kappa=1.0$). Inter-observer agreement was substantial to excellent with regard to acetabular cartilage assessment with MR arthrography and CT arthrography ($\kappa=0.76$ for MR arthrography and $\kappa=0.86$ for CT arthrography).	3
95. Lee S, Nardo L, Kumar D, et al. Scoring hip osteoarthritis with MRI (SHOMRI): A whole joint osteoarthritis evaluation system. <i>J Magn Reson Imaging.</i> 2015;41(6):1549-1557.	Observational-Dx	98 patients	To develop a semi-quantitative MR-based hip OA evaluation system, and to test its reproducibility and face validity.	ICC values were in the excellent range, 0.91 to 0.97. Cohen's Kappa values and percent agreement ranged from 0.55 to 0.79 and 66% to 99%, respectively. Coring hip OA with MRI demonstrated significant correlations with KL and OARSI grading's as well as with clinical parameters, HOOS and ROM ($P<0.05$). Among the coring hip OA with MRI features, subchondral cyst and bone marrow edema pattern showed the highest correlation with HOOS and ROM.	3

**Chronic Hip Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
96. Roemer FW, Hunter DJ, Winterstein A, et al. Hip Osteoarthritis MRI Scoring System (HOAMS): reliability and associations with radiographic and clinical findings. <i>Osteoarthritis Cartilage</i> . 2011;19(8):946-962.	Observational-Dx	52 patients	To develop a semiquantitative MRI-based scoring system (HOAMS) of hip OA and test its reliability and validity.	Distribution of radiographic grading was: KL 0=12 (27%), KL 1=11 (25%), KL 2=14 (32%), KL 3=5 (11%) and KL 4=2 (5%). Intra-reader reliability for the different features ranged from 0.18 (cysts) to 0.85 (cartilage). Inter-reader reliability ranged between 0.15 (cysts) and 0.85 (BMLs). Low kappas were due to low frequencies of some features as overall percent agreement was good to excellent (83.8% and 83.1%). There was a strong association between MRI-detected lesions and radiographic severity ($P=0.002$). Nonsignificant trends were observed between MRI features and clinical outcomes.	2
97. Laine JC, Denning JR, Riccio AI, Jo C, Joglar JM, Wimberly RL. The use of ultrasound in the management of septic arthritis of the hip. <i>J Pediatr Orthop B</i> . 2015;24(2):95-98.	Review/Other-Dx	N/A	To assess septic arthritis of the hip in a pediatric population.	The need for MRI to further evaluate the patient for adjacent infection before treatment is debatable. Once an effusion is confirmed on US, we have found that septic arthritis of the hip does not need advanced imaging before arthrotomy and debridement. Patients who fail to clinically respond to an initial hip arthrotomy and appropriate antibiotics may benefit from an MRI for the identification of concomitant infections that may require surgical intervention.	4
98. Wang JH, Chi CY, Lin KH, Ho MW, Kao CH. Tuberculous arthritis--unexpected extrapulmonary tuberculosis detected by FDG PET/CT. <i>Clin Nucl Med</i> . 2013;38(2):e93-94.	Review/Other-Dx	1 patient	To present a report regarding a 62-year-old man with fever, chronic cough, arthralgia of the left side of the hip, and body weight loss.	Chest radiograph showed increased infiltration in both upper lungs, and the acid-fast stain of sputum was positive. Whole-body PET/CT scan revealed a lesion with intense FDG uptake in the joint of the side left of the hip. OA of the hip was initially impressed by an orthopedist. However, tuberculous arthritis was subsequently confirmed by deep pus culture.	4
99. Goldman AB, DiCarlo EF. Pigmented villonodular synovitis. Diagnosis and differential diagnosis. <i>Radiol Clin North Am</i> . 1988;26(6):1327-1347.	Review/Other-Dx	N/A	To describe pigmented villonodular synovitis and outline characteristics that distinguishes it from other diseases.	No results stated in abstract.	4
100. Klomp maker J, Veth RP, Robinson PH, Molenaar WM, Nielsen HK. Pigmented villonodular synovitis. <i>Arch Orthop Trauma Surg</i> . 1990;109(4):205-210.	Review/Other-Tx	18 patients	To describe 18 patients suffering from localized or diffuse pigmented villonodular synovitis including their symptoms and therapeutic results.	No results stated in abstract.	4

* See Last Page for Key

Chronic Hip Pain
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
101. Won SH, Lee YK, Ha YC, Suh YS, Koo KH. Improving pre-operative planning for complex total hip replacement with a Rapid Prototype model enabling surgical simulation. <i>Bone Joint J.</i> 2013;95-B(11):1458-1463.	Observational-Tx	21 hips	To evaluate whether a Rapid Prototype model, which is a life-sized reproduction based on 3D CT scans, can determine the feasibility of total hip replacement and provide information about the size and position of the acetabular component in severe acetabular deformities.	All the acetabular components and femoral stems had radiographic evidence of bone ingrowth and stability. There was no detectable wear and no peri-prosthetic osteolysis. Brooker grade III heterotopic ossification was present in 1 hip. The mean Harris hip score was 79.9 points (52 to 100) at the final follow-up.	2
102. American College of Radiology. ACR Appropriateness Criteria®: Metastatic Bone Disease. Available at: https://acsearch.acr.org/docs/69431/Narrative/ .	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for metastatic bone disease.	N/A	4
103. American College of Radiology. ACR Appropriateness Criteria®: Stress (Fatigue/Insufficiency) Fracture, Including Sacrum, Excluding Other Vertebrae. Available at: https://acsearch.acr.org/docs/69435/Narrative/ .	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for stress (fatigue/insufficiency) fracture, including sacrum, excluding other vertebrae.	N/A	4
104. American College of Radiology. ACR Appropriateness Criteria®: Primary Bone Tumors. Available at: https://acsearch.acr.org/docs/69421/Narrative/ .	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for osteoporosis and bone mineral density.	N/A	4
105. American College of Radiology. ACR Appropriateness Criteria®: Osteoporosis and Bone Mineral Density. Available at: https://acsearch.acr.org/docs/69358/Narrative/ .	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for osteoporosis and bone mineral density.	N/A	4
106. American College of Radiology. ACR Appropriateness Criteria®: Osteonecrosis of the Hip. Available at: URL. Accessed April 22, 2015.	Review/Other-Tx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for osteonecrosis of the hip.	N/A	4

Evidence Table Key

Study Quality Category Definitions

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

Dx = Diagnostic

Tx = Treatment

Abbreviations Key

AUC = Area under the receiver operating characteristic curve

AVN = Avascular necrosis

BME = Bone marrow edema

CI = Confidence interval

CT = Computed tomography

dGEMRIC = Delayed gadolinium-enhanced magnetic resonance imaging of cartilage

FAI = Femoroacetabular impingement

FDG-PET = Fluorine-18-2-fluoro-2-deoxy-D-glucose-positron emission tomography

IV = Intravenous

MDCT = Multidetector computed tomography

MRI = Magnetic resonance imaging

MSK = Musculoskeletal

NPV = Negative predictive value

OA = Osteoarthritis

ON = Osteonecrosis

PPV = Positive predictive value

ROC = Receiver operator characteristic

SPECT = Single-photon emission tomography

STIR = Short tau inversion recovery

US = Ultrasound