

**American College of Radiology  
ACR Appropriateness Criteria®**

**Clinical Condition:** Chronic Hip Pain

**Variant 1:** Initial evaluation for chronic hip pain. First test.

Radiologic Procedure	Rating	Comments	RRL*
X-ray pelvis	9		Low
X-ray hip	9	AP and lateral views of the affected hip.	Med
MRI hip without contrast	1		None
MRI hip with contrast	1		None
US hip	1		None
CT hip without contrast	1		Med
CT arthrography hip	1		Med
MR arthrography hip	1		None
NUC Tc-99m bone scan hip	1		Med
X-ray arthrography hip with anesthetic ± corticosteroid	1		IP
<b>Rating Scale:</b> 1=Least appropriate, 9=Most appropriate			<b>*Relative Radiation Level</b>

**Variant 2:** Radiographs negative, suspect osseous or surrounding soft-tissue abnormality, excluding osteoid osteoma.

Radiologic Procedure	Rating	Comments	RRL*
MRI hip without contrast	9		None
MRI hip with contrast	6	If required after review of noncontrast study. See comments regarding contrast in text under “Anticipated Exceptions.”	None
MR arthrography hip	3	If femoroacetabular impingement or labral tear is suspected, see variant 5.	None
US hip	2		None
CT hip without contrast	2		Med
CT arthrography hip	2		Med
X-ray arthrography hip with anesthetic ± corticosteroid	2		IP
NUC Tc-99m bone scan hip	1		Med
<b>Rating Scale:</b> 1=Least appropriate, 9=Most appropriate			<b>*Relative Radiation Level</b>

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**Clinical Condition:****Chronic Hip Pain****Variant 3:**

**Radiographs negative, suspect osteonecrosis. Includes circumstance in which hip is asymptomatic but osteonecrosis is suspected due to known predisposing factors.**

<b>Radiologic Procedure</b>	<b>Rating</b>	<b>Comments</b>	<b><a href="#">RRL*</a></b>
MRI hip without contrast	9		None
NUC Tc-99m bone scan hip	5		Med
MRI hip with contrast	2		None
US hip	2		None
CT hip without contrast	2		Med
CT arthrography hip	2		Med
MR arthrography hip	2		None
X-ray arthrography hip with anesthetic ± corticosteroid	2		IP
<b>Rating Scale:</b> 1=Least appropriate, 9=Most appropriate			<b>*Relative Radiation Level</b>

**Variant 4:**

**Radiographs negative. Suspect osteoid osteoma.**

<b>Radiologic Procedure</b>	<b>Rating</b>	<b>Comments</b>	<b><a href="#">RRL*</a></b>
CT hip without contrast	9		Med
MRI hip without contrast	4	If CT is equivocal.	None
MRI hip with contrast	3	If CT is equivocal.	None
NUC Tc-99m bone scan hip	2		Med
CT arthrography hip	2		Med
X-ray arthrography hip with anesthetic ± corticosteroid	2		IP
US hip	1		None
MR arthrography hip	1		None
<b>Rating Scale:</b> 1=Least appropriate, 9=Most appropriate			<b>*Relative Radiation Level</b>

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**Clinical Condition:****Chronic Hip Pain****Variant 5:****Radiographs negative, suspect labral tear with or without clinical findings consistent with or suggestive of femoroacetabular impingement.**

Radiologic Procedure	Rating	Comments	RRL*
MR arthrography hip	9	Use of high resolution (3T) in the future may obviate the need for contrast. See comments regarding contrast in text under "Anticipated Exceptions."	None
CT arthrography hip	6	An alternative if MRI is not available or contraindicated.	Med
MRI hip without contrast	4	Use of high resolution (3T) in the future may obviate the need for contrast.	None
MRI hip with contrast	2		None
CT hip without contrast	2		Med
US hip	2		None
NUC Tc-99m bone scan hip	2		Med
X-ray arthrography hip with anesthetic ± corticosteroid	2	At the request of the referring physician who has indicated hip as source of pain.	IP
<b>Rating Scale:</b> 1=Least appropriate, 9=Most appropriate			<b>*Relative Radiation Level</b>

**Variant 6:****Radiographs negative or mild osteoarthritis. Suspect referred pain but wish to exclude hip.**

Radiologic Procedure	Rating	Comments	RRL*
X-ray arthrography hip with anesthetic ± corticosteroid	9		IP
MRI hip without contrast	5	If another imaging study is indicated, MRI is the study of choice.	None
CT hip without contrast	2		Med
MR arthrography hip	2		None
CT arthrography hip	2		Med
US hip	2		None
NUC Tc-99m bone scan hip	2		Med
<b>Rating Scale:</b> 1=Least appropriate, 9=Most appropriate			<b>*Relative Radiation Level</b>

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**Clinical Condition:****Chronic Hip Pain****Variant 7:****Radiographs positive, arthritis uncertain type. Infection not a consideration.**

Radiologic Procedure	Rating	Comments	RRL*
MRI hip without contrast	4	If process is monoarticular or atypical.	None
MRI hip with contrast	2	Contrast rarely necessary.	None
CT hip without contrast	2		Med
US hip	2		None
CT arthrography hip	2		Med
MR arthrography hip	2		None
NUC Tc-99m bone scan hip	2		Med
X-ray arthrography hip with anesthetic ± corticosteroid	2		IP
<b>Rating Scale:</b> 1=Least appropriate, 9=Most appropriate			<b>*Relative Radiation Level</b>

**Variant 8:****Radiographs positive, suggestive of pigmented villonodular synovitis or osteochondromatosis.**

Radiologic Procedure	Rating	Comments	RRL*
MRI hip without contrast	9		None
CT arthrography hip	5	If MRI is not available or contraindicated.	Med
MRI hip with contrast	2		None
US hip	2		None
CT hip without contrast	2		Med
MR arthrography hip	2		None
NUC Tc-99m bone scan hip	2		Med
X-ray arthrography hip with anesthetic ± corticosteroid	2		IP
<b>Rating Scale:</b> 1=Least appropriate, 9=Most appropriate			<b>*Relative Radiation Level</b>

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## CHRONIC HIP PAIN

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### **Summary of Literature Review**

Chronic hip pain and/or groin pain is a perplexing clinical problem. Symptoms may be related to numerous etiologies, including trauma, neoplasms, and arthropathies. Pain may be due to osseous, intra-articular, periarticular, or soft-tissue pathology. Referred pain from the lumbar spine, sacroiliac joints, or knee may add to the potentially confusing clinical picture. Very few references deal specifically with chronic hip pain, although the imaging of specific disorders has been the subject of many articles.

Clinical data are essential for selecting the most appropriate imaging techniques in patients with chronic hip pain. Range of motion, gait abnormalities, locking or snapping, duration of symptoms, and pain patterns (eg, worse at night, increased with exercise, relieved by aspirin) can be very useful for reducing the potentially long list of differential diagnoses. Radiographs should be obtained first in most if not all cases [1] and may provide specific information for common disorders such as osteoarthritis (OA) or less common disorders such as primary bone tumors. Whether the radiographs are normal or not, they are often of considerable value for the selection of additional techniques and for comparison with studies such as magnetic resonance imaging (MRI) examinations and radionuclide bone scans [2].

MRI is frequently performed after initial radiographs to detect osseous, articular, or soft-tissue abnormalities [3-28]. It is both highly sensitive and specific for detecting many abnormalities involving the hip or surrounding soft tissues and should in general be the first imaging technique used following radiographs [3,6,7,9-12,14,18,20,21,28]. Osteonecrosis (ON) is probably the

most common cause of chronic hip pain for which MRI is routinely used and the disorder for which the appearance and accuracy of MRI have been most thoroughly demonstrated in the literature [4,13,16,19,29-32].

Some investigators suggest that proton MRI spectroscopy may be a potential tool for predicting the risk for development of ON [33]. MRI can also accurately detect ON in the asymptomatic, contralateral hip in those cases in which ON of the other hip has been diagnosed by radiographs [23].

Other causes of a chronically painful hip for which MRI has been used with considerable success include radiographically occult fractures [6,8,20,22,34-37], acute and chronic soft-tissue injuries [7,9,12,18,20,21,38-40], infection and inflammation [14,41], and tumors [3,42-44]. Intravenous Gd-chelate agents are used to differentiate between joint fluid and synovitis [41,45]. Generally, if the arthritis has an atypical appearance on radiographs, MRI may be helpful for further characterization and the intravenous contrast is rarely needed. The only exceptions to the use of MRI as the primary technique following radiographs are cases of suspected osteoid osteoma, for which computed tomography (CT) should be performed [46]. Liu and collaborators reported that osteoid osteoma can be successfully imaged by dynamic contrast-enhanced MRI [47]. However, the opinion of this expert panel is that the MRI without and/or with intravenous contrast is generally not widely utilized and most of time not needed in the diagnosis of osteoid osteoma and should be performed under discretion of radiologist if additional information is believed could be gained. For evaluating labral tears MR arthrography should probably be used [48-52]. Direct MR arthrography with the intra-articular injection of a dilute (1:200) solution of Gd-chelate in saline has been established as a reliable technique for diagnosing of acetabular labral tears [48-52] that are frequently associated with femoroacetabular impingement syndrome [53,54]. However, several investigators suggest that high-resolution MRI with 3T may improve the visualization of the acetabular labrum and the hyaline articular cartilage [55,56], which may obviate the need for intra-articular contrast [57].

Other investigators have obtained satisfactory results in detecting labral and hyaline cartilage lesions with high-resolution MRI of the hip at 1.5T without intra-articular contrast [58,59]. Hip cartilage abnormalities can be also be successfully evaluated by high-resolution CT arthrography [60-62]. Three-dimensional CT is an accurate tool to quantify the femoral head-neck concavity, providing a noninvasive assessment of hips at risk of femoroacetabular impingement [63]. CT is also useful in evaluating hip dysplasia [64,65]. Radiotracer uptake in

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the superior or superomedial aspect of the acetabular rim on skeletal scintigraphy has been reported as a characteristic feature of a labral tear. Absence of this pattern carries a high negative predictive value for the diagnosis [66].

Indirect MR arthrography, in which Gd-chelate contrast is administered by IV injection and diffuses into the joint space through the synovium, has been proposed as an alternative to direct MR arthrography for detecting intra-articular disorders [28,67-69]. It is faster and easier to perform than direct arthrography and does not require fluoroscopy. It suffers from less consistent enhancement of the joint space as well as inability to distend the joint capsule. Its value in assessing the hyaline articular cartilage and the acetabular labrum of the hip is uncertain.

Diagnostic and therapeutic joint injections, which can be performed readily at the time of an MRI arthrogram or as dedicated procedures, are useful tools for confirming the location of pain and in some cases helping in its control for a short period [70,71]. Joint aspiration is also critical in diagnosing the presence of infection [72,73] or crystal disease. Local articular and extra-articular injections can define the symptomatic site and exclude referred symptoms. Intra-articular injection of a small amount of iodinated contrast medium under fluoroscopic guidance is used to confirm needle position. Sonography can also be used to localize fluid collections for aspiration. Sonography-guided iliopsoas bursal/peritendinous injections may be useful in determining the cause of hip pain [74].

In the presence of normal radiographs, and in the absence of ready access to MRI, a bone scan may be a useful technique. Radionuclide bone scans are effective for detecting or excluding subtle osseous abnormalities.

Other techniques such as fluoroscopic motion studies (with or without intra-articular contrast) and ultrasound (US) are useful to evaluate articular and peri-articular conditions such as snapping iliopsoas tendon [43]. Cardinal et al [75] used real-time US to evaluate the snapping iliopsoas tendon. This method is noninvasive, which is an advantage compared with injection of the tendon sheath and fluoroscopic evaluation.

### Summary and Recommendations

Imaging of chronic hip pain is a broad subject, and the imaging assessment of numerous disorders has been described in the literature. Clinical data play an important role in patients with chronic hip pain. Radiographs should be obtained as the first imaging study and, in general, MRI should be obtained as the next imaging study except in cases of suspected osteoid osteoma or labral tear as discussed above. Direct MR arthrography should be performed if acetabular labral tear is suspected, including patients with clinical evidence of femoroacetabular

impingement. Use of higher field MRI (3T) may obviate the need for intra-articular contrast. Other imaging techniques as well as image-guided aspiration have selected roles to play in certain disorders.

### Anticipated Exceptions

Nephrogenic systemic fibrosis (NSF), also known as nephrogenic fibrosing dermopathy) was first identified in 1997 and has recently generated substantial concern among radiologists, referring doctors and lay people. Until the last few years, gadolinium-based MR contrast agents were widely believed to be almost universally well tolerated, extremely safe and non-nephrotoxic, even when used in patients with impaired renal function. All available experience suggests that these agents remain generally very safe, but recently some patients with renal failure who have been exposed to gadolinium contrast agents (the percentage is unclear) have developed NSF [76-78], a syndrome that can be fatal. Further studies are necessary to determine what the exact relationships are between gadolinium-containing contrast agents, their specific components and stoichiometry, patient renal function and NSF. Current theory links the development of NSF to the administration of relatively high doses (eg, >0.2mM/kg) and to agents in which the gadolinium is least strongly chelated. The FDA has recently issued a “black box” warning concerning these contrast agents ([http://www.fda.gov/cder/drug/InfoSheets/HCP/gcca\\_200705HCP.pdf](http://www.fda.gov/cder/drug/InfoSheets/HCP/gcca_200705HCP.pdf)).

This warning recommends that, until further information is available, gadolinium contrast agents should not be administered to patients with either acute or significant chronic kidney disease (estimated GFR <30 mL/min/1.73m<sup>2</sup>), recent liver or kidney transplant or hepato-renal syndrome, unless a risk-benefit assessment suggests that the benefit of administration in the particular patient clearly outweighs the potential risk(s) [77].

### Relative Radiation Level Information

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® [Radiation Dose Assessment Introduction](#) document.

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Relative Radiation Level Designations	
Relative Radiation Level*	Effective Dose Estimate Range
None	0
Minimal	< 0.1 mSv
Low	0.1-1 mSv
Medium	1-10 mSv
High	10-100 mSv
*RRL assignments are not included for some examinations. The RRL assignments for the IP (in progress) exams will be available in future releases.	

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An ACR Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the FDA have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.