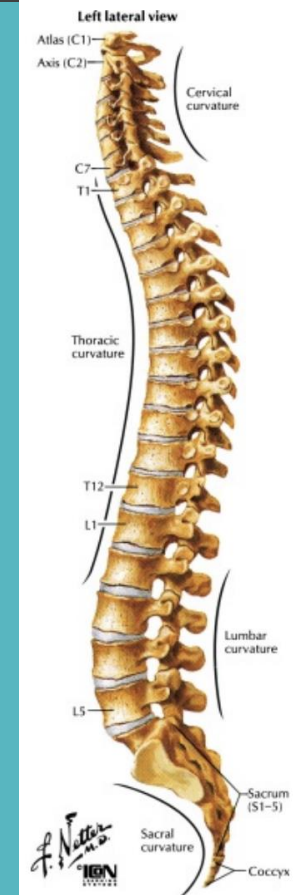
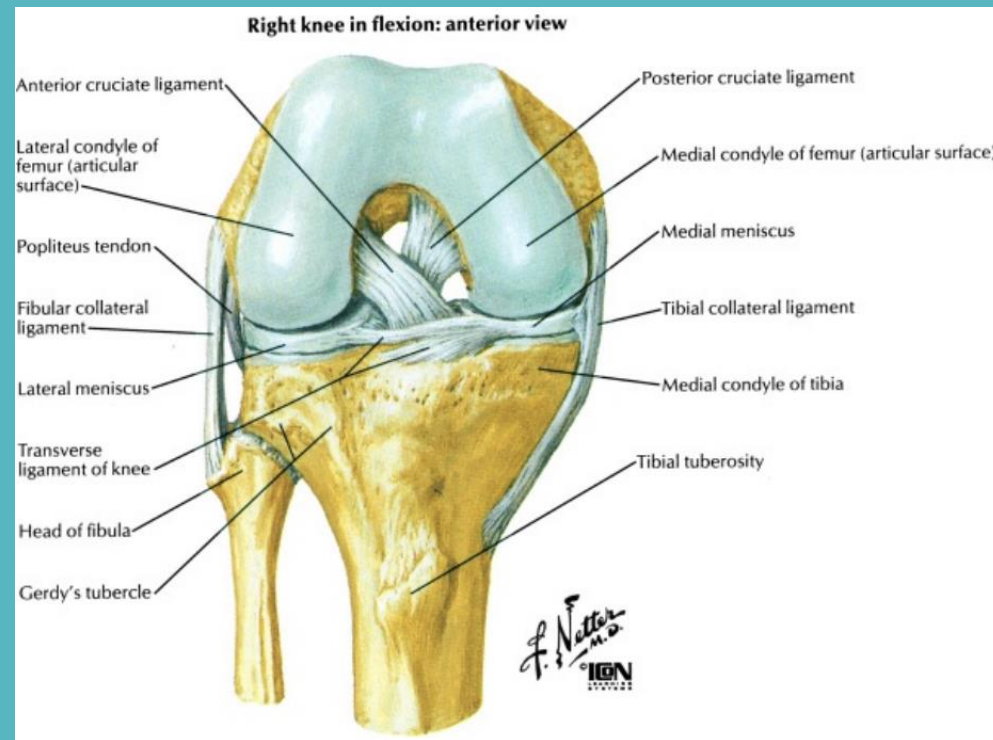
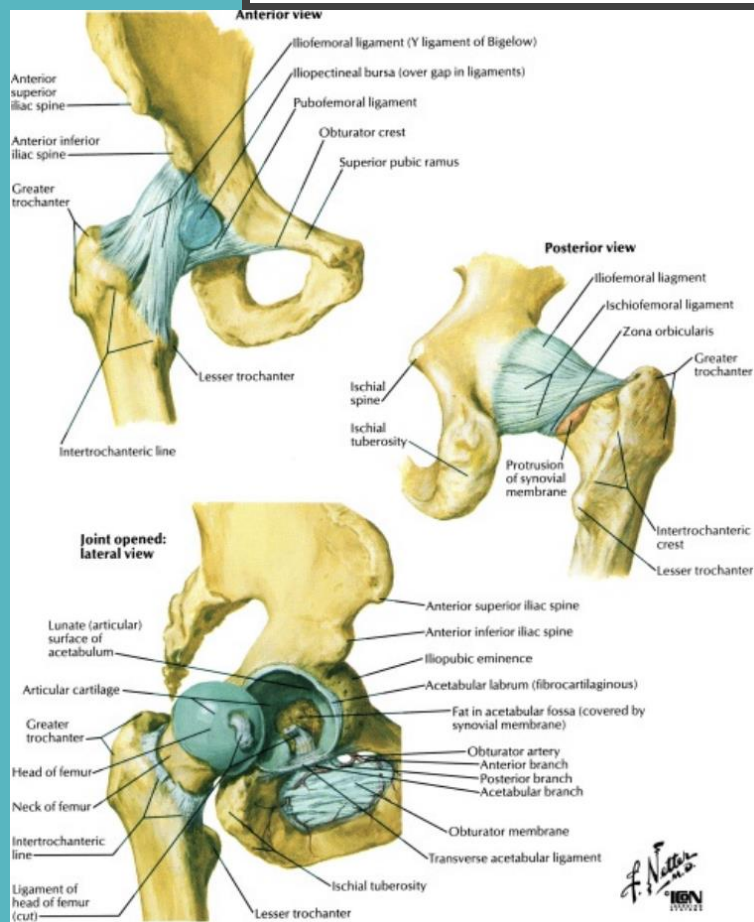


# HIPS, KNEES AND SPINE

Ortho pearls for management verses referrals

Crystal Fesperman PA-C



## DISCLOSURES

- I have no financial conflicts of interest to disclose.

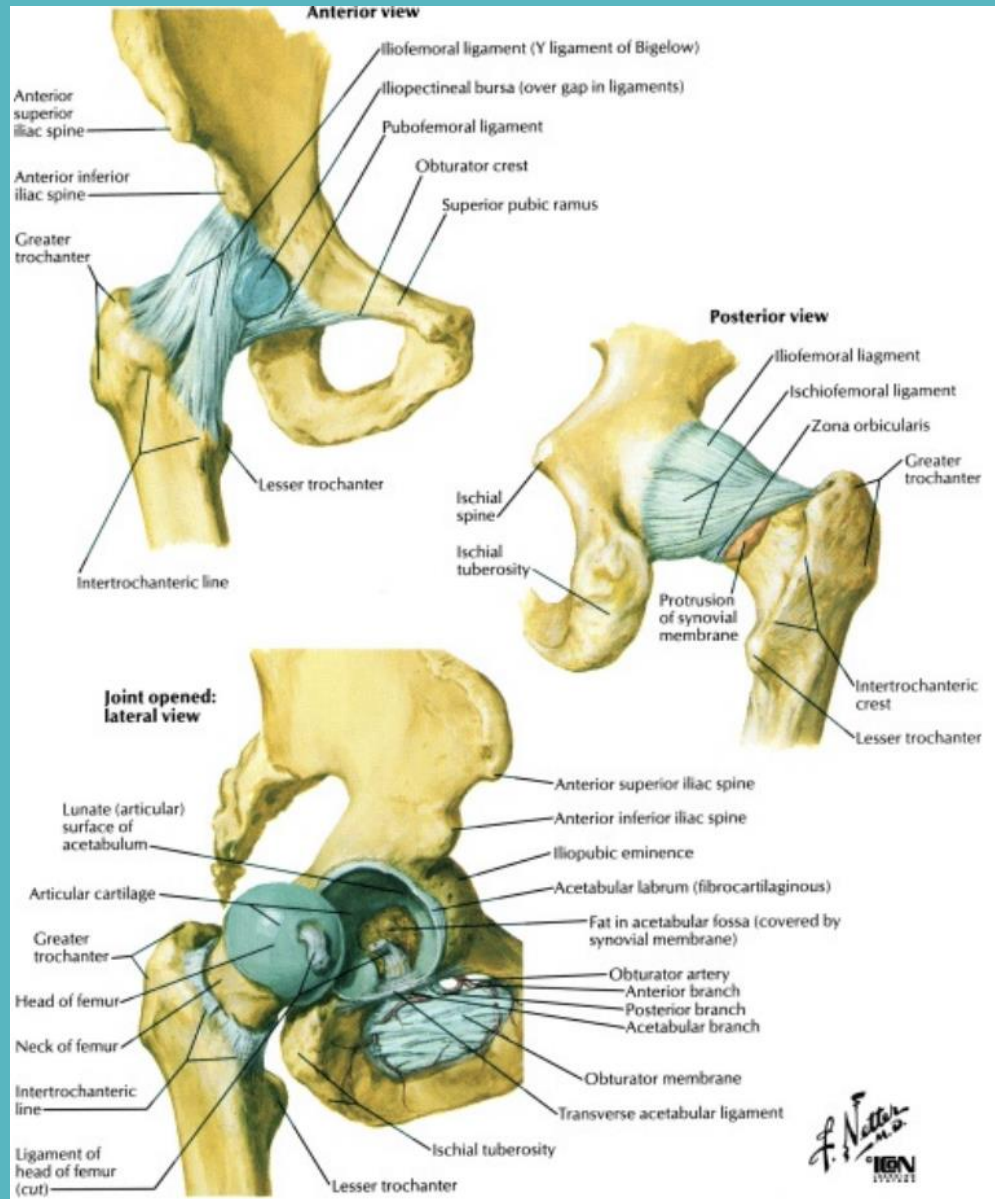
## SPECIAL THANKS

- I would like to give a special thanks to Dr. Scott Kling, Connie Kim NP, Dr. John Barley, Dr. David Scott, Allison McEntee PA-C, and Dr. David Romano with Riverside Orthopedics.

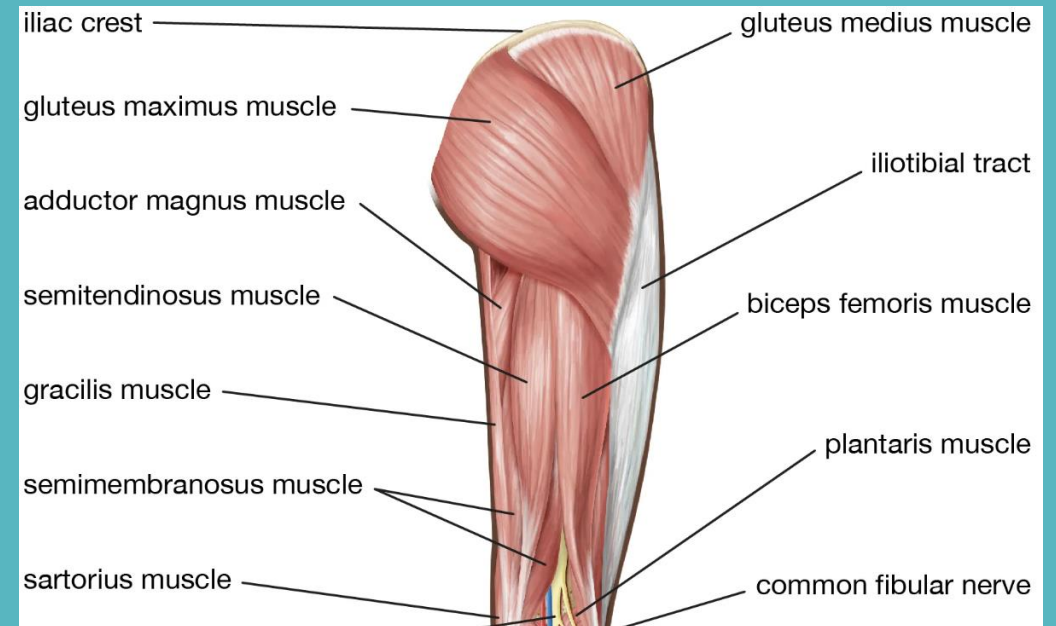
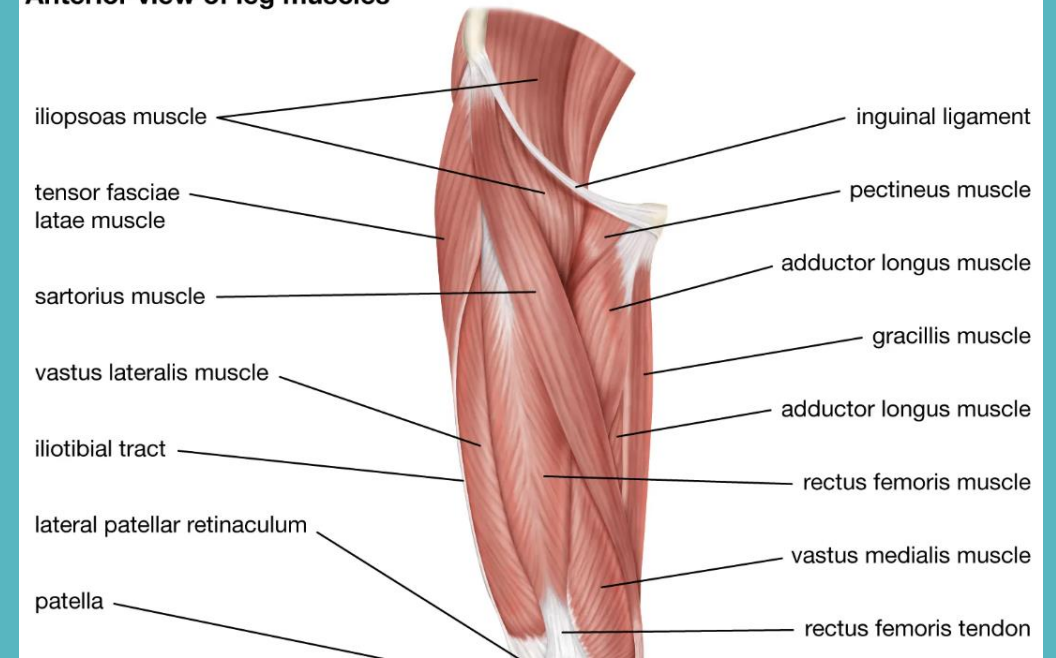
# OBJECTIVES

- Brief anatomy review of the hip joint, knee joint, and spine.
- Review common orthopedic injuries to the hips and knees and identify PCP management versus referral to orthopedic specialist.
- Review appropriate imaging in PCP office and to be obtained for referrals.
- Review orthopedic exams
- Red flags for urgent referrals
- Back exams, reflexes, and presentations needed for referral or further imaging

# HIP ANATOMY <sup>1,2</sup>



## Anterior view of leg muscles



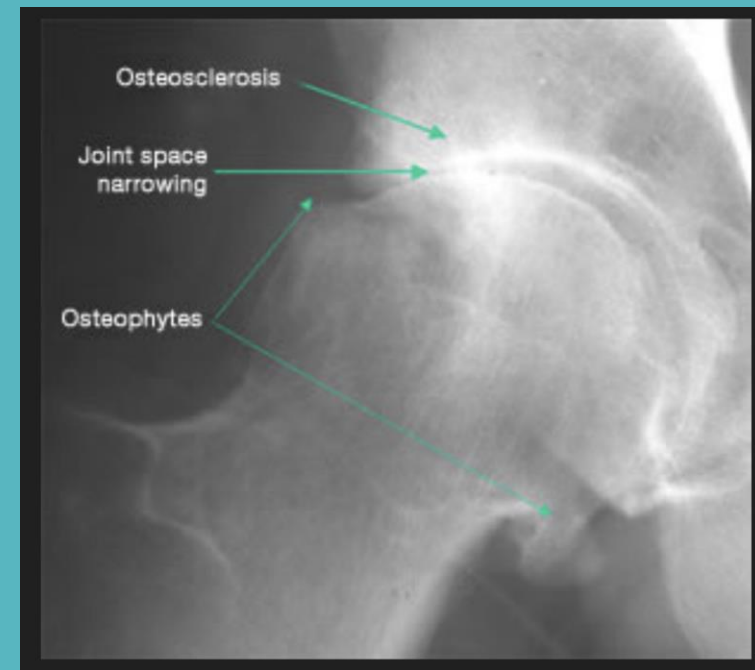
# HIP COMPLAINTS AND COMMON INJURIES

- Hip osteoarthritis
- Fractures
- Bursitis
- Labral tears
- Avascular necrosis



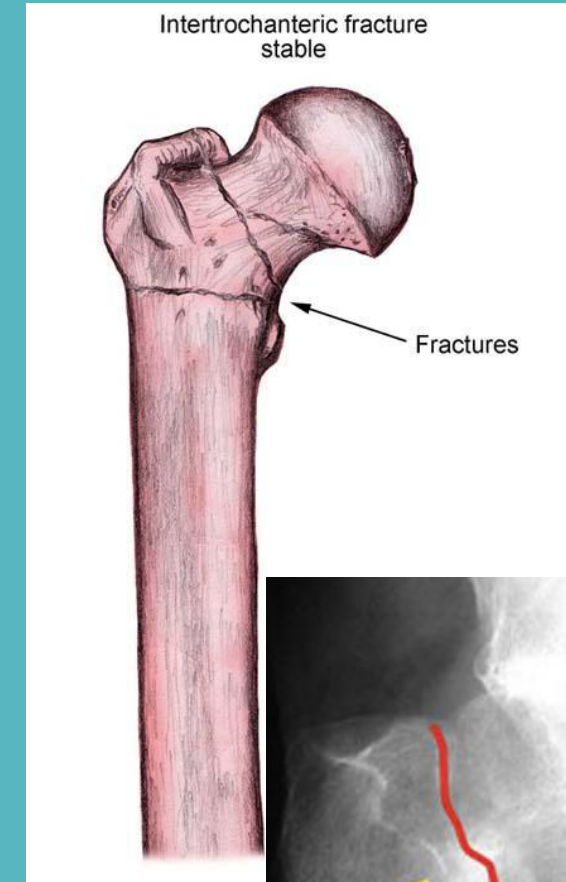
# HIP OSTEOARTHRITIS <sup>5</sup>

- Osteoarthritis is the degenerative changes of articular cartilage of the femoral head and acetabulum that can result in structural changes of the joint.
- Patients can present with changes in activity due to pain, decreased ambulation, pain at night, popping, grinding or clicking in the joint, and stiffness.
- Risk factors include age, gender, previous trauma, high impact sports, physically demanding work, acquired deformities.
- Physical exam should include inspection of gait and limb length, range of motion for flexion, extension, and internal rotation
- Imaging at a primary care level should be a weightbearing AP Pelvis and AP and lateral of the affected hip. Imaging results positive for osteoarthritis can include joint space narrowing, osteophytes, subchondral sclerosis or cysts.
- Treatments include weight loss, NSAIDS, physical therapy, a walking stick, corticosteroid injections, or surgery.

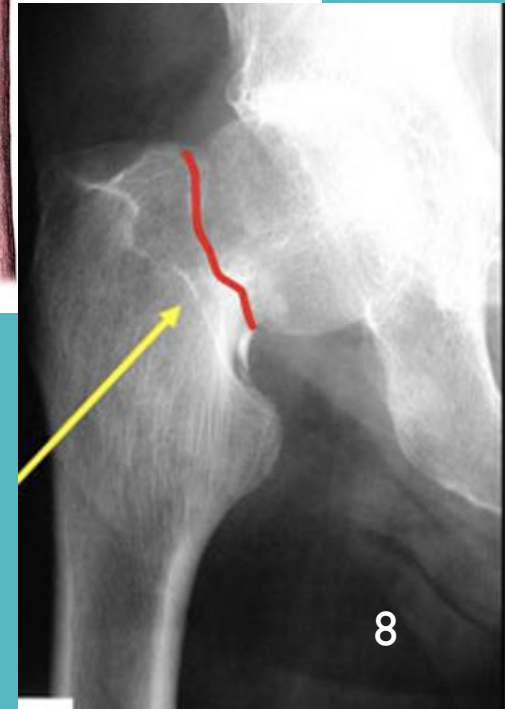


# HIP FRACTURES

- Patients can present with history of fall or trauma or can present with new onset pain with walking or standing.
- Physical exam could include pain to palpation, pain with standing and movement, inability to stand and weight bear. For severe displacement limb would be shorted +/- internal rotation.
- X-rays are key in diagnosing fractures. More likely to see minimally displaced fractures or shadowing in the bone with patients who present to an outpatient clinic.
- Most patients with fractures will need to be sent to the ER for further management and physical therapy evaluation for safety planning.



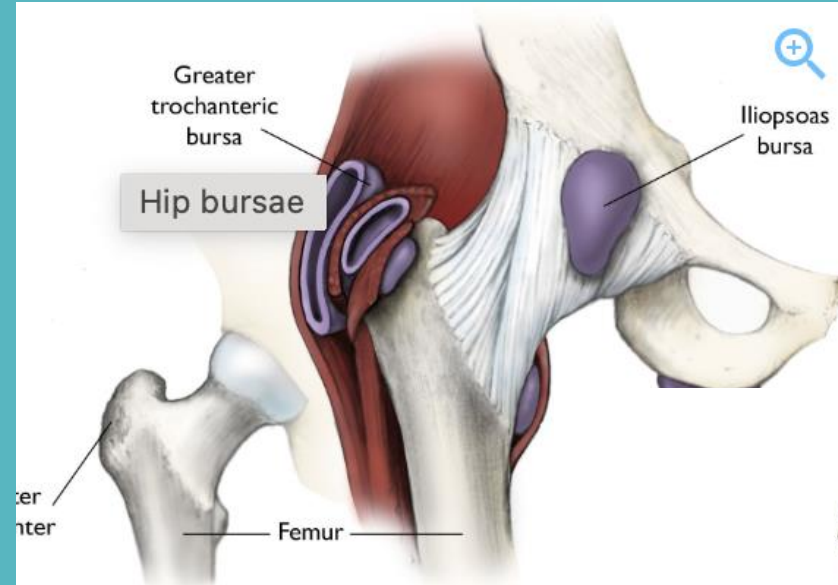
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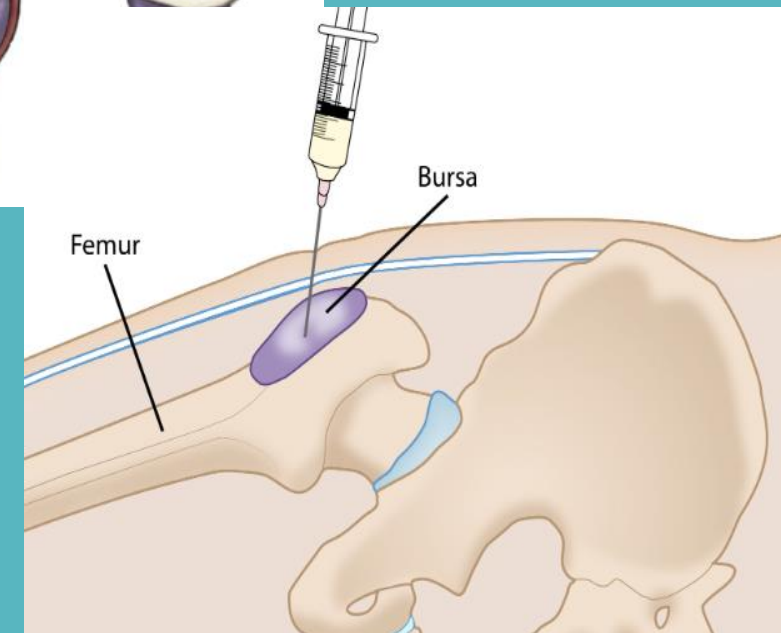
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# TROCHANTERIC BURSTITIS <sup>9</sup>

- Trochanteric bursitis is the most common cause of lateral hip pain as a result of repetitive motion of the IT band over the trochanteric bursa.
- Patient will complain of lateral hip pain with flexion and extension, point tenderness, inability to lay on that side.
- Exam should include testing range of motion and palpation of the hip and leg with specific focus over the greater trochanter. Patients will typically pin point pain at greater trochanter.
- Imaging is not needed for diagnosis. X-rays should be unremarkable unless other underline issues are seen.
- Treatments include rest, NSAIDs, physical therapy and corticosteroid injection into the bursa. For severe recurrent cases that conservative measures fail surgery could be indicated.



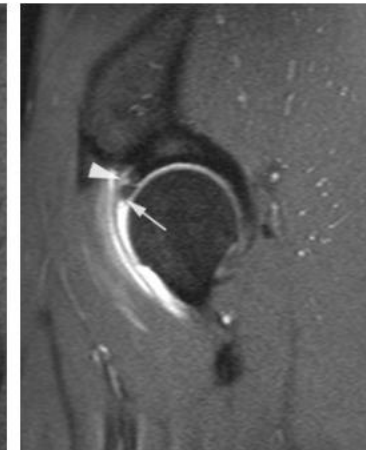
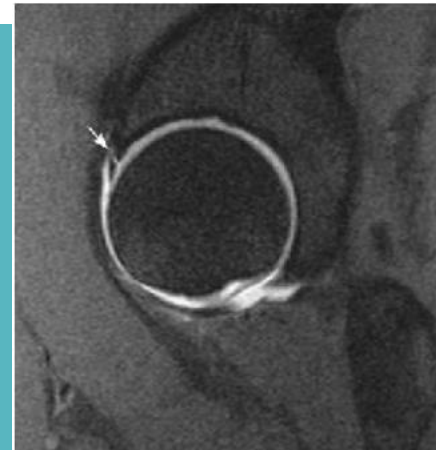
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# HIP LABRAL TEARS <sup>12</sup>

- A hip labral tear occurs when the acetabular labrum tears along the acetabular rim.
  - Can give sensation of locking or snapping with hip movement. Vague groin pain
- Higher incidents with acetabular dysplasia
- Physical exam – provocative tests
  - Anterior labrum – “pain if hip is brought from a fully flexed, externally rotated, and abducted position to a position of extension, internal rotation, and adduction”
  - Posterior labrum - ” pain if hip is brought from a fully flexed, externally rotated, and abducted position to a position of extension, internal rotation, and adduction”
- XR can show other types of hip pathology but will not show labral tear. Diagnostic imaging is MR hip arthrogram. Insurance typically only approves MR after 6 weeks of PT.
- Treatment
  - Non-operative- NSAID, Physical therapy (must do to get further imaging), steroid injections
  - Operative- arthroscopic labral repair vs debridement, typically only offered if patient is younger, active, and little to no OA, due to increased risk of post surgical arthritic development. Pt must also not have any other hip pathology for surgery to be offered.

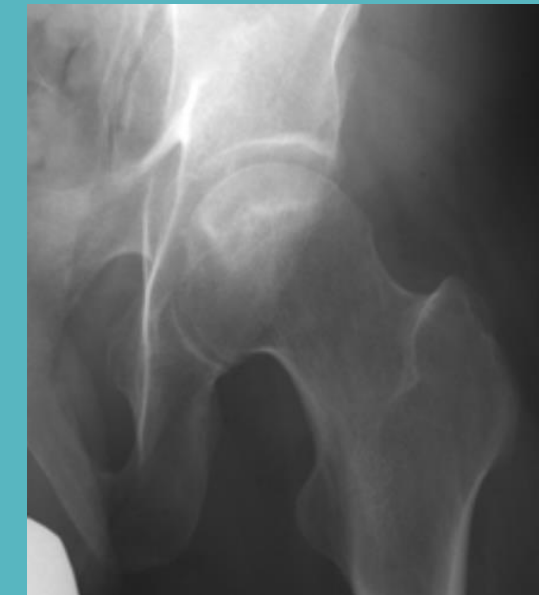


# AVASCULAR NECROSIS <sup>11</sup>

- Also known as hip osteonecrosis, is a result of lack of blood flow causing bone degradation in the femoral head. Classification stages 0-6
  - Can be caused by trauma, steroid use, sickle cell, autoimmune disease, alcoholism, drug abuse, or hypercoagulable state.
- Slow onset of pain, pain with movement of inclines, stairs and pain in the anterior hip
- PE is normal in earlier cases and later cases present similar to OA.
- Imaging must start with XR but typically negative in earlier stages.
  - XR- AP hip, frog leg hip, AP and lat of contralateral hip
  - MRI can be ordered if XR are negative and AVN is suspected. MRI is more sensitive to see early changes
- Treatment
  - Non-operative- symptom management with oral medications. Mixed research on bisphosphonate usage being beneficial
  - Operative treatment is only long term improvement option.
- Once AVN has been identified patient should be referred to ortho for treatment option discussions.



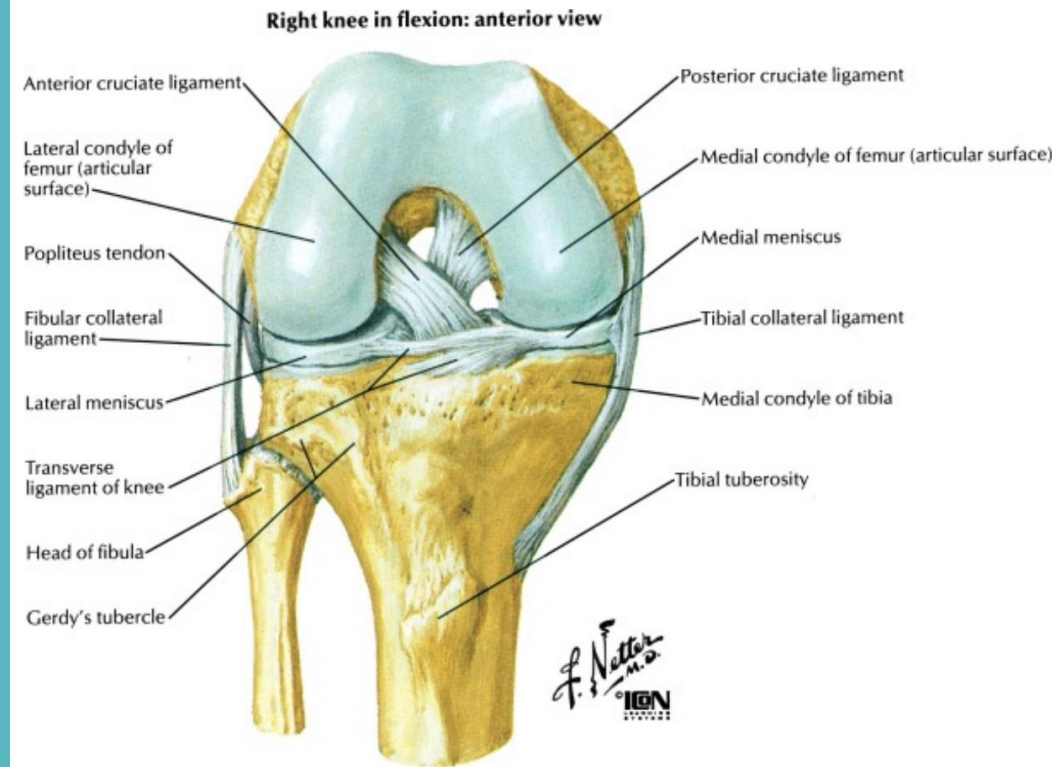
Stage 2 sclerotic changes



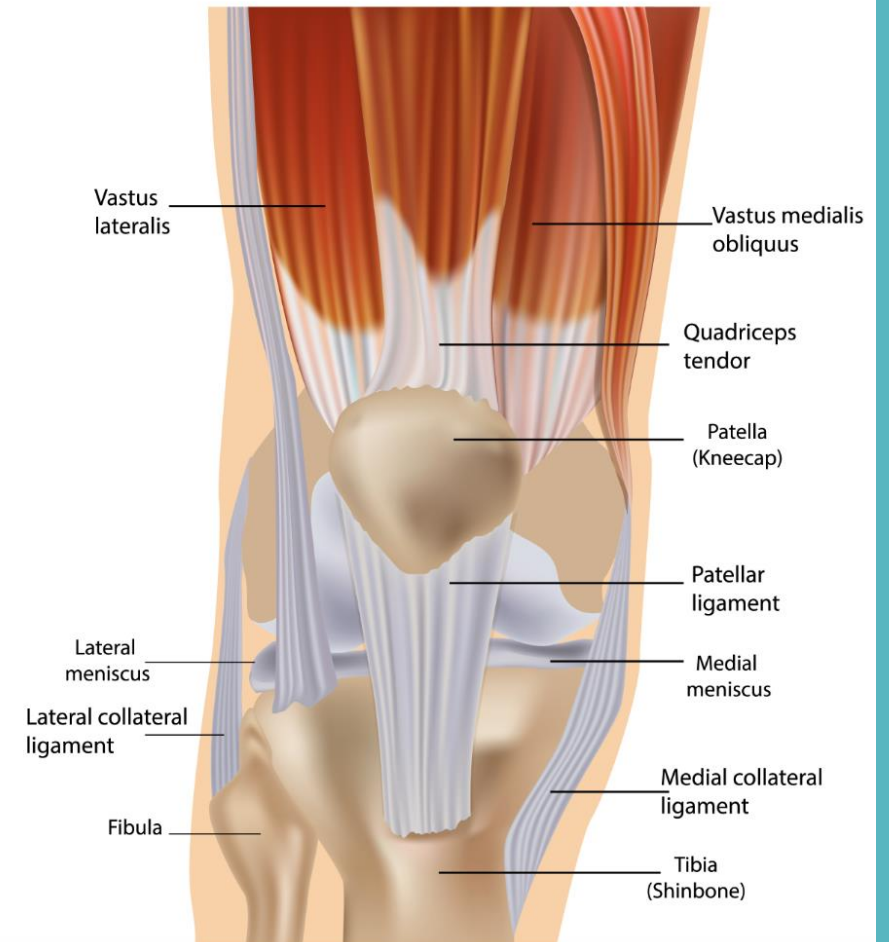
Stage 3 crescent sign

# KNEE ANATOMY<sup>1,3</sup>

## KNEE JOINTS



## TENDONS OF THE KNEE

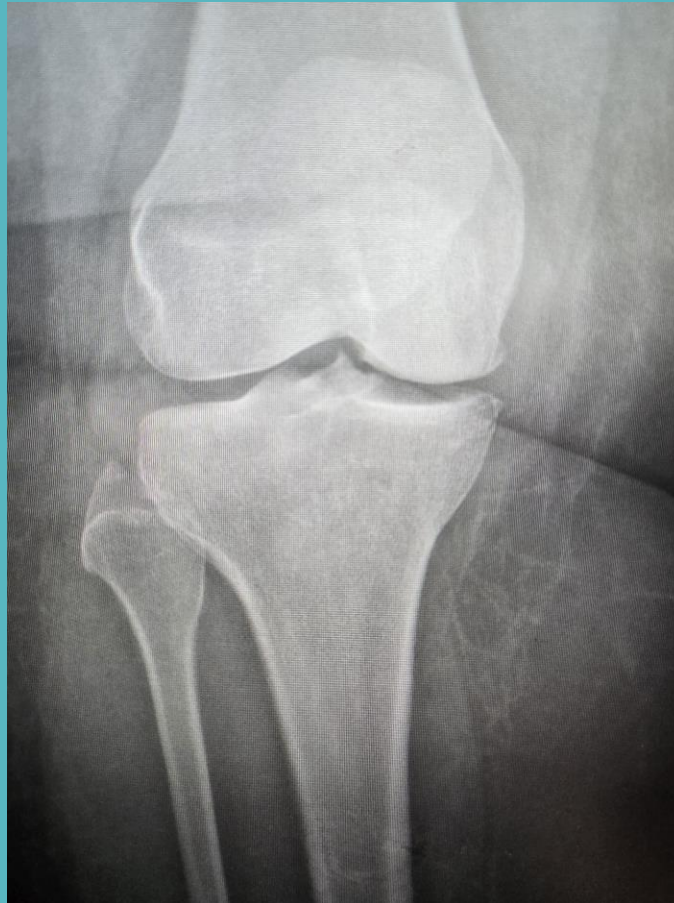


# KNEE COMPLAINTS AND COMMON INJURIES

- Osteoarthritis
- Fractures
- Tendon injuries
- Meniscal injuries
- Ligament injuries

# WHY KNEE XRAYS ARE IMPORTANT

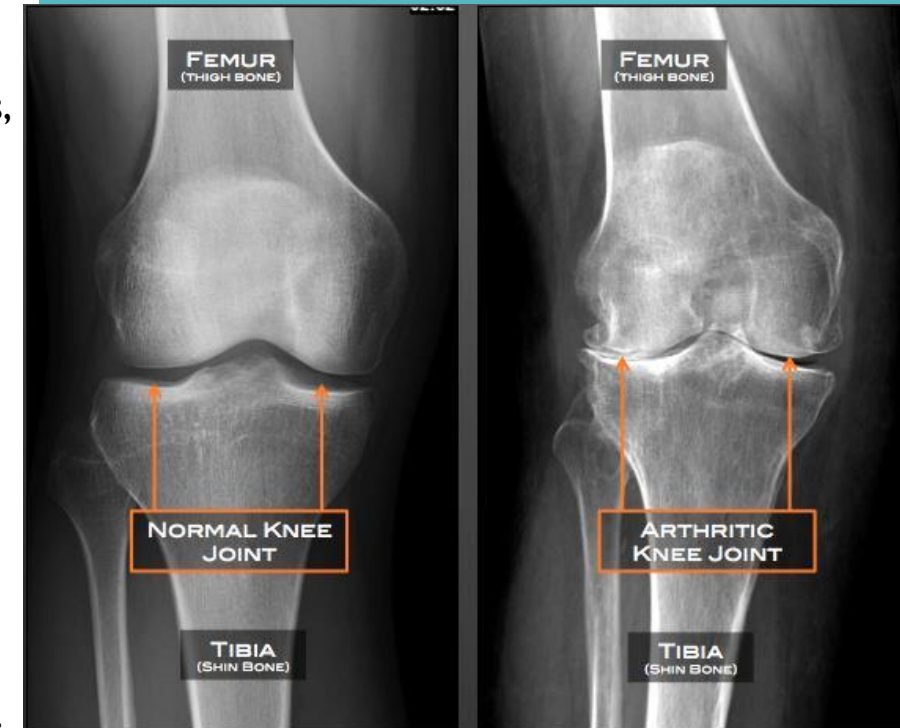
- When patients come in to clinic with any complain of knee pain and no history of trauma; always get a 4 view **WEIGHTBEARING** knee x-ray if possible.
- MRI are not a starting point for majority of knee complaints
  - MRIs can misdiagnosis and show soft tissue issues such as meniscal tears.





# KNEE OSTEOARTHRITIS <sup>4</sup>

- Osteoarthritis is a degenerative condition with loss of cartilage, changes in synovium, and bony changes.
  - Multiple causes such as age, repetitive use, previous trauma, obesity, low muscle mass, and genetics.
  - Signs and symptoms include: pain at rest, activity limiting pain, effusion, reduced range of motion, grinding, clicking, instability.
  - Exam should include gait observance, range of motion testing, palpation, and ligament stability testing.
  - Imaging should always include 4 view weightbearing of the knee
    - WB 4 view XR
  - Treatments to include NSAIDS, PT, weight loss, bracing, injections, surgery
  - Refer to ortho when not improving with conservative management or patient wishes to discuss surgery.



# KNEE FRACTURES <sup>13</sup>

- If patient presents with a known trauma and new knee pain that started with trauma, keep patient non-weightbearing and take minimum 2 view XR. No VVB XR needed if fracture is suspected.
- If fracture of the tibia, fibula, or femur is found, keep patient non-weightbearing and send urgent referral to ortho. If patella fracture is found and no other fractures are found then patient may be placed in knee immobilizer and be VVB in extension at all times and remain in knee immobilizer till seen by ortho.
- If seen in PCP clinic complete good history and neurovascular exam and document well prior to referring to ER or Orthopedics.



# TENDON INJURIES

## • Quadricep tendon injury <sup>14</sup>

- Typically a result of traumatic rupture of the quadricep tendon from the proximal patella
- Could be partial vs complete tear of tendon.
  - Complete tears will be unable to complete a straight leg raise and may have palpable defect.
  - Partial tear may be able to complete SLR but will have pain or weakness from contralateral side in comparison, weakness with knee extension against resistance
- XR may show proximal patella avulsion fracture or patella baja.
- Partial or complete quad tendon ruptures can be placed into knee immobilizer and follow up with ortho. Pt can be WBAT in KI if able to do so safely.



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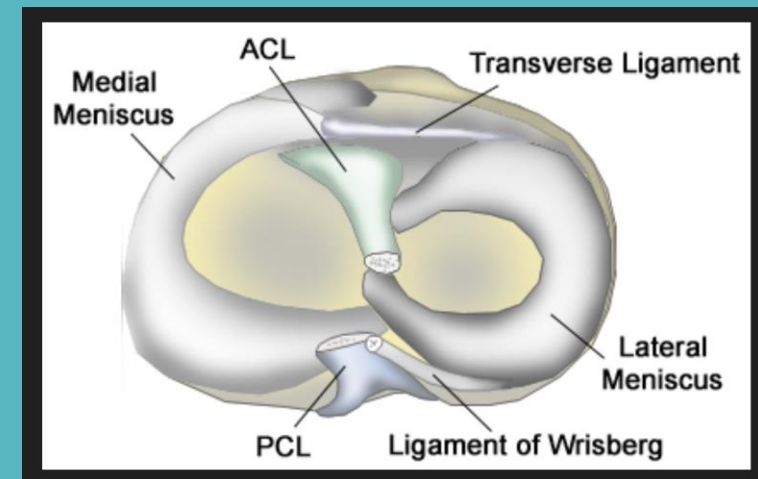


## • Patella tendon injury <sup>15</sup>

- Traumatic rupture under point of tension
- Could have partial or complete tear
  - Complete tears
    - XR of knee with show patella alta
    - Palpable tendon deficit, unable to straight leg raise- if retinaculum is intact there may only be a few degrees of extensor lag
    - should be immobilized and urgent referral for surgical fixation.
  - Partial tears
    - XR of knee will likely be normal.
    - MRI can show extent of partial tear
    - Can be managed non-operatively if intact extensor mechanism
      - Immobilize VWB in knee extension for 6 weeks with progressive rehab after 6 weeks.

# MENISCUS INJURY

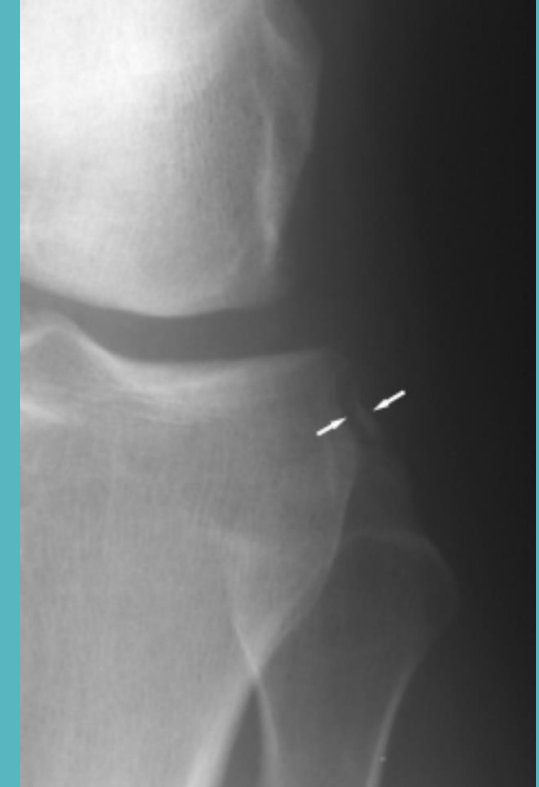
- The meniscus distributes force enacted on the knee while weightbearing and enacts shock absorption. It is also a secondary stabilizer of the knee, primarily in ACL deficient patients.<sup>16</sup>
- Meniscal tear is the most common indication of knee surgery
  - Higher risk for meniscal injuries in ACL- deficient knees.
  - Medial tears are more common than lateral, but lateral tears typically occur with an ACL injury
- Patients present with symptoms to include one sided knee pain, clicking or locking with knee flexion, +/- effusion. PE includes effusion, joint line tenderness is most sensitive finding. Specialized testing includes:
  - McMurray's test - <https://youtu.be/lwBW-X4nIfU>
  - Thessaly test - <https://youtu.be/hZgnl7lrjXM?si=HMs3cn6yMTxglGV4>
  - Apley compression - <https://youtu.be/IVwLXYkE4LY?si=b40-04w7VVwIfRBYV>
- Imaging- XR should be normal in younger patients. MRI is most sensitive. If MRI shows meniscal injury can refer to ortho at that time.
- Treatment – non-operative management includes rest, NSAIDS, PT. Operative treatment includes partial meniscectomy, meniscal repair, meniscal transplantations, and totally meniscectomy.



# KNEE LIGAMENT INJURY

## ANTERIOR CRUCIATE LIGAMENT <sup>17</sup>

- Provides 85% of stability to prevent anterior translation of the tibia as well as secondary restraint to tibial, varus and valgus rotation.
  - 54% of ACL injuries occur with lateral meniscus tear
- Accounts for half of all knee injuries with female having and 4.5:1 occurrence rate to males "due to landing biomechanics and neuromuscular activation patterns (quadriceps dominant) play the biggest role" <sup>17</sup>
- Non-contact injury is the result of pivoting with varus or valgus rotation. Contact injury is from a lateral blow to the knee
  - Seen most commonly in soccer, basketball, skiing, and football.
- Pt will likely complain about a pop with immediate swelling and deep internal knee pain, unstable feeling and possible difficulty WB
- PE likely will show an effusion, avoidant of full extension, possible foot drop. Test for other soft tissue injuries of the knee as well
  - Lachman test is most sensitive – but be aware PCL tear may give a false positive.  
<https://youtu.be/gfN-p-xZx24>
- XR can show Segond fracture- rupture of anterolateral ligament (ALL) present in 75-100% ACL ruptures
- MRI can be confirmatory and identify concomitant injuries
- Treatment of operative vs non-op would depend on the patient activity level, physical demand, associated injuries.





# KNEE LIGAMENT INJURY

## POSTERIOR CRUCIATE LIGAMENT <sup>18</sup>

- Accounts for 5-20% of all ligament injuries. Posterior Lateral Corner (PLC) and ACL injuries are commonly associated with PCL injuries.
- PCL main functions include restraint to posterior tibial translation and prevent hyperflexion. 90degrees flexion is zone of most instability with injury
- Injuries result from a direct blow to anterior tibia or hyperflexion with a plantar flexed foot.
- Main complaints are typically posterior knee pain with minimal or asymptomatic instability
- PE can be difficult to diagnose lone PCL injury
  - Varus/ valgus stress - if laxity is noted at 0 degree flexion MCL/LCL and PCL injury should be suspected. If laxity is at 30 degrees flexion alone proves MCL/LCL injury
  - Posterior drawer test at 90 flexion <https://youtu.be/KAUDTMu8fS0>
- XR of AP and supine lateral are needed to show subluxation posteriorly or avulsion fractures associated with other injuries. Lateral XR stress view with pressure applied to anterior tibia is become gold standard to imaging
  - MRI for confirmatory/ identifying other injuries.
- Treatment non-op vs operative
  - Operative is never recommended for isolated PCL injury
  - Non-op treatment is protected WB and time out of activity depends on grade of injury.



# KNEE LIGAMENT INJURY

## MEDIAL COLLATERAL LIGAMENT<sup>19</sup>

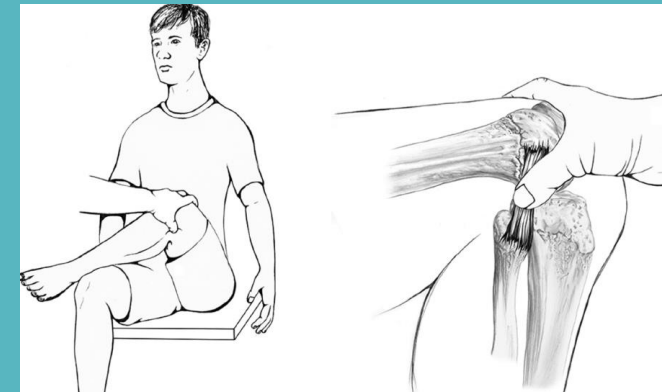
- MCL is the primary stabilizer against valgus stress and secondary stabilizer against tibial ER and tibial anterior translation
- Injury is a result of valgus force at the lateral aspect of the knee. More commonly seen in men vs women. Low grade injuries are often missed.
  - Sports commonly associated with MCL injury are skiing, rugby, football, soccer, and ice hockey
  - Non-contact injuries have low grade injuries.
- 95% of MCL injuries will have an ACL injury. 5% of MCL injuries will have a medial meniscus tear.
- Patients will complain of feeling a pop, medial joint pain, swelling and difficulty ambulating.
- Exam will show medial joint line tenderness, effusion/ecchymosis, laxity with valgus stress at 30 degrees flexion is isolated MCL, laxity with valgus stress at 0 degrees flexion is an ACL/ posterior medial capsule injury as well.
  - Check saphenous nerve function
- XR AP and lateral are typically normal. MRI is preferred modality for MCL diagnosis.
- Non-operative treatment recommended for isolated injuries. NSAIDS, ice, rest and physical therapy. Grade 1 can return to sport 5-7 days. Grade 2 and 3 return to play 2-8 weeks.
  - Surgical treatment needed for multiligament injury or chronic injury of MCL that fails conservative treatments.



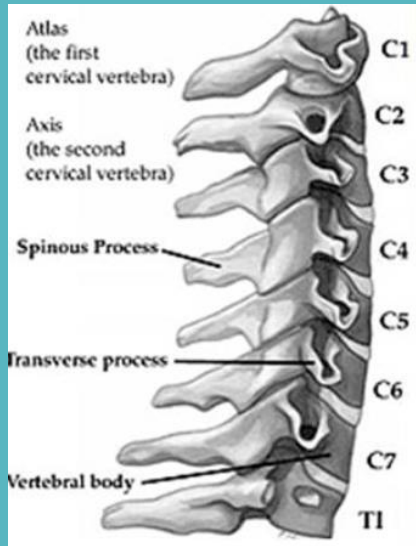
# KNEE LIGAMENT INJURY

## LATERAL COLLATERAL LIGAMENT <sup>20</sup>

- LCL injuries are extremely rare as a isolated injury. If isolated injury likely due to tennis or gymnastics injury.
- Injuries occur due to sudden varus force.
- Typically LCL injuries are concurrent with PLC, ACL, or PCL injuries.
- Patients present with lateral knee pain and difficulty with stairs and instability in near extension.
  - Ligament can be palpated if patient sits in the position pictured.
  - Gait analysis will show hyperextension or varus thrust.
  - Varus stress laxity at 30 degree flexion is LCL only <https://youtu.be/ubP-IWaFeEc>
  - Varus stress laxity at 0 and 30 degree flexion would indicate LCL + ACL/PCL
- XR of AP, lateral, and lateral with varus stress showing varus laxity. MRI for confirmatory and grading.
- Treatment is non-op vs operative
  - Non-op would include bracing, increasing ROM and guided PT.
  - Expect return to sports 6-8 weeks if grade 1 or 2
  - Surgical treatment for grade 3 tears, concurrent injuries of other ligaments,



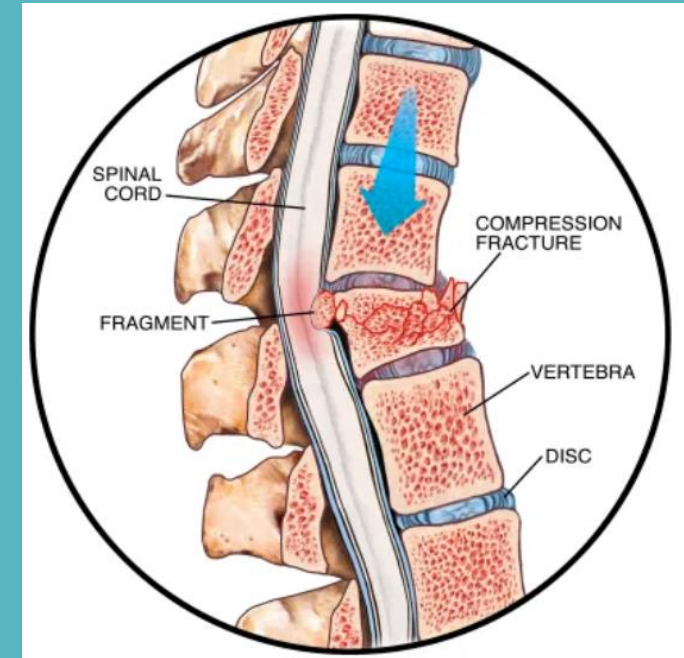
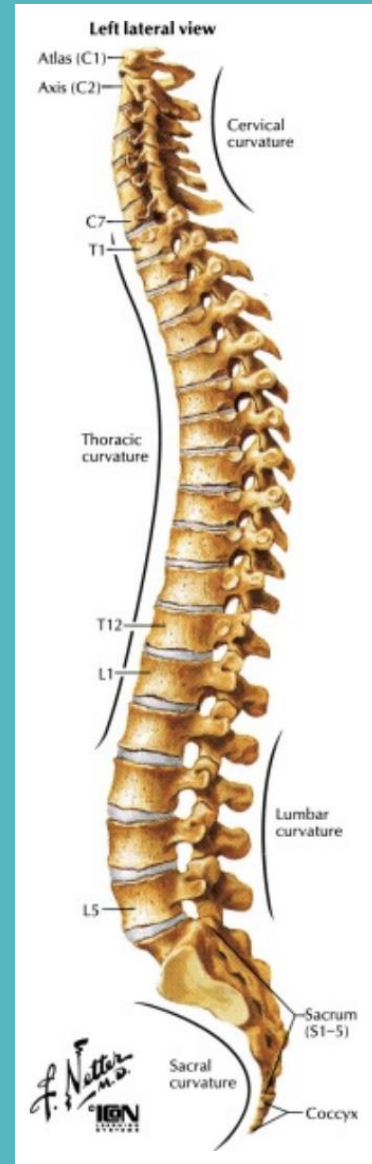
# SPINE



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26



21

# BACK PAIN

- Back pain is a common clinic complaint. For classification purposes when compiling a differential diagnosis the duration of pain is important to establish. Acute pain is less than 4 weeks, sub acute 4-12 weeks and chronic back pain is longer than 12 weeks.<sup>21</sup>
- Acute back pain have many causes which proves the importance of ruling out the Red flag diagnosis
  - Red flag diagnosis needing immediate referral<sup>21</sup>
    - Cancer – higher suspicion if patient has a history of cancer diagnosis
    - Infection – concerns in the immunocompromised community
    - Vertebral fracture- if patient has a history of trauma or osteoporosis
    - Cauda Equina syndrome- saddle paresthesia, urinary retention, or urine/fecal incontinence
    - Significant neurologic progressing deficits. This could be coming from any level.
- Imaging for red flag concerns
  - MRI vs CT is recommended for imaging in patients with concerns for infection, cauda equina, and significant progressing neurologic symptoms. Imaging is recommended at or above levels of symptoms.<sup>21</sup>
  - XR is recommended for patients with suspected cancer or suspected fractures.<sup>21</sup>
- A thorough history of activity, PMH, mental health history, and social history is important in gathering a full picture of your patient.
- Physical exam should include checking temperature, gait analysis including heel toe walk, strength deficits comparing sides, reflexes, range of motion of the spine and extremities, palpation of the spine and lateral to the spine, straight leg raise.<sup>22</sup>



# BACK PAIN

- Diagnosis and management varies widely based on patient presentation
- For red flag diagnosis with concerns of acute spinal infection, cauda equina syndrome or in some cases of significant neurologic progressive deficits, those all qualify for emergent referral to the ER.<sup>23</sup>
- For concerns of cancer, vertebral fractures, disc herniation, or acute nerve compression qualify for urgent referral.<sup>23</sup>
- If red flag diagnosis have been excluded and there is a diagnosis of generalized back pain with musculoskeletal origin treatment should include remaining active as able to tolerate, spine and core strengthening exercises with PT, and medications. If pain persists without improvement patient may need to be referred.<sup>24</sup>

Neck & Upper Extremity Spine Exam

Root	Primary Motion	Tested Muscles	Sensory	Reflex
<b>C4</b>	Scapular stabilization (winging)	Upper portion of serratus anterior (significant variation in innervation)	Upper shoulder, over clavicle 📷	-
<b>C5</b>	Shoulder abduction Elbow flexion (palm up)	Deltoid Biceps	Lateral arm below deltoid 📷	Biceps
<b>C6</b>	Elbow flexion (thumb up) Wrist extension	Brachioradialis ECRL	Thumb and radial hand/forearm 📷	Brachioradialis
<b>C7</b>	Elbow extension Wrist flexion	Triceps FCR	Fingers 2, 3, 4	Triceps
<b>C8</b>	Finger flexion, hand grip, thumb extension	FDS	Finger 5 📷	-
<b>T1</b>	Finger abduction	Interossei muscles	Medial elbow 📷	-

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Lower Extremity Spine and Neurologic Exam

Nerve Root	Primary Motion	Primary Muscles	Sensory	Reflex
<b>L1</b>			Iliac crest and groin 📷	Cremasteric reflex (L1 and L2)
<b>L2</b>	Hip flexion and adduction	Iliopsoas (lumbar plexus, femoral nerve) Hip adductors (obturator nerve)	Anterior and inner thigh 📷	Cremasteric reflex (L1 and L2)
<b>L3</b>	Knee extension (also L4)	Quadriceps (femoral nerve)	Anterior thigh, medial thigh, and medial knee 📷	-
<b>L4</b>	Ankle dorsiflexion (also L5)	Tibialis anterior (deep peroneal nerve)	Lateral thigh, anterior knee, and medial leg 📷	Patellar
<b>L5</b>	Foot inversion Toe dorsiflexion Hip extension Hip abduction	Tibialis posterior (tibial nerve) EHL (DPN), EDL (DPN) Hamstrings (tibial nerve), gluteus maximus (inferior gluteal nerve) Gluteus medius (superior gluteal nerve)	Lateral leg and dorsal foot 📷	-
<b>S1</b>	Foot plantar flexion Foot eversion	Gastrocnemius (tibial nerve) Peroneals (SPN)	Posterior leg 📷	Achilles
<b>S2</b>	Toe plantar flexion	FHL (tibial nerve), FDL (tibial nerve)	Plantar foot 📷	-
<b>S3 &amp; S4</b>	Bowel & bladder function	Bladder	Perianal 📷	-

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