



# Radiology Rounds

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## Imaging Evaluation of Knee Pain

- Knee pain evaluation differs depending on whether the etiology was traumatic or atraumatic
- If imaging is required, an initial radiographic (X-ray) examination should be ordered
- MRI is only indicated for evaluation of pain without mechanical symptoms if unexplained pain persists for 3-6 weeks
- Injuries that are complex or indicative of tears in multiple ligaments should have urgent referral to the emergency department or to an orthopedist
- Questions of acute septic joint will require aspiration. Plain film imaging may be helpful but is not diagnostic

**K**nee pain is categorized as traumatic or atraumatic, and as acute or non acute. In each category, the presence of swelling, fever, and pain severity should be assessed. Mechanical symptoms such as locking or catching, and instability due to buckling, catching, or weakness help determine the likely utility of imaging. Because the plain film imaging study of knee pain differs on whether the cause is traumatic or atraumatic, this aspect of the history should be provided when the patient is referred for imaging.

### Traumatic Knee Pain

The injuries from trauma that need emergent treatment are fracture and femoral-tibial dislocation. Symptoms that are indicative of severe injury include extreme global pain that increases with weight bearing or motion, and persists at rest. Joint swelling is generally rapid in onset and accompanied by severe restriction of the range of motion (usually only 20° arc). There may be a feeling of knee instability (buckling, weakness with weight bearing, or a feeling of insecurity).

Symptoms that indicate a possible fracture are localized point tenderness, inability to flex the knee to 90°, age ≥ 55 yrs, or inability to bear weight both immediately after the injury and in the emergency department. These indicators have a sensitivity of 100% with a specificity of 46-52%. Anterior-posterior and lateral plain film examination for a fracture has a slightly lower sensitivity of 85-100%. Hence, if the symptoms persist but radiography results are negative, a follow up radiographic examination is appropriate.

**Most Common Diagnoses for Acute Knee Pain in Adult Primary Care Setting**

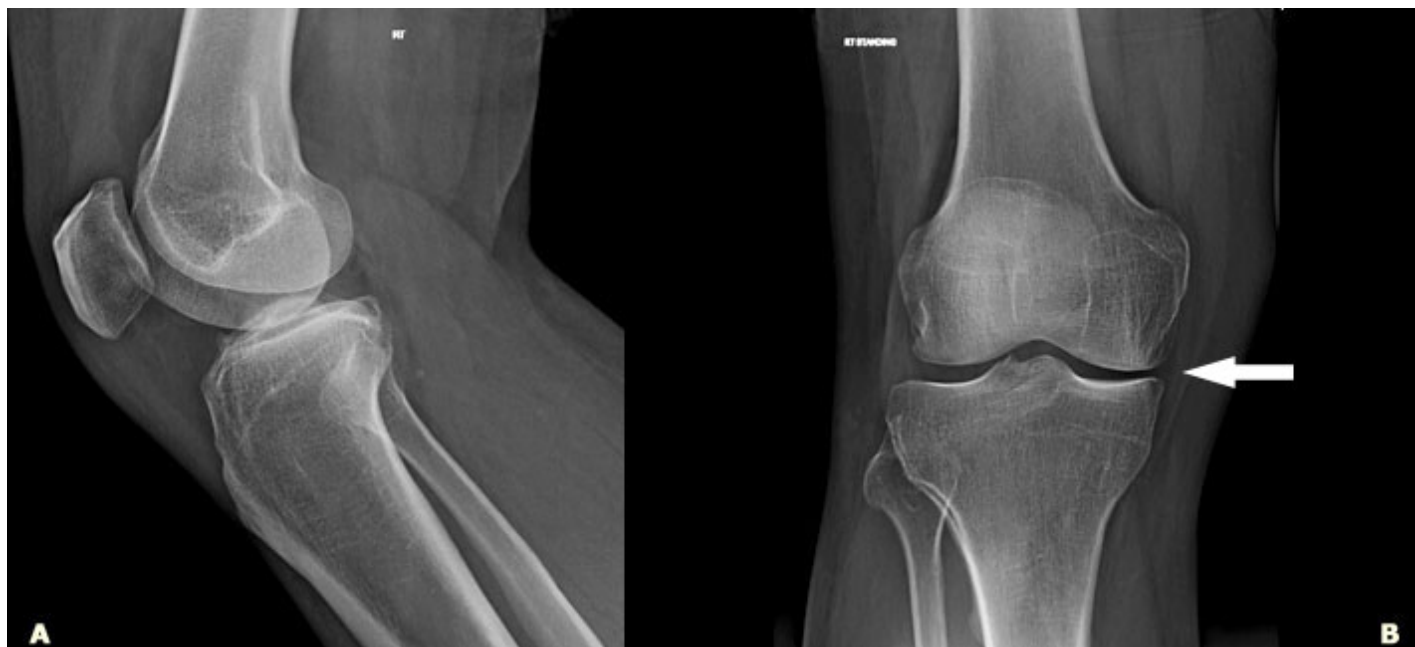
Sprain or strain	42%
Osteoarthritis	34%
Ligamentous injury	11%
Mensical injury	9%
Gout	2%
Fracture	1.2%
Rheumatoid arthritis	0.5%
Infectious arthritis	0.3%
Pseudogout	0.2%

If there is evidence of femoral-tibial dislocation, which can occur as a result of an automobile accident or high-speed impact, there is a possibility of damage to the popliteal artery or nerve. These patients should have evaluation in the emergency department, where specialists may order MR angiography to evaluate for this possibility.

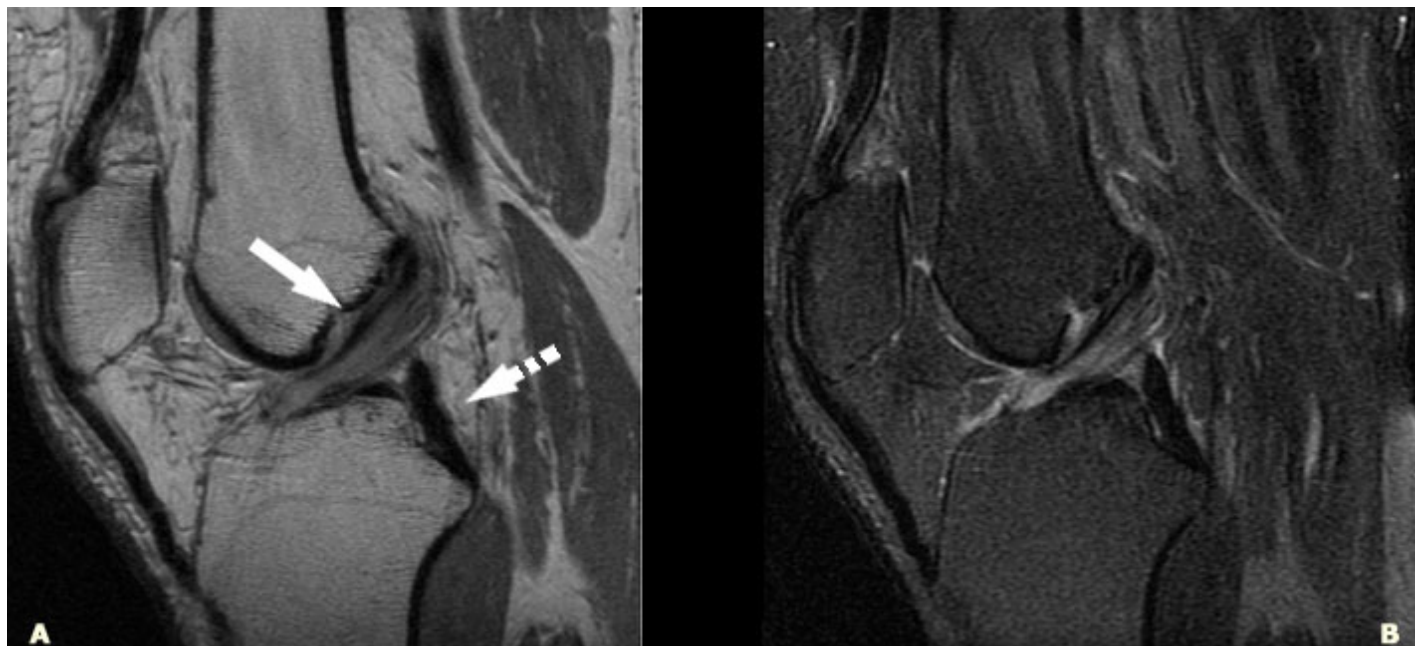
Fractures and injuries that result in tears in multiple ligaments or are otherwise complex should have urgent referral to the emergency department or to an orthopedist. For these presentations with clinical signs of complex injuries, MRI imaging is usually not indicated prior to subspecialist evaluation. If uncertain of the severity of the injury, a referral to orthopedics is appropriate.

In cases where the injury is less severe, there is a strong likelihood that the injury will not require surgery and that the pain will resolve in 3-6 weeks. Therefore, if the plain films are negative, there is no previous history of knee problems, no clinical evidence of instability or giving way, and the pain is moderate, conservative treatment is

indicated (rest, NSAIDS, ice, compression, elevation, activity modification, physical therapy, crutches). MRI may be indicated in these patients if clinical re-evaluation 3-6 weeks after the injury reveals persistent symptoms. In these cases, MRI may be ordered prior to an orthopedic consultation.



Plain film radiographs of the right knee in a 49 year-old with knee pain. Lateral (A) and anteroposterior (B) views demonstrate medial compartment narrowing and small osteophytes (arrow) are consistent with chronic degenerative changes. No fractures or joint effusion is identified.



MRI of the right knee 7 weeks following the plain radiographs demonstrates muroid degeneration of the anterior cruciate ligament. Proton density images (A) demonstrate a normally-oriented anterior cruciate ligament (solid arrow) with thickening and increased signal. The posterior cruciate ligament (dashed arrow) is normal. Inversion recovery images (B) demonstrate no joint effusion or marrow edema indicating that this injury is likely subacute or chronic.

Comparison of Imaging and Clinical Examination for Acute Knee Pain					
Injury	Radiological Examination			Physical Examination	
		Sensitivity	Specificity	Sensitivity	Specificity
Fracture	Plain Radiography	85-100%	88-92%	100%	54%
Meniscal tear	MRI	79-89%	80-91%	86-88%	72-92%
Ligamentous tear	MRI	75-87%	91-93%	74-81%	95%
Cartilage damage	MRI	84%	90%	51%	96%

Results from a meta analyses of data published from 1986 to 1999 (Jackson et al, 2003)

### Atraumatic Knee Pain

Knee pain that is atraumatic or has gradual onset is commonly due to degenerative joint disease (osteoarthritis) but may also be due to tendonitis, bursitis, inflammatory joint disease, chondromalacia, osteochondritis dessicans, septic knee, or tumor. Patients presenting with atraumatic knee pain should first be evaluated with plain film radiographs. An anterior-posterior view in full extension will show knee alignment, a posterior-anterior view while standing with 45° inflexion is best for showing joint-space narrowing.

An MRI examination may be indicated if the patient has not responded to a trial of conservative treatment for 3-6 weeks. However, MRI alone has little to offer for patients with non-traumatic knee pain, **no** mechanical symptoms, and findings of degenerative arthritis on plain films. Because the incidence of abnormal findings such as meniscal tears is high in asymptomatic patients, any MRI finding must be carefully correlated with clinical signs and symptoms. Patients with persistent or recurrent unexplained pain after 3-6 weeks of conservative treatment may require MRI and may require referral to an orthopedist as a next step in the evaluation. However, it should be noted that some orthopedic surgeons do not consider an MRI to be necessary before arthroscopic surgery or total knee replacement.

### Septic Knee

Symptoms of warmth, marked pain with even a small range of knee motion, exquisite tenderness, and painful effusion are consistent with septic knee. In these cases, a routine X-ray may be helpful since an underlying bone infection can break out into the joint and cause a secondary infection. In addition, arthrocentesis and laboratory analysis should be performed to evaluate for infection.

### MGPO Guidelines for Knee Pain

Managed care contracts at MGH require management of high cost imaging utilization. In response, an MGH team, involving orthopedics, radiology, primary care, and others has been working to develop guidelines for the optimal management of knee pain. These guidelines are scheduled to be distributed in the next few months.

### Scheduling

Appointments for knee imaging at all sites can be scheduled through the Radiology Order Entry system, <http://mghroe/> or by calling 617-724-9729 (XRAY).

### Further Information

For further questions, please contact [William Palmer, M.D.](#), Musculoskeletal Radiology, at 617-726-8784.

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