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Types of Arthritis:

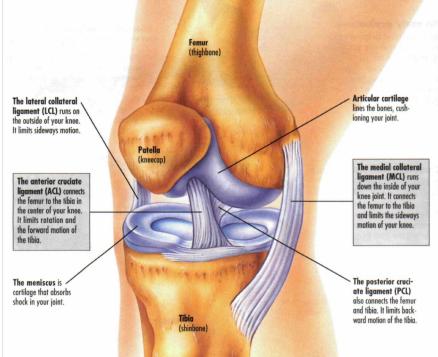
- Rheumatoid Arthritis
- Osteoarthritis
- Crystalline Arthropathies
- Seronegative Arthritis
 - Psoriatic Arthritis
 - AS
 - SLE, etc.





What does normal look like first....

Native Knee Anatomy



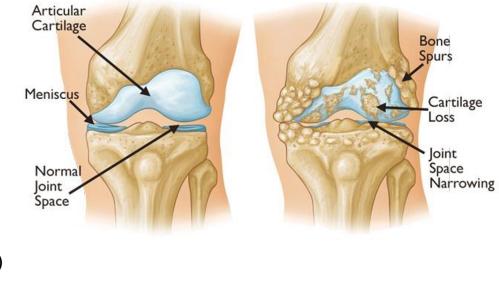
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M. OLINSKI*, A. GRONOWICZ and A. HANDKE. Design and Characterization of a Novel Knee Articulation Mechanism. Int. J. of Applied Mechanics and Engineering, 2016, vol.21, No.3, pp.611-622. DOI: 10.1515/ijame-2016-0037



Now, what is pathologic....

- Depends on the type of arthritis
- Look at the bone quality
- Joint space?
- Osteophytes present?
- Cysts? Sclerosis?
- What can't you see on a radiograph?
 - Menisci likely degenerative
 - Cruciates may be absent
 - Instability apparent (ALIGNMENT)



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Orthoinfo. (2012). Diseases and Conditions: Arthritis of the Knee. Retrieved from; https://orthoinfo.aaos.org/en/diseases--conditions/ of-the-knee/ Accessed June 2020

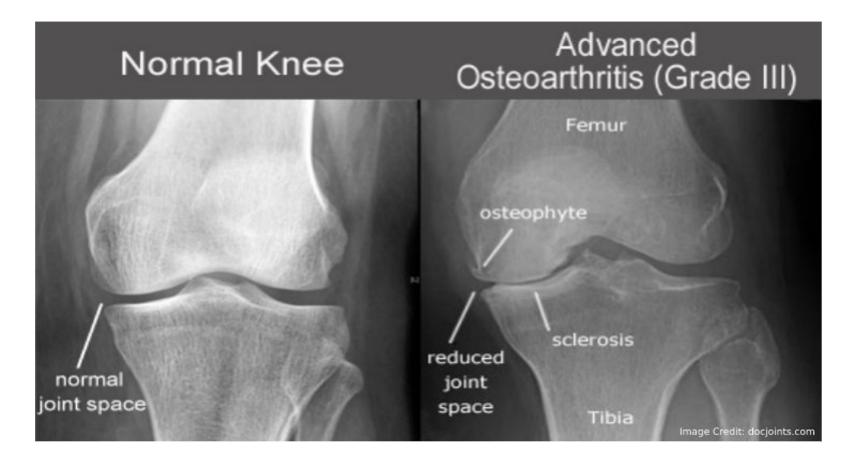


Osteoarthritis:

- Bone usually sclerotic
- Asymmetric Joint Space narrowing
- Osteophyte Formation
- Subchondral Sclerosis
- Subchondral Cysts
- You don't need all the signs to make this diagnosis!







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Consumer Health Digest. (2019). Arthritis on X-Ray: Diagnosing Arthritis with X-Ray. Retrieved from: https://www.consumerhealthdigest.com/joint-pain/arthritis-onx-ray.html. Accessed June 2020



Causes of OA:

- Primary/Degenerative "wear and tear"
- Secondary:
 - Trauma
 - Infection
 - = AVN
 - Developmental: Perthes/Dysplasia/SCFE





Rheumatoid Arthritis:

- Bone usually with osteopenia
- Symmetric Joint Space narrowing
- Limited osteophyte Formation
- Limited Subchondral Sclerosis
- Limited Subchondral Cysts
- If there are osteophytes, etc., the patient can still have RA.





Aditya Bahel, D.O., Yatin Chadha, M.D., Donald Resnick, M.D. Radsource. (2016). MRI Web Clinic — June 2016. MR Imaging of Rheumatoic Arthritis. Referenced from: http://radsource.us/mr-imaging-rheumatoid-arthritis/.



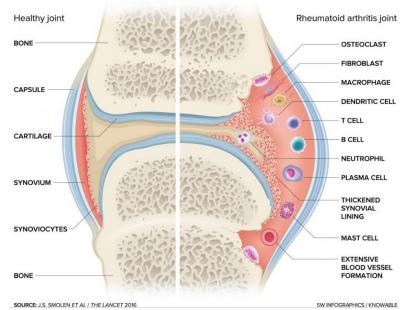
Rheumatoid Arthritis:

- Bilateral Symmetry
- Periarticular Soft Tissue
 Swelling
- Uniform Joint Space Loss
- Marginal Erosions
- Justarticular osteoporosis
- Joint Deformity

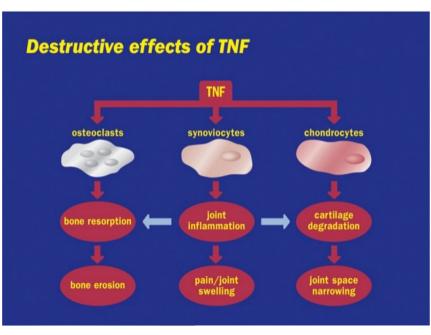
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Anatomy of an RA joint

In contrast to a healthy joint (left), one affected by rheumatoid arthritis harbors a multitude of cells that cause inflammation and damage the bone and cartilage.



Rheumatoid arthritis is a TNF/synovial driven disease:





Slideplayer. (2015). Drugs Used in Joint Disease. A Video Powerpoint. Referenced from: https://slideplayer.com/slide/5706001/. Accessed June 2020



Crystalline Arthropathies:

- Hot swollen joint mimics septic arthritis
- Gout: negatively birefringent sodium monourate crystals
- Pseudogout: positively birefrigent calcium pyrophosphate crystals
 Meniscal deposition on radiograph

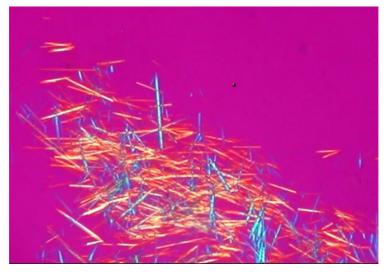
Diagnosed via aspiration

• You don't need all the signs to make this diagnosis

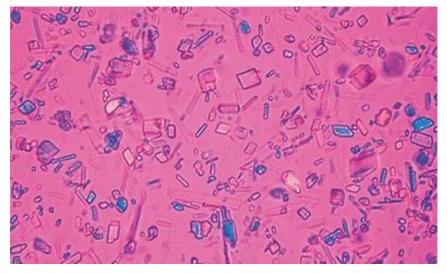


Crystals: Viewed Under Polarized Light

Sodium Monourate Crystals



Calcium Pyrophosphate Crystals





Flickr. (2010). Monosodium Urate Crystals in Tophaceous Gout. Referenced from: https://www.flickr.com/ohotos/euthman/4306256393 Accessed June 2020 Dieppe P, Swan A. Identification of crystals in synovial fluid. Annals of Rheumatic Disease. Vol.58 Issue 5, 1999. http://dx.doi.org/10.1136/ard.58.5.261. Accessed June 2020



Causes of Crystalline Arthropathy:

- Dietary causes: high protein diets
- Urate is the end product of purine metabolism
- As serum urate levels rise, reaches a level where it is NO LONGER soluble in the serum THEN crystalizes in the tissues.
- Hyperuricemia is either OVERproduction or UNDERsecretion







Gout on x-rays:

- Common in First MTP joint.





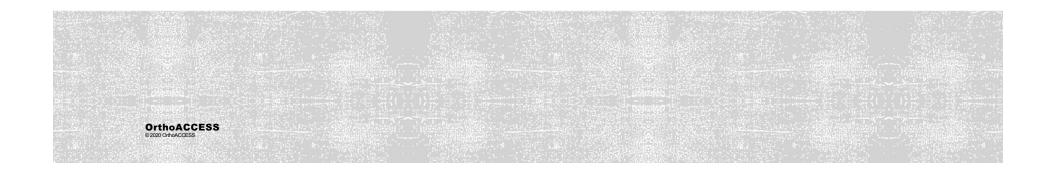
Simon JA. Radsource. (2011). MRI Web Clinic Gout. Referenced from: http://radsource.us/gout/ Accessed June 2020.



Gout Pathology: Hyperuricemia Precipitation of urate crystals in joints Complement activation Phagocytosis by monocytes Neutrophil chemotaxis Release of IL-1, TNF, IL-6, IL-8 Phagocytosis of crystals by neutrophils Release of LTB4, prostaglandins, Cartilage Release free radicals of crystals Synovium Lysis of neutrophils Release of **Release of** lysosomal enzymes proteases 10,01 OrthoACCESS Tissue injury and Blog Artikel Kesehatan. (2011). Rheumatic in Geriatric. 20 OrthoACCESS inflammation







Right Knee Pain:

- •58 y.o. gentleman with left knee pain
 - Common Complaints:
 - Pain
 - Swelling/Effusions (fluid palpable in joint)
 - Bowing of the leg (deformity)
 - Instability, "It feels like it gives out."
 - Stiffness, doesn't bend like it used to.





History Cont:

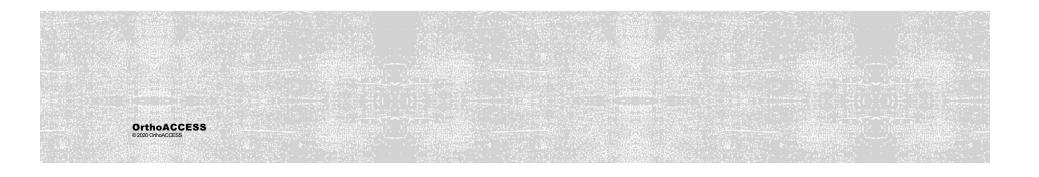
- Location of the pain
- Frequency of symptoms
- Intensity of the pain
- Treatment thus far?
 - Meds
 - Injections
 - PT











Physical Exam: Be gentle!

- Exam the other extremity
- ALWAYS examine the hip with including an evaluation of internal rotation
 - Hip disorders can present with ipsilateral knee pain
- Have the patient walk
 - Gait pattern
 - Antalgic gait painful, shortened stride
 - Varus or valgus thrust
 - Need for a gait aid

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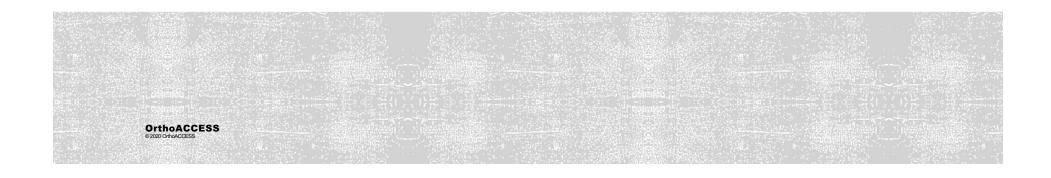
Physical Exam:

- Swelling/redness in the leg
- Evaluate for the presence of an effusion in the knee
- Active and Passive Range of Motion compared to other extremity
 - Assess for flexion contracture
 - Assess for extensor lag
- Palpate the area of interest
- Perform a ligament exam of the extremity
 - ACL, PCL, MCL, LCL









Radiographs: Standing AP Left Knee

 Try to obtain standing films to assess joint when bearing weight.



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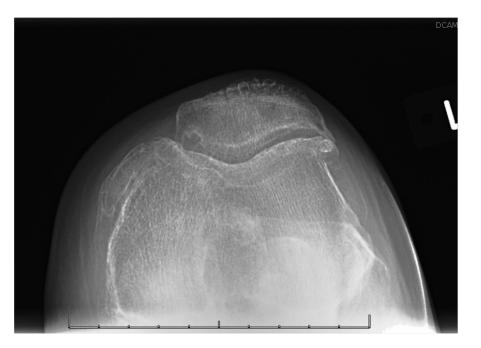
Radiographs: Lateral Left Knee



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Radiographs: Sunrise View Right Patellofemoral Joint



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Radiographs: Long Leg Alignment

- Allows you to assess the weight bearing axis.
- If plumb line falls medial (varus alignment) or lateral (valgus alignment) to the joint it is pathologic.

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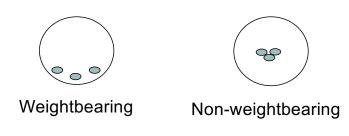




Radiographs:

- Weight bearing imaging will be listed on the film:

- By saying, "Weight Bearing" on the film
- With an arrow pointing up or proximal
- With a marker that has three BBs.
 - The BBs fall to the bottom of the cup in weight bearing.



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The plan

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Treatment Options:

Non-operative

- NSAIDs
- **Physical Therapy**
- Ice
- Activity Modification
- Weight Loss
- Assist Devices

Operative

- Arthroscopy for mechanically symptomatic meniscus tear
- Osteotomy
- Fusion
- **Partial Arthroplasty**
- **Total Arthroplasty**

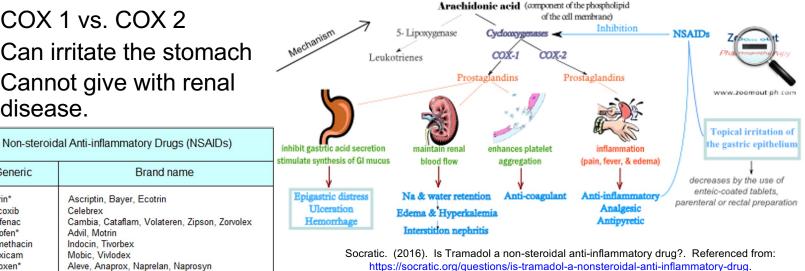




Non-Operative Treatment:

- NSAIDs
 - COX 1 vs. COX 2
 - Can irritate the stomach
 - Cannot give with renal disease.

Non-steroidal Anti-inflammatory Drugs - Mechanism of Action



https://socratic.org/questions/is-tramadol-a-nonsteroidal-anti-inflammatory-drug.

Figure 1: Common oral NSAIDs * available over the counter

Daypro Feldene

Celebrex

Advil, Motrin

Indocin, Tivorbex

Mobic, Vivlodex

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Generic

Aspirin*

Celecoxib

Diclofenac

Ibuprofen*

Indomethacin

Meloxicam

Naproxen* Oxaprozin

Piroxicam

The Asthma Education Clinic, (2017), Should NSAIDs be considered dangerous? Referenced from 2017/7/11/09o0vkuniu4lcwisn434pbtm91f91a. Accessed June 2020 http://www.asthmaed.com/io





Non-Operative Treatment:

- Physical Therapy:
 - ROM
 - Quad Strength (VMO)
 - Gait Training
 - Balance

Physical Therapy before Knee Surgery?!



Speed up recovery and decrease pain with this essential advice



The Fit Stop. (2015). Can physical therapy help my knee pain before surgery? Referenced from: //fitstopphysicaltherapy.com/2015/06/can-physical-therapy-help-my-knee-pain-before-surgery/. Accessed June 2020



Non-Operative Treatment:

• Use a Gait Aid: Opposite hand for a Cane!





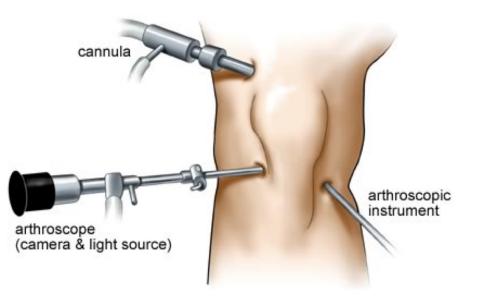
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Health Products for You. (2019). Guardian Easy Care Folding Walker. Accessed June 2020. Vive Health. (2019). Vive Health Four Prong Cane. Accessed June 2020



Operative Options: Knee

- Arthroscopy:
 - Little value for Arthritis treatment
 - Only indicated for mechanical symptoms from a meniscus tear or loose body
 - Locking
 - Catching



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Quora. (2019). What is the procedure of knee arthroscopy? What are the benefits of knee arthroscopy? Referenced from: https://www.guora.com/What-is-the-procedure-the-benefits-of-knee-arthroscopy Accessed June 2020



Operative Options: Fusion

- Bone grows together
- Eases pain in the joint
- Functionally limiting
- Alternative to amputation in infection cases
- Can cause pain in other joints in ipsilateral extremity

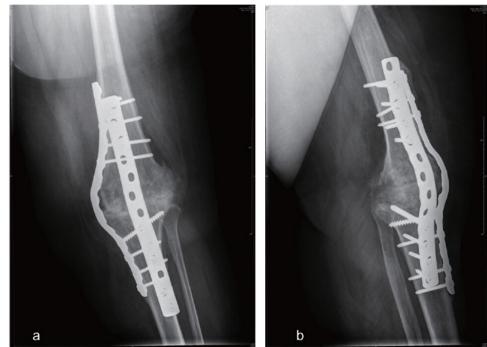


Figure 5 Knee fusion with compression plate technique after failed TKA.

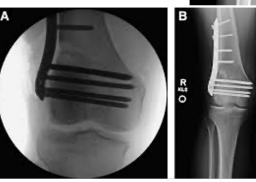


Kim K, Snir N, Schwarzkopf R. Modern Techniques in knee arthrodesis. Int J Ortho Vol 3, Issue 1. 2016.



Operative Options: Knee

- Osteotomy:
 - Reserved for younger, active patients
 - Often a stepping-stone to joint replacement
 - Distal Femoral:
 - Varus Producing
 - Offloads Lateral Knee
 - High Tibial:
 - Valgus Producing
 - Offloads Medial Knee





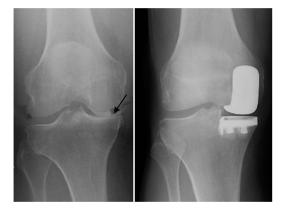
Taipei Veterans General Hospital International Medical Service Center. High Tibiel Osteotomy (HTO) – Joint Preservation Surgery Wylie JD, Jones DL, Hartley MK, Kapron AL, Krych AJ, Aoki SK, Maak TG. Distal Femoral Osteotomy for the Valgus Knee: Medial Closing Wedge versus Lateral opening Wedge: A Systematic Review. Attrinoscopy, Vol 32, No. 10 (Oct) 2016; 2141-2147.



Operative Options: Knee

- Arthroplasty (uni vs total):
 - Procedure Selection
 - Location of pain
 - Location of damage (XR)
 - Patient expectations
 - Patient Selection
 - Overall health status
 - DM want good glycemic control
 - BMI caution with morbidly obese as risk of complications increases





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Summary

- Variety of types of arthritis: osteoarthritis, post-traumatic, inflammatory
- Understand the key points to a good history and physical
- Radiographs are your best imaging test should be weight bearing
- Treatment ranges from nonsurgical treatments to surgical treatments including joint replacement

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