Joint disease

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What are joints?

joints are places where two or more bones come together. Your shoulders, elbows, hips, knees, and knuckles are all joints. But joints are more than bones. They include the soft tissues around them, such as cartilage, tendons and ligaments.

Joint diseases: refer to conditions that affect the joints, causing pain, swelling, stiffness, and reduced mobility. They can be caused by inflammation, degeneration, infections, or autoimmune reactions.

Some common joint diseases include:

- Degenerative arthritis, commonly known as Osteoarthritis (OA), is the most prevalent type of arthritis. It is a chronic non-inflammatory condition that results from the gradual breakdown of cartilage in the joints, leading to pain, stiffness, and reduced mobility.

- Osteoarthritis is a **wear-and-tear** disease that occurs when the protective cartilage cushioning the ends of bones deteriorates over time. As the cartilage wears away, bones begin to rub against each other, causing pain, swelling, and joint damage.

Other common types:

- **Rheumatoid arthritis (RA)** : autoimmune, symmetric polyarthritis affecting small joints.
- **Gout** : crystal-induced (monosodium urate), very painful flares.
- **Septic arthritis**: bacterial infection of a joint.
- **Psoriatic arthritis**: associated with psoriasis; can be oligo- or polyarticular.

Primary Causes:

- **Aging:** Cartilage naturally breaks down over time.
- **Joint Overuse:** Repetitive stress on joints from work, sports, or daily activities.
- **Cartilage Breakdown:** The body's inability to repair cartilage damage effectively.

Risk Factors:

- **Age:** Common after 50 but can start earlier.
- **Genetics:** Family history increases risk.
- **Obesity:** Extra weight puts stress on weight-bearing joints (knees, hips, spine).
- **Injuries:** Past joint injuries (e.g., fractures, ligament tears) can lead to OA.
- **Joint Misalignment:** Structural issues in bones/joints.
- **Inflammation:** Low-level chronic inflammation may accelerate cartilage damage.

- Osteoarthritis (OA)

X-ray: Asymmetric joint-space narrowing, osteophytes, subchondral sclerosis, subchondral cysts, joint deformity in advanced disease.

MRI: Cartilage thinning/defects, full-thickness cartilage loss in late disease, subchondral bone-marrow lesions (BML/edema), meniscal degeneration/tear (knee), osteophytes, mild synovial hypertrophy.

- Rheumatoid arthritis (RA) / Inflammatory arthritis

X-ray: Periarticular osteopenia, symmetric (uniform) joint-space narrowing, marginal erosions (bare area), subluxation in advanced stages.

MRI: Prominent synovitis with post-contrast enhancement (pannus), bone-marrow edema (early osteitis), early bone erosions, tenosynovitis.

- Gout (Monosodium urate)

X-ray: Late erosions with sclerotic margins and overhanging edges (“rat-bite” erosions); soft-tissue tophi (may calcify); acute films often normal.

MRI: Tophi = heterogeneous intermediate T1 / variable T2 signal, may enhance after contrast; adjacent bone marrow edema and erosions possible. (DECT best for mapping urate.)

- Calcium Pyrophosphate Deposition (CPPD / Pseudogout)

X-ray: Chondrocalcinosis — linear/punctate calcification within hyaline or fibrocartilage (menisci, TFCC, symphysis); may co-exist with OA changes.

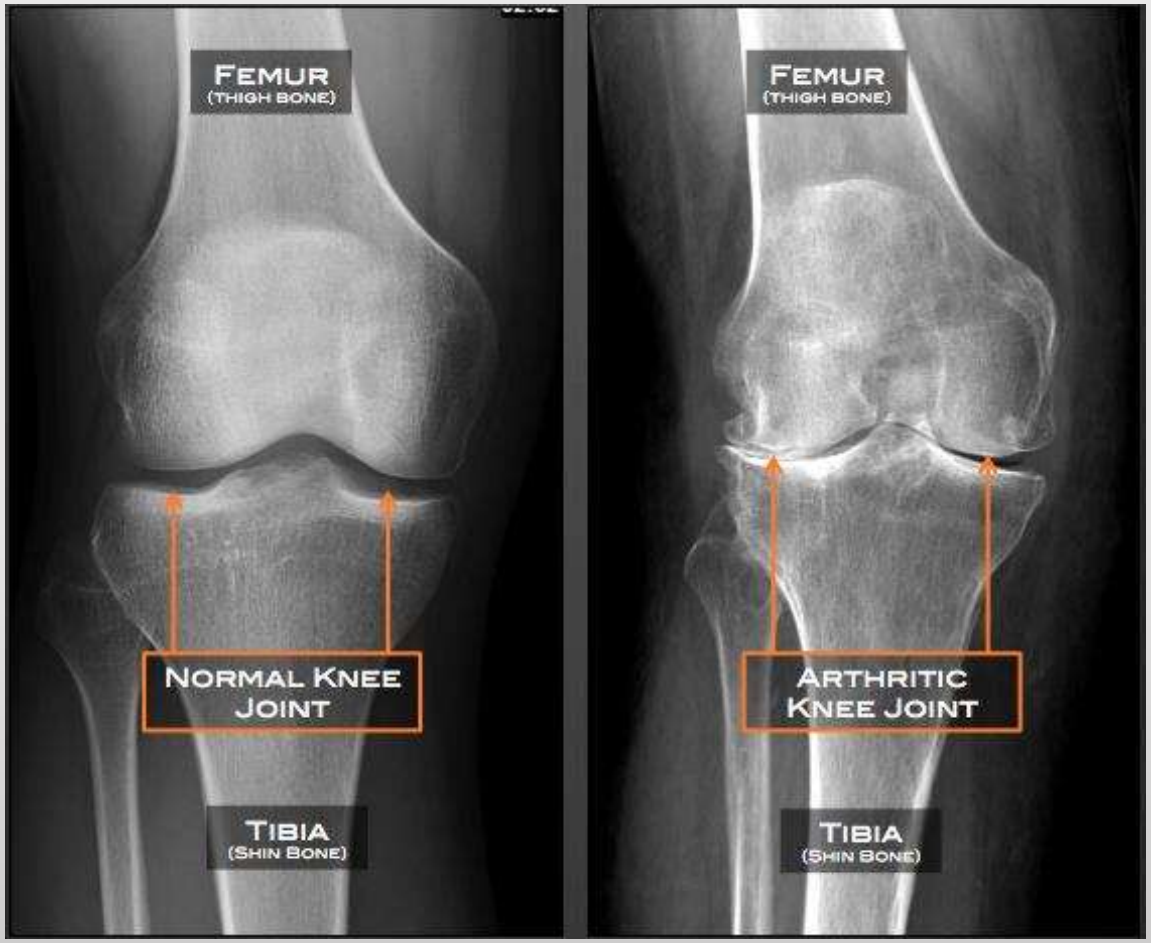
MRI: Cartilage degeneration, joint effusion, synovitis; calcifications are often subtle on MRI (CT better for detecting deposits).

- Septic arthritis

X-ray: Often normal early; later: joint-space narrowing, periarticular demineralization, subchondral bone destruction.

MRI: Large joint effusion with synovial thickening and marked post-contrast enhancement; adjacent bone-marrow edema/osteomyelitis and soft-tissue abscesses.

This figures shows x-ray of the knee, normal knee joint with specs between femur and tibia (present of cartilage), and shows arthritic knee joint with no spaces as result of cartilage damaging and the joint presses on the joint.



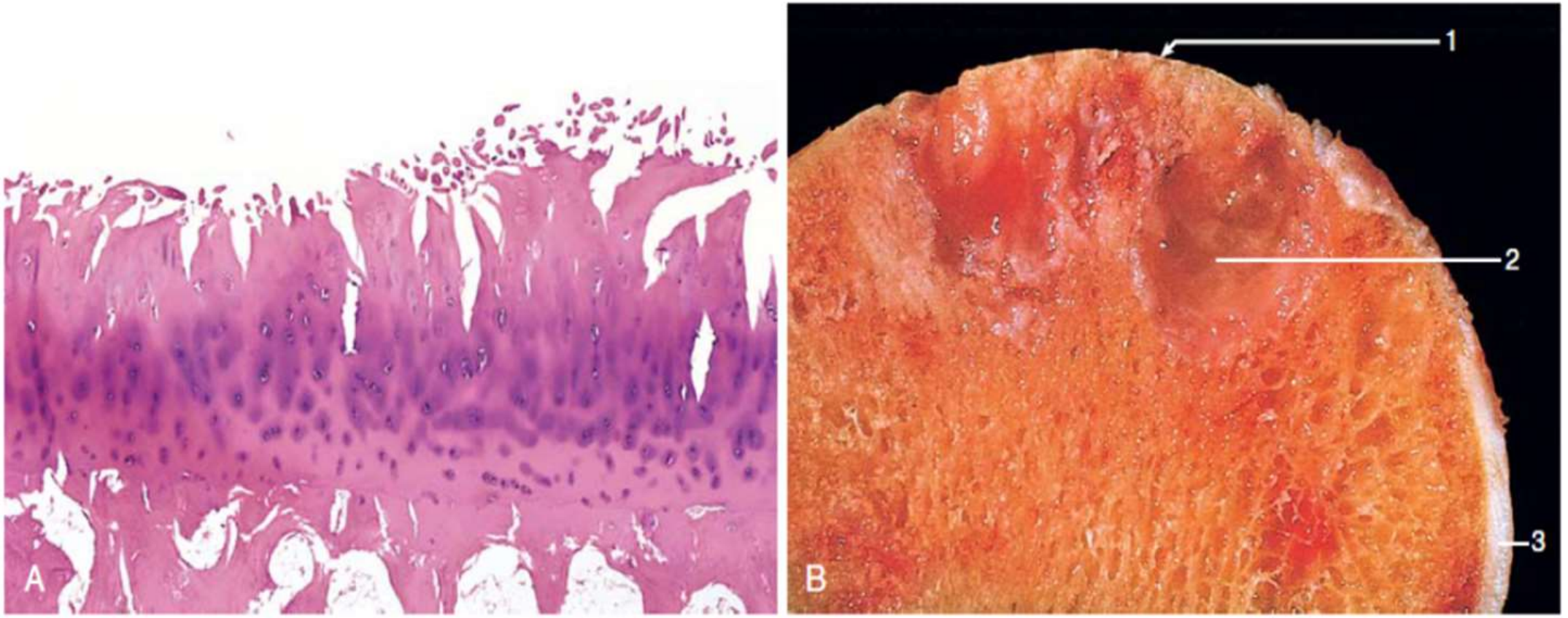
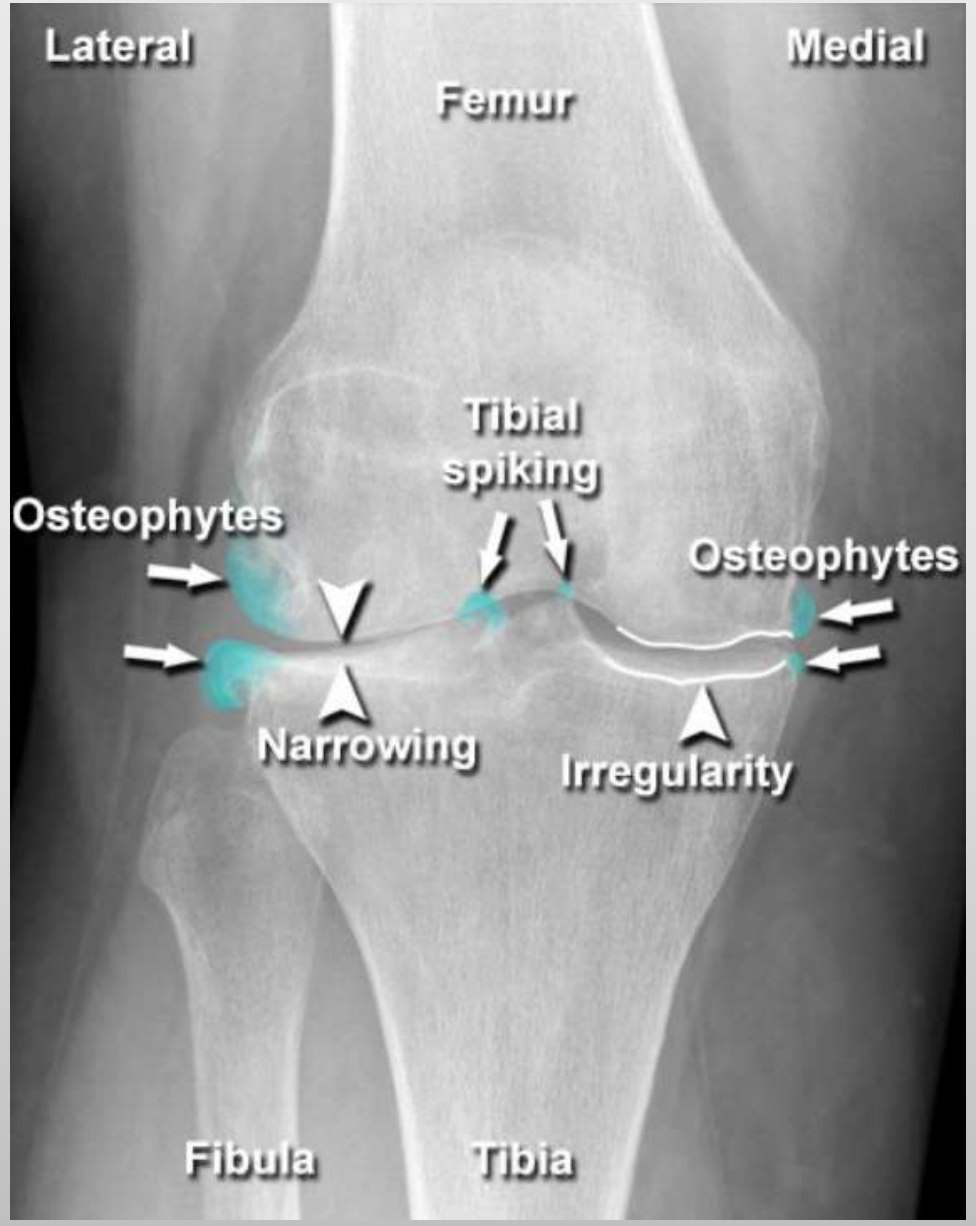


FIG. 19.32 Osteoarthritis. (A) Histologic demonstration of the characteristic fibrillation of the articular cartilage. (B) Eburnated articular surface exposing subchondral bone *(1)*, subchondral cyst *(2)*, and residual articular cartilage *(3)*.

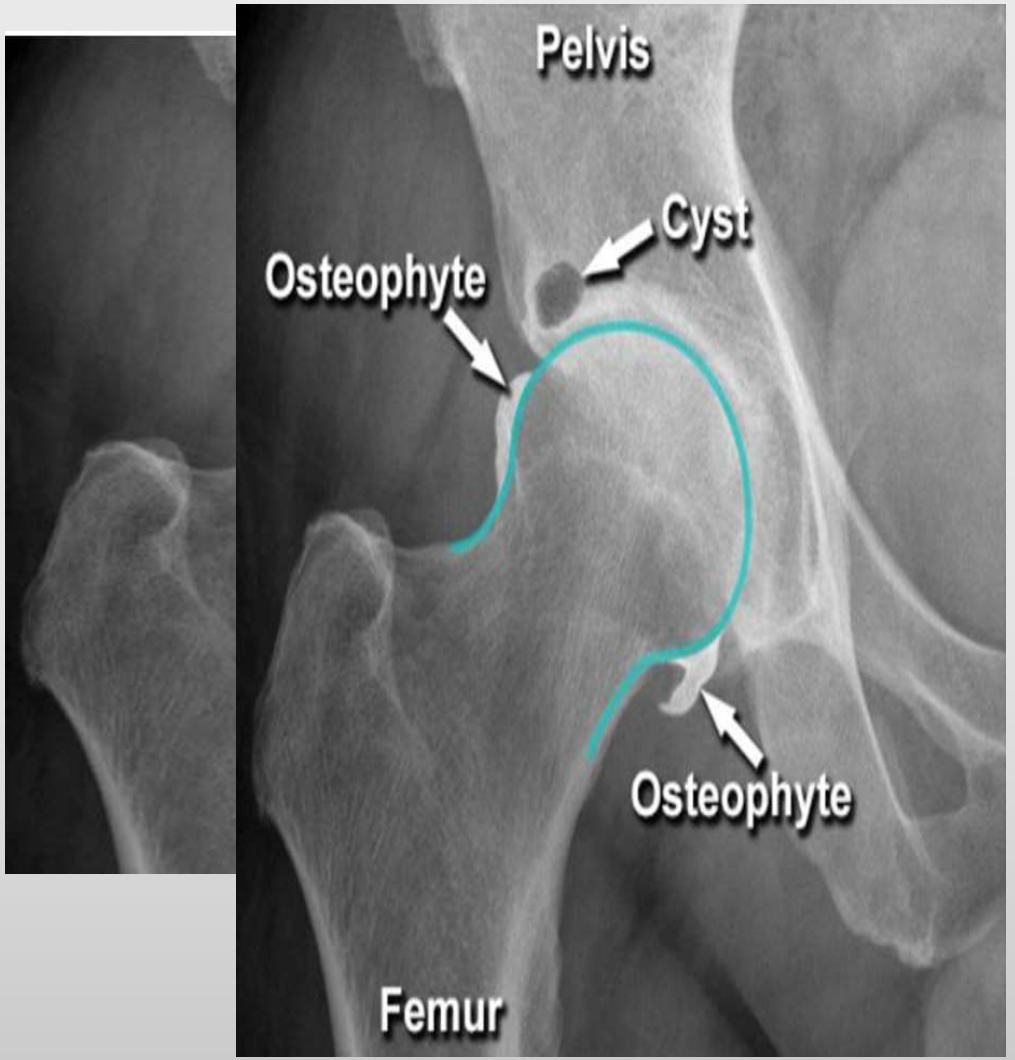
Anteroposterior (AP) X-ray of the knee demonstrating findings consistent with Osteoarthritis (OA). Note the narrowing of the medial joint space (the inner side of the knee), which suggests loss of articular cartilage, and early formation of osteophytes (bone spurs) along the joint margins.

- Osteophytes, commonly known as bone spurs, are small, smooth growths of bone that often develop along the edges of bones, most frequently at the joints. They are a key feature of Osteoarthritis (OA), the "wear-and-tear" form of arthritis. The body creates these spurs in an attempt to stabilize the joint and spread the load over a wider area, compensating for the deterioration of the articular cartilage (the protective tissue at the ends of bones).

- The formation of osteophytes (bone spurs) is a common feature of osteoarthritis
- This AP view of the knee shows osteophytes of the tibia and femur
- Small osteophytes have also formed at the tibial spines (tibial spiking)
- The knee joint spaces are narrowed and irregular
- See an example of a normal knee X-ray

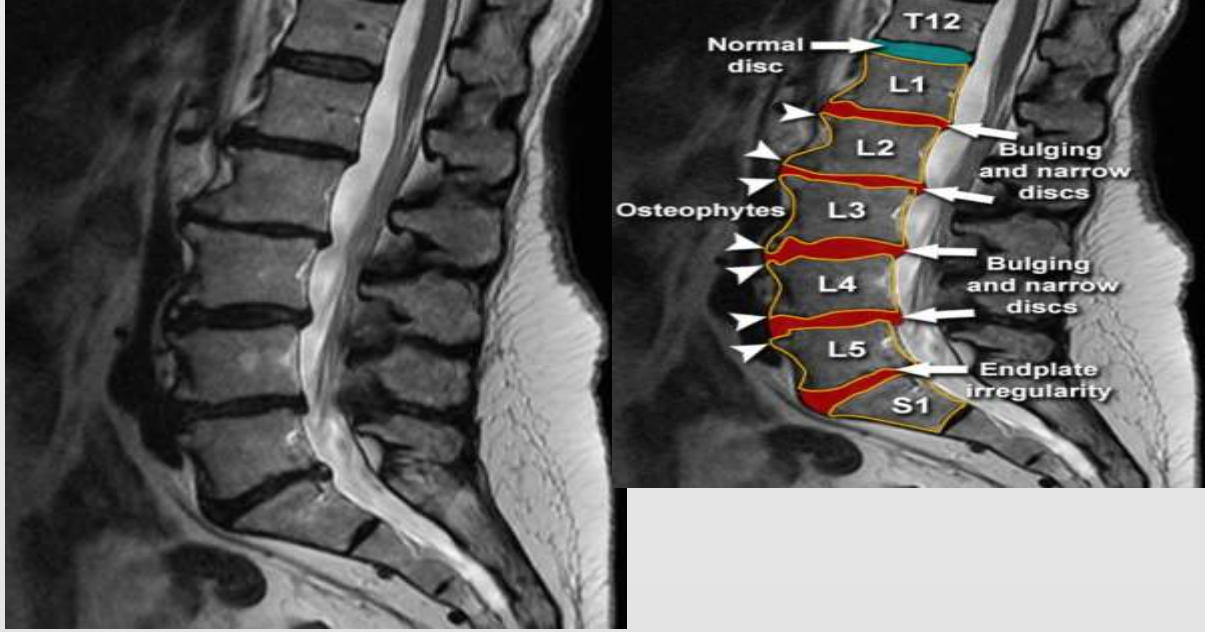


- Although sub-cortical bone cysts are a characteristic finding of osteoarthritis, they are only visible in approximately one third of X-rays of osteoarthritic joints
  - This hip joint is narrowed and large osteophytes have formed
- Note: These cysts may be called ‘sub-chondral cysts’, ‘sub-cortical cysts’, or 'geodes' – any of these terms are acceptable



X-ray views contrasting two common findings in arthropathy (joint disease): Image 1 highlights a prominent osteophyte (bone spur), typically seen in Osteoarthritis. Image 2 illustrates chondrocalcinosis (calcification of cartilage) characteristic of CPPD (Calcium Pyrophosphate Deposition Disease).

Same patient



X-ray: The disc spaces are narrow due to reduction of disc height

Prominent vertebral body osteophytes have formed anteriorly

Cortical irregularity of the facet joints is a sign of facet joint arthrosis

Note: The intervertebral disc spaces are not synovial joints and so osteoarthritis is an incorrect term for degenerative disc disease. However, the facet joints are synovial joints and so are susceptible to osteoarthritis – often referred to as ‘arthrosis’.

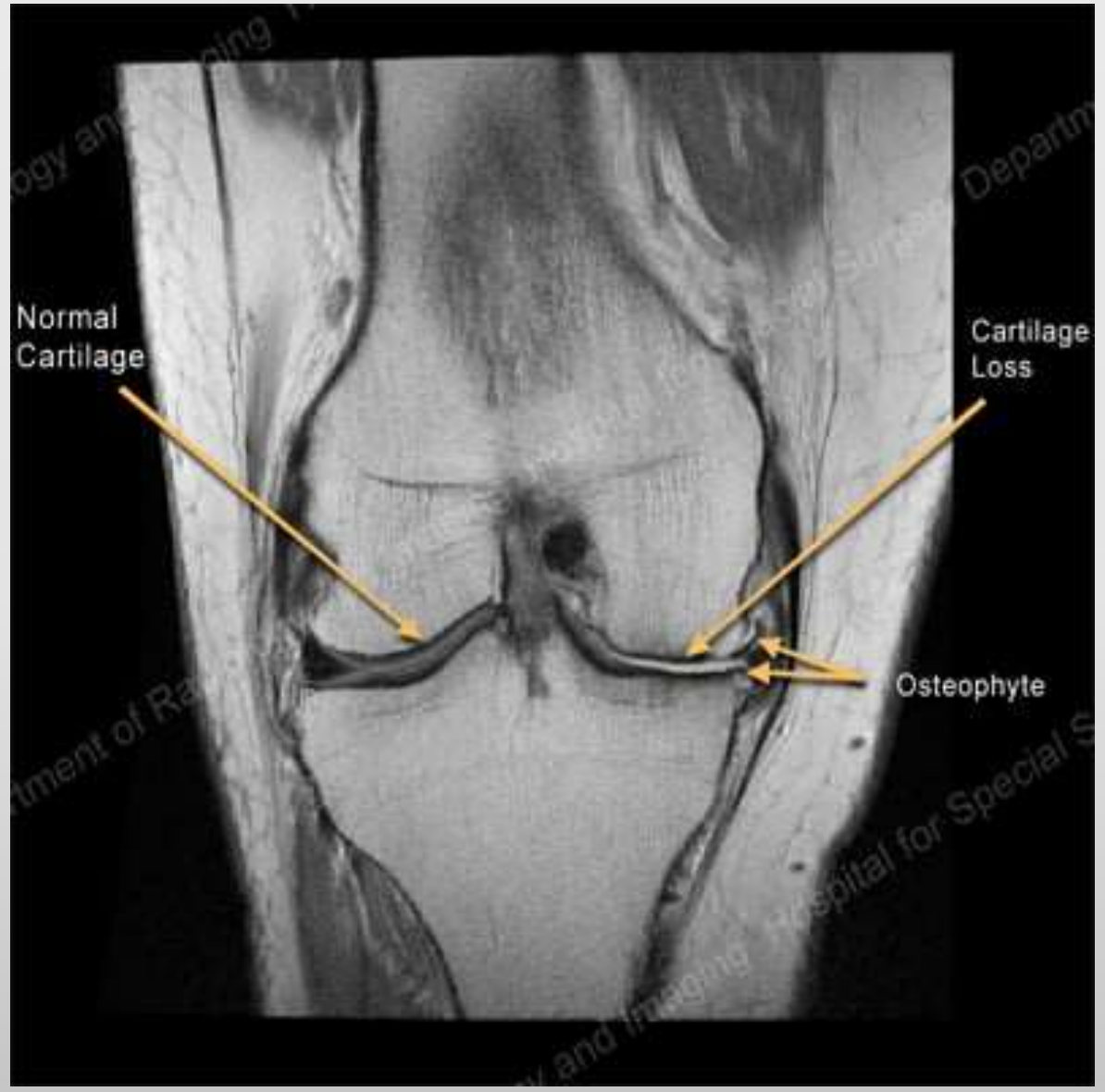
Unlike on the X-ray, the intervertebral discs are clearly visible with MRI

This T2-weighted MRI image shows reduced fluid signal within the discs; the discs appear blacker than usual – compare with the normal disc at T12/L1

The discs are bulging and reduced in height

The endplate surfaces appear irregular and prominent osteophytes have formed (arrowheads)

MRI of the knee showing normal cartilage on one side and cartilage loss and an osteophyte on the other.



Bilateral Knee Radiograph (AP View) demonstrating severe tricompartmental Osteoarthritis (OA). Key findings include marked joint space narrowing in the medial and lateral compartments of both knees, prominent osteophyte formation (bone spurs), and underlying subchondral sclerosis

- subchondral sclerosis: thickening of bone that happens in joints affected by osteoarthritis.
- varus deformity: when the knee bows inward.

Prominent degenerative change is seen throughout the hands, primarily involving the interphalangeal joints (especially distal). There is joint space loss and marginal osteophytes. The metacarpophalangeal joints of the fingers are relatively spared, although prominent degenerative change is also seen at the MCP joint of the thumb.

Gout disease: type of inflammatory arthritis that causes pain and swelling in your joints, usually as flares that last for a week or two, and then resolve. Gout flares often begin in your big toe or a lower limb. gout is a progressive disorder of urate metabolism disease resulting in the deposition of monosodium urate crystals in joints and soft tissues.

Risk Factors:

- High purine diet (red meat, seafood, alcohol)
- Obesity & metabolic syndrome
- Kidney disease (poor uric acid excretion)
- Genetics & family history
- Male sex

This X-ray demonstrates characteristic radiological features of an aggressive form of arthritis, specifically showing joint space loss, marginal erosions (damage to the bone ends), and associated soft tissue edema/swelling. common finding in active gout

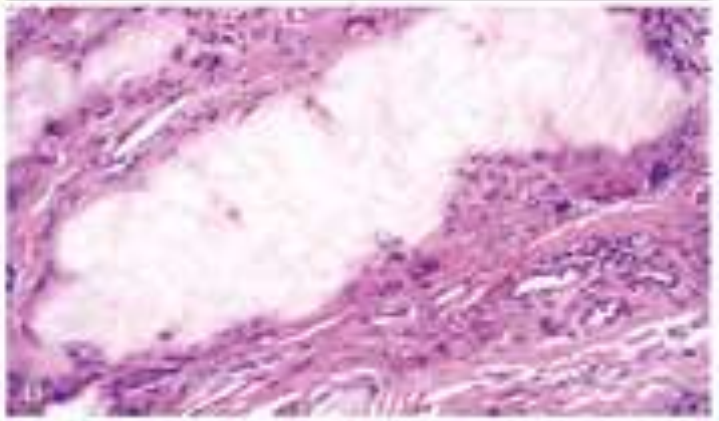
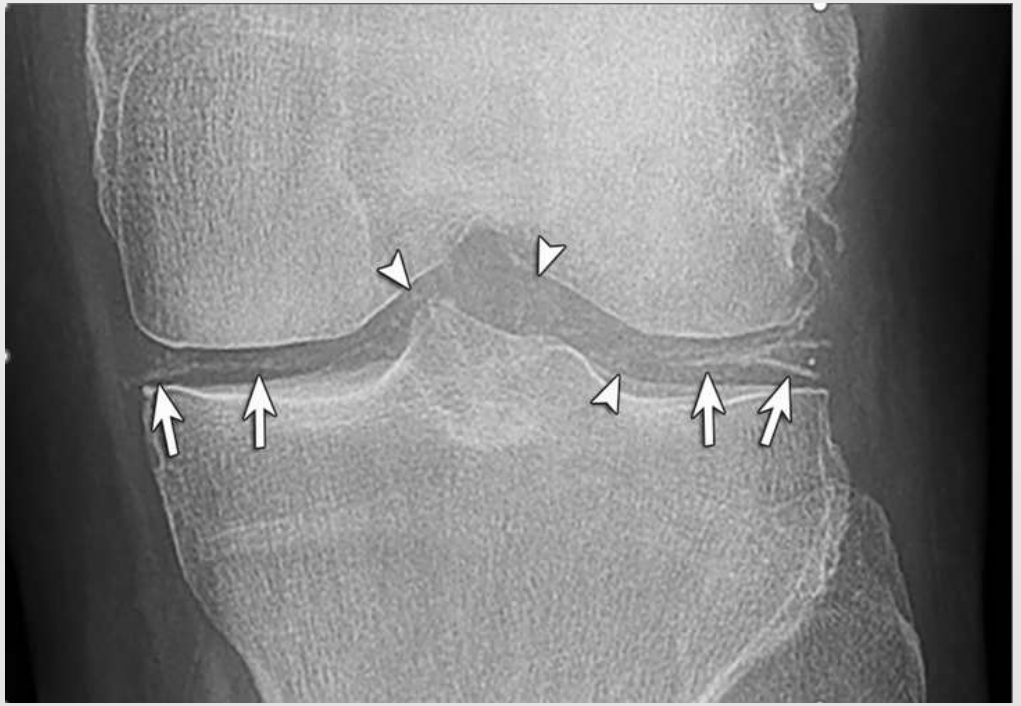


FIG. 19.40 Gout. (A) Amputated great toe with a tophi (arrows) involving the joint and soft tissues. (B) Gouty tophus—an aggregate of dissolved urate crystals is surrounded by reactive fibroblasts, mononuclear inflammatory cells, and giant cells. (C) Urate crystals are needle shaped and negatively birefringent under polarized light.

Pseudogout (Calcium Pyrophosphate Deposition Disease - CPPD): Pseudogout is caused by calcium pyrophosphate (CPP) crystal deposits in the joints. It is not related to uric acid and can be triggered by aging, joint damage, or metabolic disorders.

Risk Factors:

- Aging (common after 60 years old)
- Joint injuries or osteoarthritis
- Calcium metabolism issues (hyperparathyroidism, hemochromatosis)



Anteroposterior knee radiograph shows cartilage icing with linear opacity outlining of the menisci and hyaline cartilage (arrows). Chondrocalcinosis appears as speckled calcifications within the hyaline cartilage (arrowheads).

Coronal MRI of the wrist (STIR or T2-weighted image) demonstrating extensive joint destruction and inflammation, findings highly characteristic of severe Rheumatoid Arthritis (RA) or infectious (septic) arthritis. The yellow arrows highlight key features:
Synovitis/Joint Effusion: Increased signal (bright white areas) representing fluid and inflammation within the wrist joints.

Marginal Erosions: Destructive changes along the joint surfaces of the carpal bones and the distal ulna/radius.
Bone Marrow Edema: High signal within the bone ends, indicating severe inflammation and bone damage.
Soft Tissue Edema: Swelling and fluid surrounding the joint (e.g., around the distal ulna on the right side of the image).

Differences

Feature	Gout	Pseudogout
Crystal Type	**Uric acid**	**Calcium pyrophosphate (CPP)**
Common Joint	**Big toe (Podagra)**	**Knee, wrist, shoulder**
Attack Duration	**3–10 days**	**Can be longer**
Risk Factors	**High purine diet, alcohol, obesity**	**Aging, joint injury, calcium metabolism disorders**
Diagnosis	**Uric acid blood test, joint fluid analysis**	**X-ray (shows calcifications), joint fluid analysis**

Infectious Arthritis

- is a **painful joint infection** caused by **bacteria, viruses, or fungi**. It leads to **joint inflammation, swelling, and destruction** if not treated quickly.

Causes of Infectious Arthritis

- **Bacterial Infection (Most Common Cause) – Septic Arthritis**

Bacteria enter the **joint fluid (synovial fluid)** and cause infection.

Common bacteria:

Staphylococcus aureus, **Neisseria gonorrhoeae**

- **Viral Arthritis**

- **Examples:**
  - Hepatitis B & C, Parvovirus B19, HIV

- **Fungal Arthritis**

Rare, but seen in people with **weak immune systems**.

Common fungi:

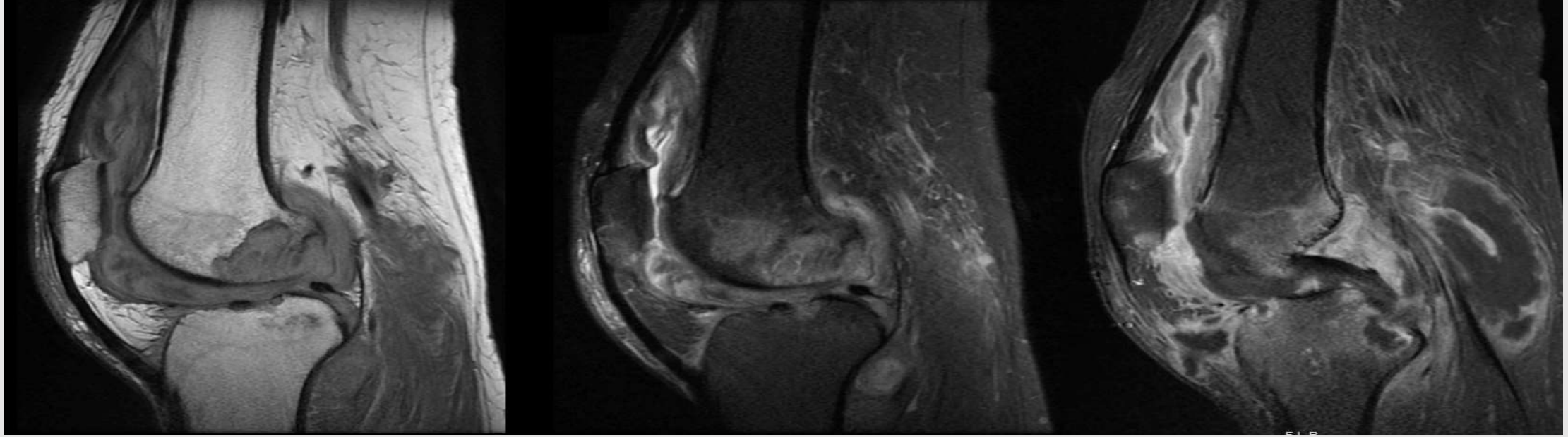
Candida, Histoplasma and Aspergillus

The infection enter the body throw:

Bloodstream (Most Common Way) – Infection from another part of the body spreads to the joint.

Direct Joint Injury – Trauma, surgery, or an injection introduces bacteria.

Nearby Infection – Bone or skin infections spread into the joint (e.g., cellulitis, osteomyelitis).



Sagittal Magnetic Resonance Imaging (MRI) sequence of the knee across three different views (T1, T2, and/or T2 Fat-Saturated) demonstrating features of severe inflammatory or infectious arthropathy. Key findings include: **Extensive Bone Marrow Edema** (bright signal within the bone, indicating inflammation/fluid) in the distal femur and proximal tibia. **Joint Effusion** (excess fluid accumulation) within the joint capsule. **Synovial Enhancement/Thickening** (lining of the joint capsule is thick and potentially inflamed), which, when coupled with the clinical picture, strongly suggests either Septic Arthritis (joint infection) or an acute inflammatory disease process.

X-ray shows complete loss of the right superior femora acetabular joint space. Destruction of the acetabular roof.