


I Need a Knee Replacement???

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About me...



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Hometown - Newport Beach, CA



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BA – Cornell University MD – Medical College of Wisconsin



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Orthopaedic Surgery Residency – Emory University, Atlanta, GA



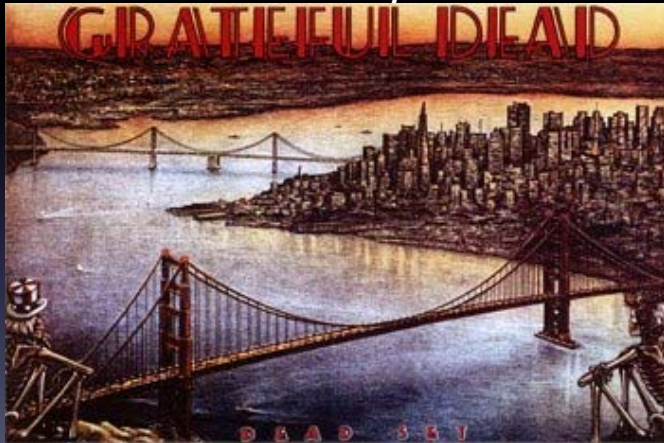
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Sports Medicine Fellowship – Steadman-Hawkins Clinic, Vail, CO



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Foot & Ankle Fellowship – Oakland, CA



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Orthopaedic Associates of Wisconsin

- Sports Medicine – Shoulder and Knee Surgery
- Foot & Ankle Reconstruction
- Fracture Care
- 75-100 patients seen in clinic per week
- ~5-10 Surgeries per week

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The Knee

- Anatomy
- Biology of Cartilage
- Knee Arthritis
- Partial Knee Replacement
- Total Knee Replacement
- Causation Summary

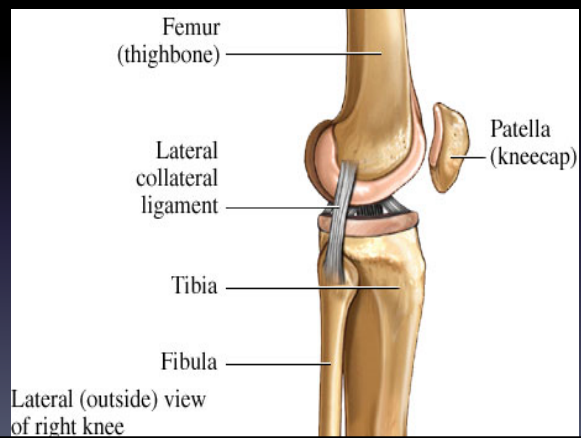
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Bony Anatomy



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Bony Anatomy



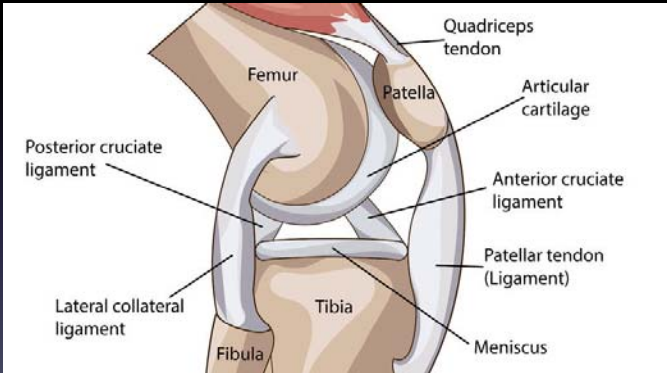
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Tendons of the Knee



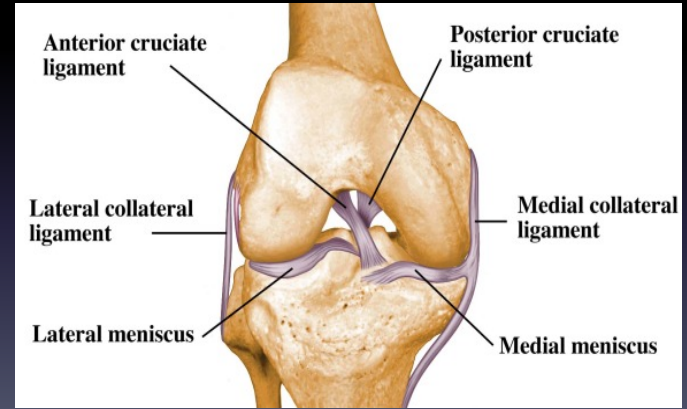
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Tendons of the Knee



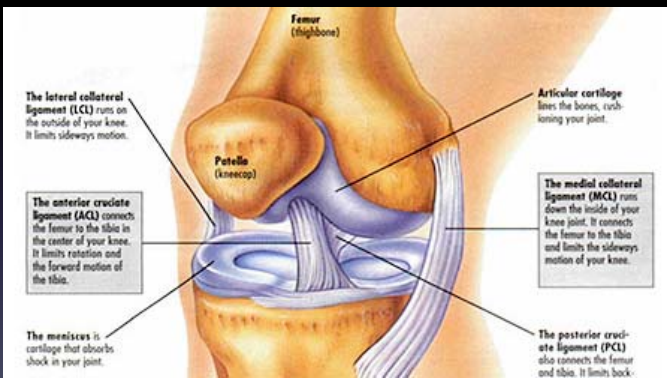
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Ligaments of the knee



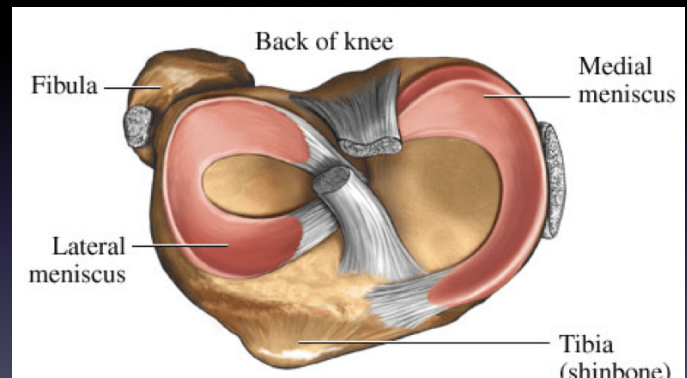
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Medial and lateral meniscus



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Medial and lateral meniscus



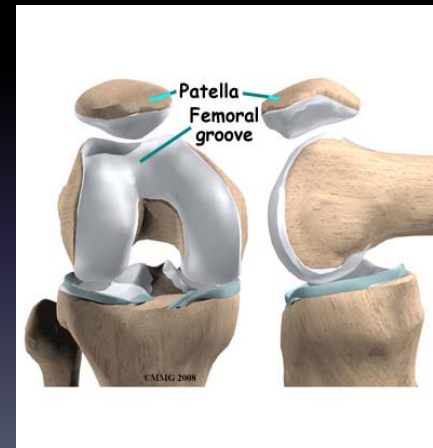
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Articular cartilage



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Articular cartilage



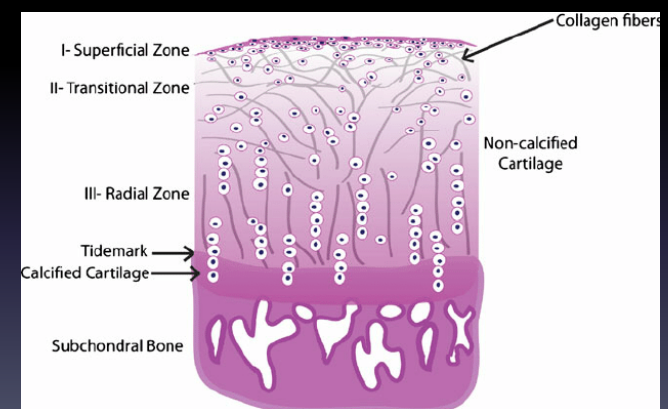
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Articular Cartilage

- Avascular (i.e. no blood flow)
- 2-5 mm thick
- Chondrocytes (cartilage cells)
- Extracellular matrix (collagen fibers and proteoglycans)

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Articular Cartilage



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Extracellular Matrix

The diagram illustrates the structure of the extracellular matrix. Part A shows a schematic of a proteoglycan aggregate with labels for the Second globular domain (G2), N-terminal, HA-binding domain (G1), KS-rich region, CS-rich region, and C-terminal domain (G3). It also identifies Link protein, HA, KS chains, CS chains, and a Protein core. Part B shows a cross-section of the aggregate with a height of 200-400 nm and a width of 1,200 nm. Part C shows a network of HA, Monomer, Interstitial fluid, Collagen fibril, and Attached monomer at a 40 nm scale. The source is cited as JAAOS - JOURNAL OF THE AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS.

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What is arthritis?

- Arthritis = loss of cartilage
- Cartilage = the lining of the hip and knee that allows you to move your joint smoothly without pain
- Cartilage Loss = pain, swelling, stiffness

The image compares a 'Normal knee' and 'Arthritis of the knee'. The normal knee shows a smooth surface of cartilage between the femur and tibia. The arthritic knee shows 'Cartilage injury', 'Bone exposure', 'Erosion of cartilage', 'osteophytes', and 'Fragments of cartilage'. Labels for 'Fluoride' and 'Tibia' are also present.

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In other words...

Normal Joint....

Arthritic Joint....

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Knee Arthritis

- Degenerative Joint Disease (DJD)
- Post-traumatic Arthritis
- Inflammatory Conditions
 - Gout, Pseudogout
 - Rheumatoid Arthritis
 - Psoriatic Arthritis

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Degenerative Joint Disease (DJD)

- AKA Osteoarthritis
- The most common form of arthritis
- Breakdown and eventual loss of cartilage
- Can be part of the normal aging process

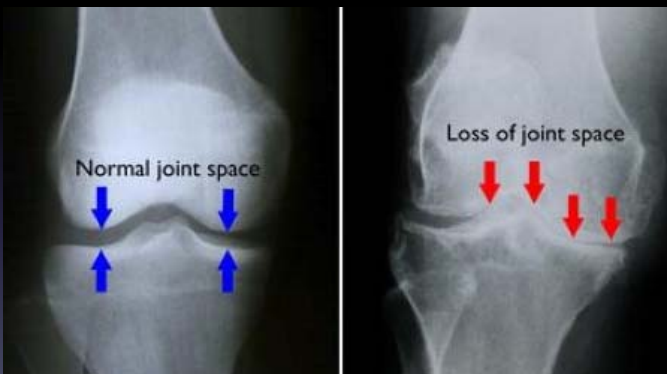
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Risk Factors for DJD

- Age
- Sex (women > men). Unclear why.
- Obesity
- Genetics
- Bone deformities (mal-alignment)

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DJD X-rays



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Hallmarks of DJD

- Loss of joint space
- Osteophytes (aka bone spurs)
- Degenerative meniscal tears
- Extrusion of menisci

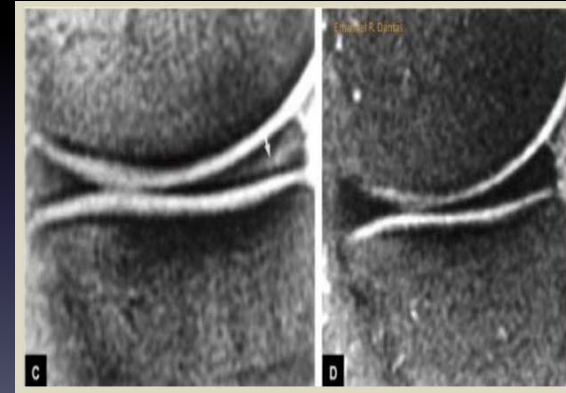
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Osteophytes/Bone Spurs



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Meniscal Degeneration



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Meniscal Extrusion

Normal Meniscus



Meniscal Extrusion



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Degenerative Meniscal Tears

- Found in 75% of asymptomatic patients with x-ray changes of arthritis
- Found in >90% of symptomatic patients with x-ray changes of arthritis
- Get an MRI of an arthritic knee and you WILL find a meniscal tear

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Degenerative Meniscal Tears

- Arthroscopic knee surgery for treatment of a degenerative meniscal tear unlikely to provide any significant long term relief.
 - Should be avoided
- Possible exception: new onset of mechanical symptoms (i.e. locking, catching).

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Post-traumatic arthritis

- Arthritis that occurs as the result of an injury
- Same end result – loss of articular cartilage

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Knee Injuries

- Fractures
- Ligament injuries
- Dislocations
- Meniscal injuries
- Chondral injuries

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Fractures

- Femur
- Tibia
- Patella



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Knee Fractures

- Key Concept #1: Any fracture that extends into the joint surface can lead to long term cartilage damage (i.e. arthritis).
- Key Concept #2: Any fracture that changes the alignment of the joint surface can lead to abnormal knee mechanics and, eventually, arthritis

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Distal Femur Fracture



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Distal Femur Fracture Treatment

- Nondisplaced – no surgery. Low likelihood of developing long term problems, disability
- Displaced – Surgery with Open Reduction Internal Fixation (ORIF).

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ORIF of Distal Femur Fracture



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Generally speaking, worse outcomes of fracture about the knee with...

- Increased displacement
- Increased comminution (i.e. many pieces)

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Proximal Tibia Fractures

- Tibial Plateau fracture involves the articular surface
- Extra-articular fractures do NOT involve the articular surface

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Mildly displaced, minimally comminuted Tibial Plateau fracture



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ORIF Tibial Plateau Fracture



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Highly displaced and comminuted tibial plateau fracture



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Tibial plateau fracture outcomes

- Widely believed that these do poorly and will require a knee replacement in the future
 - Common misconception, even amongst orthopaedic surgeons
 - Studies show ~15% of these fractures will go on to need knee replacement within 10 years

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Patella Fractures



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Patella Fracture treatment

- Non-operative if nondisplaced or direct blow type of injury
- Surgery for displaced fractures
- Rarely is a patellectomy indicated

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ORIF Patella Fracture



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Outcomes of Patella Fractures

- Most do fine with minimal disability
- Not unusual to have mildly limited ROM upon end of healing
- Could have long-term difficulty kneeling
- If highly displaced, could cause post-traumatic arthritis and need for TKA
- Bad outcome if patellectomy required

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Take-home message on fractures about the knee...

- The greater the degree of comminution and displacement, the worse the outcome (i.e. worse injuries lead to worse outcomes).
 - Not all fractures are the same (i.e. wide range of outcomes following different types of tibial plateau fractures).

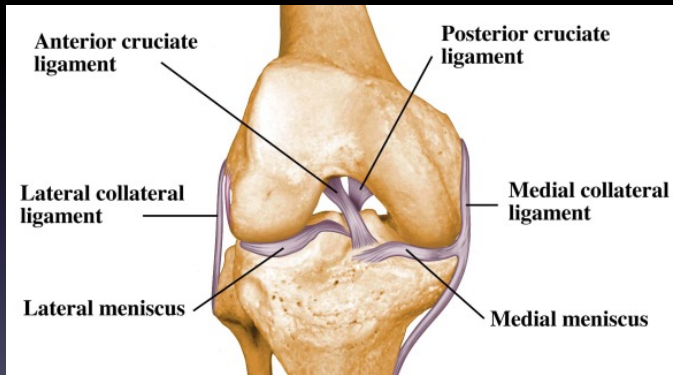
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Ligament Injuries

- Medial Collateral Ligament (MCL) tear
- Lateral Collateral Ligament (LCL) tear
- Anterior Cruciate Ligament (ACL) tear
- Posterior Cruciate Ligament (PCL) tear
- Combined injuries

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Knee Ligaments



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Terms

- ACL tear? ACL sprain? ACL rupture?
- Rupture = High grade tear = High grade sprain
- A sprain or a tear can be partial or complete

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ACL Tear

- Leads to abnormal biomechanics of the knee
- With or without surgery will have an increased risk of knee arthritis
- Without surgery, knee will usually be unstable and not allow patients to participate in sports or manual labor

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ACL tear

- Treatment for active patients in relatively good health is surgical reconstruction (not repair) of ACL
 - Can use patellar tendon, hamstring tendon, quad tendon, or allograft tissue to reconstruct

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ACL take home

- Patients should be able to get back to high level of function after surgery
- Have increased risk of developing arthritis in the long run

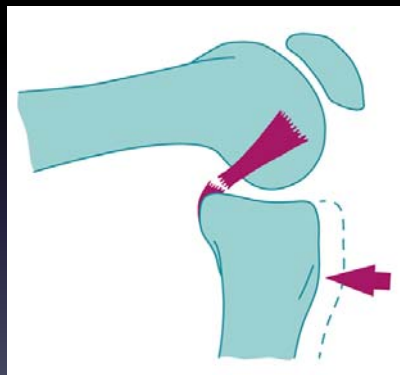
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PCL tear

- Mechanism of injury is a posteriorly directed force to the proximal tibia
- Classic is the knee hitting the dashboard

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PCL Tear



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PCL Treatment

- An isolated PCL tear is usually treated nonoperatively. Therapy and a brace.
- Most do well long term.
- Many players in NFL and NBA participating with PCL deficient knees.
- Can lead to long term laxity.
- Different story with combined injury...

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Combined ligament injuries of the knee

- ACL and MCL.
- PCL and LCL.
- ACL and LCL.
- ACL, PCL, and LCL.

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Multiligamentous knee injury

- Often seen with knee dislocations

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Knee Dislocation



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Knee Dislocation

- High energy injuries.
- Usually involve multiple torn ligaments.
- Can also involve arterial and nerve injuries.
- Poor long term outcomes.

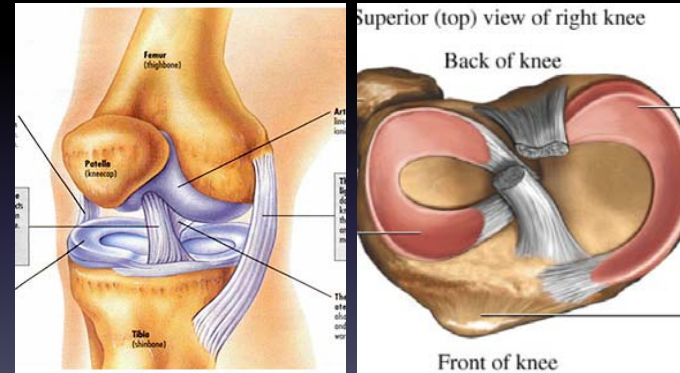
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Knee Dislocation

- Not unusual for patients to have significant long term disability and need for further treatment.

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Meniscal Injuries



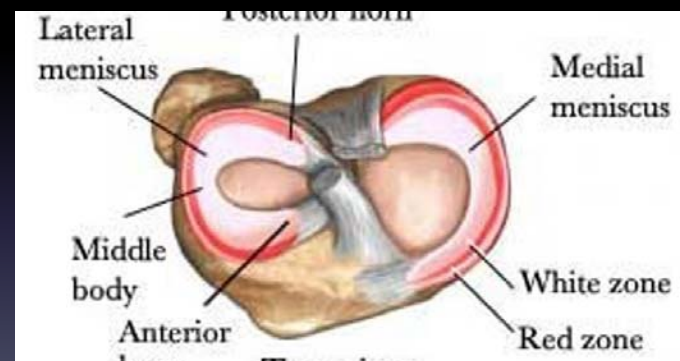
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Meniscal Injuries

- Usually a twisting injury.
- Can also occur in patient with ligament injury.
- Patients often have popping or catching in the knee.

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Meniscal Blood Supply



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Meniscal Tear - treatment

- Most tears involve area without blood flow, so cannot be repair.
- If tear configuration and location is ideal, then repair can be successful

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Meniscal Tear

- 30 minute surgery
- 4-6 weeks recovery
- Patients generally do very well, unless...

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Meniscal tear and arthritis!

- 75% of Asymptomatic patients with x-ray findings of DJD will have MRI findings of meniscal tear.
- >90% of symptomatic patients with x-ray findings of DJD will have MRI findings of meniscal tear

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Meniscal tear and DJD

- Arthroscopic surgery to address meniscus tear in a knee with underlying DJD usually does NOT provide lasting relief
- The source of the pain is DJD, not the degenerative meniscal tear

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Meniscal tear and arthritis

- Most of these patients have pre-existing meniscal tears.
- They don't get better with arthroscopic meniscal surgery.
- Must look for signs of arthritis –narrowing and osteophytes on x-rays, meniscal degeneration and extrusion on MRI

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Meniscal tear and arthritis

- If MRI shows a meniscal tear in an extruded meniscus, then meniscus is already nonfunctional, so tear and treatment of tear inconsequential in progression of arthritis.

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Meniscal tear and arthritis - Key points

- If knee is arthritic, then meniscal tear likely pre-existing.
- Arthroscopic surgery for treatment of meniscal tear in face of arthritis usually not successful.
- Extruded meniscus is non-functional, so loss of meniscal tissue inconsequential (i.e. horse is out of the barn).

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Chondral injury to knee

- Chondral injury = cartilage injury
- Can occur with fracture, ligament injury, twisting injury, or axial load
- Need to differentiate if cartilage defect is degenerative or traumatic
 - Long term problem or acute injury?
 - Old vs young patient?
 - MRI findings (edema pattern)?
 - Healthy cartilage "shoulders"?

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Chondral injury to knee



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Chondral injury to knee



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Nonoperative Treatment of DJD

- Avoid aggravating activities
- Weight loss
- PT
- Icing
- NSAIDs (ibuprofen, naproxen, diclofenac, etc.)

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Nonoperative Treatment of Knee Arthritis

- Cortisone injections (no more than every 3-4 months)
- Viscosupplementation injections (Synvisc, Orthovisc, etc.)

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Nonoperative Treatment of Knee Arthritis

- Platelet Rich Plasma (PRP). Often not covered by insurance
- Stem Cell injections. Not covered by insurance. No high quality evidence showing benefit.

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Surgical Treatment of Knee Arthritis

- Partial Knee Replacement
- Total Knee Replacement

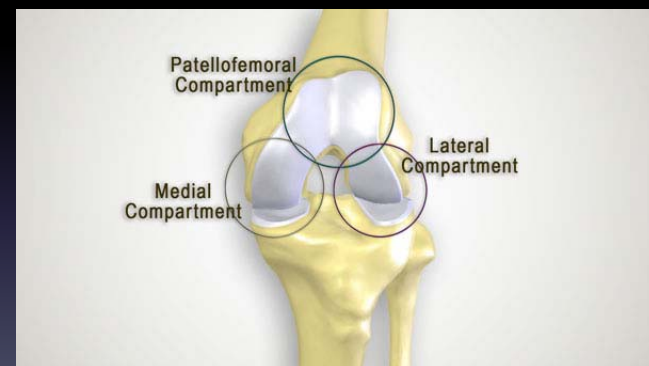
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Partial Knee Replacement

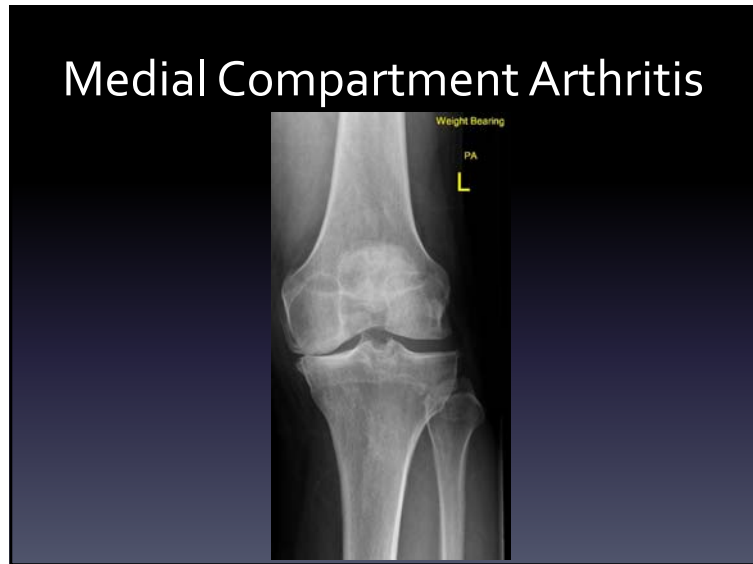
- AKA Unicompartmental Knee Replacement
 - Usually only replacing one compartment
 - Medial compartment (most common)
 - Patellofemoral compartment
 - Lateral compartment

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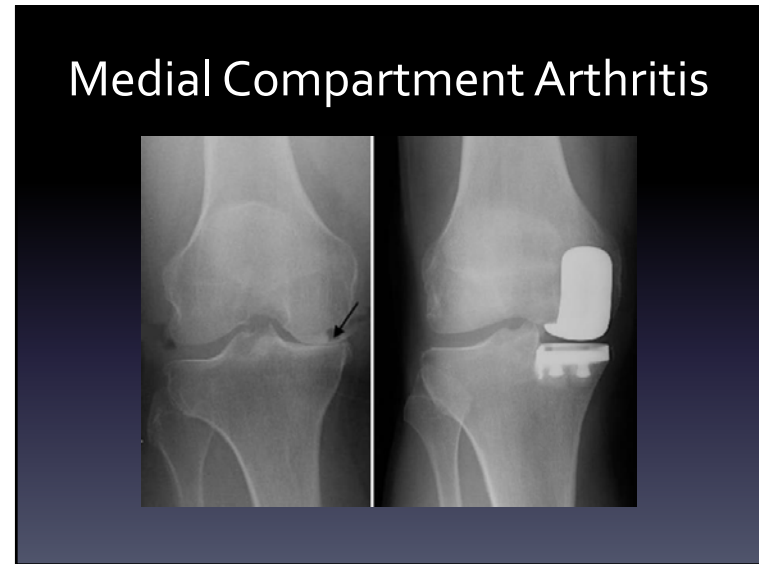
Compartments of the knee



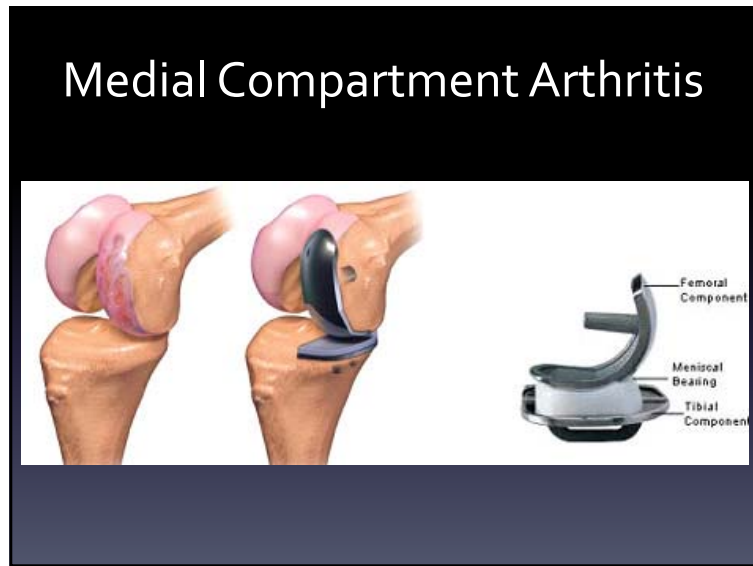
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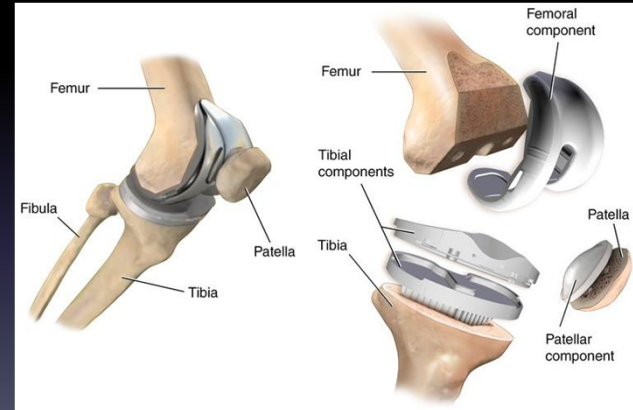
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Patellofemoral Arthritis



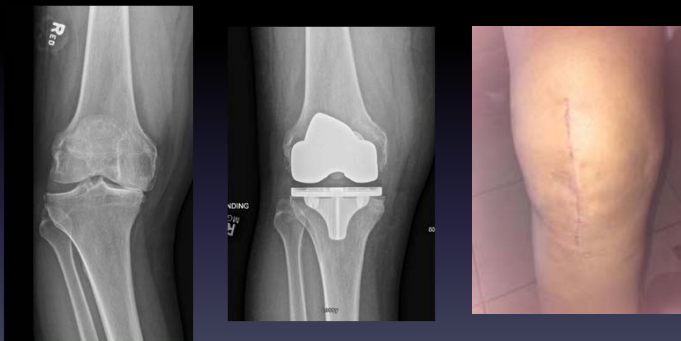
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Total Knee Replacement



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Total Knee Replacement



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Total Knee Replacement



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Thoughts on Causation

- Is there objective evidence of an injury that would cause or aggravate arthritis?
 - A fracture through the joint itself
 - A fracture that changes the alignment of the knee
 - A ligament injury that changes the mechanics of the knee

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Thoughts on Causation

- An acute meniscal tear that results in significant loss of meniscal tissue, thereby leading to increase stress on the knee
- An acute chondral injury

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What helps me with evaluations???

- Objective Evidence
 - X-rays
 - Thorough physical exam findings
 - MRI (sooner, rather than later)
- Prior records/prior symptoms???
- Nail down an EXACT description of the injury, if there was one. Witnesses?

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Help with Evaluations

- Get an MRI sooner, rather than later.
- Get injured person to see orthopaedic surgeon sooner, rather than later.

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ALL DONE - THANK YOU!!!



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