

Top 5 tips: Osteoarthritis

Arthritis Subcommittee



ESSR EUROPEAN SOCIETY OF
MUSCULOSKELETAL
RADIOLOGY

Tip#1: Role of imaging modalities in osteoarthritis

- Radiography is the imaging modality of reference for the diagnosis of osteoarthritis.
- Radiography allows the diagnosis of osteoarthritis and enables the grading of its severity (classically done using the Kellgren-Lawrence system).
- Cross-sectional imaging methods are usually not needed. They are required for the assessment of focal cartilage lesions and for the preoperative setting of prosthetic surgery.
- Compositional MRI techniques are mainly used in research and currently have no routine clinical application.

Tip#2: Main findings at radiographs

NARROWING OF THE JOINT SPACE (dotted squares in Figure 1)

- Bilateral PA weight-bearing radiographs in flexion are the reference for the knee (Lyon-Schuss or Rosenberg views).
- Due to the great interindividual variability, the application of a threshold to detect joint space narrowing is difficult.
- Comparison between the medial and lateral femorotibial compartments is not possible. The medial femorotibial joint space is physiologically narrower than the lateral.
- Comparison to the contralateral asymptomatic site is useful.
- Comparison to previous radiographs is useful but should only be performed on similar views.

SUBCHONDRAL BONE SCLEROSIS/HYPEROSTOSIS

(arrowheads on figure 1)

OSTEOPHYTES (arrowheads on Figure 1)

SUBCHONDRAL CYSTS (arrows on Figure 2)

- Their pathogenesis is controverted with 2 theories:
 1. Bony contusion theory → high loads or trauma lead to trabecular microfractures, necrotic bone, and focal bone resorption, resulting in cysts development
 2. Synovial fluid intrusion theory → alteration of the calcified barrier between cartilage and subchondral bone which enables the entrance of fluid into the subchondral bone, causing a fluid-filled cyst lesion.

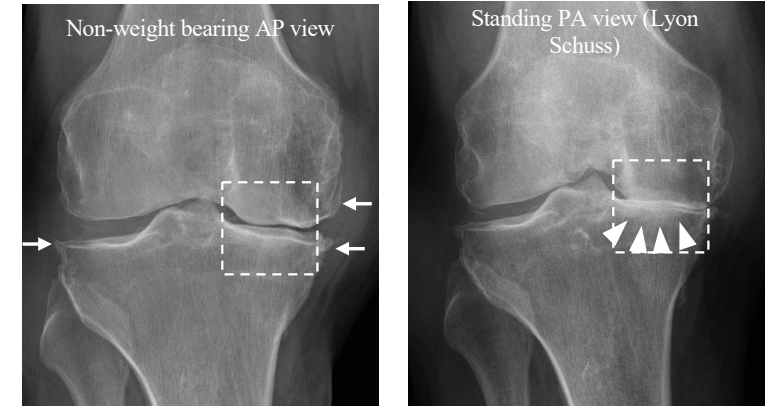


Figure 1: comparison of the joint space width in the same patient between non-weight-bearing and weight-bearing views

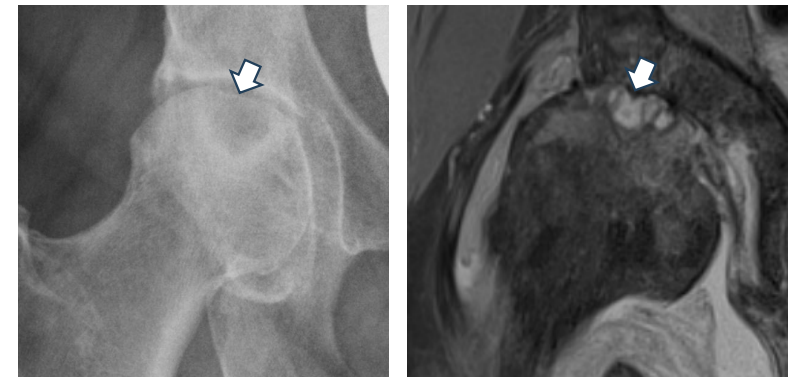
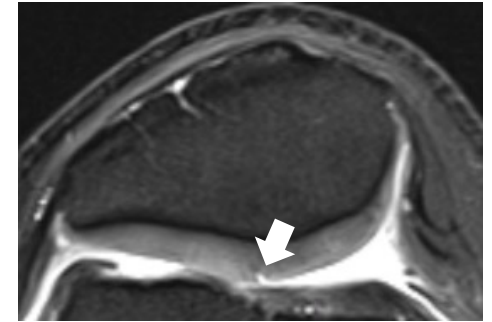


Figure 2: subchondral bone cysts of the femoral head seen on X-rays and MRI.

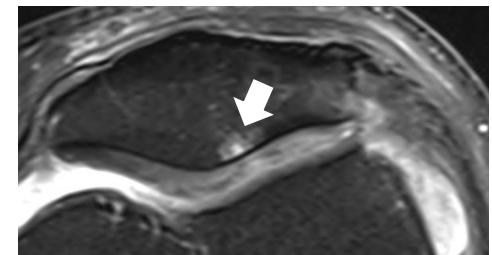
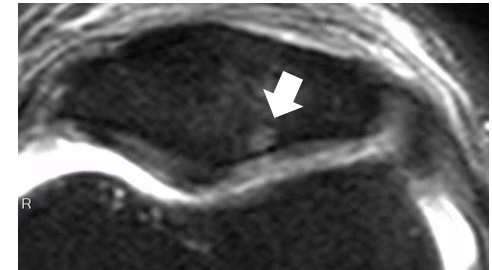
Tip#3: Focal cartilage lesions

- **Modified Outerbridge classification (MR)**

0. Homogeneous cartilage
 1. Areas of hyperintensity with preserved contours
 2. Fraying of the articular cartilage extending to the surface
 3. Partial thickness cartilage loss with focal ulceration
 4. Full-thickness cartilage loss with reactive changes of the exposed bone
- It is useful to measure size/diameter of the cartilage defect
 - Cartilage lesions usually are high in signal intensity, but may have variable signal.
 - Bone marrow edema-like lesions are usually associated with full-thickness cartilage defects.



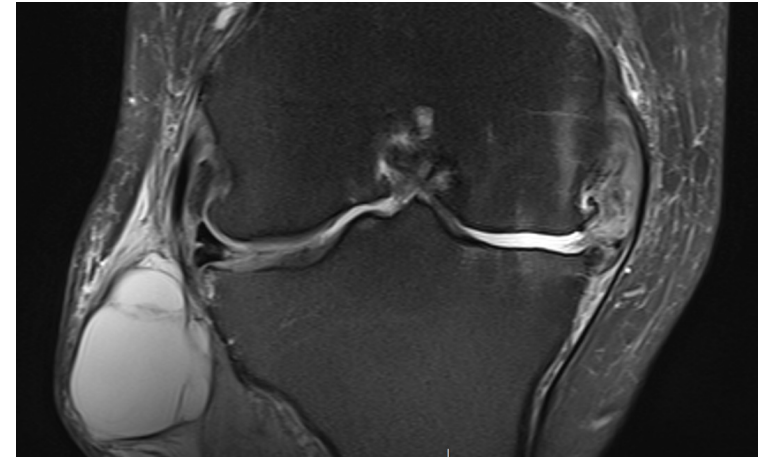
Grade 2 cartilage lesion



Focal cartilage loss with bone marrow edema-like lesion associated with a likely down-to-bone lesion (grade 4), stable over 3 years. Note that cartilage lesions appears as signal heterogeneity.

Tip#4: Focal cartilage lesions do not always represent OA

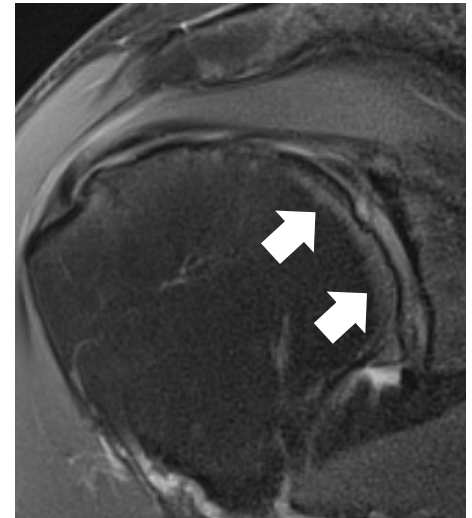
- Osteoarthritis is a whole-organ disease, with involvement of cartilage but also of other structures such as the synovium, menisci, and bone.
- MRI definition of osteoarthritis (Hunter et al. 2011):
 - OA is defined by the presence of 2 Group A criteria or 1 Group A + 2 Group B criteria
 - Group A criteria:
 - Definite osteophyte
 - Full-thickness cartilage loss
 - Group B criteria:
 - Partial-thickness cartilage loss
 - Meniscal tear/extrusion >3mm
 - BML
 - Bone attrition



MRI showing knee osteoarthritis with presence of osteophytes, meniscal tear, bone marrow edema and bone attrition

Tip#5: Bone marrow edema-like lesions (BMELs)

- Edema-like signal in the subchondral bone.
- BMELs correlate with pain in patients with osteoarthritis and are often seen in patients with progressive disease. Nevertheless, BMELs can also be detected in healthy asymptomatic patients.
- The pathogenesis of BMELs is not fully understood, they are probably an early stage of subchondral cysts.



References

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