

Sports Injuries to the Knee, Hips and Ankle



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Banner Pediatric Subspecialists

William Osler

The very first step towards success in any occupation is to become interested in it



Goals

- Help you feel more comfortable with basic orthopedic problems of the knee, hips, and ankles
- Improve diagnostic skills in identifying problems
- Become more interested in the function and treatment of musculoskeletal problems

Goals: When to refer to ortho



This is a workshop

If there are questions, no need to wait till the end, fire away and we can have a discussion

Please raise your hand or even yell out if I don't see you and we can spend some time on questions

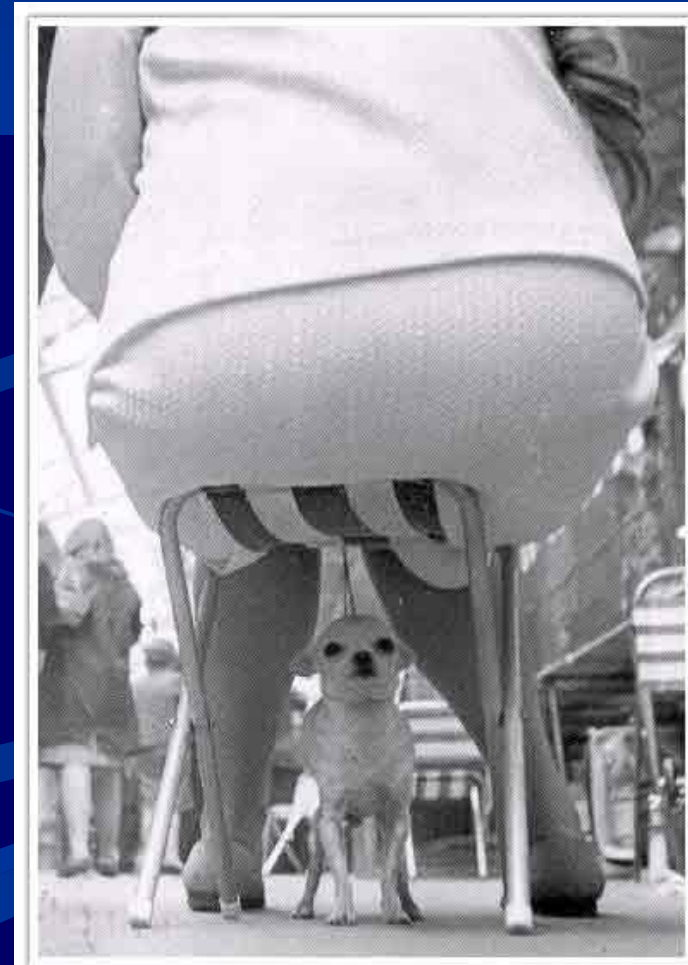
THERE ARE NO DUMB QUESTIONS

Overview of lower extremity injuries, aches and pains

- Knees
 - Hips
 - Ankles
 - History and Physical
 - Imaging
 - Anatomy/Mechanics
 - Injuries/pathology
 - Treatment
- 

Why Are Sports Injuries more commonly seen in the pediatric population now???

- Increasing frequency of sport participation
- Younger patients in competitive sports
- Greater Intensity/competition
- Parental Pressure
- Better Physician recognition
- Female athletes participation ↑




“The good physician treats the disease; the great physician treats the patient who has the disease.”

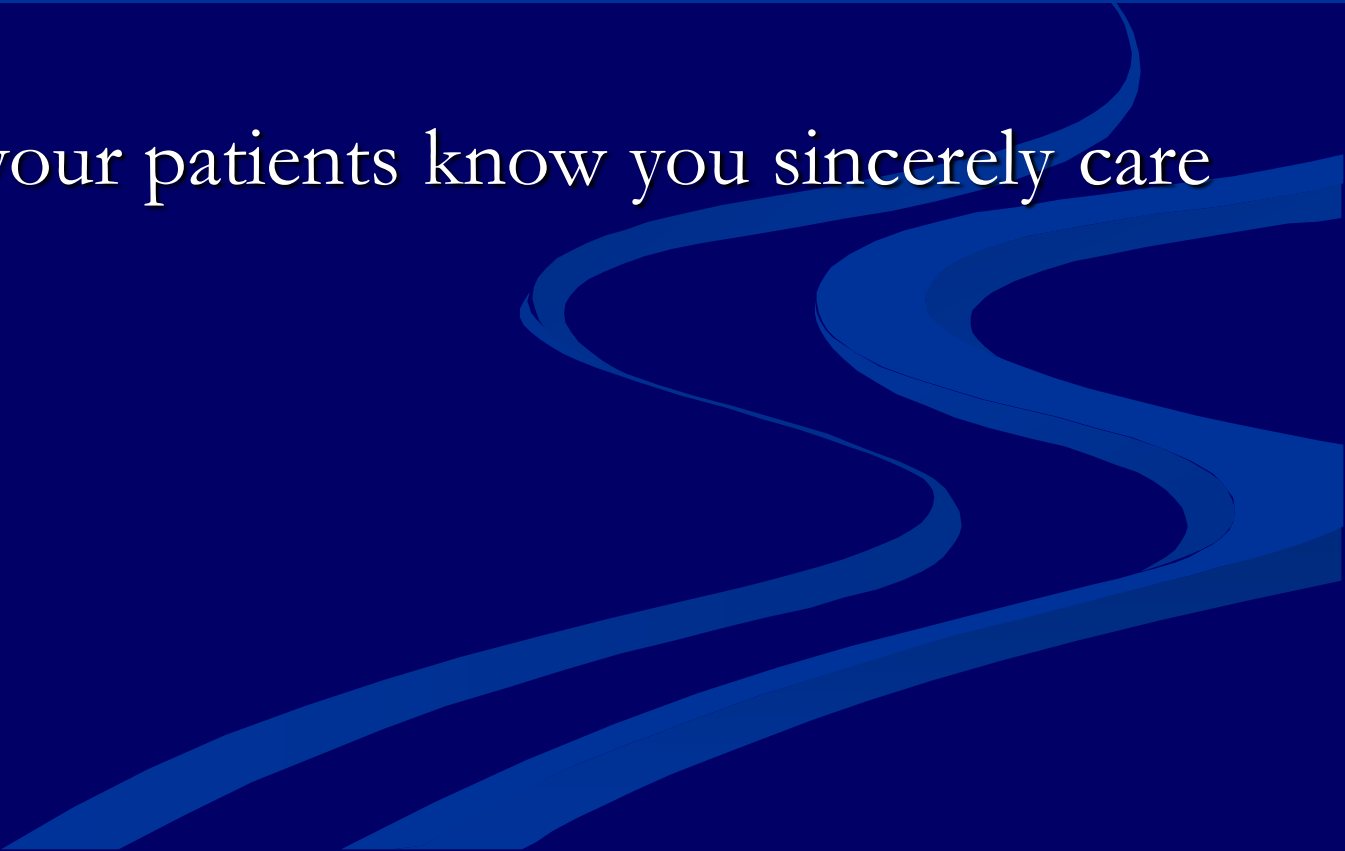
-William Osler

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- Laugh with your patients



- Laugh with your patients
 - Have fun with the people that come through your door
- 
- The bottom half of the slide features several thick, wavy, blue lines that flow from the right side towards the left, creating a sense of movement and depth against the dark blue background.

- Laugh with your patients
 - Have fun with the people that come through your door
 - Make sure your patients know you sincerely care
- 

- Laugh with your patients
- Have fun with the people that come through your door
- Make sure your patients know you sincerely care
- Leave your office each day feeling good about what you have done

History

- What brings you in today?
 - Chief Complaint
 - Open ended questions
- Was there an injury?
 - Mechanism, swelling, pop, weight bearing
- Pain – Location, duration, intensity, frequency
 - Where is the pain,
 - Point with one finger

Seek to Understand, Seek to Comfort



Observation

- Is the patient male or female?
- Is the patient obese/sedentary?
- Pain threshold
- “helicopter parent”
- Patient age
- Anxiety level



Battle of the sexes!

■ Boys

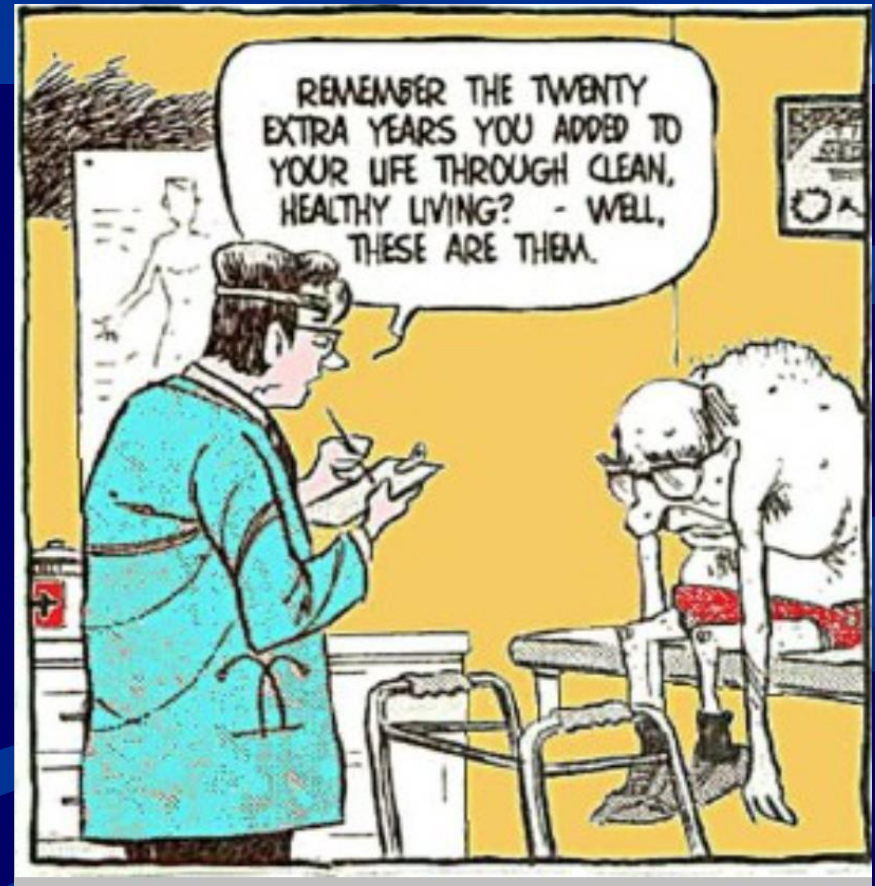
- Osgood Schlatter, osteochondritis dissecans, ACL, traumatic injuries
- Hip labral tears and Femoroacetabular Impingement

■ Girls

- Patellofemoral pain (3 times more common), patellar instability
- ACL tears 2-4 times more likely
- Laxity (loose jointed) related pain

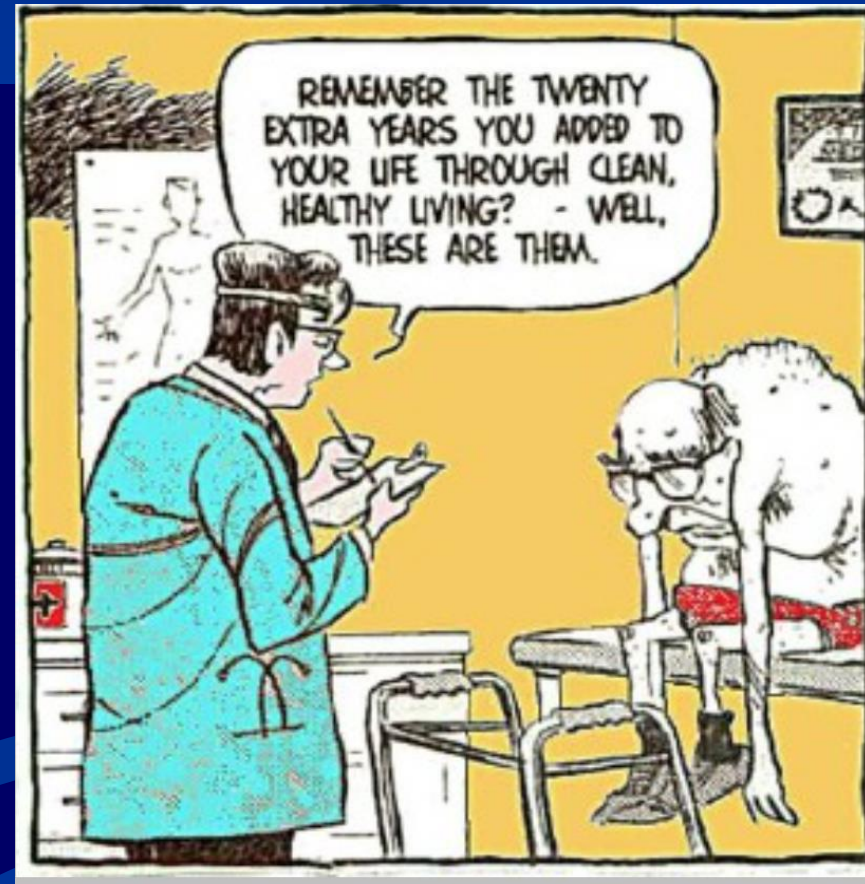
Age of Patient

- Younger patients = less serious problem (usually)
 - Less stress through knee
 - Healthier tissue
- “Growing pains”
- “Alignment issues”
 - <8 years - wait, watch, see,
- Reassure



Age of Patient

- Older Patients – increase muscular force/weight lead to more damage
- Injured Tissue
 - not as regenerative




Imaging

Wilhelm Röntgen



When to get x-rays


- Any injuries, especially with swelling
 - Long term pain
 - Patellar Dislocations
 - Patellofemoral pain
 - Swelling
 - Groin pain
 - Ankle injuries/pain
- 

When to get x-rays

- A “negative” x-ray often tells you much more than read







When to get x-rays (in hip)

- Any injuries, especially with swelling
 - Long term pain
 - “groin pain”
- 

Relative Radiation Exposure

- Chest X-ray = Flight from NYC to LA
(or 4-10 days of ambient radiation exposure in daily living)
- X-ray of the extremity (hand, foot) = 3 hours ambient exposure
- X-ray of knee = less than 1 day ambient exposure

Relative Radiation Exposure

BONE 	Procedure	Approximate effective radiation dose	Comparable to natural background radiation for:
	Spine X-ray	1.5 mSv	6 months
	Extremity (hand, foot, etc.) X-ray	0.001 mSv	3 hours
CENTRAL NERVOUS SYSTEM 	Procedure	Approximate effective radiation dose	Comparable to natural background radiation for:
	Computed Tomography (CT)-Head	2 mSv	8 months
	Computed Tomography (CT)-Head, repeated with and without contrast material	4 mSv	16 months
	Computed Tomography (CT)-Spine	6 mSv	2 years
CHEST 	Procedure	Approximate effective radiation dose	Comparable to natural background radiation for:
	Computed Tomography (CT)-Chest	7 mSv	2 years
	Computed Tomography (CT)-Lung Cancer Screening	1.5 mSv	6 months
	Chest X-ray	0.1 mSv	10 days
DENTAL 	Procedure	Approximate effective radiation dose	Comparable to natural background radiation for:
	Dental X-ray	0.005 mSv	1 day

Relative Radiation Exposure

ABDOMINAL REGION

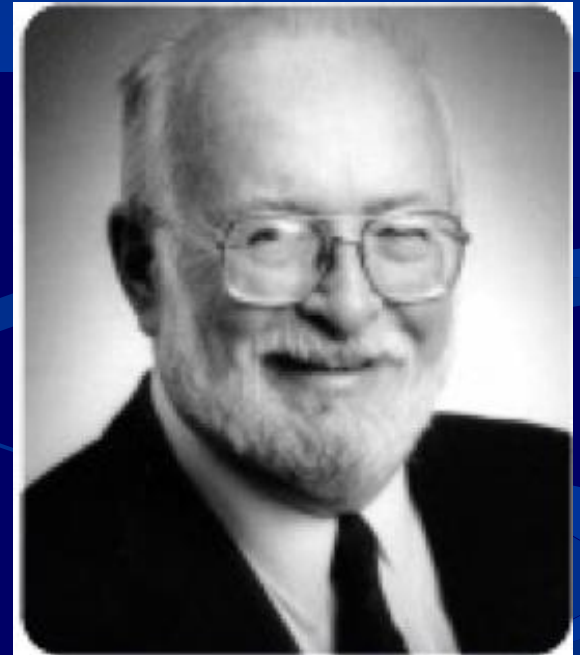


Procedure	Approximate effective radiation dose	Comparable to natural background radiation for:
Computed Tomography (CT)–Abdomen and Pelvis	10 mSv	3 years
Computed Tomography (CT)–Abdomen and Pelvis, repeated with and without contrast material	20 mSv	7 years
Computed Tomography (CT)–Colonography	6 mSv	2 years
Intravenous Pyelogram (IVP)	3 mSv	1 year
Barium Enema (Lower GI X-ray)	8 mSv	3 years
Upper GI Study with Barium	6 mSv	2 years

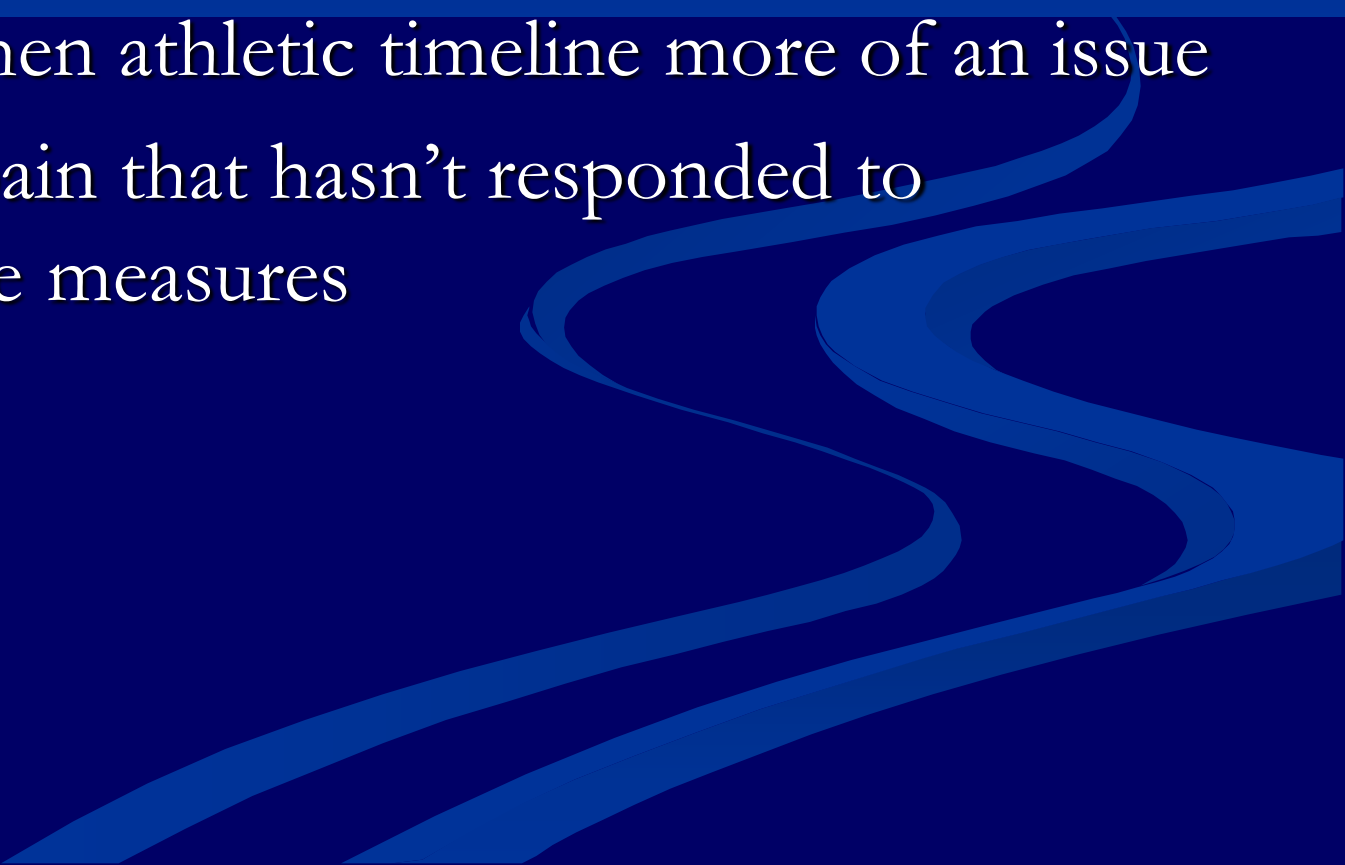
Relative Radiation Exposure



MRI



When to get an MRI

- Major swelling with injury to rule out fractures/ligament tears
 - Anytime when athletic timeline more of an issue
 - Persistent pain that hasn't responded to conservative measures
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- A decorative graphic consisting of several overlapping, wavy, blue lines that flow from the bottom left towards the right side of the slide, creating a sense of motion and depth.

CT Scan

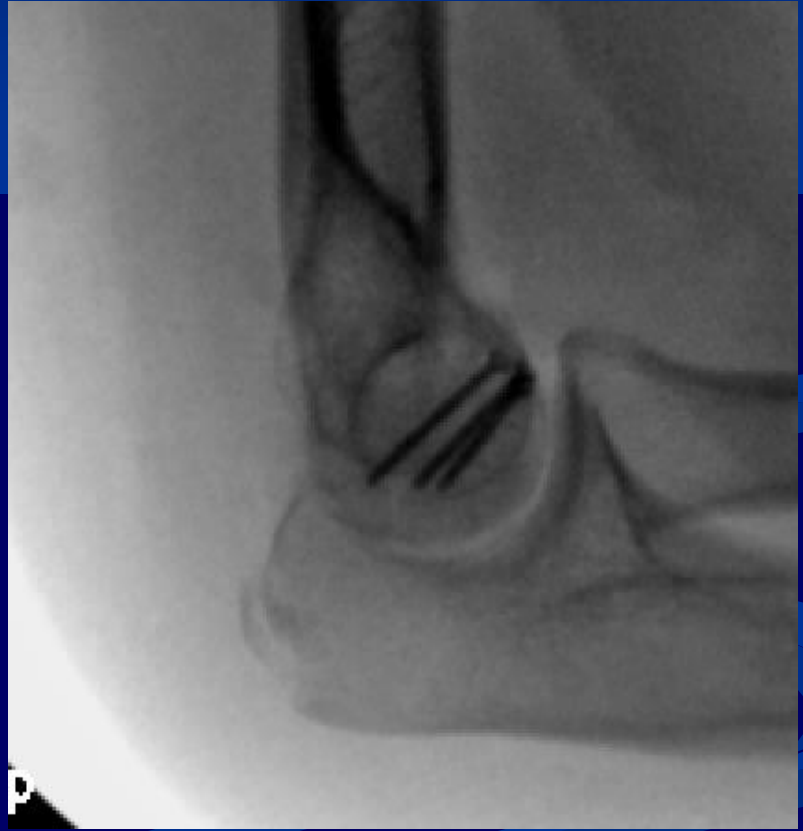
- Complex intraarticular fractures
- Rotational profile
- Pelvic Fractures



CT Scan

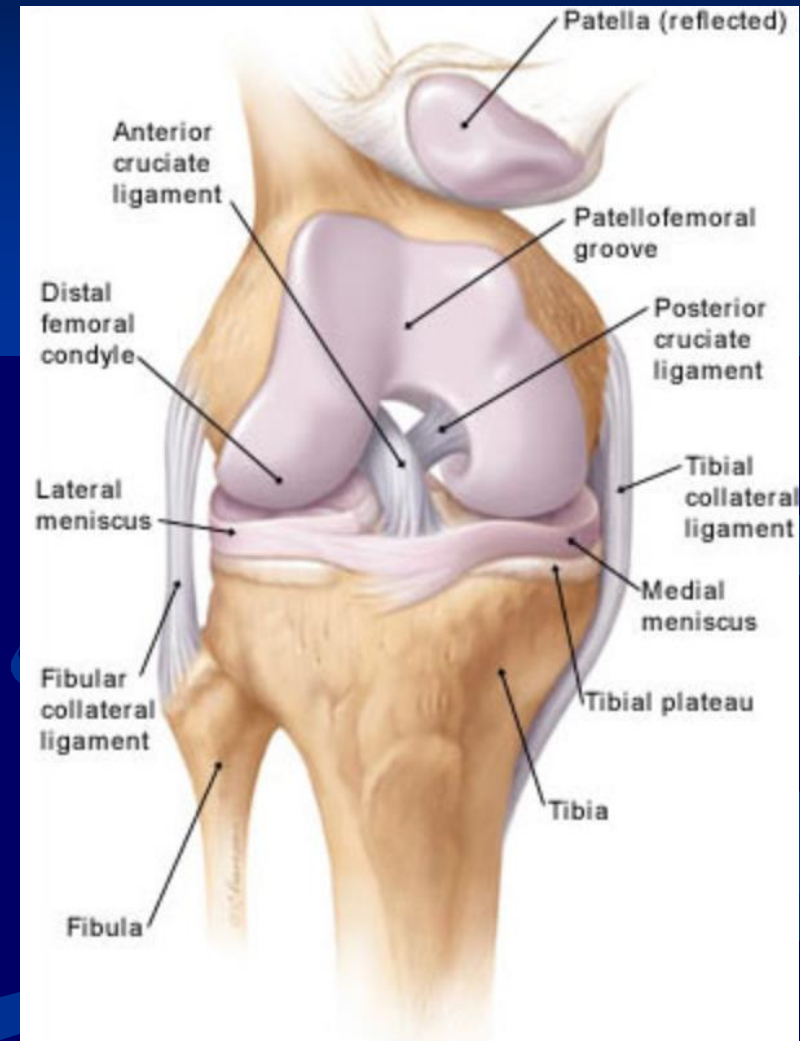
- Complex intraarticular fractures
- Rotational profile
- Pelvic Fractures





Knee Anatomy/Mechanics

- Function of the Bones
 - Hinge joint
 - Less bony stability
 - Rely on ligaments/menisci



Relative Bony stability



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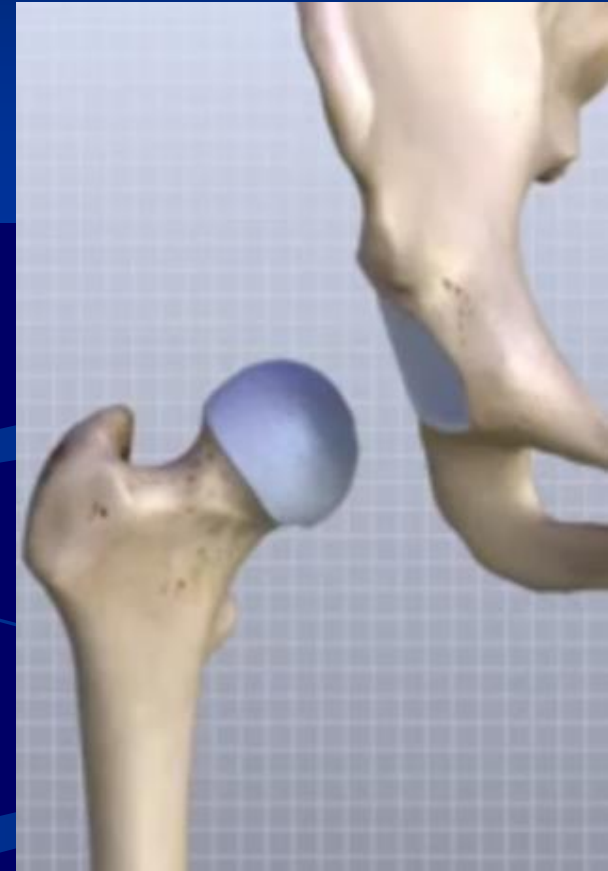
Relative Number of Visits to office



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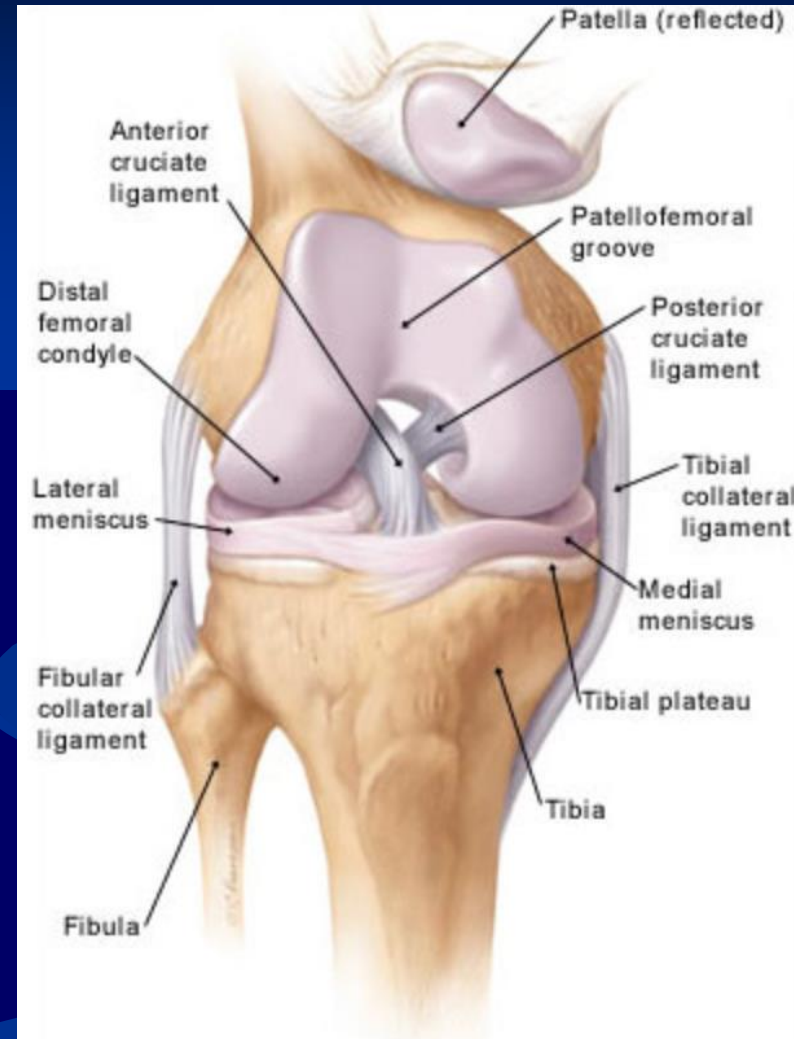


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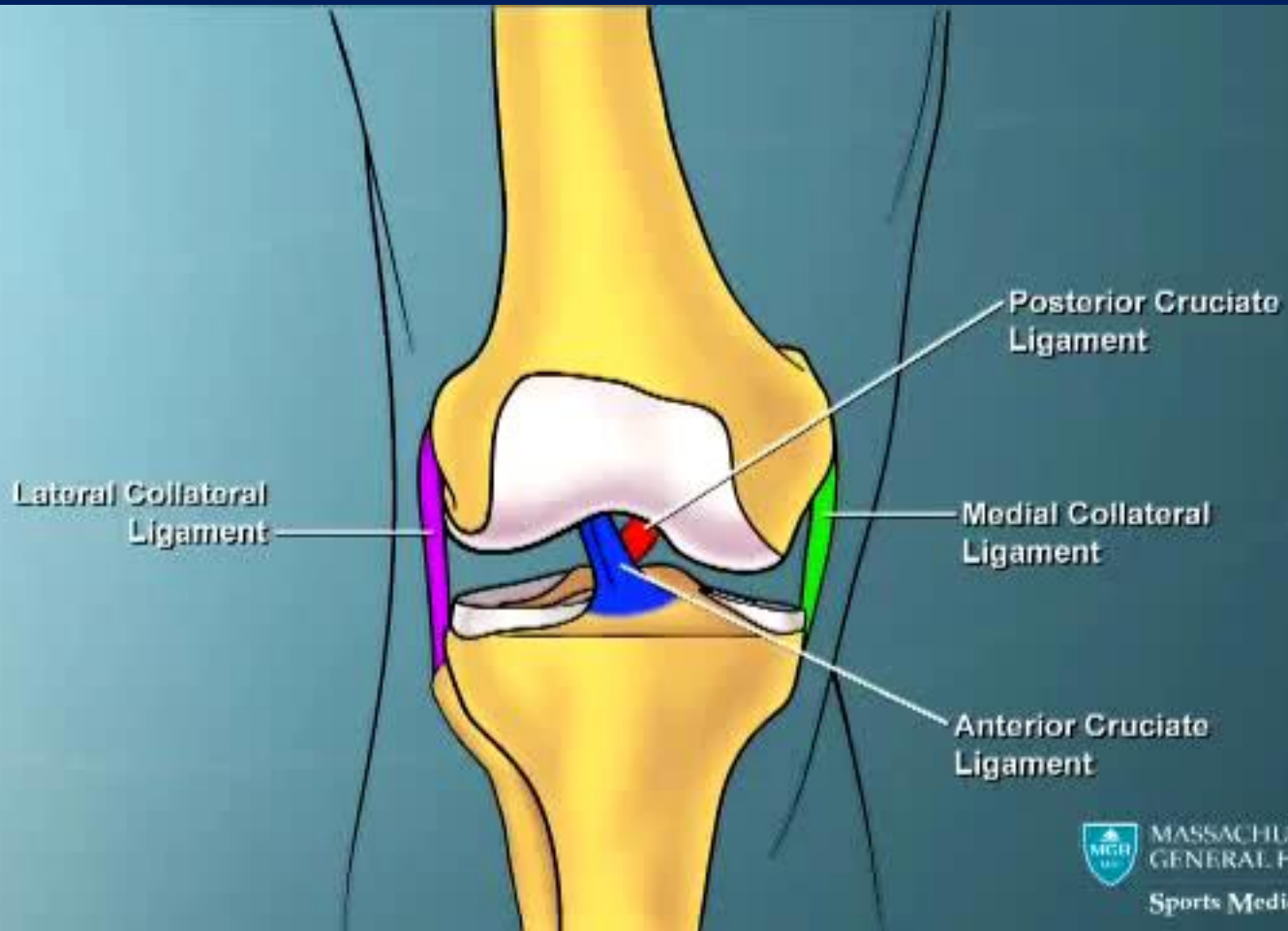


Knee Anatomy/Mechanics

- Function of the ligaments
 - Knee – few bony restraints
 - IMPORTANT stabilizers
 - ACL, MCL, LCL, PCL
 - There are minor ligament stabilizers as well

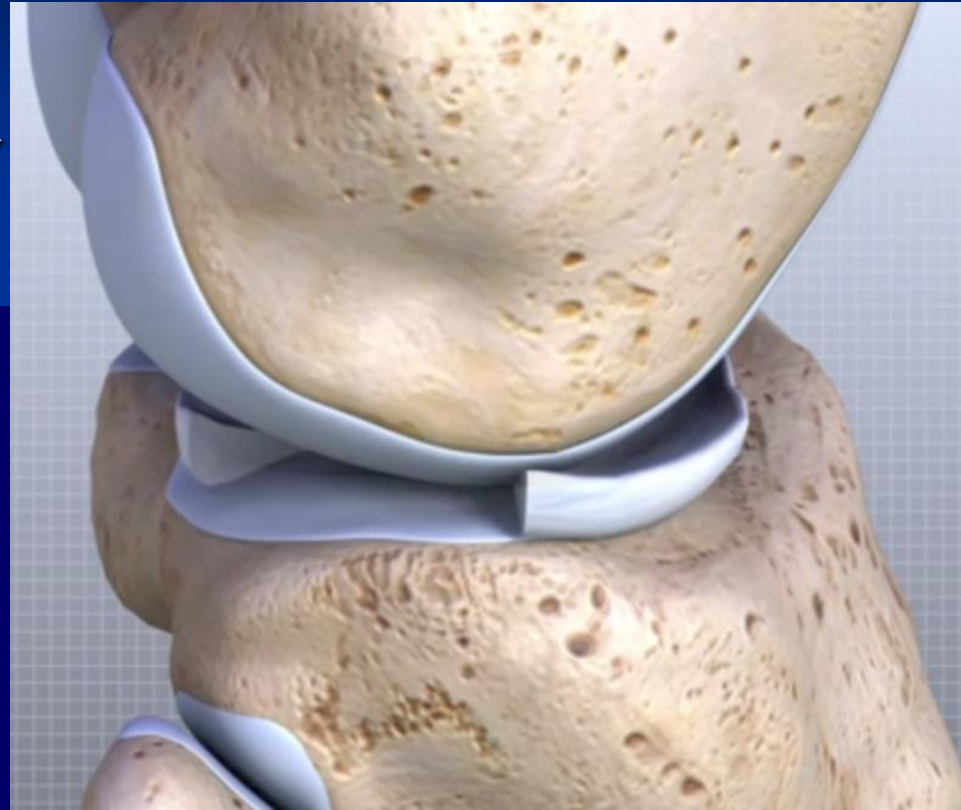


Knee Mechanics



Meniscus Anatomy/Mechanics

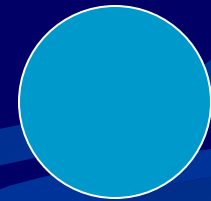
- Function of the Menisci
 - Distribute pressure evenly
 - Stabilize the knee
 - Arthritis prevention



Knee Anatomy/Mechanics



Surface area

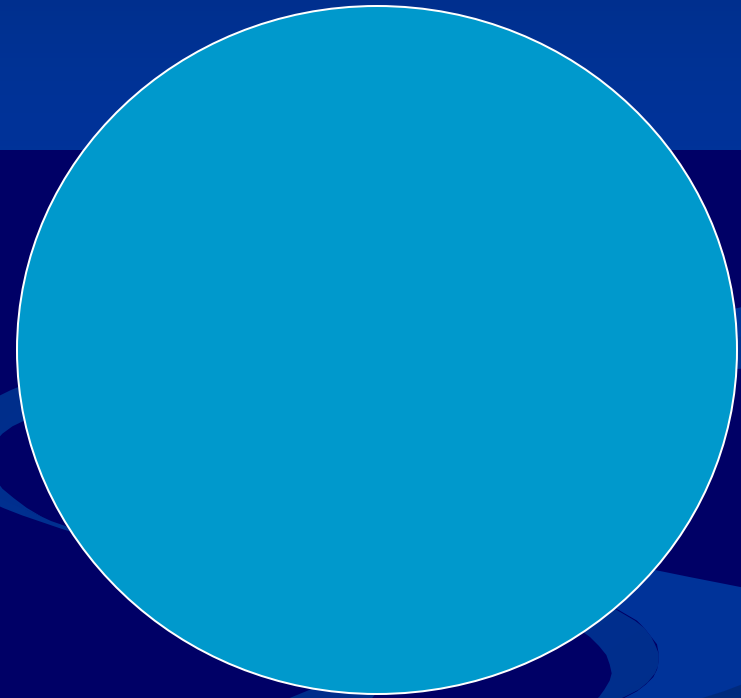


Head on floor similar to knee
without meniscus

Knee Anatomy/Mechanics

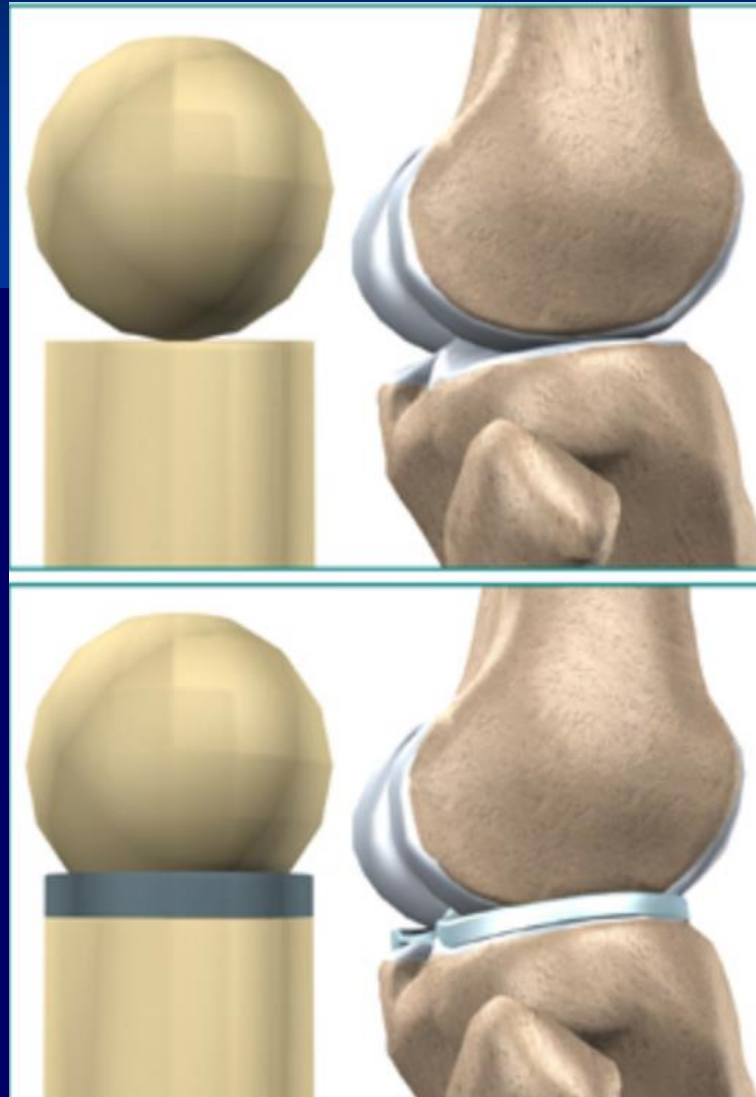


Surface area

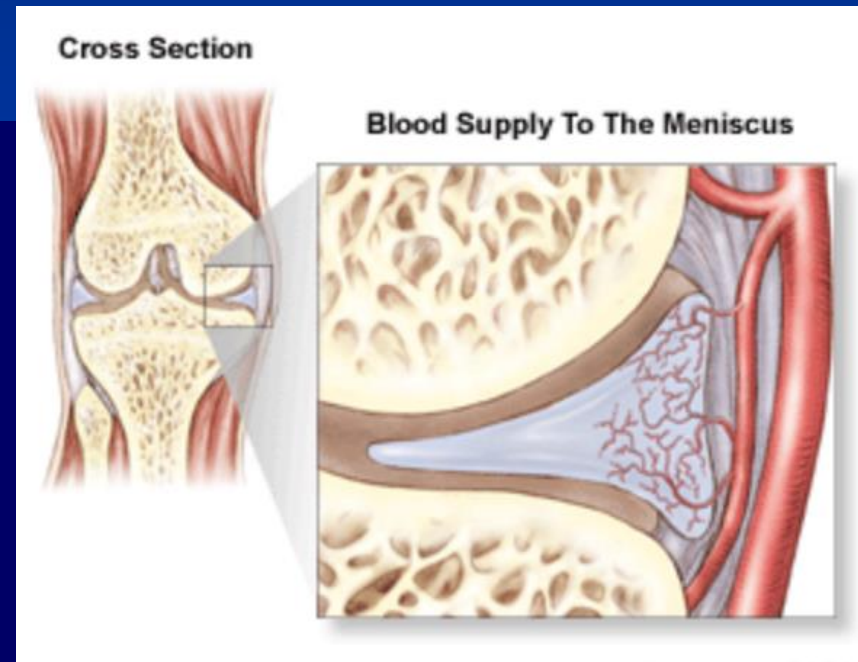
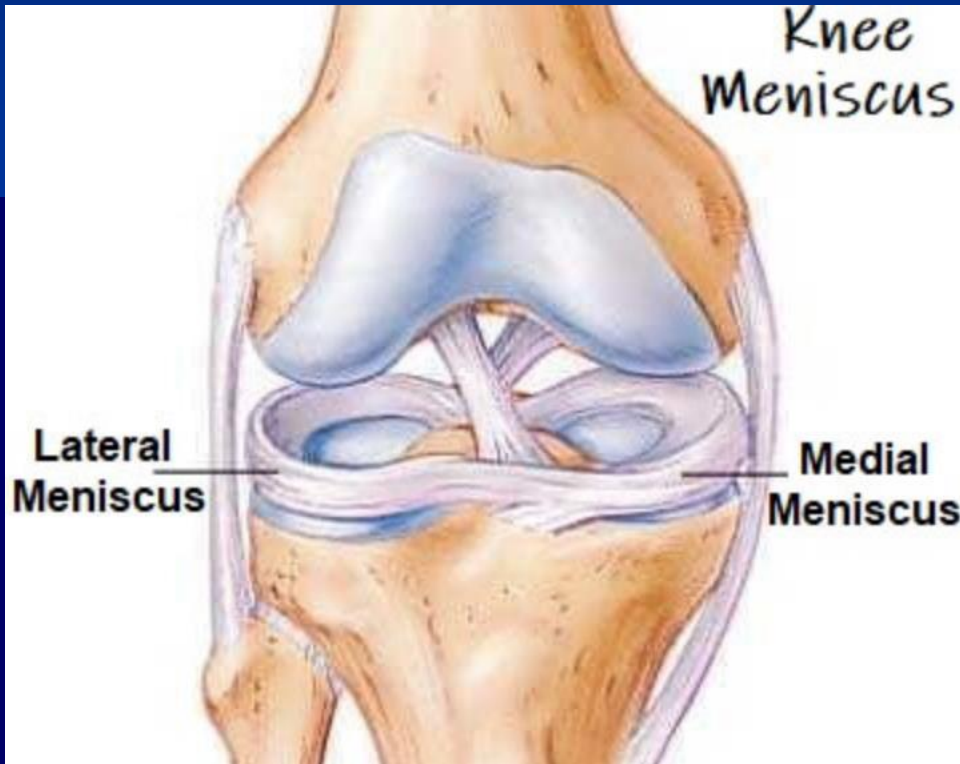


Head with pillow
similar to knee with
meniscus

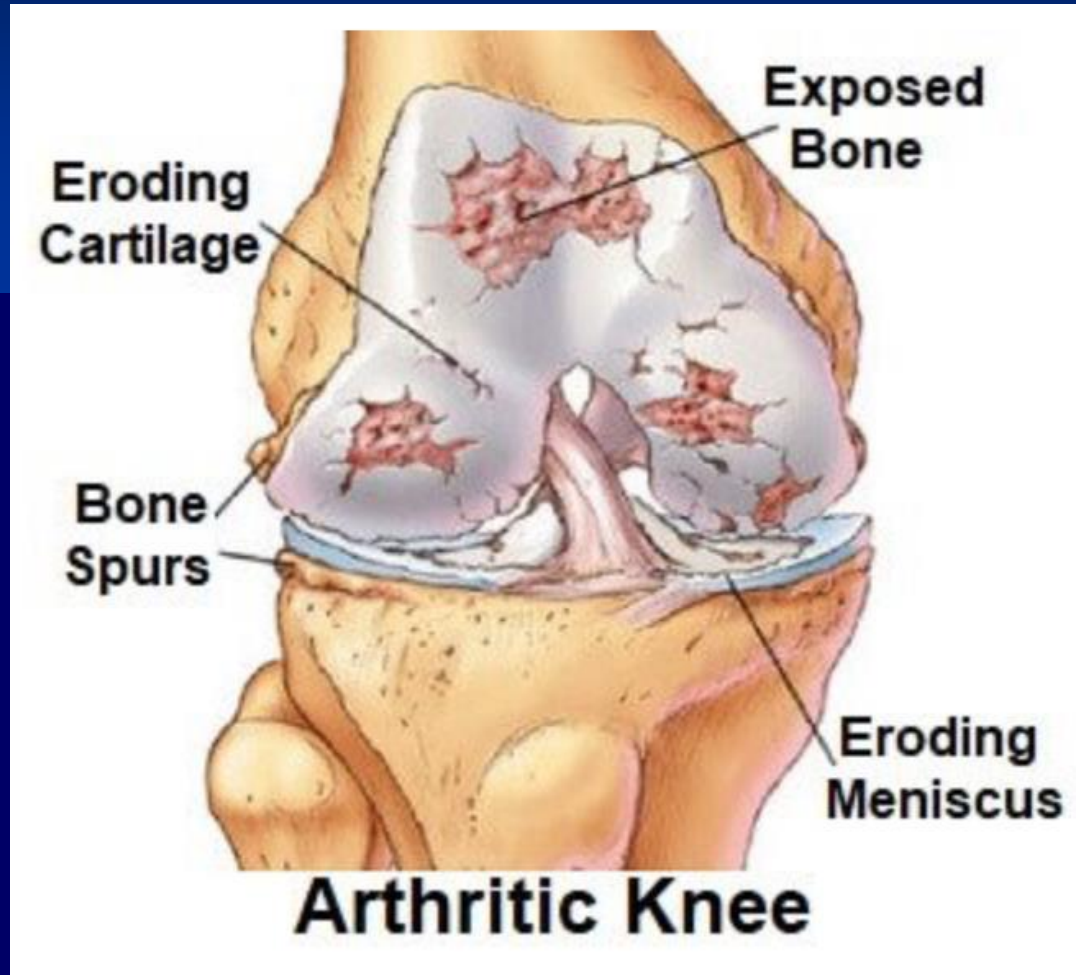
Menisci help distribute pressure evenly



Meniscus Anatomy

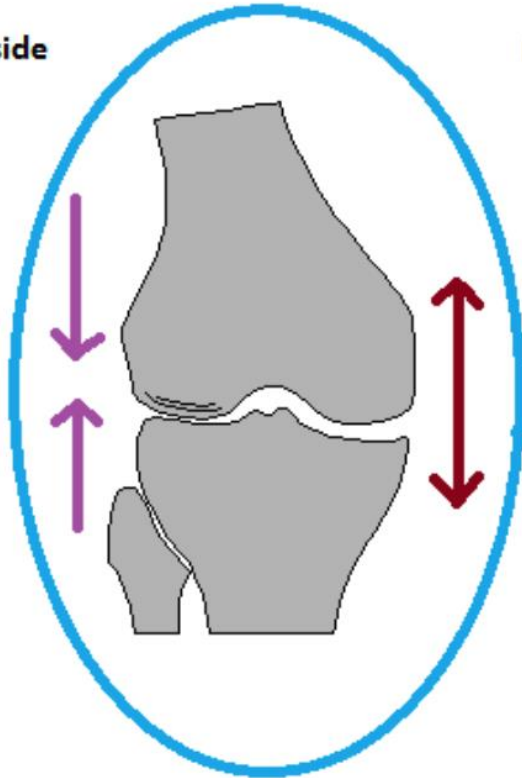


No meniscus = Increase Arthritis



Alignment

Lateral side



Medial side

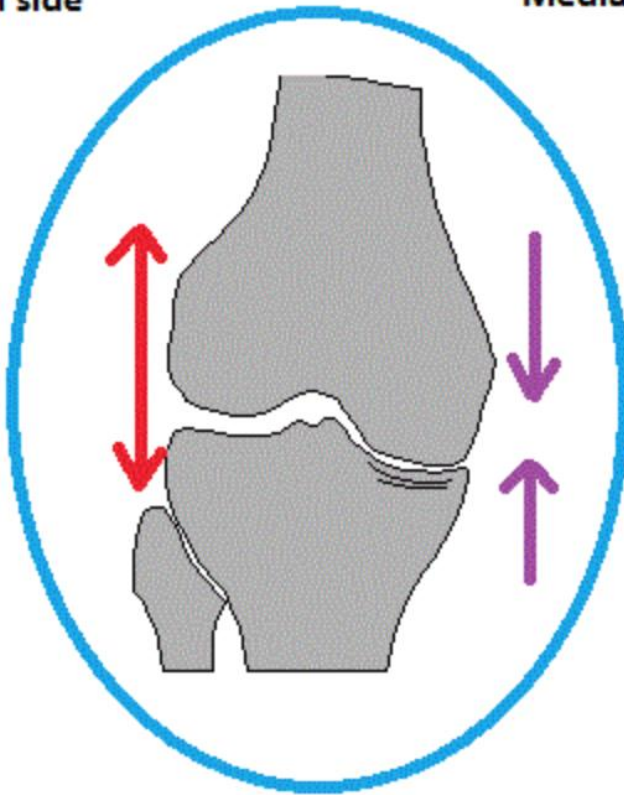


$$\text{Force} = \text{Pressure} / \text{Area}$$

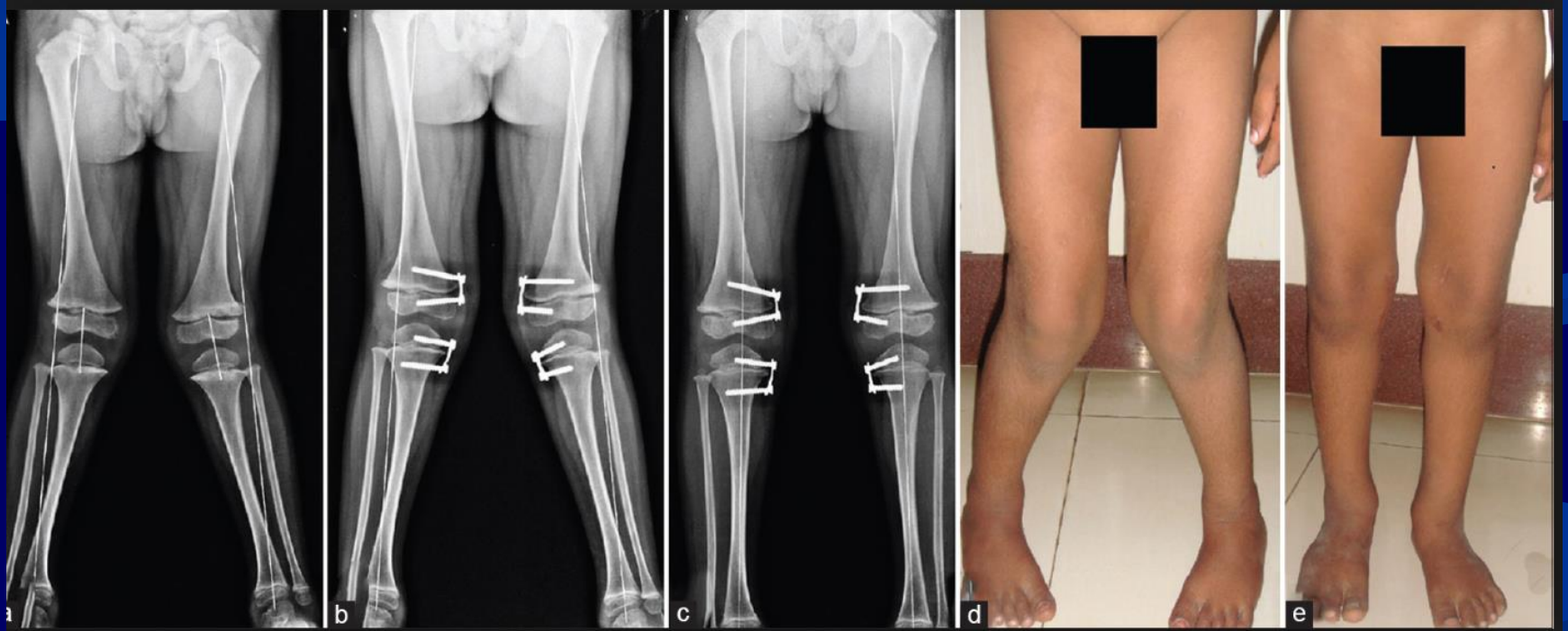
Alignment

Lateral side

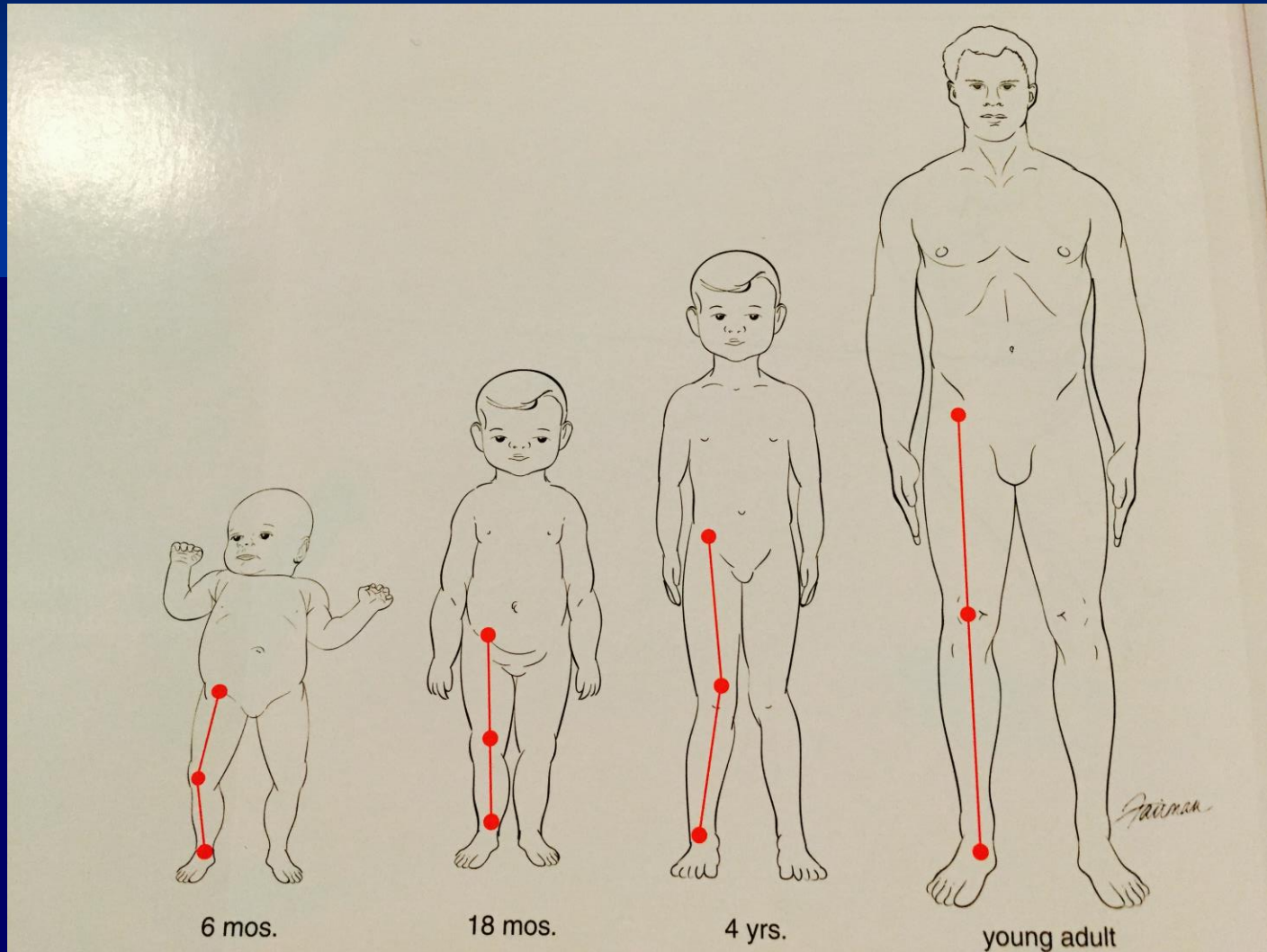
Medial side



Alignment



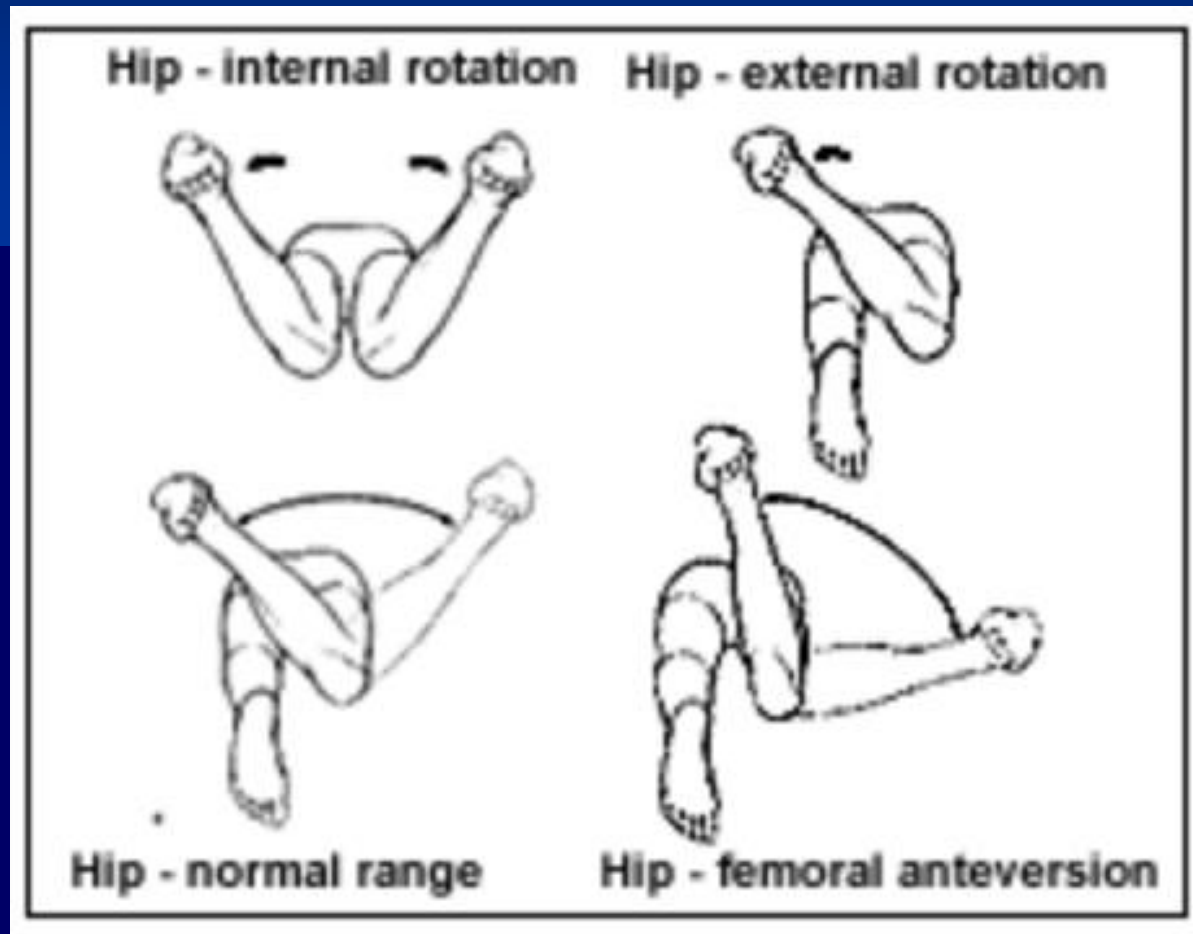
Alignment Changes With Age



Balance is key to happy knee



Rotational Alignment



Rotational Alignment

- Video



Rotational Alignment (measure prone)

■ Infants

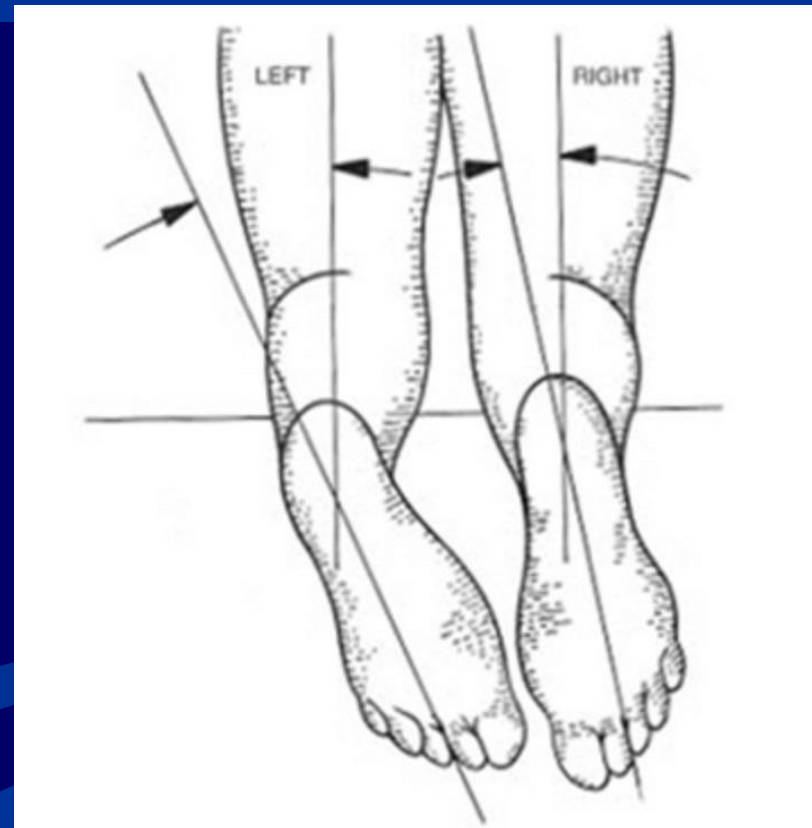
- 40° internal rotation
- 70° external rotation

■ Age 10

- 50° internal rotation
- 45° external rotation
- Mild, moderate, and severe increases in internal rotation are demonstrated at 70°, 80°, and 90°

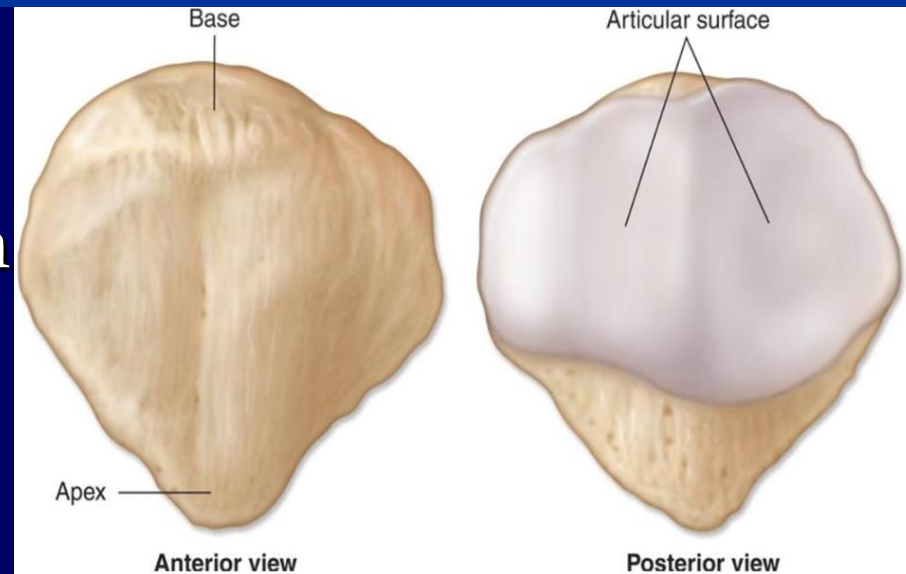
Rotational Alignment (measure prone)

- Thigh Foot Axis
 - Infants - 5° Internal Rotation
 - 8-year olds - 10° of Ext Rot

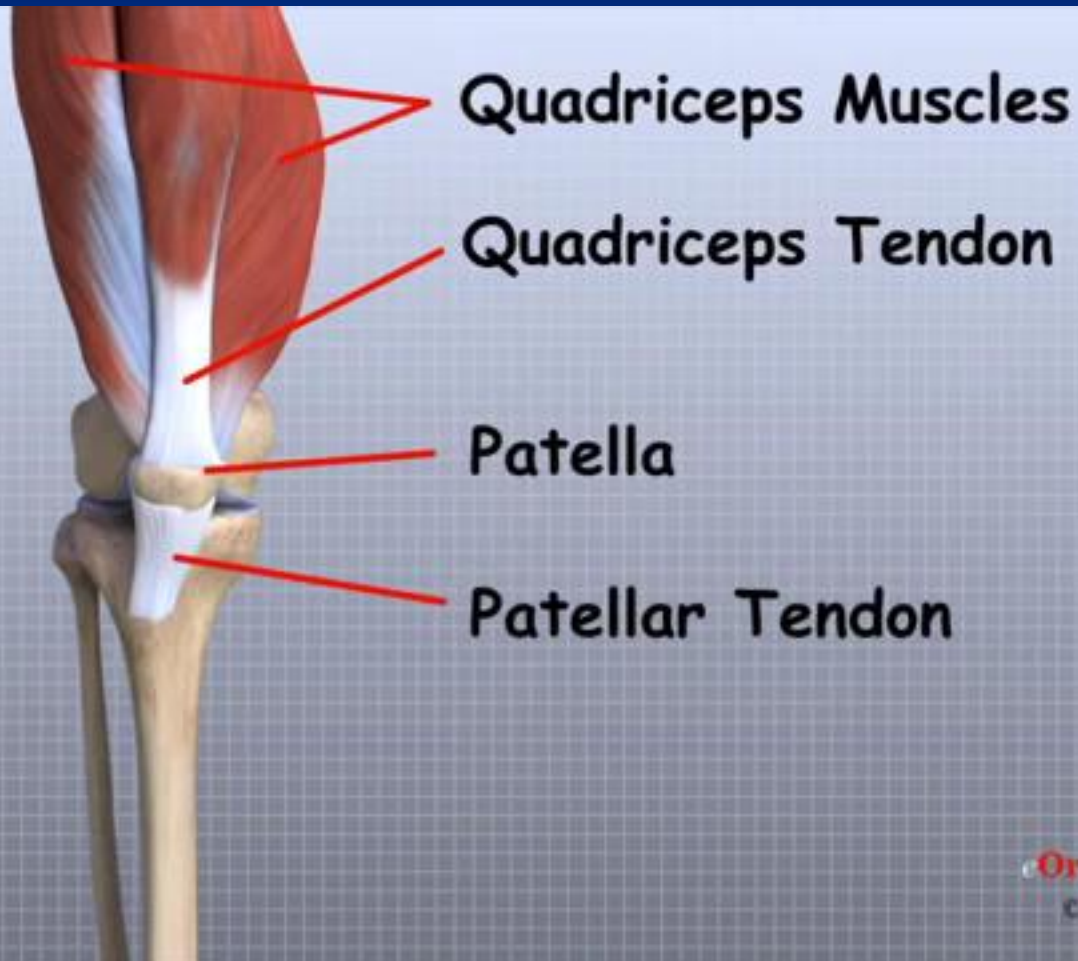


Patella Anatomy/Mechanics

- Largest Sesamoid bone
 - Acts as fulcrum for the quads to increase contractile force
 - Protects the knee
- Poor Tracking-common



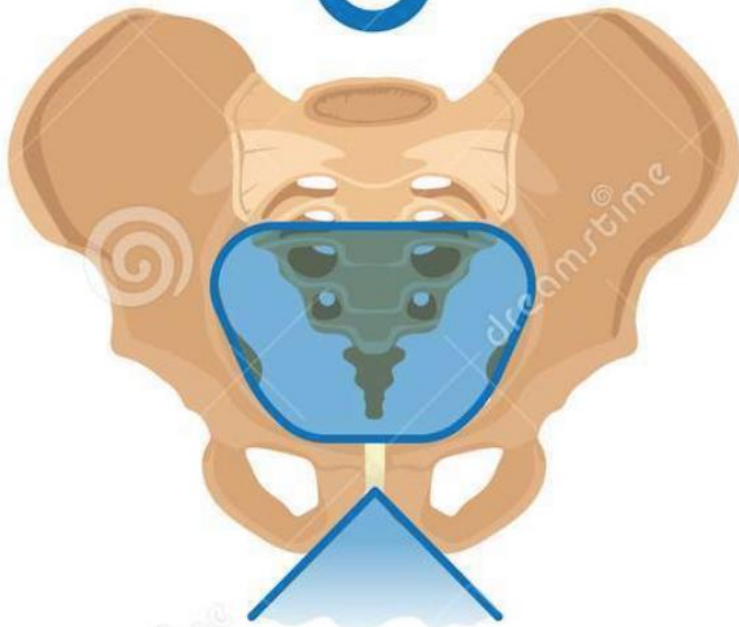
Patella Anatomy/Mechanics



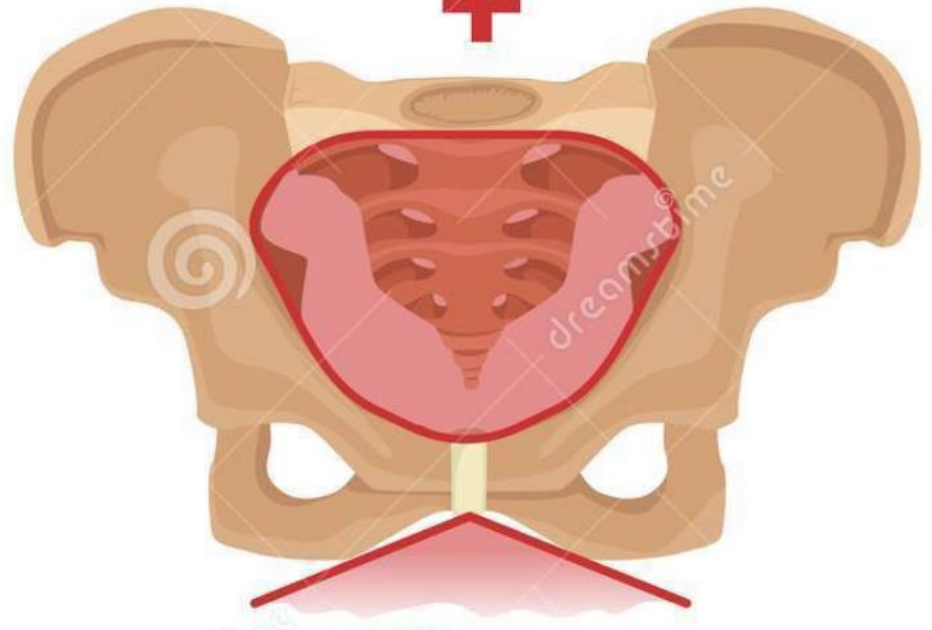
- Knee anatomy and patellofemoral pain – YouTube (3 minutes)



Male Vs Female Pelvis



NARROW PUBIC ARCH



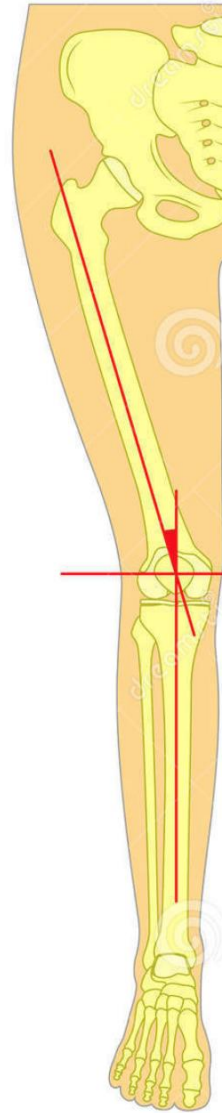
WIDE PUBIC ARCH

MALE

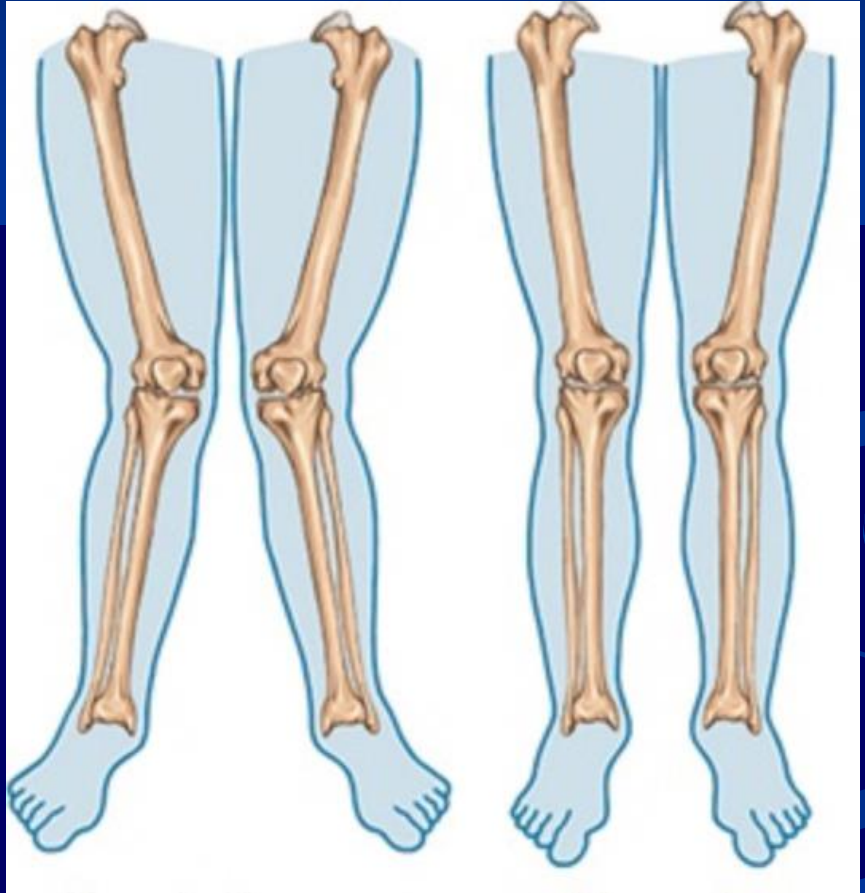
FEMALE




angle 12 °



angle 16 °



Patella Mechanics / Anatomy

- Mechanics and anatomy determine pathology
 - Rotation
 - Coronal alignment
 - Muscular imbalance leads to issues
- 
- A decorative graphic consisting of several overlapping, wavy, blue lines that flow from the right side of the slide towards the left, creating a sense of movement and depth.

Patella Exam

- Exam and observation
 - Look for internal rotation
 - Evaluate Single leg squat
 - Check Rotational profile



Patella Mechanics

- Exam and observation
- Kissing Patella
 - Patella facing each other
 - Internal Rotation of femur
 - Alignment leads to pain



Patella Mechanics

- Single leg squat Exam
- Look for patella turning in
- Look at weakness with squat



Patella Mechanics

- Single leg squat Exam
- Look for patella turning in



Physical Exam Cont.

- Does the patient have loose joints



Any patients with a atraumatic
history....



Any patients with a atraumatic history....

- Check joint laxity



Beighton Score

Beighton Hypermobility Score

The Beighton score is a simple system to quantify joint laxity and hypermobility.

It uses a simple 9 point system, where the higher the score the higher the laxity.

The threshold for joint laxity in a young adult is ranges from 4-6. Thus a score above 6 indicates hypermobility, but not necessarily true BHJS (see below)

Joint	Finding	Points
left little (fifth) finger	passive dorsiflexion beyond 90°	1
	passive dorsiflexion <= 90°	0
right little (fifth) finger	passive dorsiflexion beyond 90°	1
	passive dorsiflexion <= 90°	0
left thumb	passive dorsiflexion to the flexor aspect of the forearm	1
	cannot passively dorsiflex thumb to flexor aspect of the forearm	0
right thumb	passive dorsiflexion to the flexor aspect of the forearm	1
	cannot passively dorsiflex thumb to flexor aspect of the forearm	0
left elbow	hyperextends beyonds 10°	1
	extends <= 10	0
right elbow	hyperextends beyonds 10°	1
	extends <= 10	0
left knee	hyperextends beyonds 10°	1
	extends <= 10	0
right knee	hyperextends beyonds 10°	1
	extends <= 10	0
forward flexion of trunk with knees full extended	palms and hands can rest flat on the floor	1
	palms and hands cannot rest flat on the floor	0

Beighton Testing

- >10 degrees hyperextension at elbow



Mother's elbow



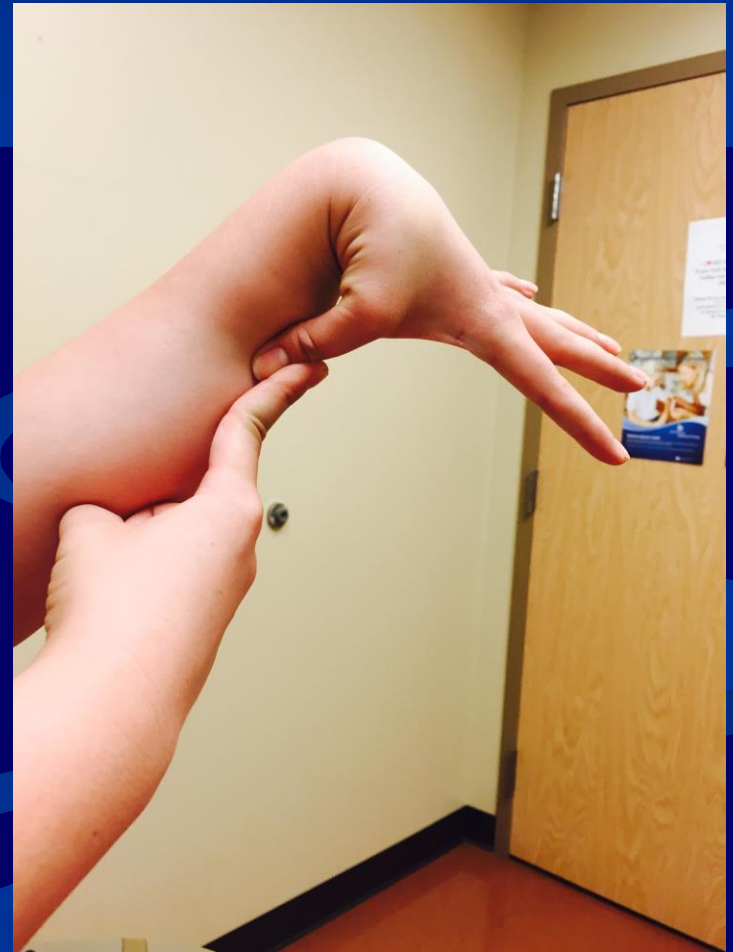
Beighton Testing

- 90 or $>$ at Metacarp-phal joint



Beighton Testing

- Thumb to forearm



Beighton Testing

- 10 deg or more knee hyperextension at knee




Beighton Testing

- Palms to ground



Beighton Testing

- Score of 4-6 is threshold for laxity
 - Greater than 6 = hypermobility
- 
- The bottom half of the slide features a decorative graphic consisting of several overlapping, wavy, blue lines that flow from the right side towards the left, creating a sense of movement and depth against the dark blue background.

Why do we care about loose joints?

- Can be a very disabling problem that can last into adulthood
- Help patients to understand where their pain is coming from
- Can affect almost any joint and lead to painful hypermobility
- Helps guide treatment options

What can we do for our loose jointed patients???

- Physical Therapy to increase stability about joints
- Encourage not to stretch or show friends
“Cool Tricks”
- Bracing
- Help choose appropriate activities

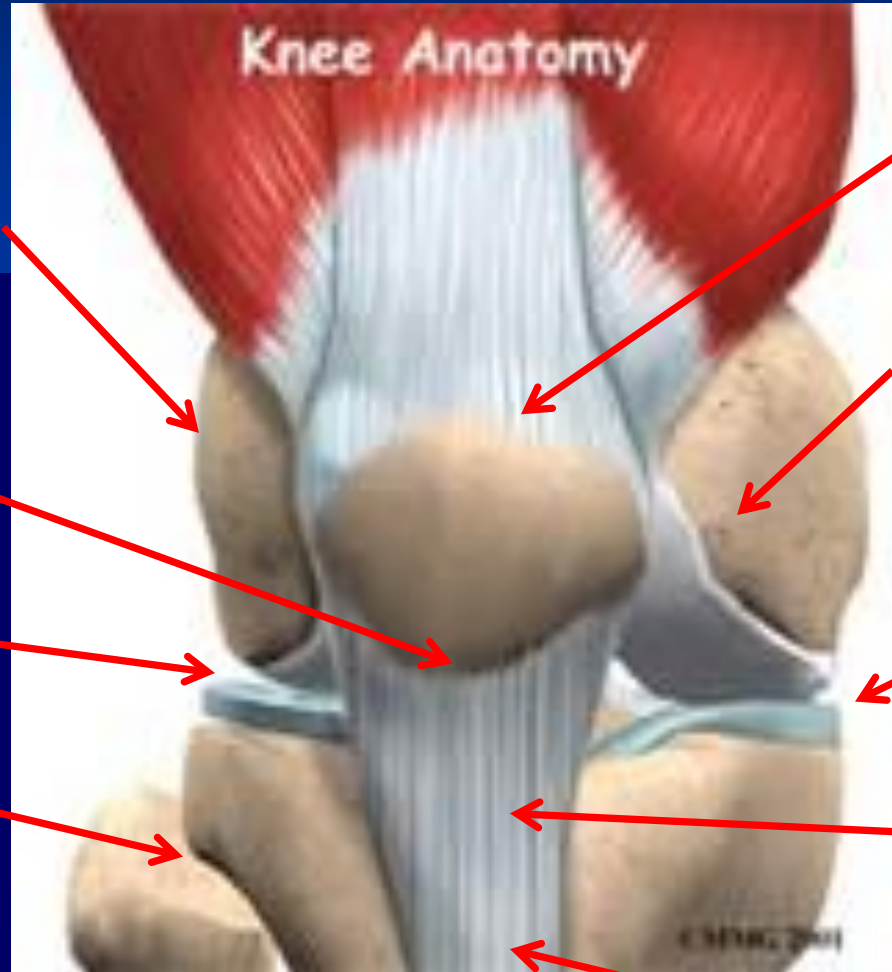
Physical exam cont.

- Swelling
 - fracture
 - ligament
 - meniscus tear
 - ACL tear
 - Rheumatological problems
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- The bottom right portion of the slide features several overlapping, wavy, blue lines that create a sense of motion and depth. These lines are in various shades of blue, from a deep navy to a lighter, more vibrant blue, and they curve and flow across the bottom right corner of the slide.

Physical Exam



Location of pain



Lateral condyle- ITB

Sinding Larsen Johansson

Lateral joint line- discoid meniscus

Tib-fib joint instability

Patellofemoral pain

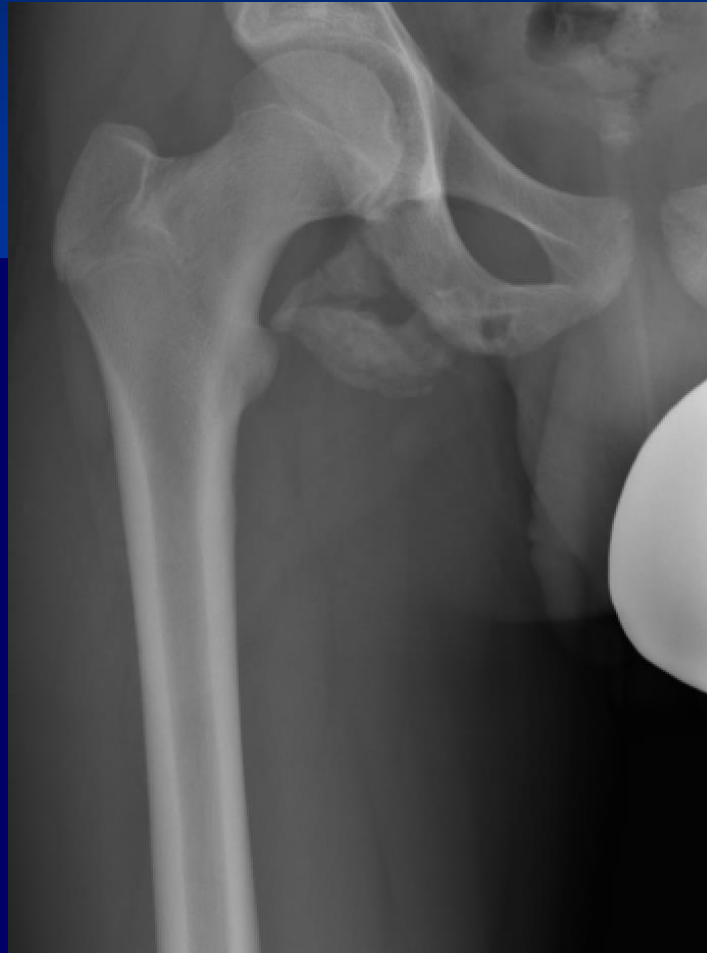
Medial Condyle- plica Patellofemoral pain

Joint Line- meniscus

Patellar tendinitis

Tubercle- Osgood Scatter

**With knee pain, remember to
examine the hip!**



Avoiding the Pitfalls: Referred Knee Pain in Children

- Hip pain can often be referred to the knee in children
- Sensory distribution of obturator nerve to medial knee
- **ALWAYS** Examine hip in any child with knee pain
- Misdiagnosis common: LCPD [Perthes], SCFE [slipped capital femoral epiphysis]



Anterior Knee Pain: “The Headache of the Knee”

- Chronic knee pain in any part of extensor mechanism of knee
- Spectrum includes patellofemoral pain syndrome, Osgood Schlatter disease, Sinding-Larsen-Johansson syndrome, plica
- Peri-patellar, insidious pain
 - no known trauma or injury
- Occasional complaints of knee locking, acute swelling, or giving way/buckling



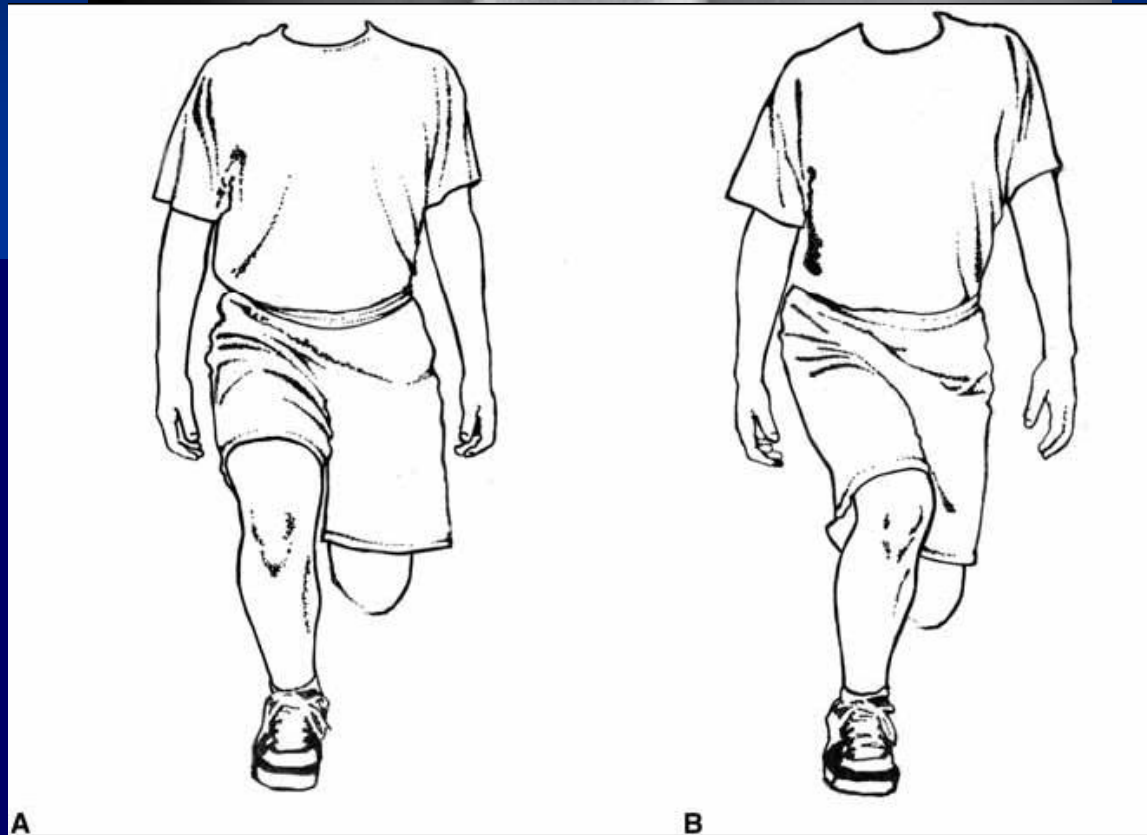
Patellofemoral Pain

- Definition – Pain originating from maltracking or anatomical problems (cartilage damage) to the patella



Causes Patellofemoral Knee Pain

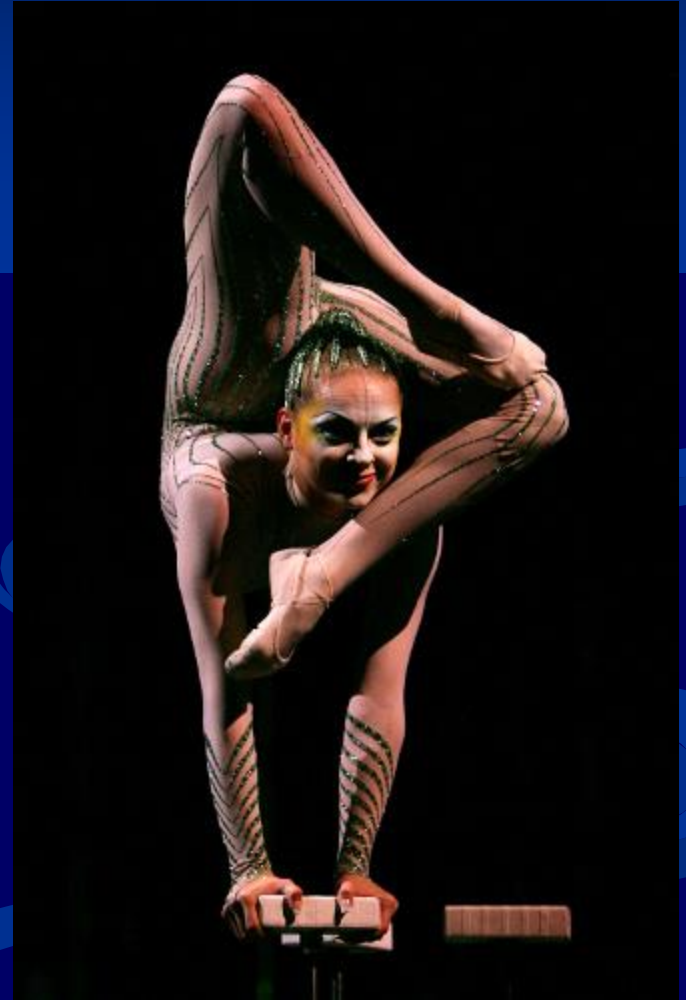
- Femoral anteversion
- Genu valgum
- Patella alta
- Shallow patellar groove
- Ligament laxity
- Weak hip
& knee muscles



INSERT EXAM ON KIDS

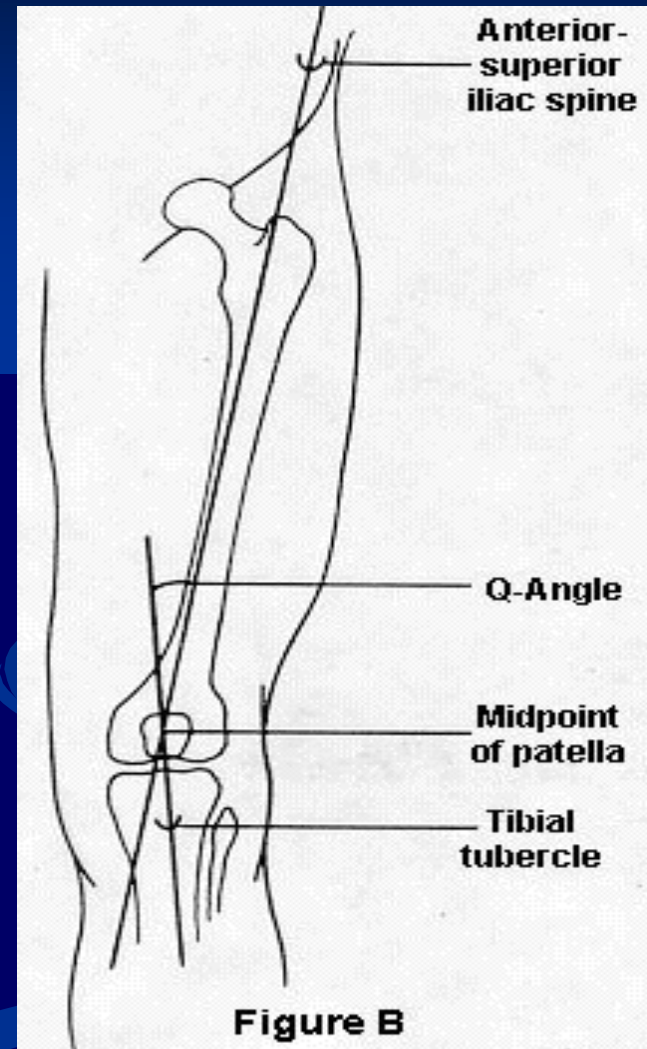


The Suspects



Patellofemoral Knee Pain

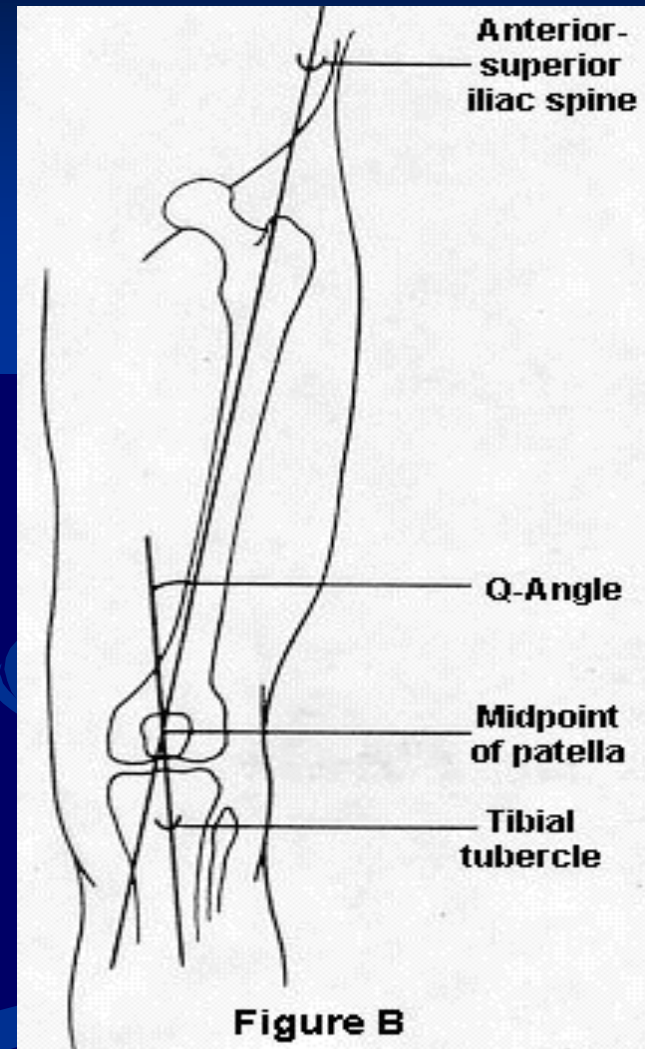
- Very common—most common in adolescent females



Greater Q angle in Females

Patellofemoral Knee Pain

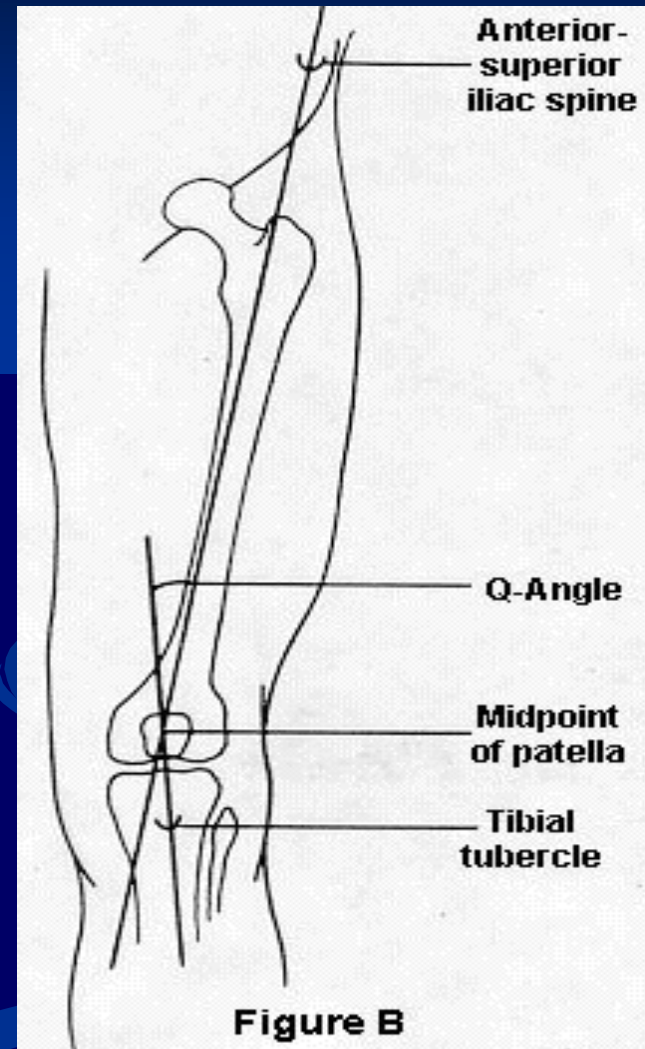
- Very common—most common in adolescent females
- Dull anterior poorly localized knee pain: often worse with stairs, squatting, jumping



Greater Q angle in Females

Patellofemoral Knee Pain

- **Very common—most common in adolescent females**
- **Dull anterior poorly localized knee pain: often worse with stairs, squatting, jumping**
- **Poor Patellar tracking**
 - **Contributing factors: biomechanical (larger Q angle, weaker quadriceps/ VMO/hip abductors, tight hamstrings/ITB, rotational problems)**



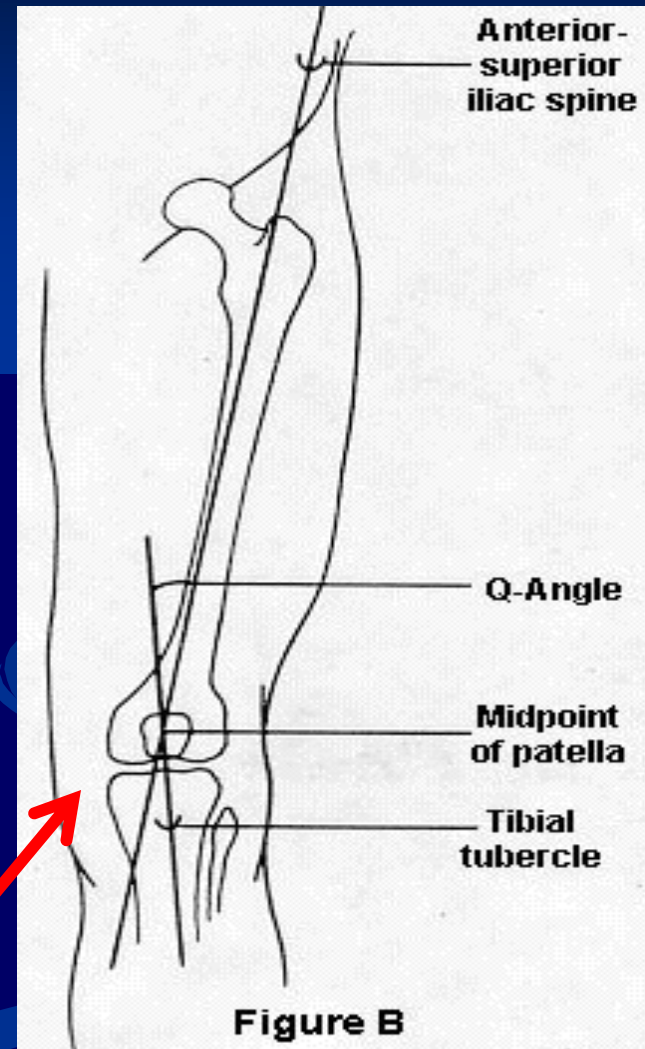
Greater Q angle in Females

Patellofemoral Knee Pain

- Very common—most common in adolescent females
- Dull anterior poorly localized knee pain: often worse with stairs, squatting, jumping
- Poor Patellar tracking
 - Contributing factors: biomechanical (larger Q angle, weaker quadriceps/ VMO/hip abductors, tight hamstrings/ITB)

Pain often medial to patella

- Plica



Greater Q angle in Females

Patellofemoral Maltracking



Anterior Knee Pain: Management

- Manage conservatively with NSAIDs, physical therapy, isometric exercises, activity modification, bracing, orthotics
- Often frustrating problem to treat in the adolescent: activity modification hard for athlete
- Physical therapy: Emphasis of strengthening VMO, hip abductors, improving patella tracking, correcting biomechanical faults, etc.
- Generally responds well to conserv.



Patellofemoral Pain

- When to Operate?

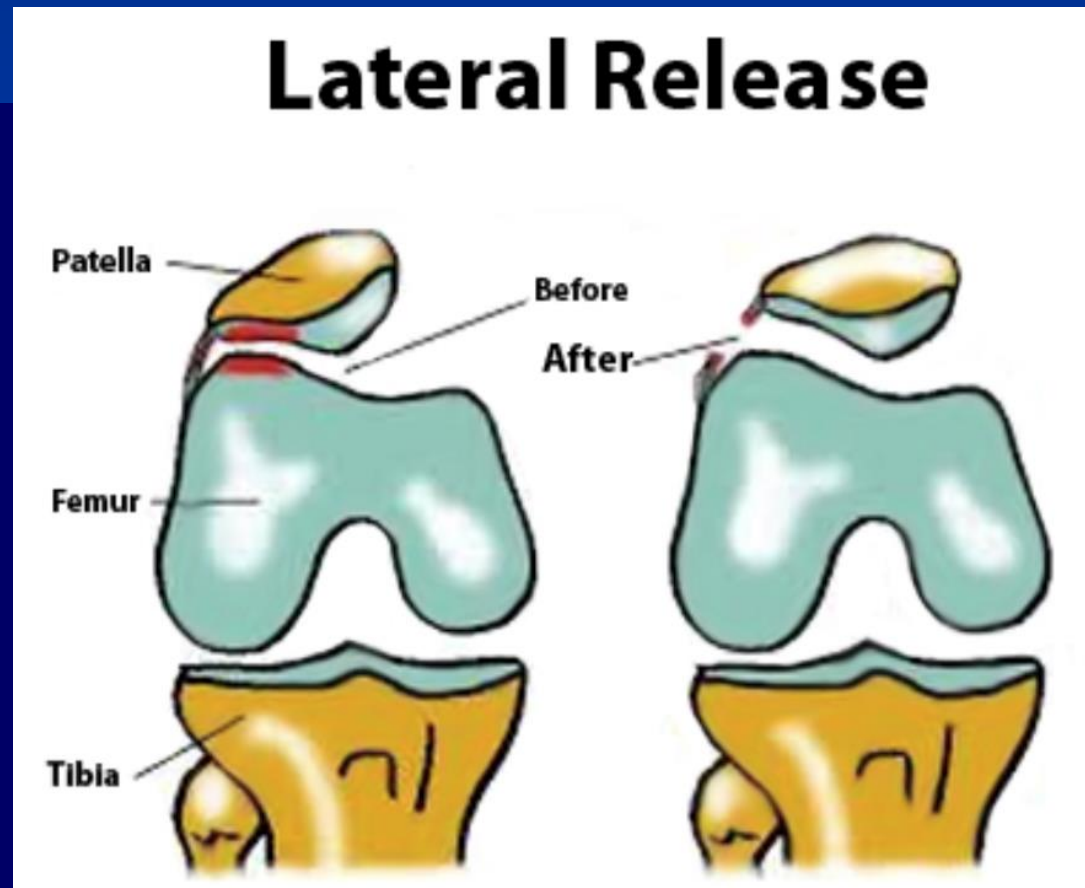


Patellofemoral Pain

- When to Operate?
 - **At least 6** months failed nonoperative treatment
 - Anatomical problems that can be addressed
- Educating parents key
 - Discussion about causes
 - Discussion about success rate

Patellofemoral Pain Operations

- Lateral releases- less popular now



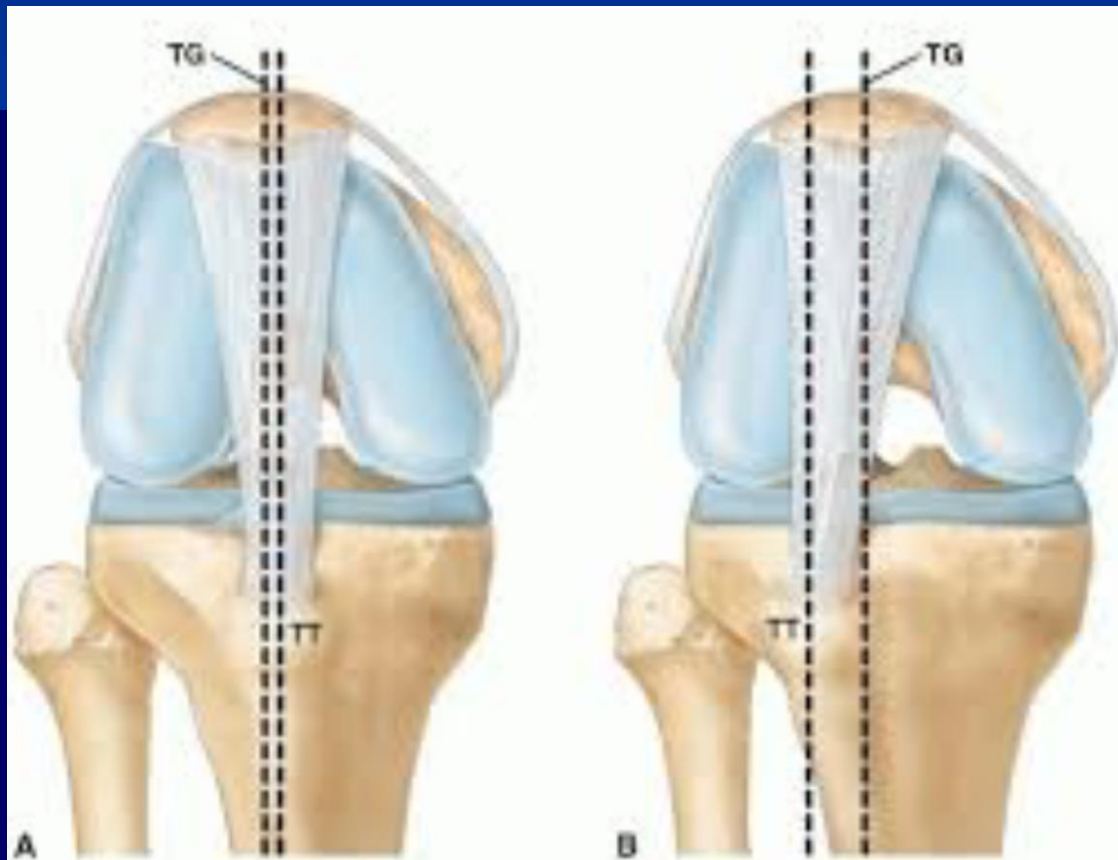
Patellofemoral Pain Operations

Lateral lengthening



Patellofemoral Pain Operations

Tibia tubercle transfers

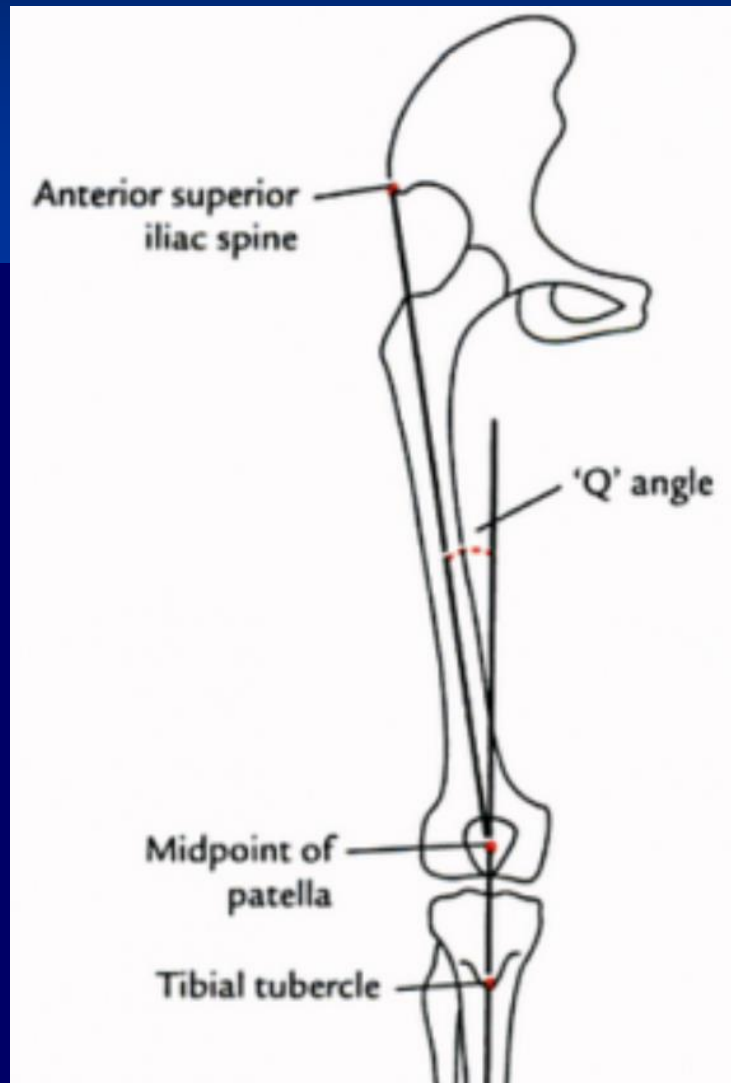


Patellofemoral Pain Operations

Tibia tubercle transfers

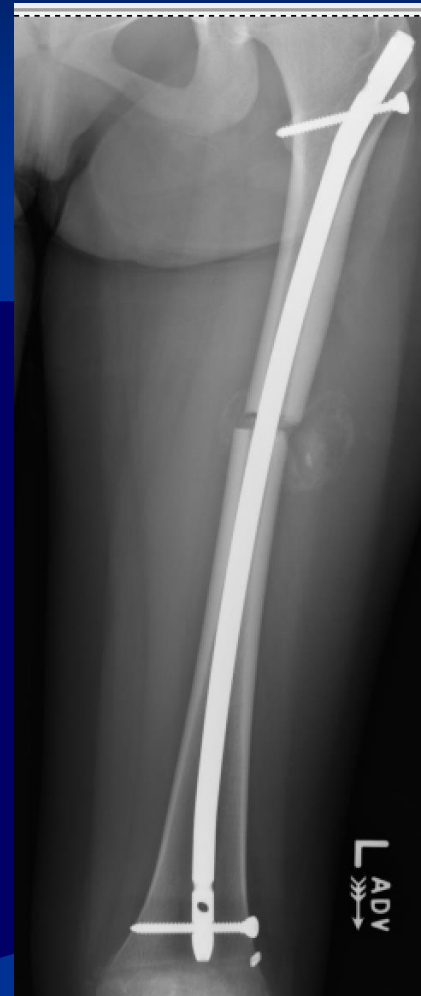


Tibia tubercle transfers



Patellofemoral Pain Operations

Derotational osteotomies



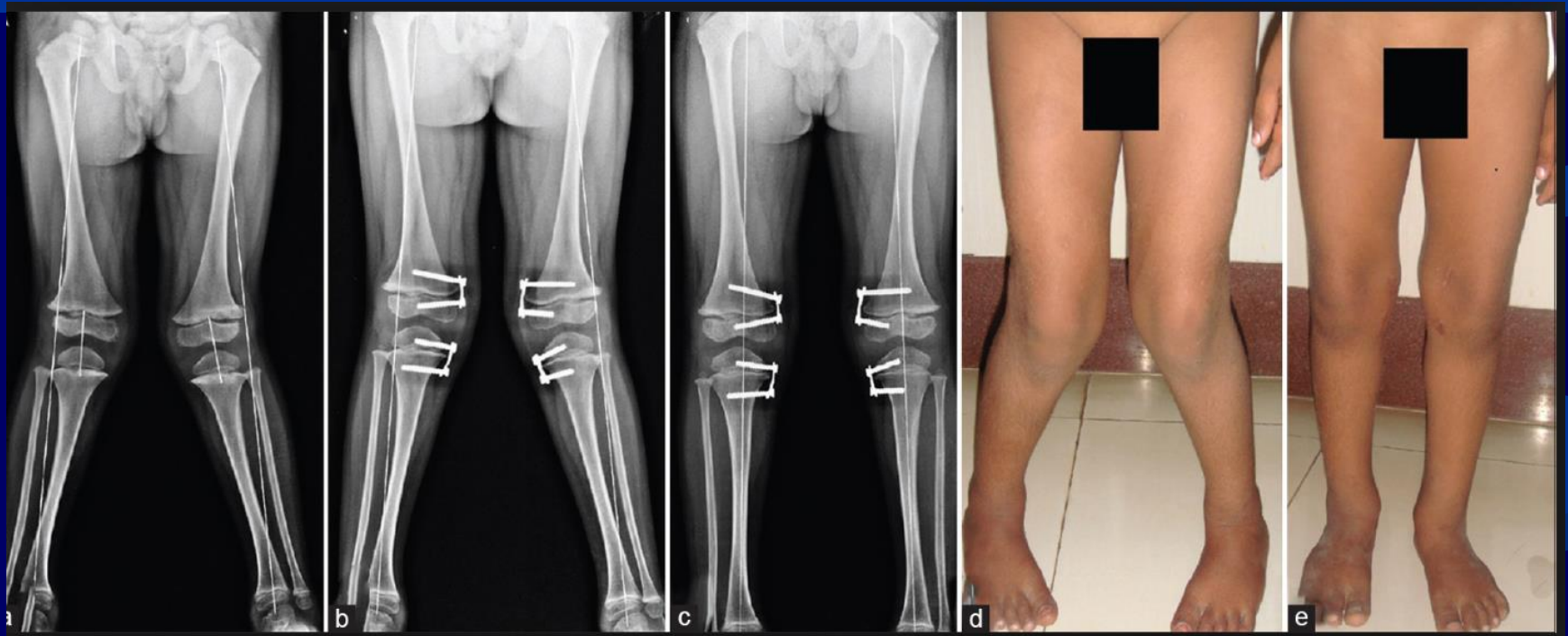
Patellofemoral Pain Operations

Derotational osteotomies



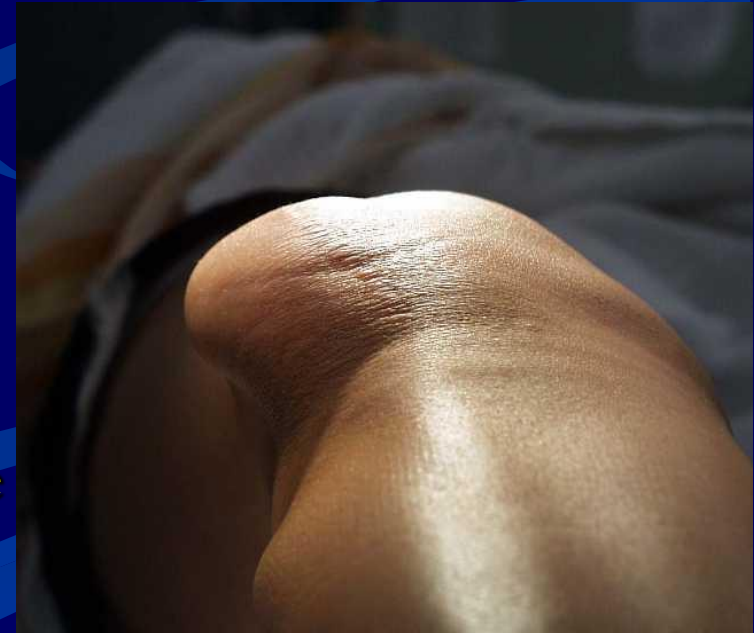
Patellofemoral Pain Operations

- Coronal alignment procedures



Patella Dislocation (Instability)

- **Anatomical (non-traumatic) Factors**
 - Femoral anteversion (internal rotation)
 - Genu valgum (knock knee)
 - Patella alta (high riding patella)
 - Ligament laxity
 - Shallow Trochlear (patellar) groove



Patella Dislocation (Instability)

- Traumatic Dislocation
 - Tearing Medial Patellofemoral Ligament
 - Anatomical risk factors



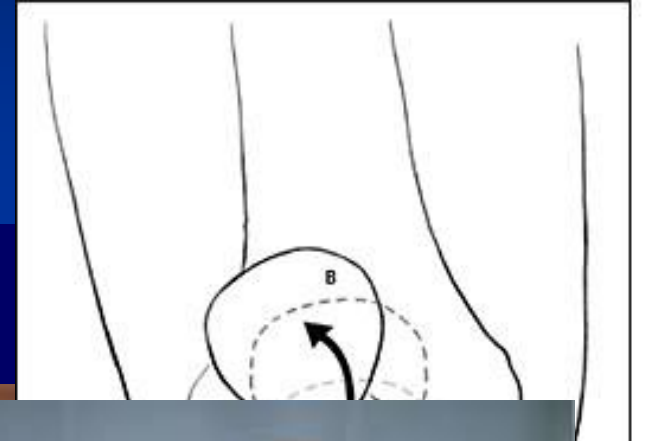
Patella Dislocation (Instability)

- Up to 50% redislocation rate
- Cartilage Damage
 - Worse with tight jointed patients
 - Loose= elastic system



Patellar Instability Testing

- Apprehension Test
- J-Sign- extend while sitting
- Overall joint laxity
- Single leg squat
- Femoral Anteversion



J Sign – trochlea dysplasia

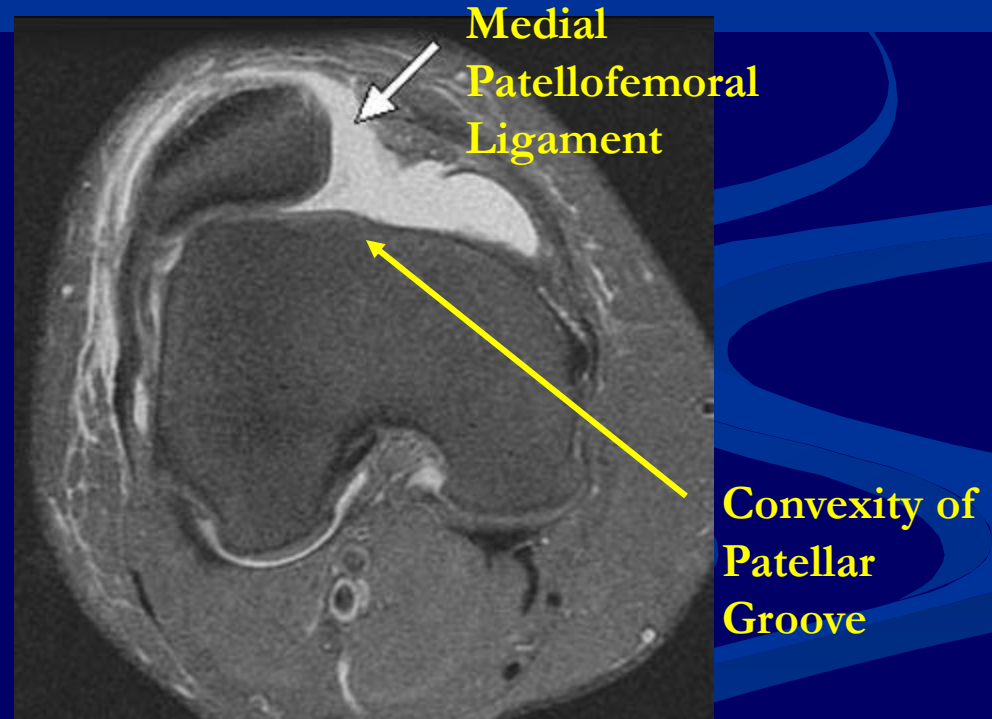


X-Rays Cross Over Sign



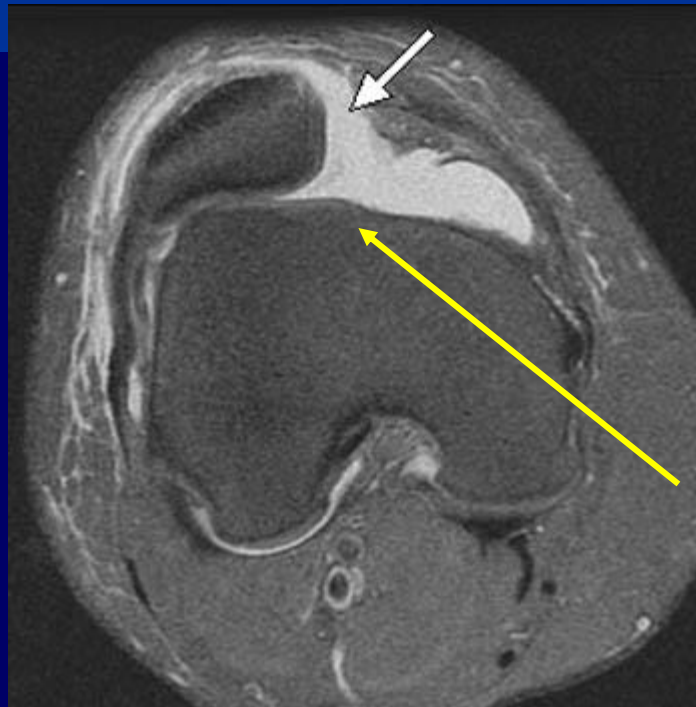
Knee Dislocations

- Tearing of Medial ligaments
- Convex patellar groove
- Increased Q angle
 - TTTG



Trochlea dysplasia

- Convex trochlea groove (groove that patella sits in)

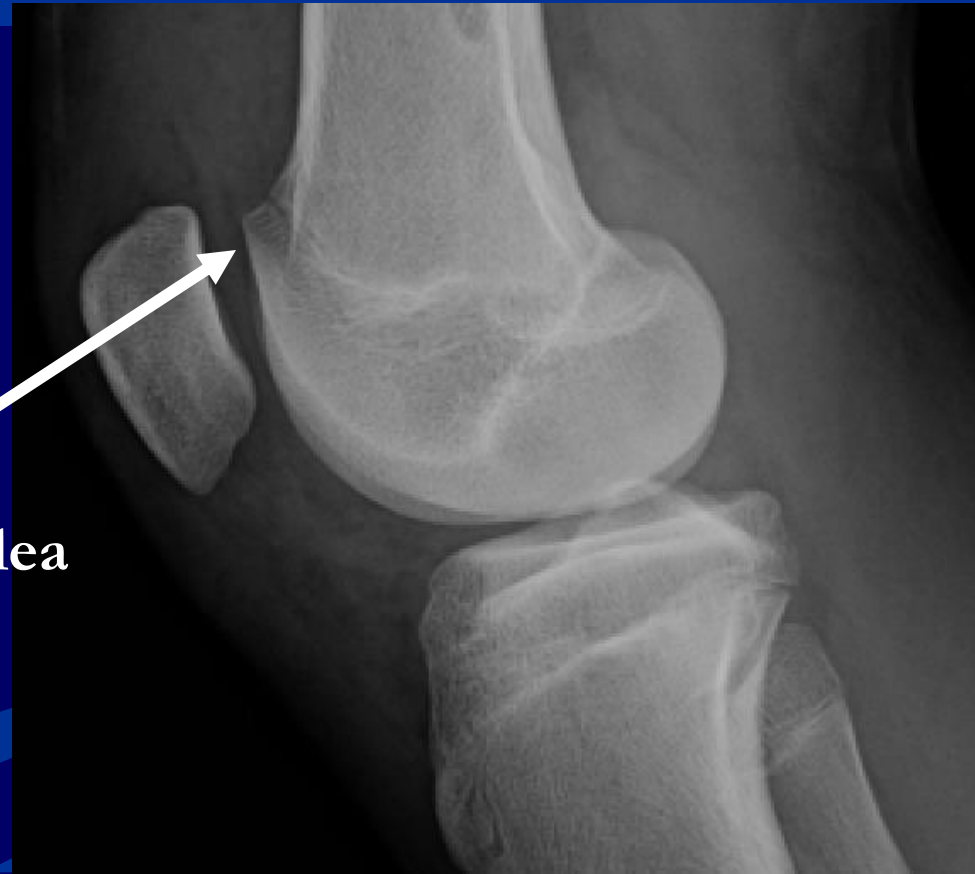


Convexity
of
Patellar
Groove

Imaging for first dislocation

- Xrays for all patients (AP, lateral, sunrise)
 - Good lateral most important view

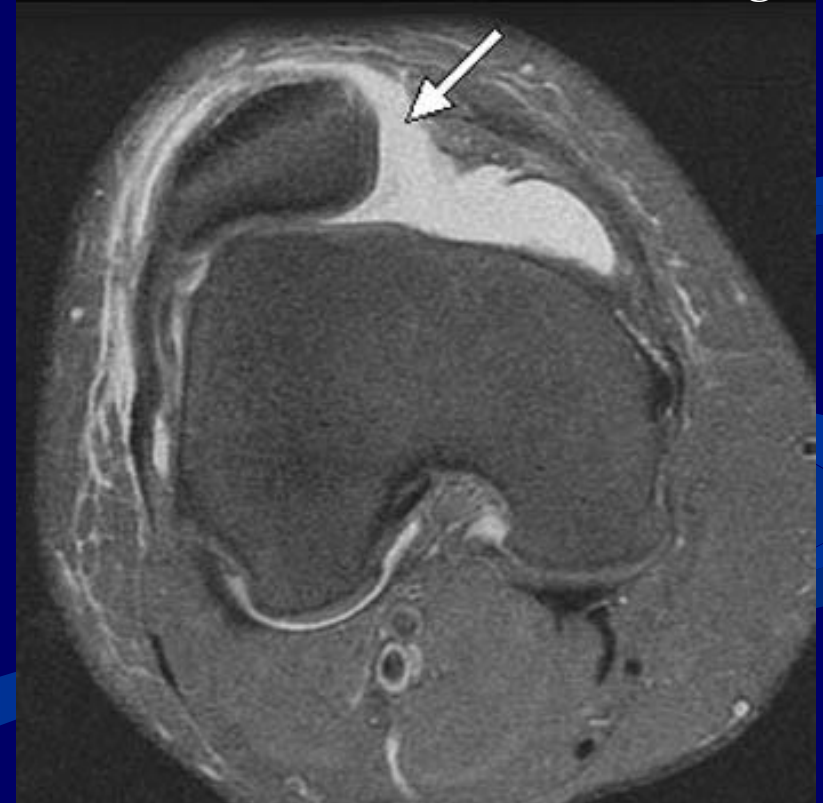
Convexity of trochlea



Imaging for first dislocation

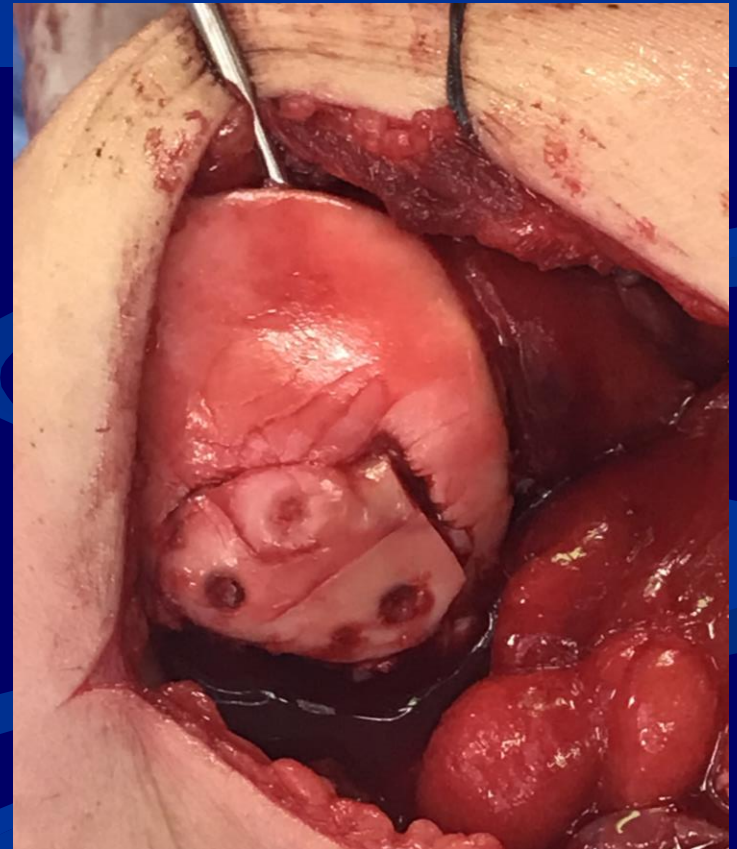
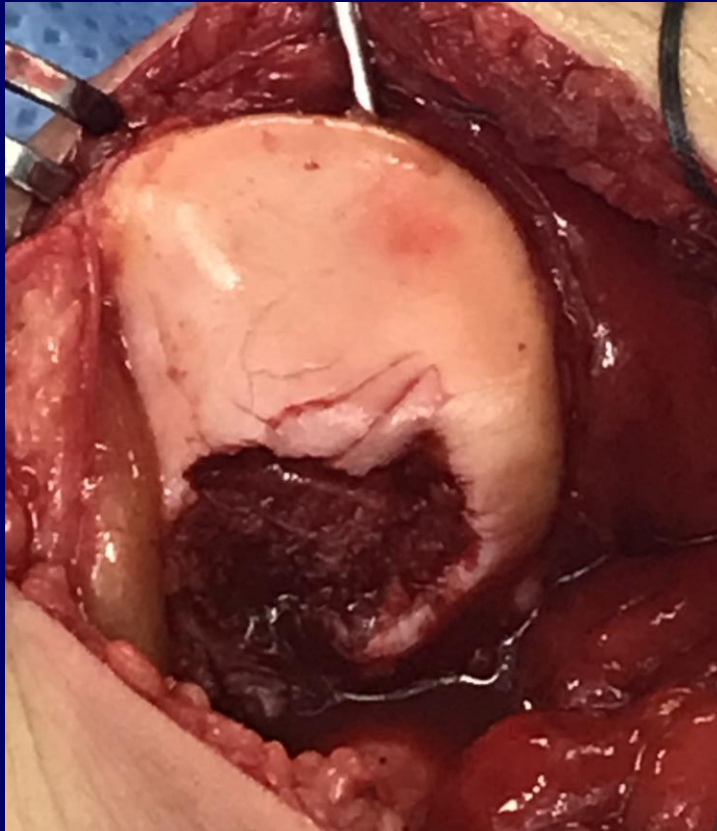
- MRI – for massive swelling
 - Often have a cartilage lesion

MPFL - ligament



Imaging for first dislocation

- MRI – for massive swelling
 - Often have a cartilage lesion



Patellar Dislocations

Treatment

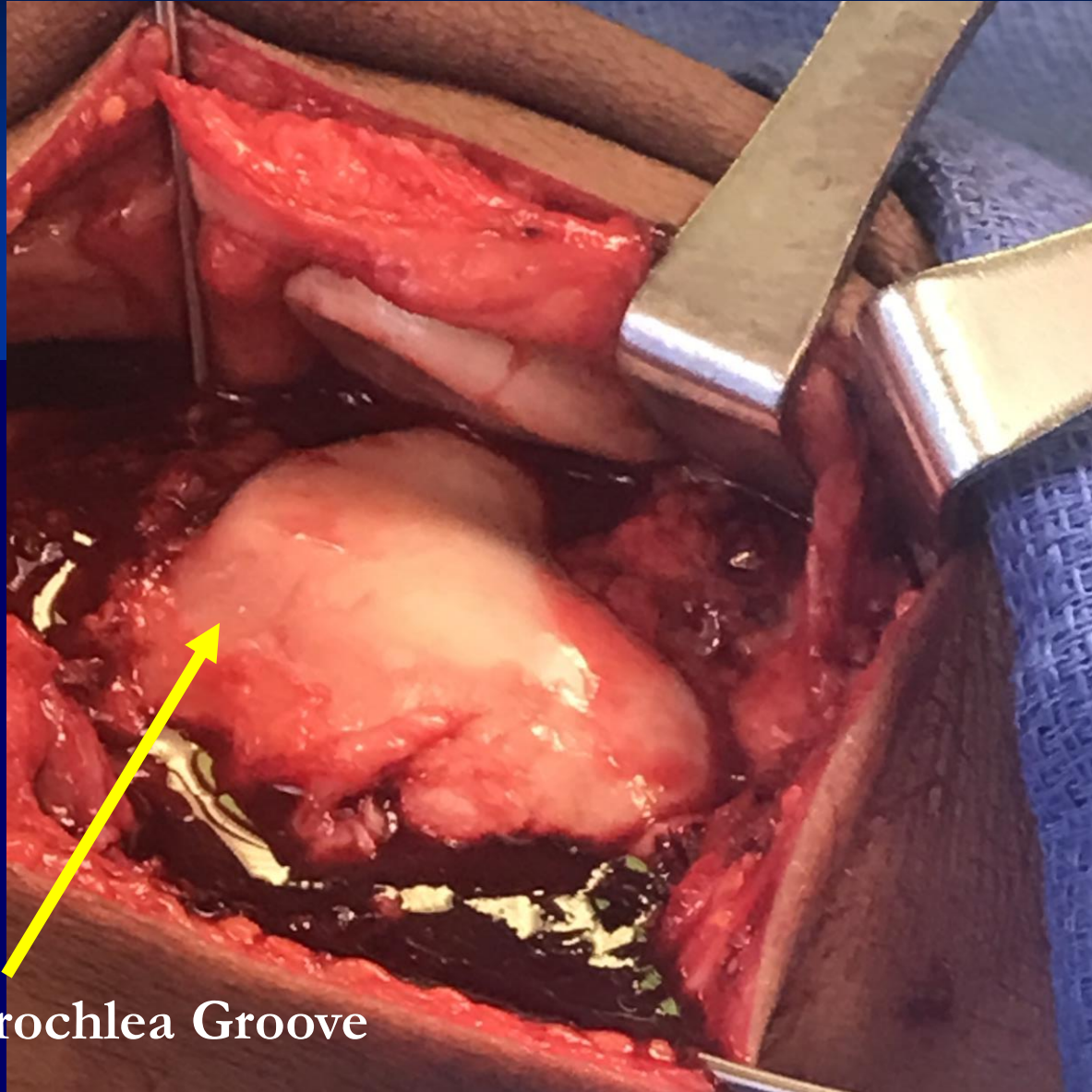
- First time dislocators – Non-operative
 - If there is bony fragment in joint-surgery
 - Physical Therapy, immobilizer 1-2 weeks, brace
 - Operative for loose fragments or poor anatomy
- 2+ dislocations – Discuss surgery
- How debilitating is the problem?

Treatment

- **Medial patellofemoral ligament reconstruction**
 - **Reconstruct medial restraint**

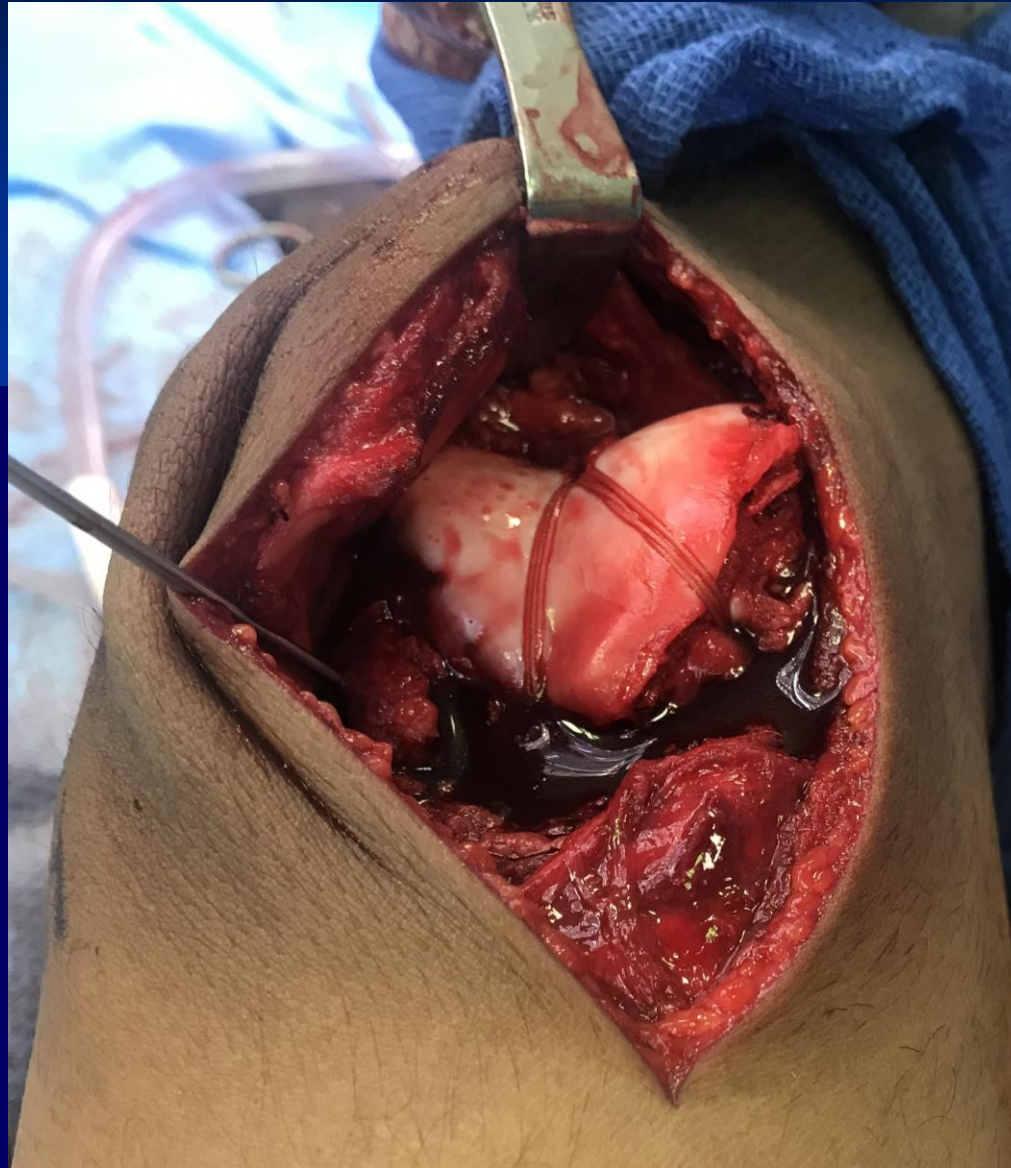


Surgery for trochlea dysplasia



Convexity of trochlea Groove

Surgery for trochlea dysplasia



Osgood Schlatter

Apophysitis of the tibial tubercle

Problem of the active child

Usually a problem of 10-16 year olds

Pain is self limiting

Bracing sometimes helps, sometimes doesn't

Patient with this xray doesn't need to be referred

Treatment –Reassurance, education,
Brace, activity modification



Osgood Schlatter

- It's Not Osgood Schlatter if the growth plates are closed
- Insertional patellar tendinitis



Osgood Schlatter's Disease of the Knee



Osgood schlatter

- This won't heal
- Needs surgery



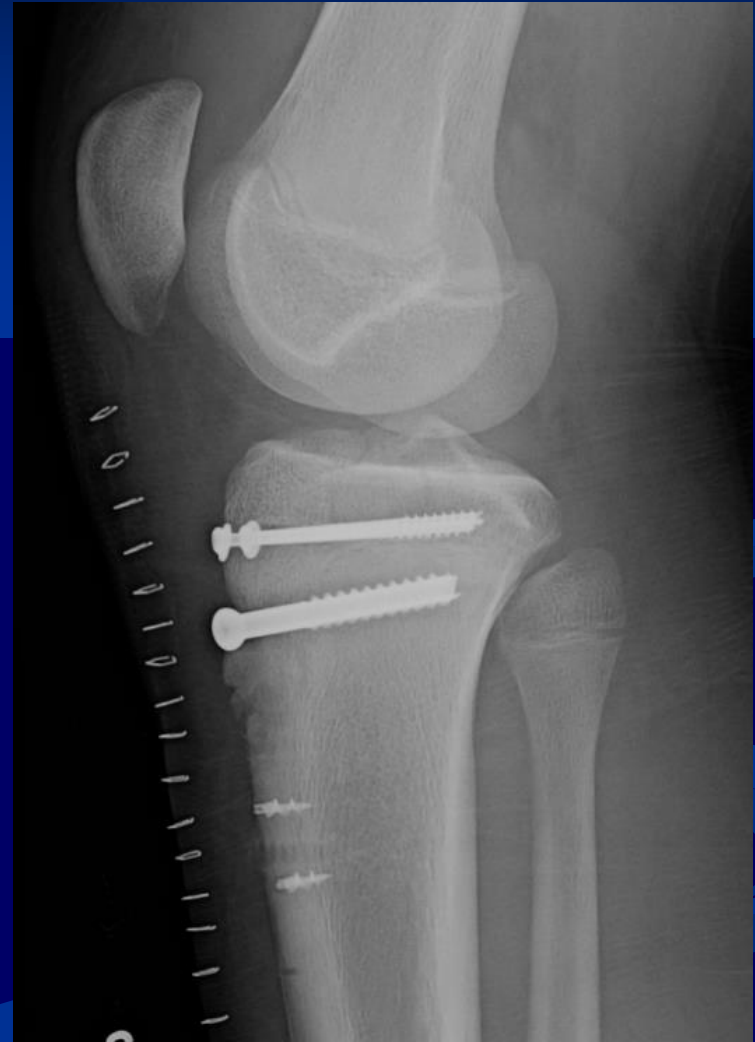
The bigger the bump, the more likely a loose fragment is present



Osgood Treatment

- Activity Modification
- Knee bracing
- Education of parents
- Physical therapy (stretching and strengthening)
 - Usually only moderately beneficial

Tibial Tubercle Fracture



Sinding-Larsen-Johansson Syndrome

- The “Osgood Schlatter” of the patella
- Traction apophysis of the distal pole of patella: repetitive microtrauma
- Self-limiting: Resolves in approx 6-12 months, responds to activity modification, NSAIDS, occasional PT



Ossification/fragmentation seen at distal pole of patella

Traumatic Knee injuries



Can you name this players injury?



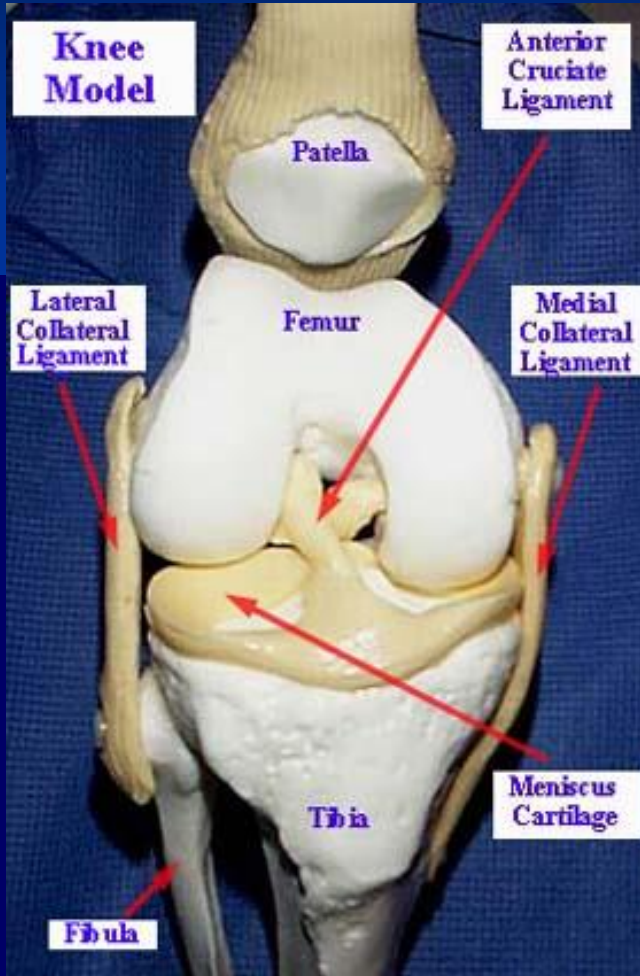
Can you name this Players Injury



Can you name this players injury?



ACL Injuries



ACL Mechanics



ACL Mechanism of Injury

- 70% Noncontact
- 30% Contact (player is hit by opposing player)
- Hyperextension or valgus load to knee





	TOR 80		GS 83	3rd 2:22 24	
TO: 4	BONUS	TO: 4	BONUS	NBA FINALS - TOR LEADS 3-2	

Function of ACL

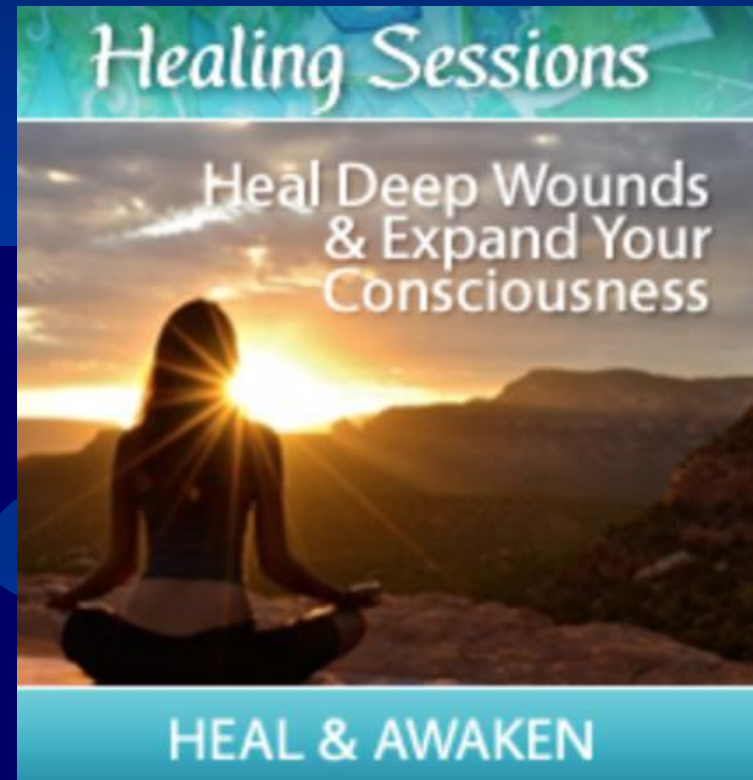
- Prevent anterior translation
- Prevent Rotation of the knee
- Necessary for cutting sports
- Protect menisci
- Efficient transfer of force



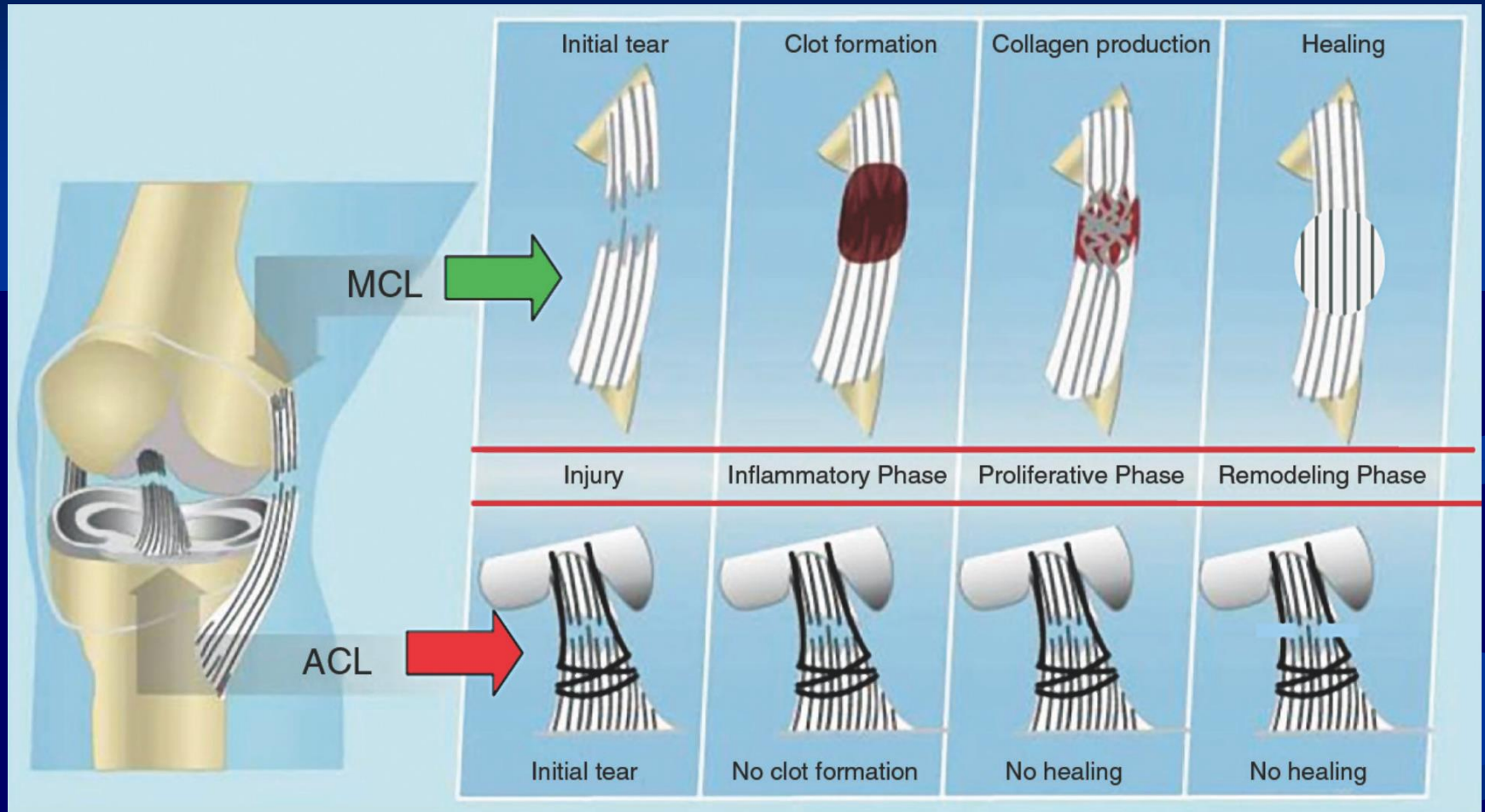
Knee Anatomy/Mechanics

Sedona Vortex don't heal ACLs

- Ligaments
 - Extra-articular heal well
 - MCL/LCL
 - Intra-articular heal poorly
 - ACL
 - PCL better healing then ACL
 - Synovial fluid



ACL vs MCL healing




ACL Injuries in Female Adolescents

- Female athletes 2-4 times more susceptible to ACL injuries
- Theories...anatomic differences: smaller intercondylar notch, smaller size of ACL, landing mechanics, larger Q-angle, ligamentous laxity, imbalance between hamstring and quad strength, hormonal differences (estrogen/menstrual cycle) improper training/conditioning program



Non Sex-Dependent Risk Factors

- Artificial surfaces
 - Increase friction at shoe-playing surface interface
 - More cleats
 - Bigger cleats
 - Drier climates
 - Sport
 - Soccer, football, basketball
 - Hockey – rare
- 

How do you know when the ACL is torn??

- Very Painful
- Often a pop is heard
- Immediate swelling common
- Pop + Swelling- 70%



Concomitant Injuries

- Meniscus – 50%
- Collaterals



Testing



Lachman Exam

- Need a relaxed patient!
- Compare sides
- Do on every patient (regardless of suspicion) to increase skills



Lachman Exam

- 20 deg. Flexion of knee, stabilize femur with one hand, use other to anteriorly translate tibia
- Test PCL first with posterior drawer
- Multiple times bilaterally to get sense of stability
- Sensitivity 85% specificity 94%

Lachman Test



Tough Exam



When do we operate on these?

ALWAYS

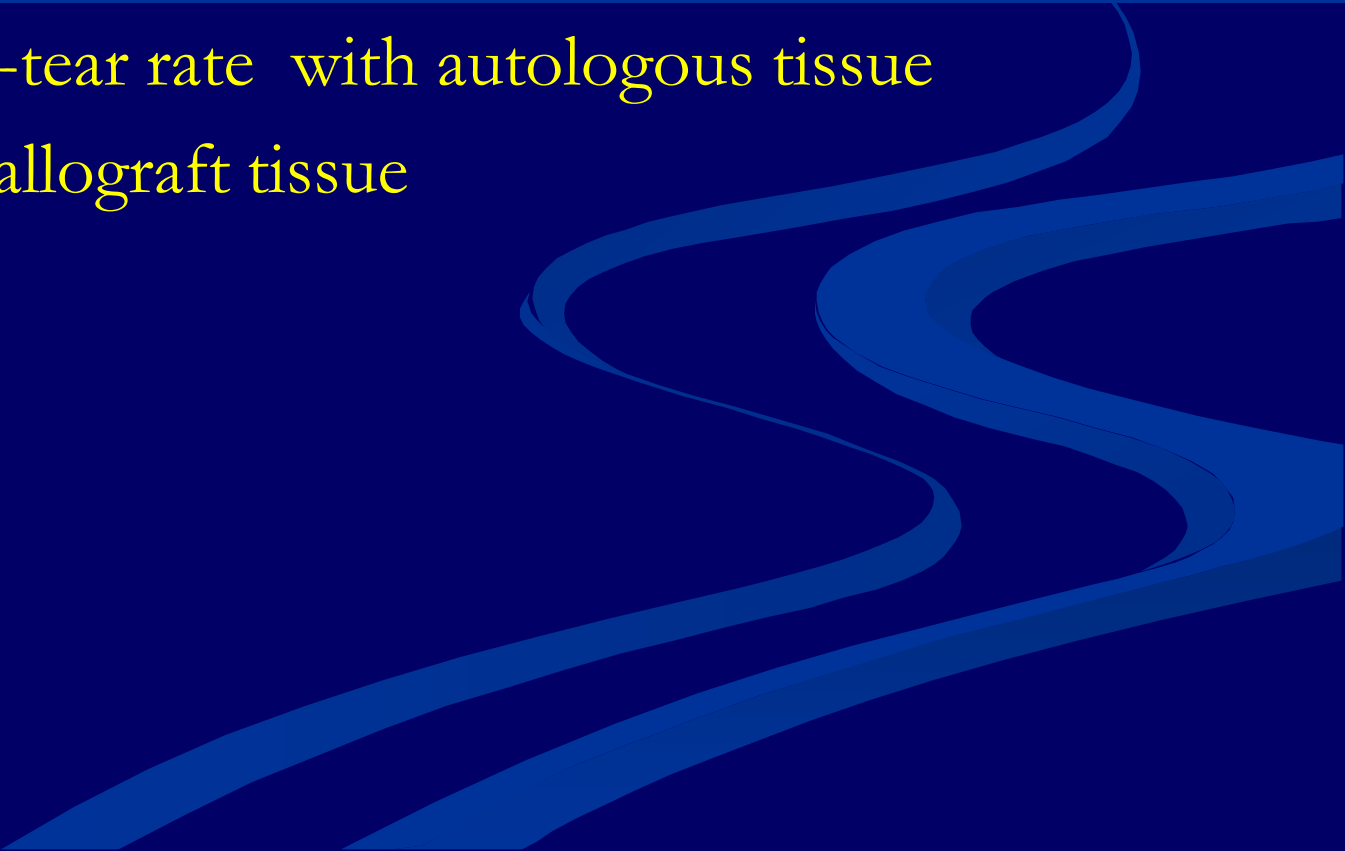
The background of the slide is a solid dark blue. In the lower right quadrant, there are several thick, wavy, light blue lines that flow from the right edge towards the center, creating a sense of movement or a stylized wave pattern.

ACL Reconstruction

Does surgery prevent Arthritis??

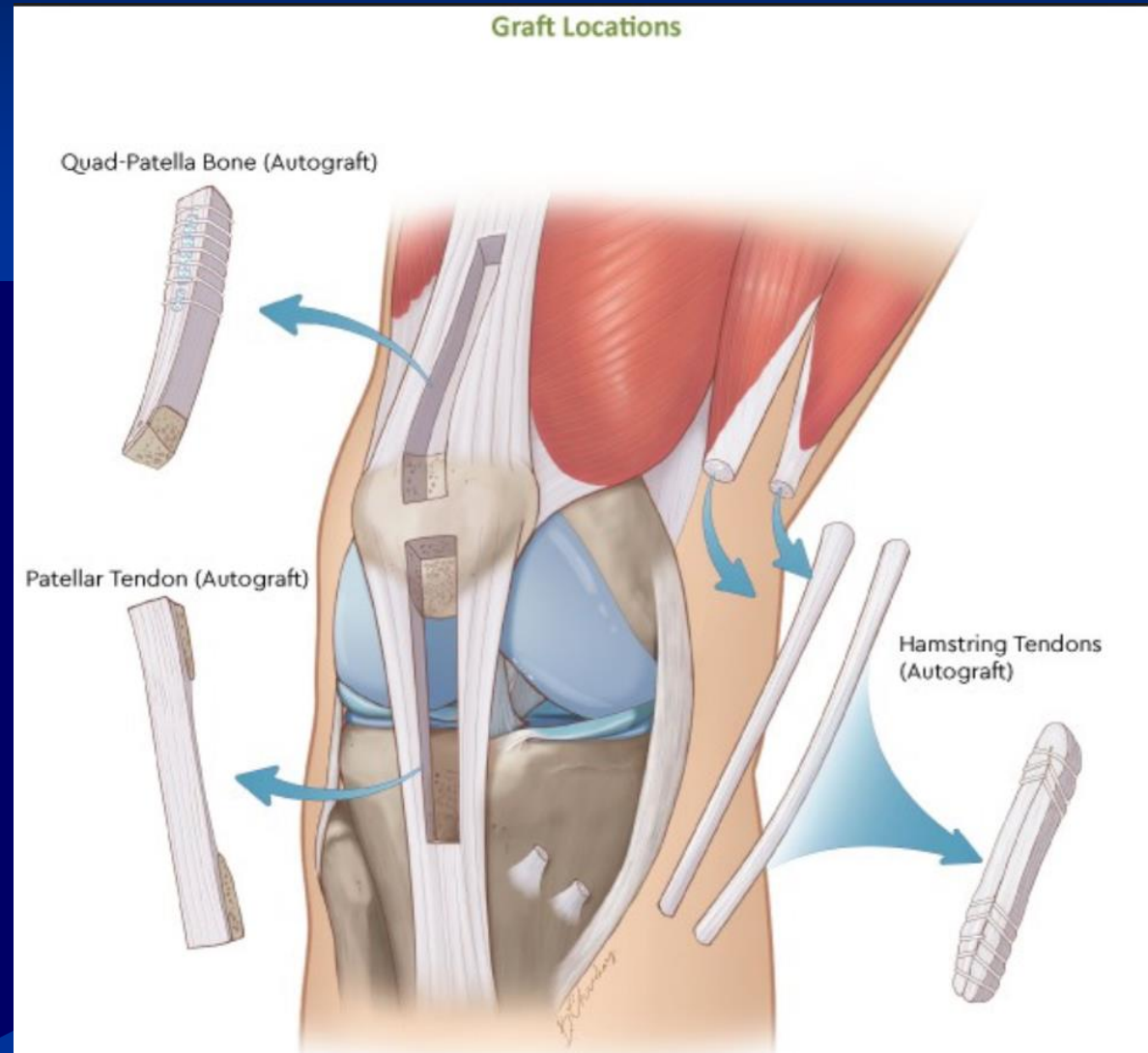


Pediatric ACL Reconstruction

- In open growth plates, always soft tissue graft
 - Always use autologous tissue
 - 10-15% re-tear rate with autologous tissue
 - 30% with allograft tissue
- 
- A decorative graphic consisting of several overlapping, wavy, blue lines that flow from the bottom right towards the center of the slide.

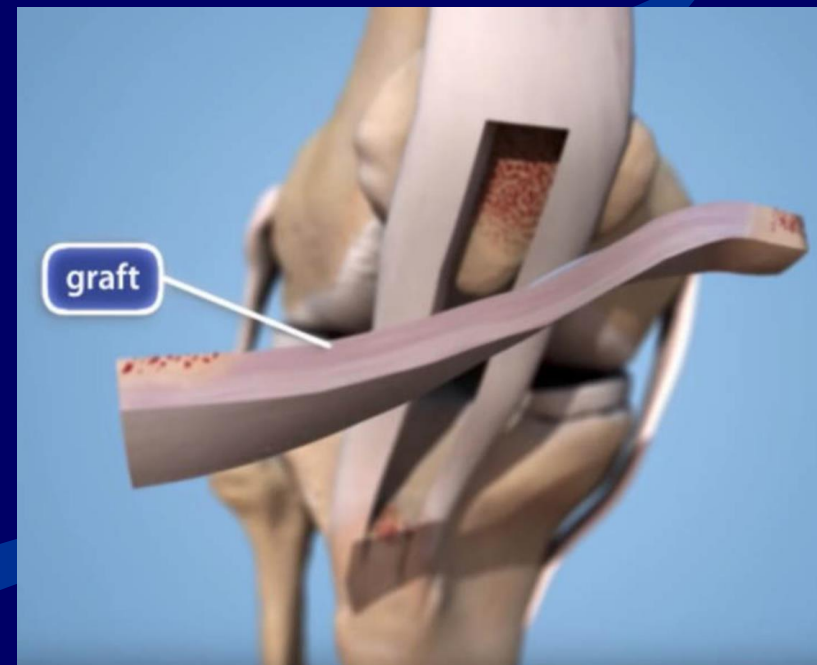
Graft Sources

- Hamstring
- Patellar Tendon
- Quadriceps
- Iliotibial Band



Pediatric ACL Reconstruction

- Closed growth plates can get patellar tendon grafts
 - Better in soccer players
 - Better in loose jointed girls
 - Large Football players



Retear rates

- 17% - Hamstring reconstruction
 - Only option in skeletally immature
- 8% - BTB recon
- 33% -allograft



How do patients do post surgery?

- 9-12 month minimum to get back to sports
- 5,770 patient meta-analysis Arden, et al (2011 Br J sports med)
- 82% returned to sports
- 63% returned to preinjury sport
- 44% returned to competitive sport

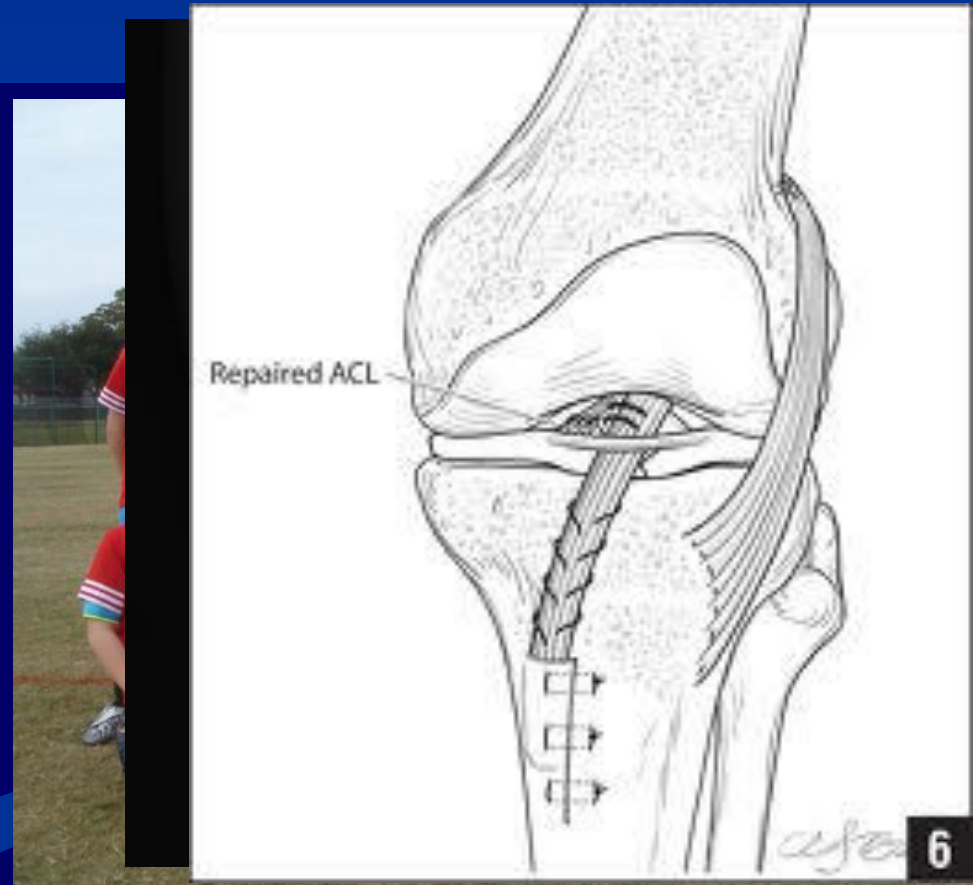
How about the patient under 10 with ACL Injuries?

- Fix or watch?
- Ortho Mantra - Heal With Steel!

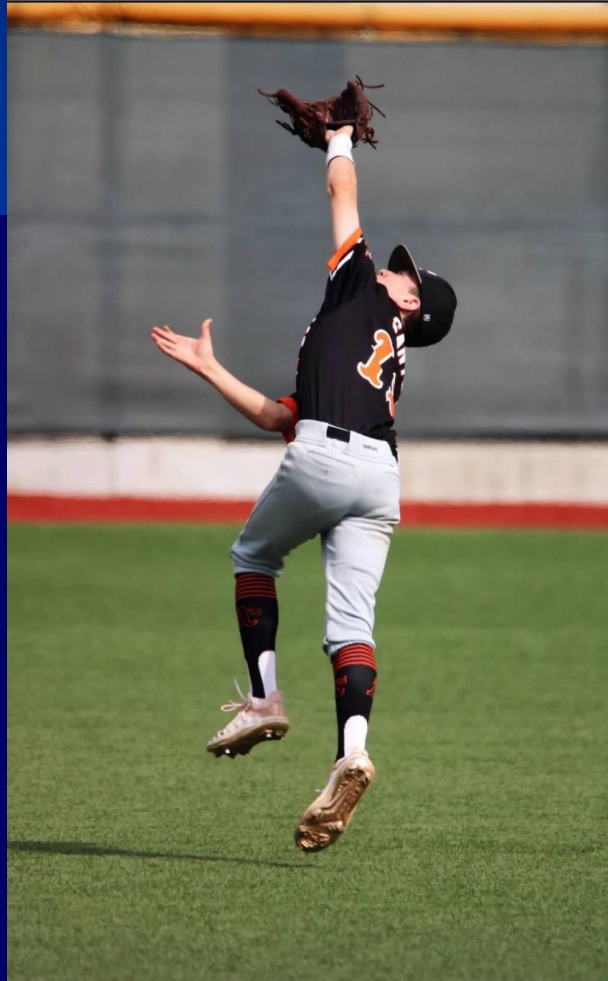


ACL Tears in Skeletally Immature

- Recommendations: FIX!
- Surgical limitations
 - Timing
 - Modified procedure



14 year old male 8 years post ACL reconstruction



Can we prevent ACL tears??

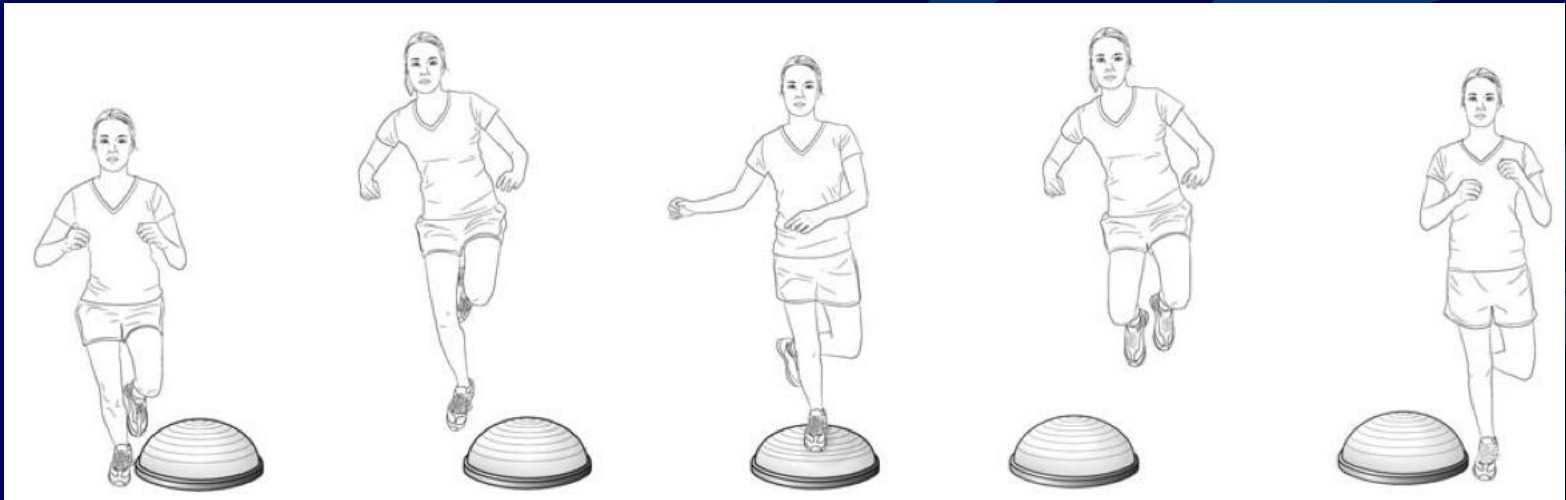


ACL prevention

- 62% reduction rate of ACL injuries with prevention program employed

(Sadoghi JBJS 2012)

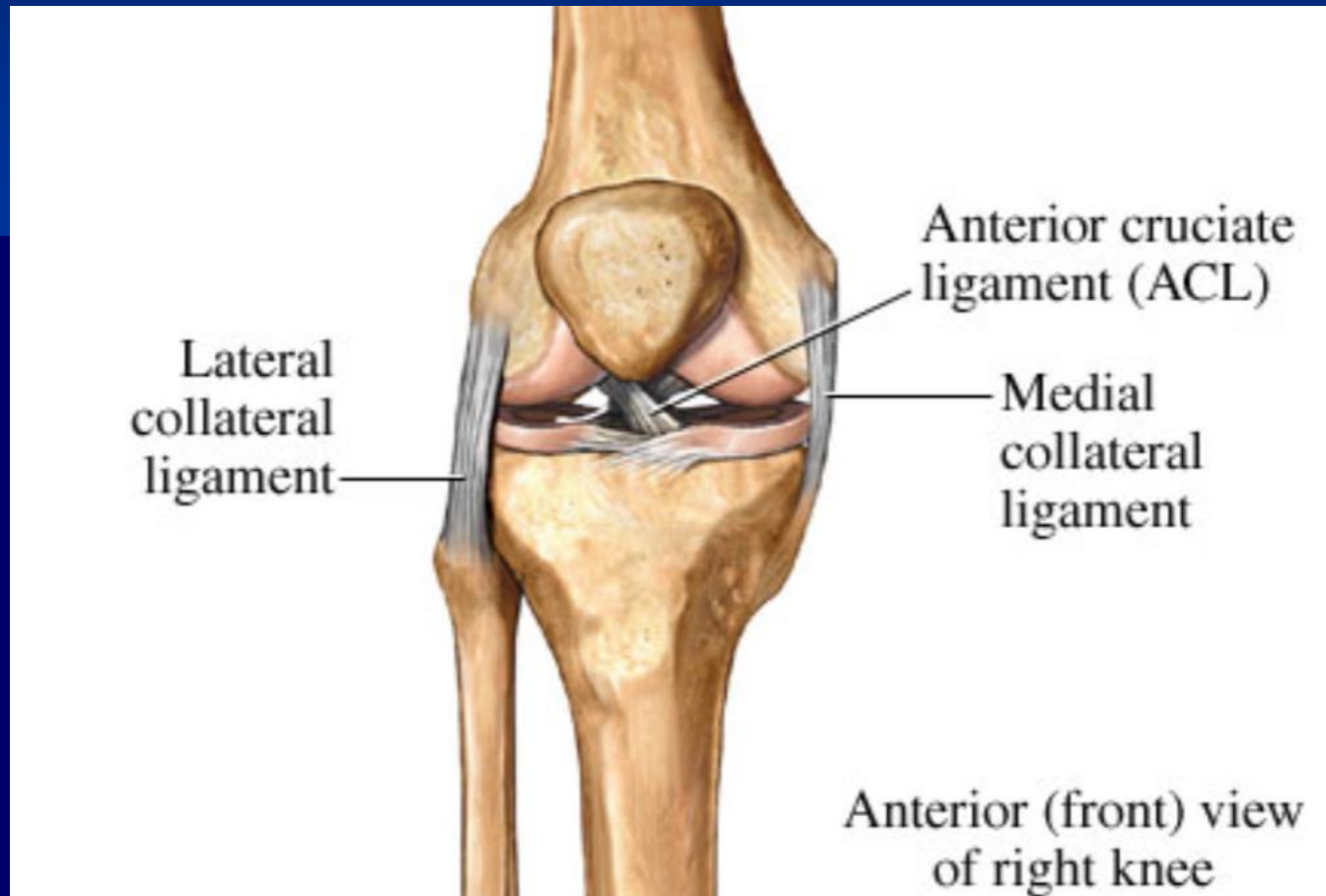
- Focus on “knee over foot landing”



ACL prevention



Collateral ligament injuries



Collateral ligament injuries

- MCL most common ligament injury in knee
- Grade 1-3
 - Grade 1-2 Nonoperative
 - Grade 1 – Back to sports 10.6 days
 - Grade 2 – Back to sports 19.4
 - Grade 3 – possible surgery
- Bracing may help

Collateral ligament injuries

- Lateral collateral ligament – Usually heal with nonoperative treatment
- TX: Brace, PT, activity restriction (6 weeks)
- In chronic setting surgery may be needed

LCL ligament injuries

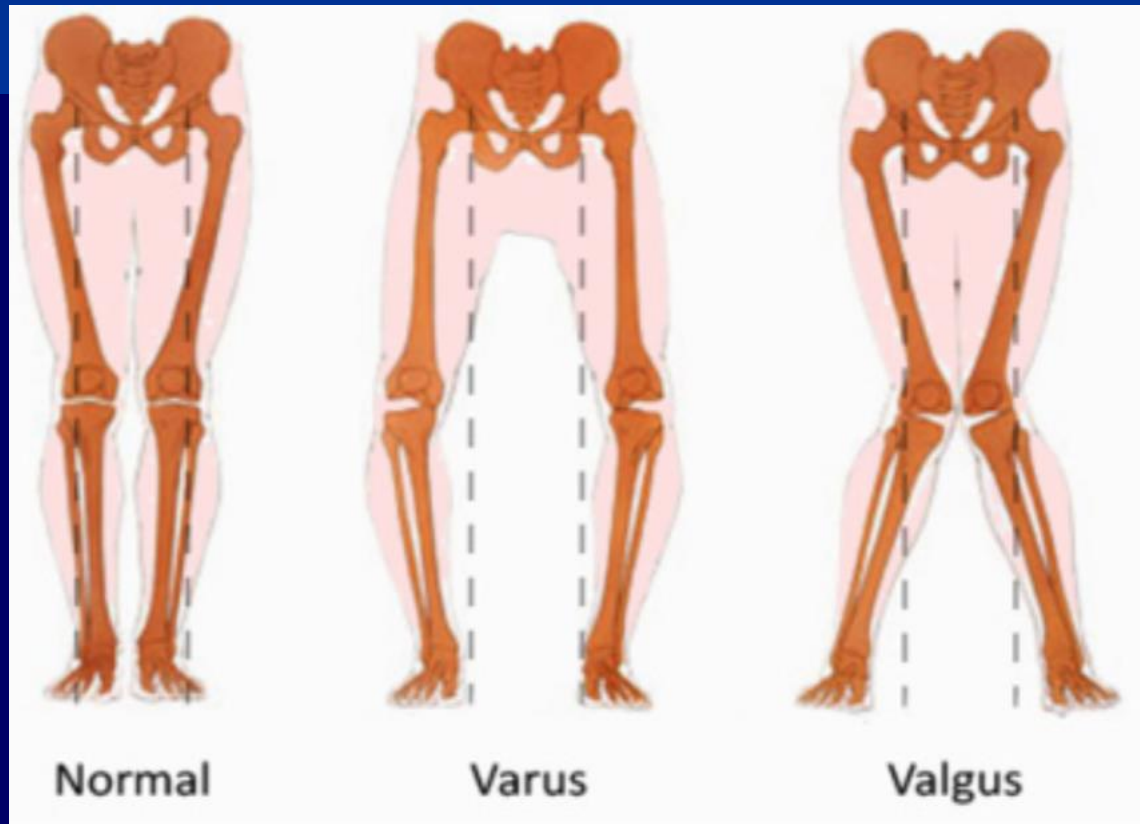


Post LCL reconstruction



Collateral ligament injuries

- Always check alignment



Collateral Ligament Tests

- Varus and Valgus loads at 20 degrees
- It's not a collateral tear without matching history



Osteochondritis Dissecans (OCD)



Osteochondritis Dissecans of the Knee

- Fragmentation of cartilage and avascular necrosis of subchondral bone
Unknown Etiology: repetitive microtrauma, ischemia, genetic component
- **Medial femoral condyle**, occasionally lateral condyle or patella, bilateral in approx 30%
- **Symptoms:** pain, locking, recurrent mild effusion



OCD- Whose at risk?



OCD – Who's at risk

- The very active tween or teen

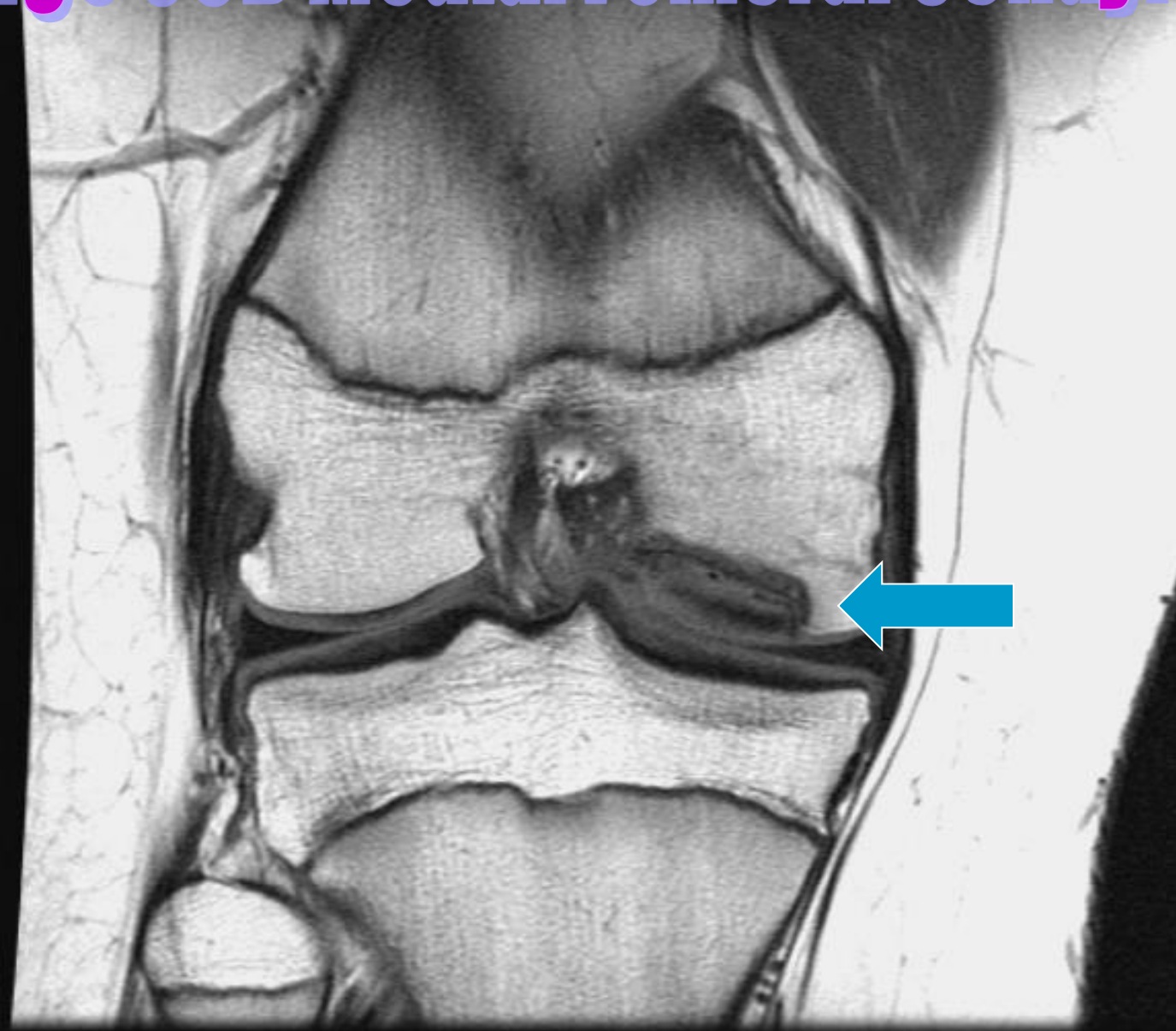


Tunnel X-Rays Critical



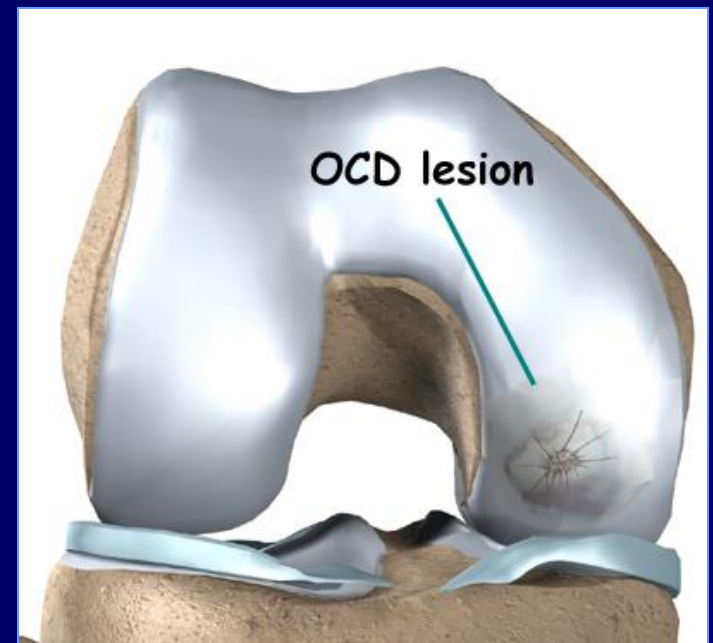
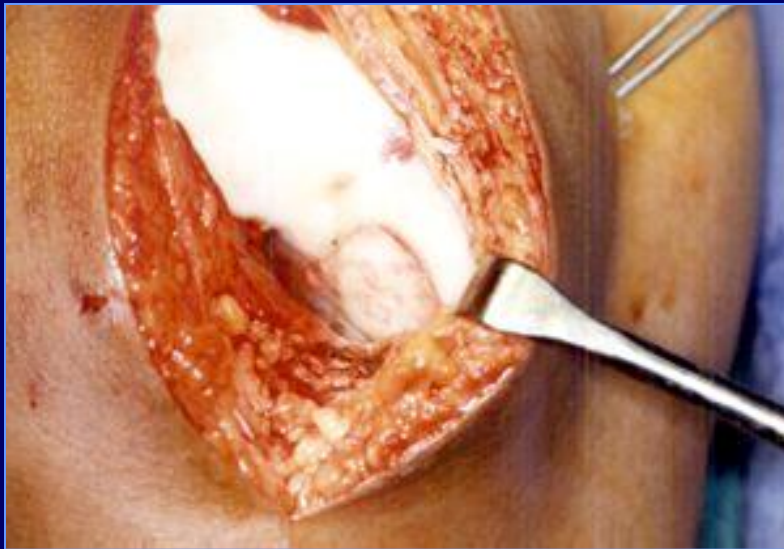
8. Ratio: 6.0

Large OCD Medial Femoral Condyle



Osteochondritis Dissecans: Management

- Best treatment???
- REST, REST, REST!!!
- unloader brace, activity modification, surgery

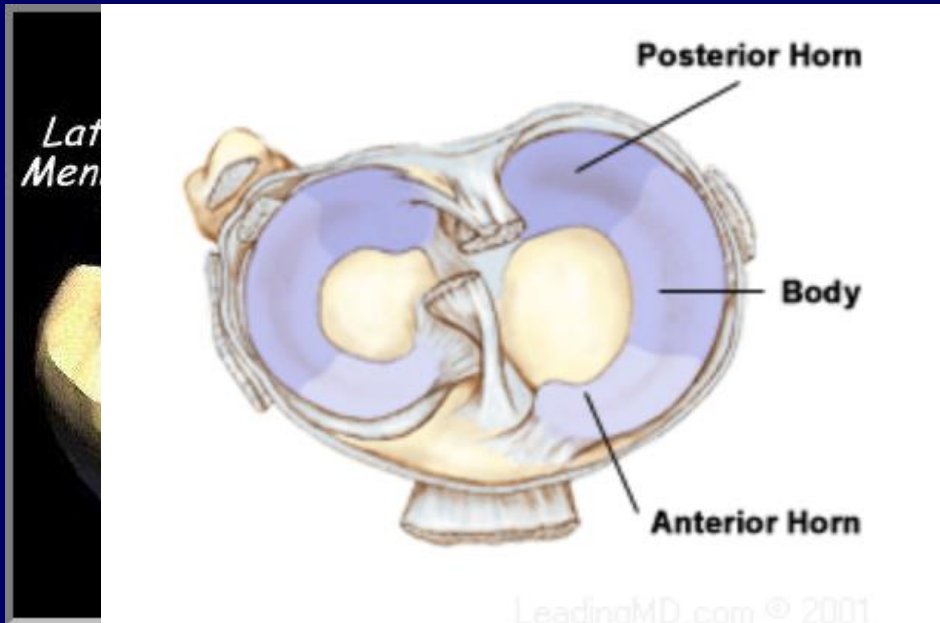


The Meniscus



Meniscus Function

- **Stability & shock absorption**
- If ACL torn... meniscus takes more stress
- Torn/compromised meniscus ---- Future Arthritis



Meniscus function



Meniscal tears

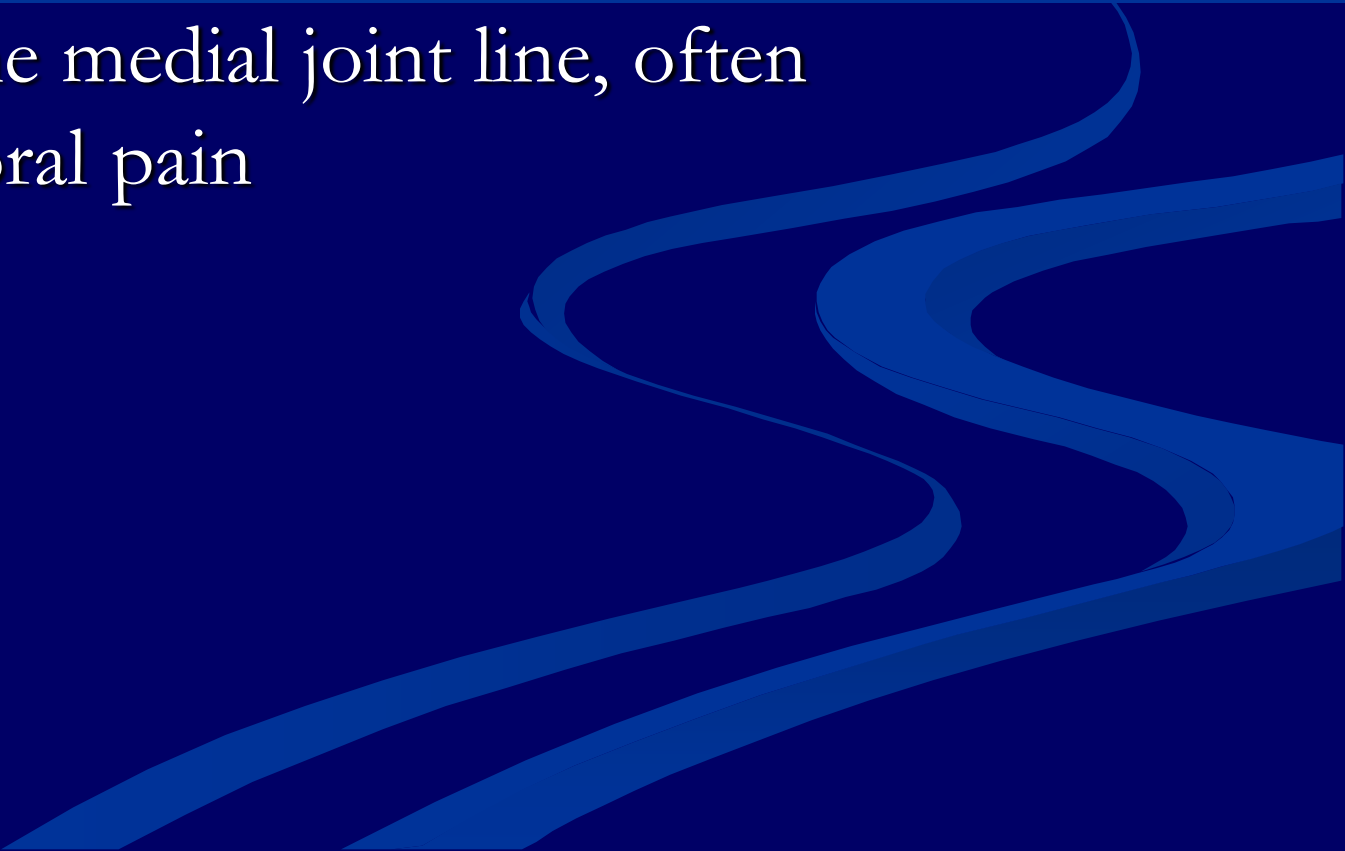
How do they present?

- Adults
 - often no known injury (degenerative)
- Pediatric population
 - Usually a traumatic injury (not always)
 - Lateral sided pain be ware of discoid meniscus

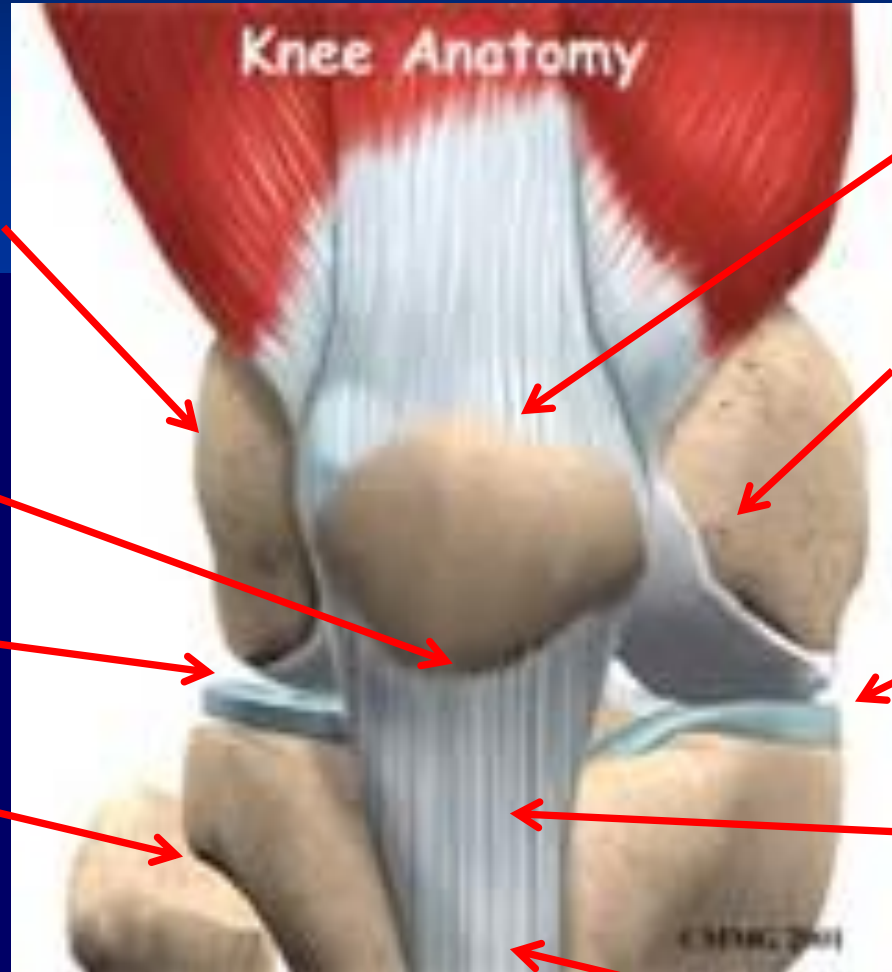
What age do Meniscal tears occur?

- Usually teenage patients
- If under 10 and point tenderness at lateral joint line, think discoid meniscus

Location of pain

- Joint Line pain
 - Posterior pain
 - If pain at the medial joint line, often patellofemoral pain
- 
- A decorative graphic consisting of several overlapping, wavy, blue lines that flow from the bottom left towards the top right, set against a dark blue background.

Location of pain



Lateral condyle- ITB

Sinding Larsen Johansson

Lateral joint line- discoid meniscus

Tib-fib joint instability

Patellofemoral pain

Medial Condyle- plica Patellofemoral pain

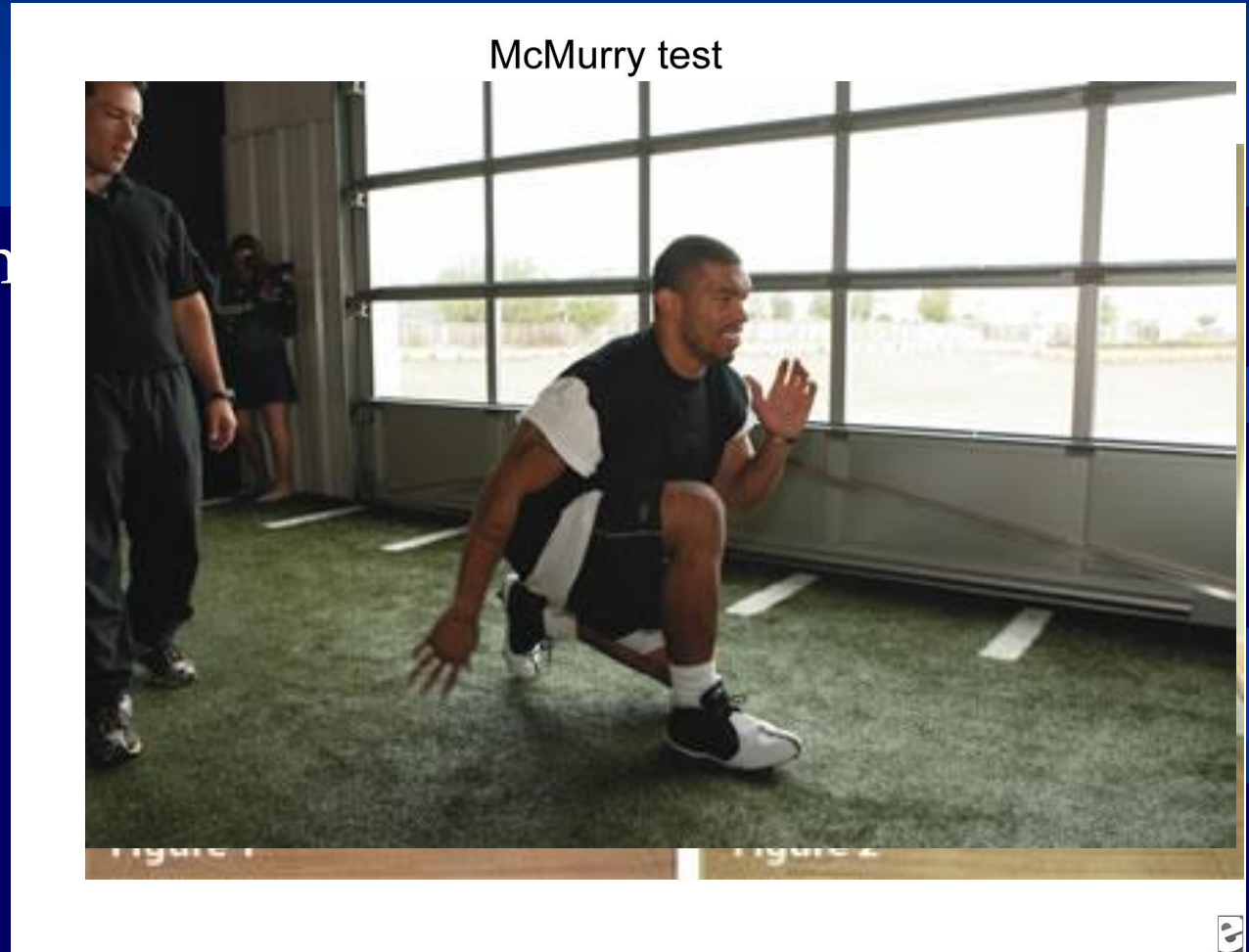
Joint Line- meniscus

Patellar tendinitis

Tubercle- Osgood Sclatter

Meniscal Testing

- McMurray
- Thessaly
- Duck walking



Meniscal Testing

- McMurray an Thessaly – Both have sensitivity and specificity of mid 60s



McMurray Testing

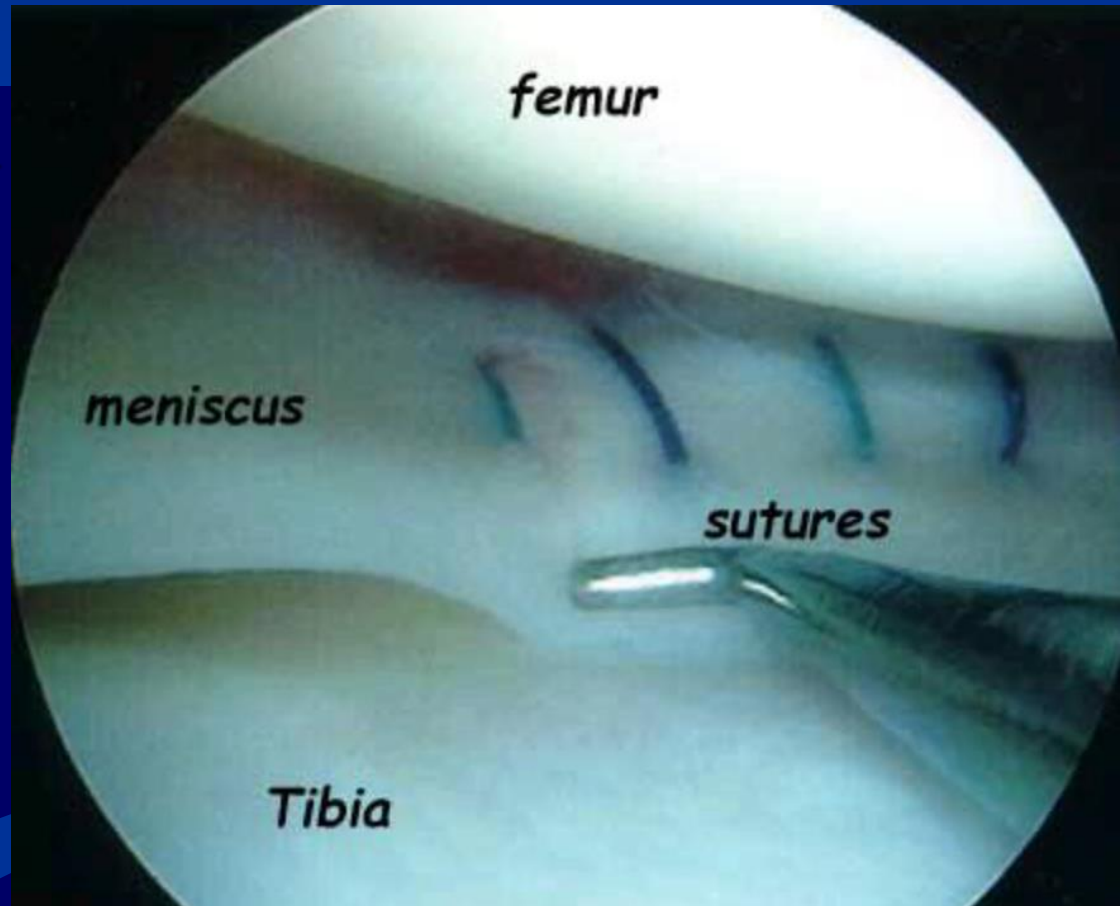


Thessaly Test

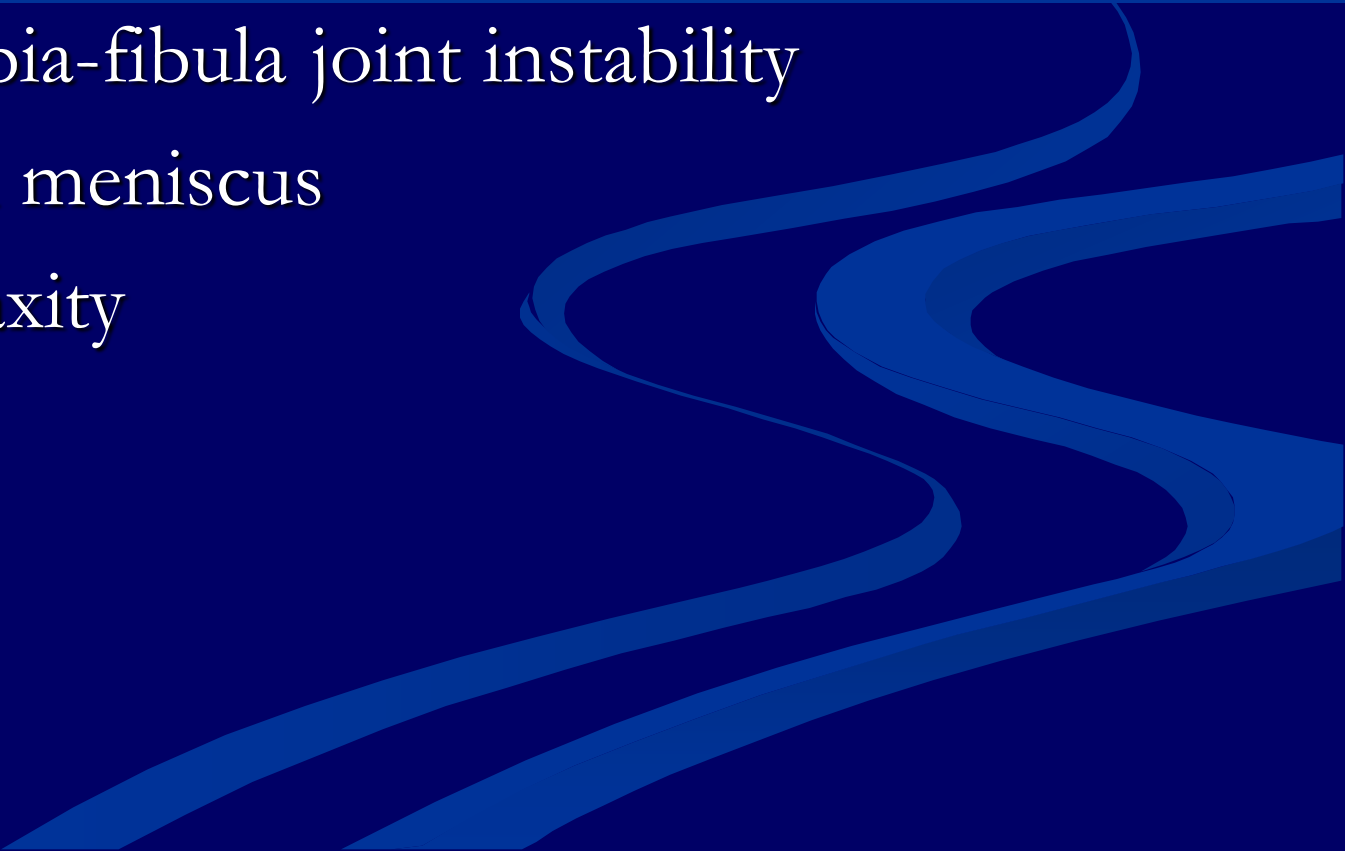


Meniscal Treatment?

- Usually surgery
- Repair preferable
- Recovery 6 month



Lateral sided Knee Pain

- Discoid Lateral Meniscus
 - Iliotibial band syndrome
 - Proximal tibia-fibula joint instability
 - Torn lateral meniscus
 - LCL tear/laxity
- 

Discoid Meniscus

- Congenitally enlarged meniscus
 - (almost always lateral)



Normal



Incomplete



Complete

Discoid Meniscus

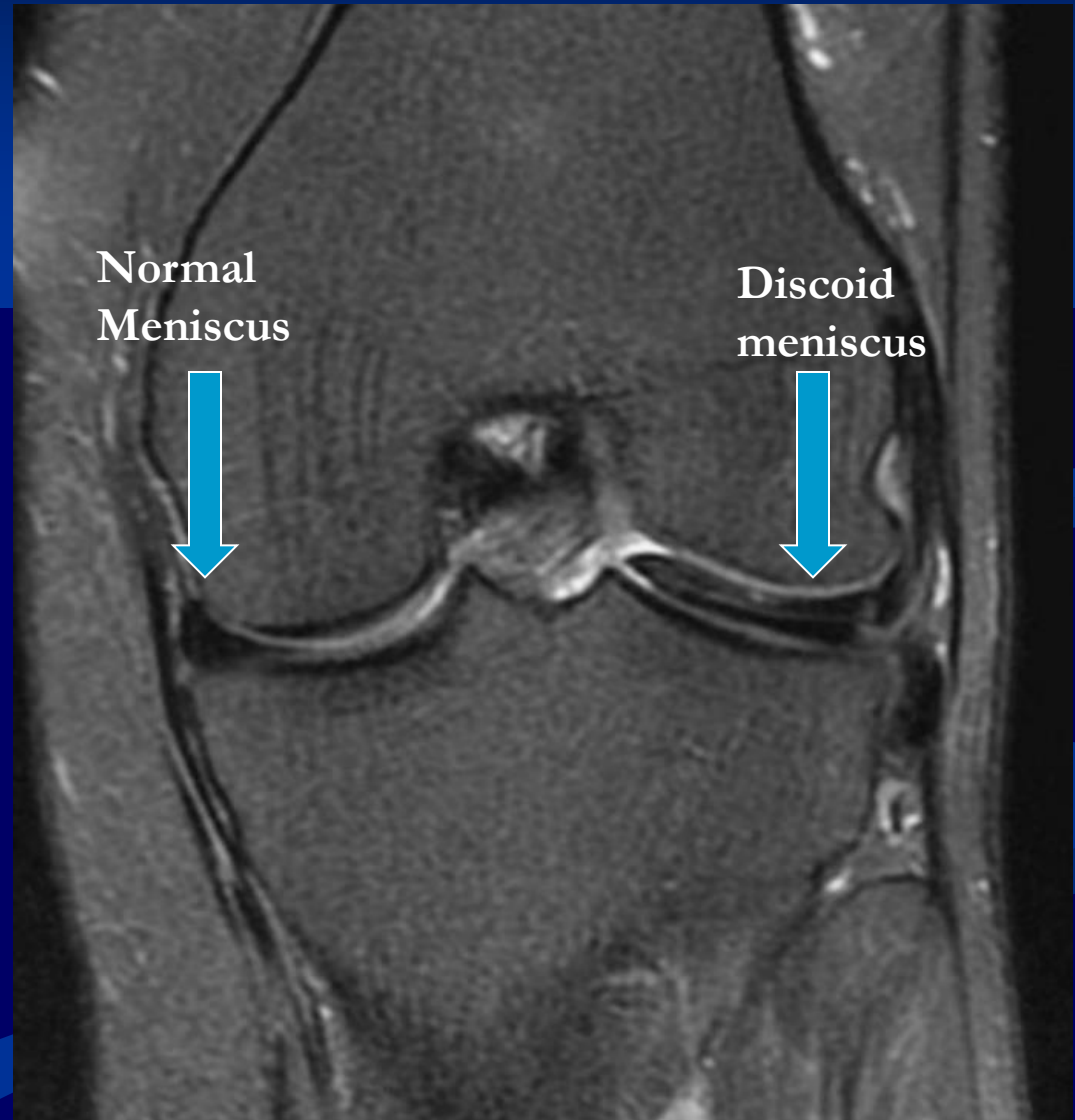
- **Age at Presentation**

- **Varies**


- **If <10-12 years w/meniscal tear, likely discoid**

- **Symptoms**

- **Lateral pain, locking, swelling**



Discoid Meniscus Treatment

- Non-operative if incidental finding and symptom free
 - If symptomatic, operative intervention
- 
- A decorative graphic consisting of several overlapping, wavy, blue lines that flow from the bottom right towards the center of the slide, creating a sense of movement and depth.

G6545175Q
ZHANG
HANG



G6545175Q
ZHANG
HANG



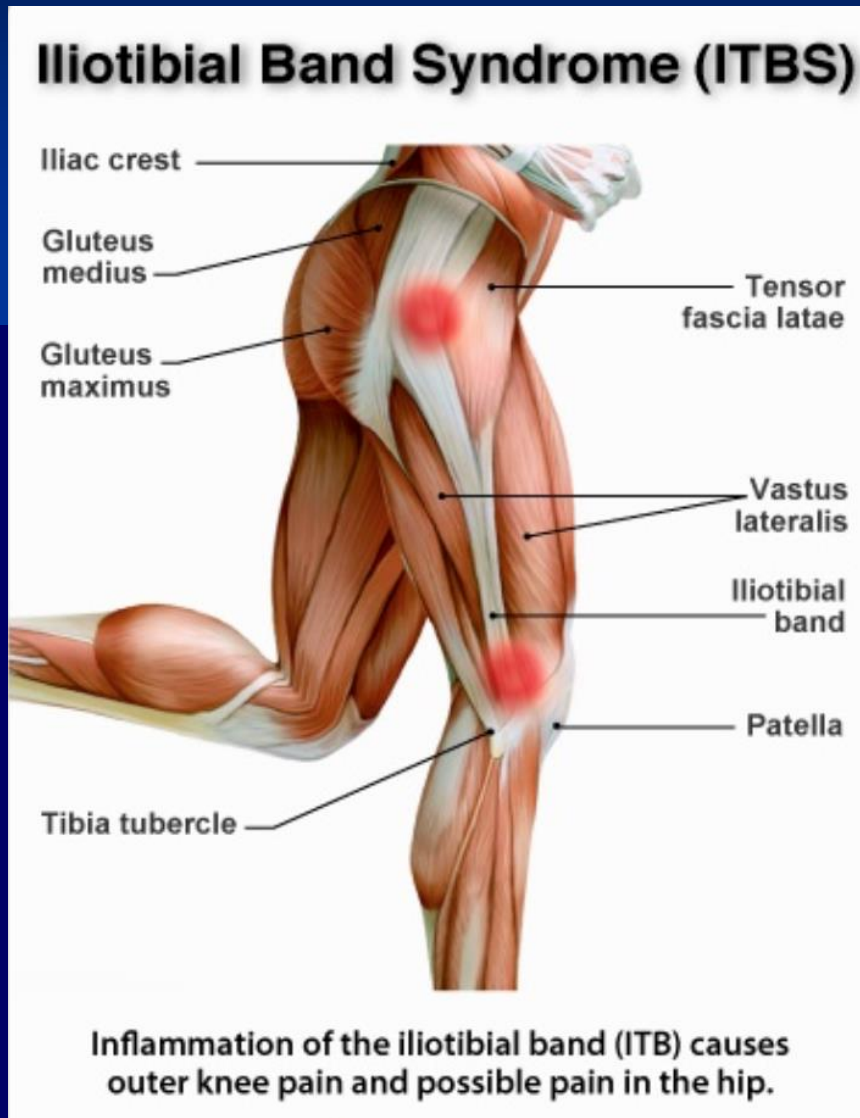
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Iliotibial Band Friction Syndrome



Noble Test



Noble Test



Ober Test



Proximal Tibia-Fibula Joint Pain

- Lateral sided pain just distal to joint line at tib-fib joint
- Frustrated patients
- Negative studies
- Failed PT



Proximal Tibia-Fibula Joint Pain

- Test- grab fibula head and shift ant-post to illicit pain
- Injection can help dx
- Imaging negative
- Surgery if pain bad



Hip Problems



Hip Problems

- Slipped Capital Femoral Epiphysis
 - Transient Synovitis
 - Septic Arthritis
 - Femoroacetabular Impingement
 - Snapping Hip
 - Avulsion Injuries
- 

Slipped Capital Femoral Epiphysis

- 2-3 times more common in boys than girls
- Often overweight patients
- 80% occur during adolescent growth spurt
 - ~12 y/o girls
 - ~13.5 y/o boys
- 25% bilateral (some think 60-80%)

Slipped Capital Femoral Epiphysis

- If patient doesn't look like....
- Look for other problems
 - Renal osteodystrophy
 - Hypothyroidism
 - Panhypopituitarism
 - Hypogonadal syndrome



Slipped Capital Femoral Epiphysis

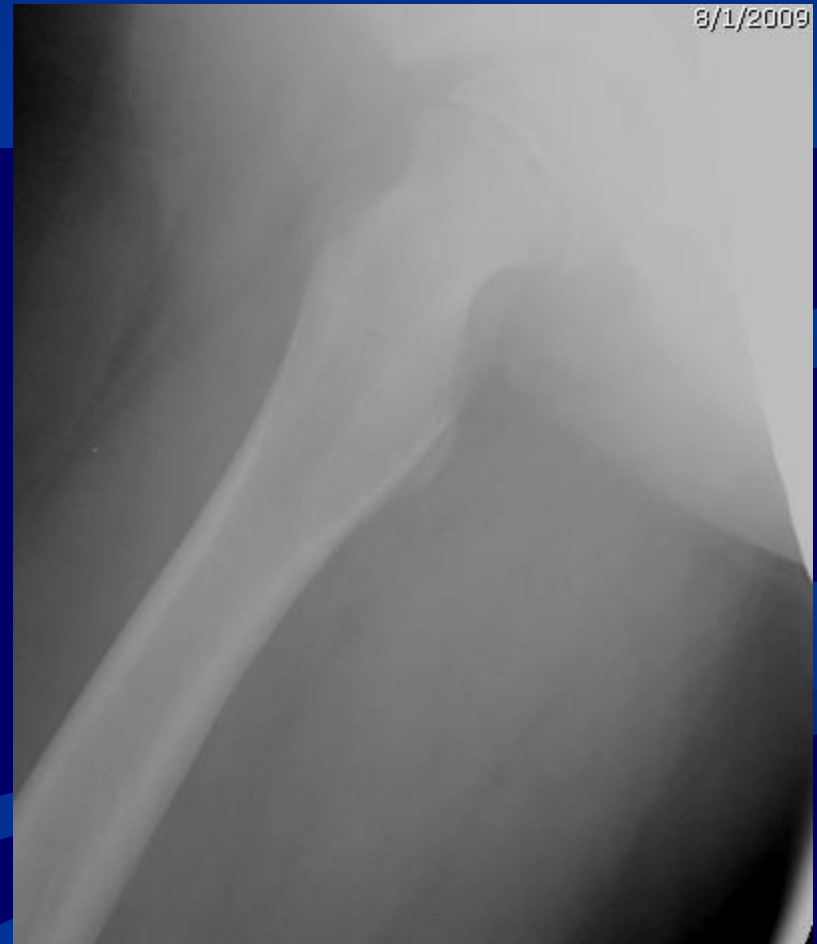
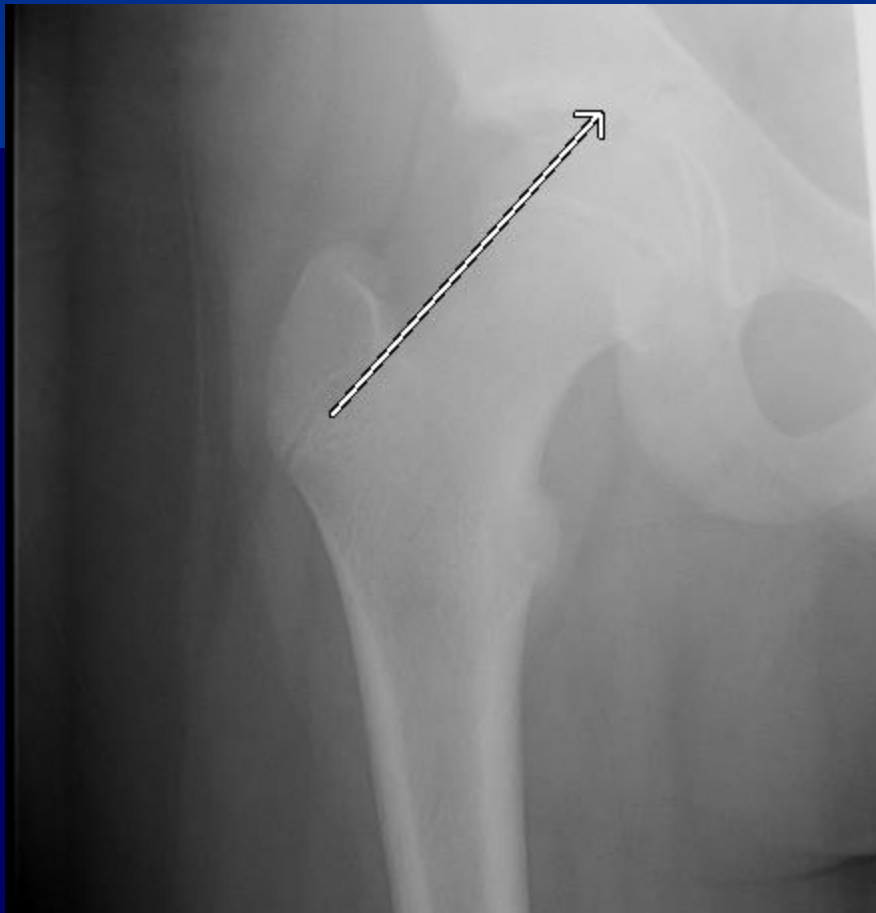
- Up to 4 months from first physician visit to diagnosis
- Presentation
 - Hip, Groin, Thigh, or knee pain for long time
 - Abductor Lurch
 - Foot externally rotated
 - Poor internal rotation with hip flexed

Avoiding the Pitfalls: Referred Knee Pain in Children

- Hip pain can often be referred to the knee in children
- Sensory distribution of obturator nerve to medial knee
- **ALWAYS** Examine hip in any child with knee pain
- Misdiagnosis common: LCPD [Perthes], SCFE [slipped capital femoral epiphysis]



10 year old female presents to ER 8/1/09 with months of hip pain secondary to a groin pull



10 year old female presents to ER 9 days
later with severe pain now



Slipped Capital Femoral Epiphysis Treatment

- Heal with Steel...



Legg Calves Perthes



Legg Calves Perthes

- Idiopathic avascular necrosis of the femoral head
- 10% Bilateral
- Most common between 4-8 years of age
 - Can be seen in kids less than 2
- Diagnosis can be difficult/subtle
 - Can be mistaken for synovitis
 - “I notice a slight limp at the end of the day, but he doesn’t complain of pain”

Legg Calves Perthes

- Exam
 - Slight assymetry with loss of abduction/internal rotation
- Diagnosis – Xrays (occasioanally MRI)
 - Sometimes can be missed initially

Legg Calves Perthes Treatment

- Casting
- Rest
- NSAIDs
- Surgery




Transient Synovitis

- Most common cause of pain in school age kids
- May have elevated labs, fever, inability to walk
- More common in boys than girls (2-4xs)
- May have viral etiology or trauma (30% & 5%)
- Treatment – NSAIDs
- Lasts 7-10 days – up to 17% recur

Septic Arthritis



Septic Arthritis

- Bacterial Infection
 - Patient looks sick, getting worse
 - Nonweightbearing
 - Pain with even log role of hip
- 

Septic Arthritis Diagnosis

- Kocher Criterium- Non-weight bearing, ESR>40, fever, WBC>12,000
 - 4/4 of the above (+) - 99% chance septic
 - 3/4 above positive - 93% chance
 - 2/4 above positive - 40% Chance
 - 1/4 above positive - 3% chance

Septic Arthritis

- Suspicious???
 - Bypass the ortho doc and send to the ER
- 
- A decorative graphic consisting of several overlapping, wavy, blue lines that flow from the bottom right towards the center of the slide.

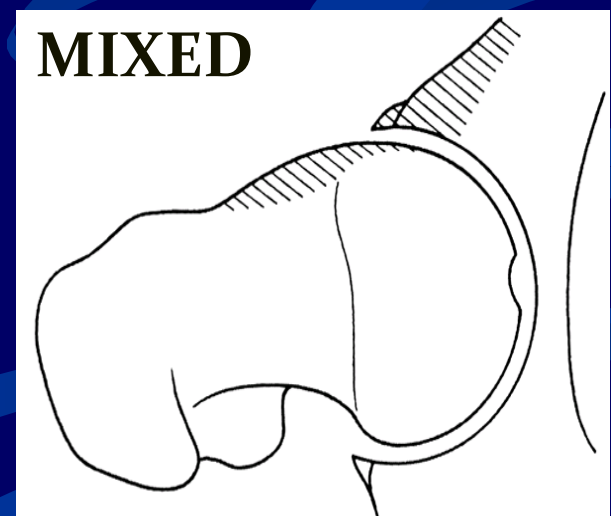
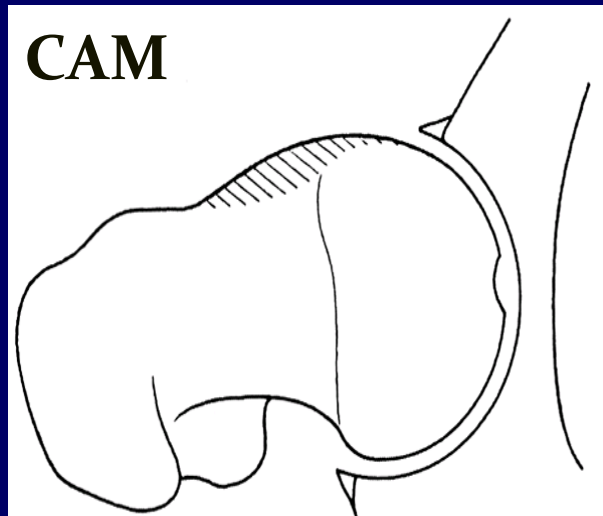
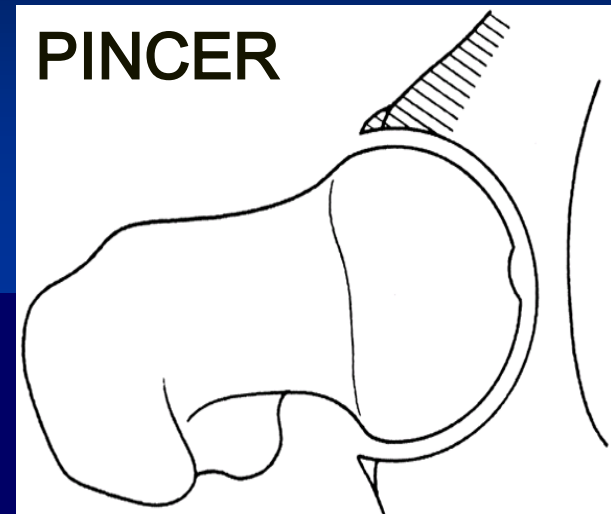
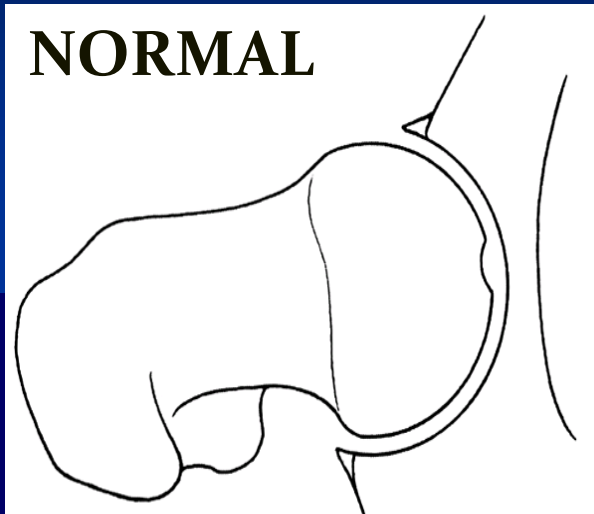
Femoroacetabular Impingement

- New “Hot Topic” in Orthopaedics
- Impingement is the next frontier for sports medicine
- High profile athletes with FAI have raised awareness
- Process can start early in adolesc. and progress with age (McCarthy)




Femoroacetabular Impingement

What is it?



Femoroacetabular Impingement

- Ball and Socket configuration
 - When the ball or socket has an abnormal shape, bone on bone/cartilage contact occurs leading to damage of the labrum or cartilage
- 
- A decorative graphic consisting of several overlapping, wavy, blue lines that flow from the bottom left towards the top right, set against a dark blue background.

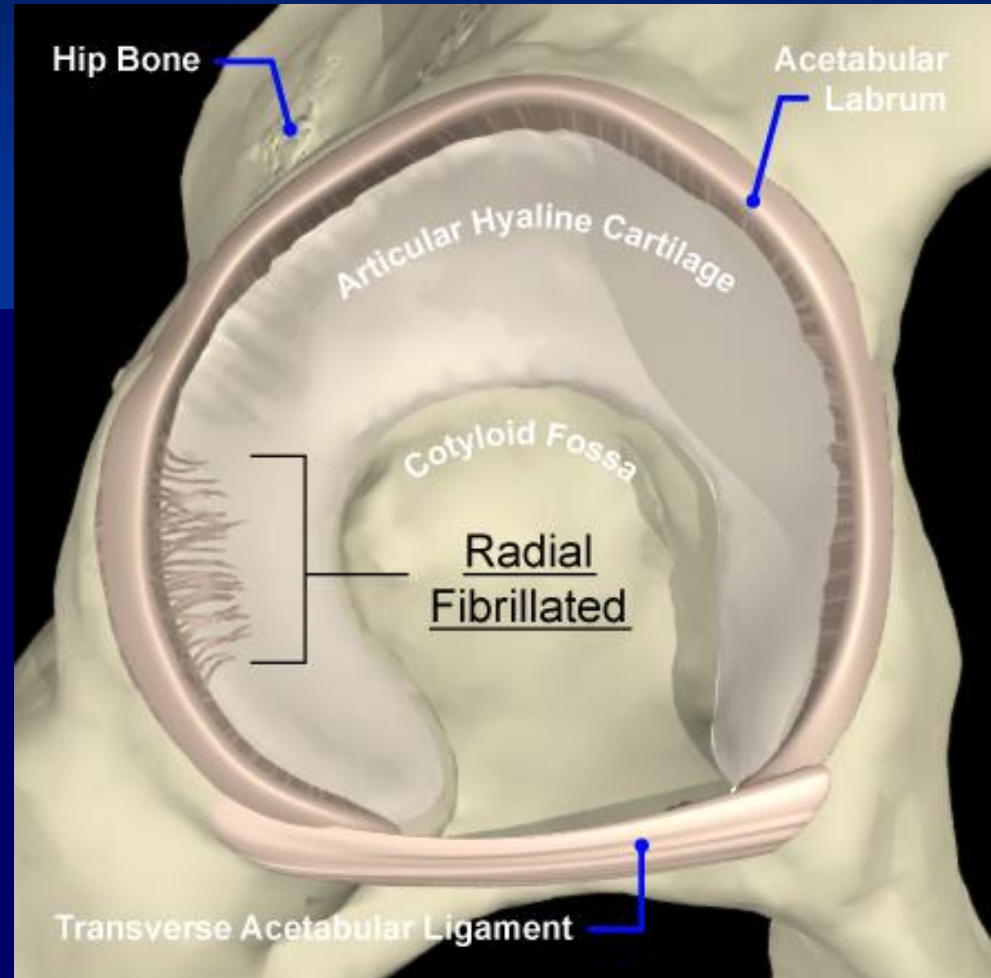
Femoral Acetabular Impingement



Labral Function

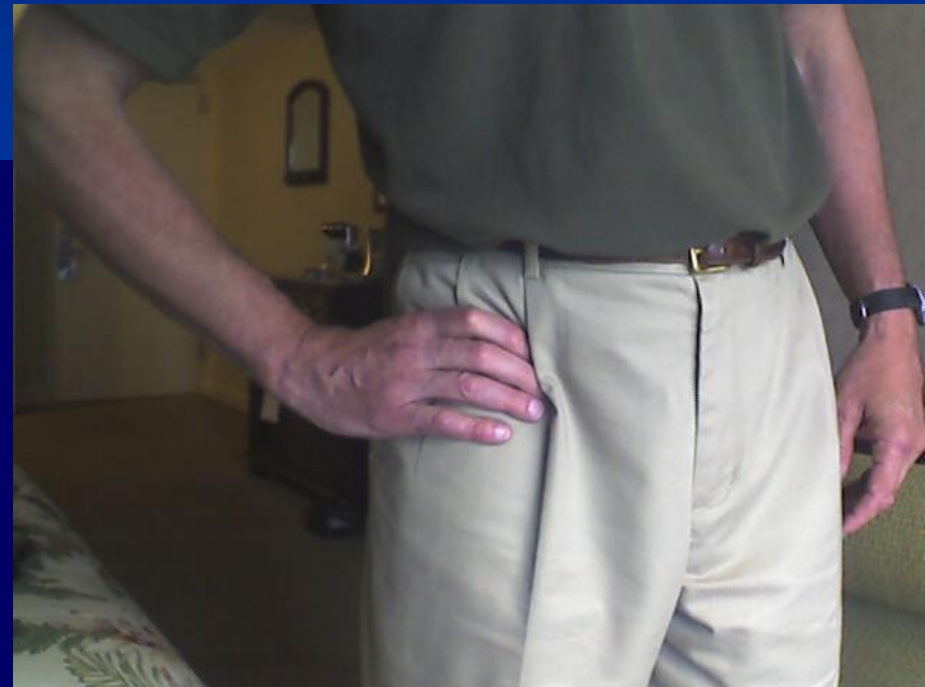
Role of the labrum

1. Increases joint stability, improves hydrostatic fluid pressure in the intraarticular space
2. Increased joint stability, deepens socket
3. Load transmission
Isolated labral tears are uncommon



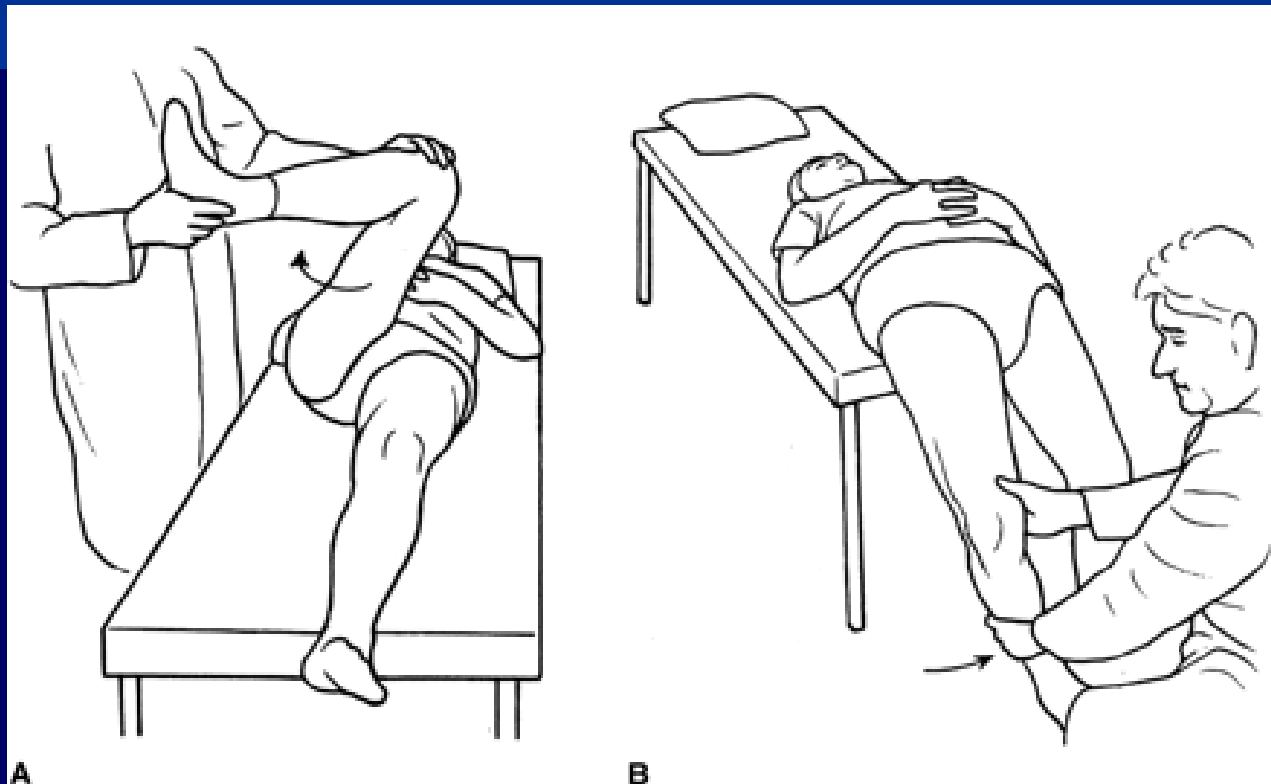
Labral Tear Presentation

- Pain is classically in the anterior groin
- “C”-sign
- Less commonly in posterior hip



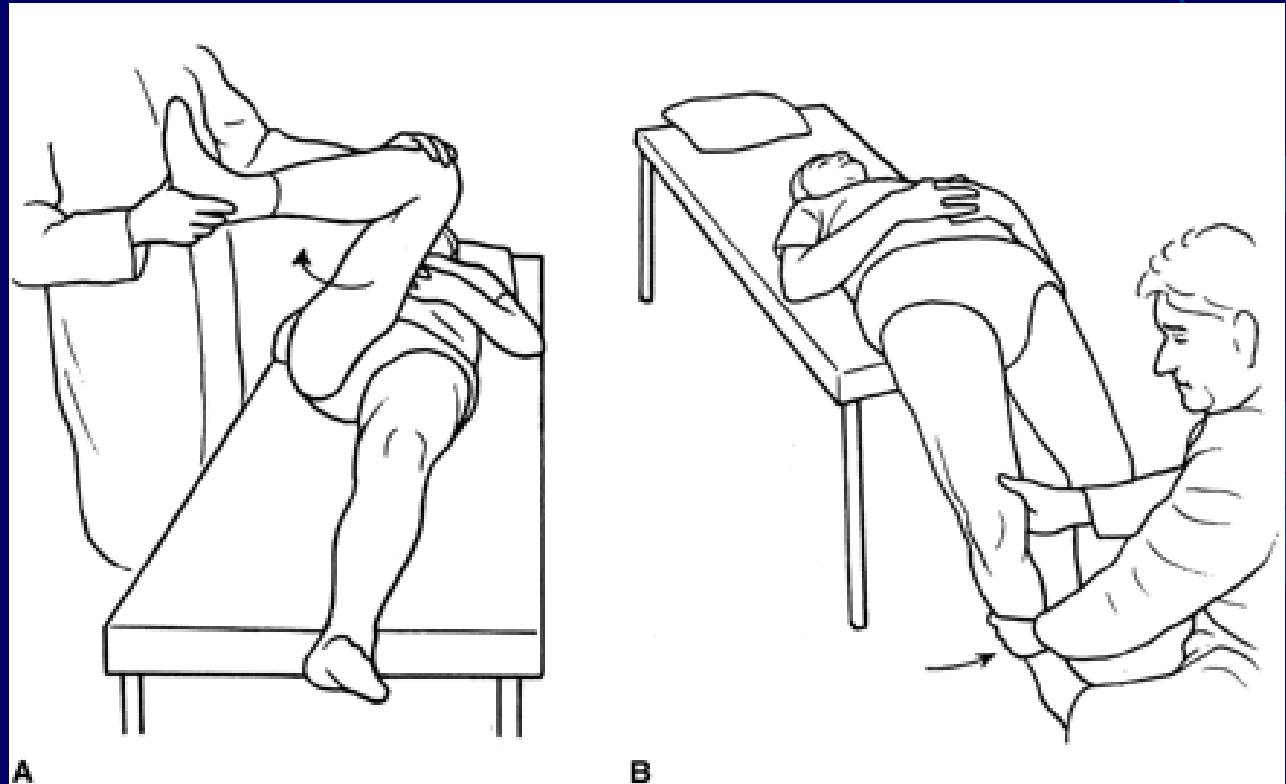
How do we diagnose?

- Clinical exam is very sensitive
 - “Impingement test”



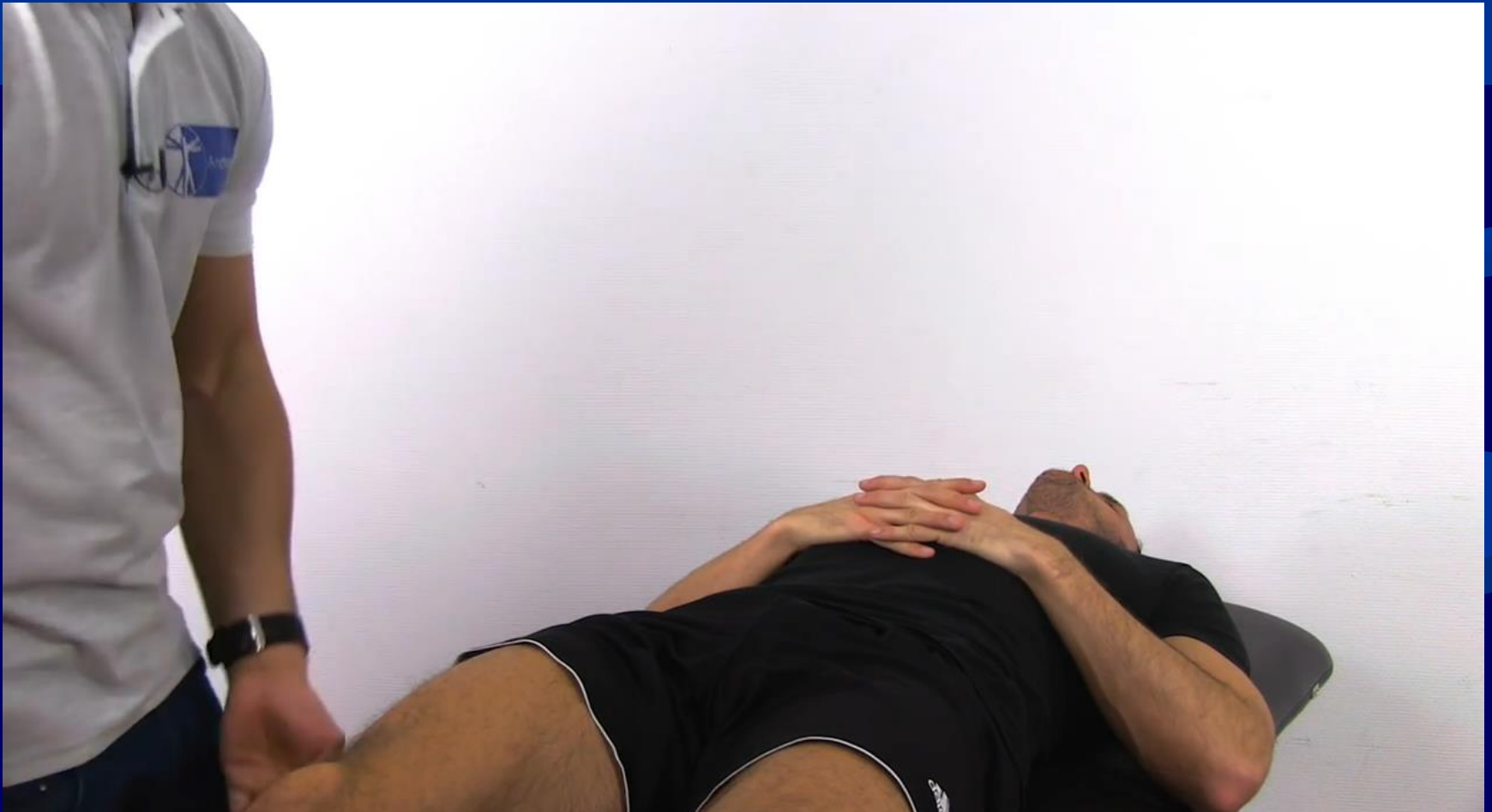
How do we diagnose?

- Clinical exam is very sensitive and specific
 - Impingement test
 - Flexion Adduction Internal Rotation



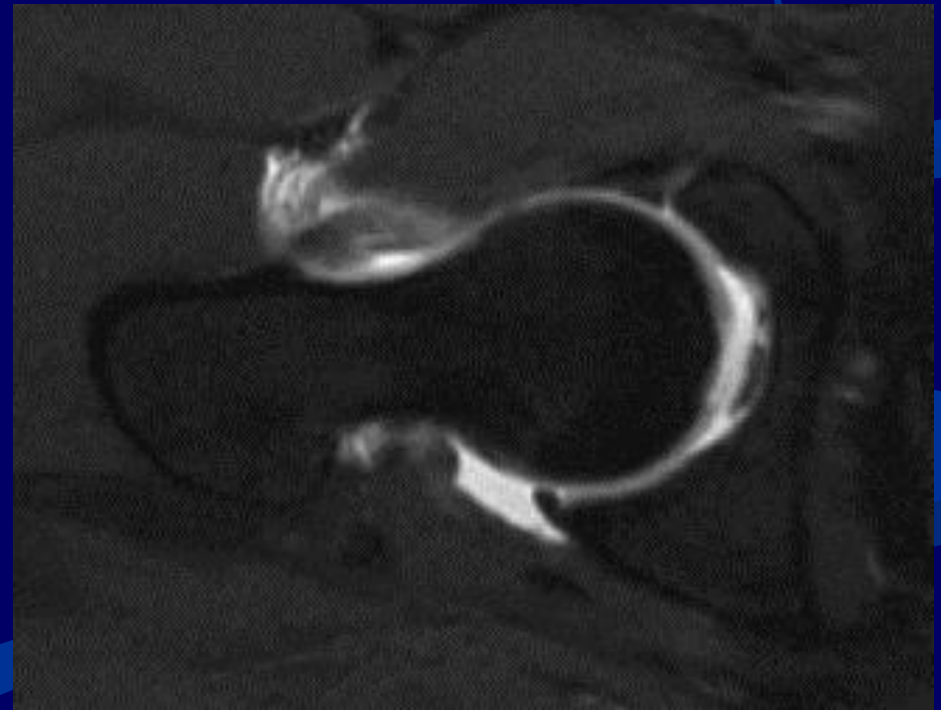
How do we diagnose?

- Clinical exam is very sensitive and specific




MRI Sensitivity for labral tears

- Pelvis MRI with Large Field of View 8% sensitivity
- Hip MRI noncontrast 25%
- MRI Hip Arthrogram 92%
 - Toomayan et al, AJR, 2006



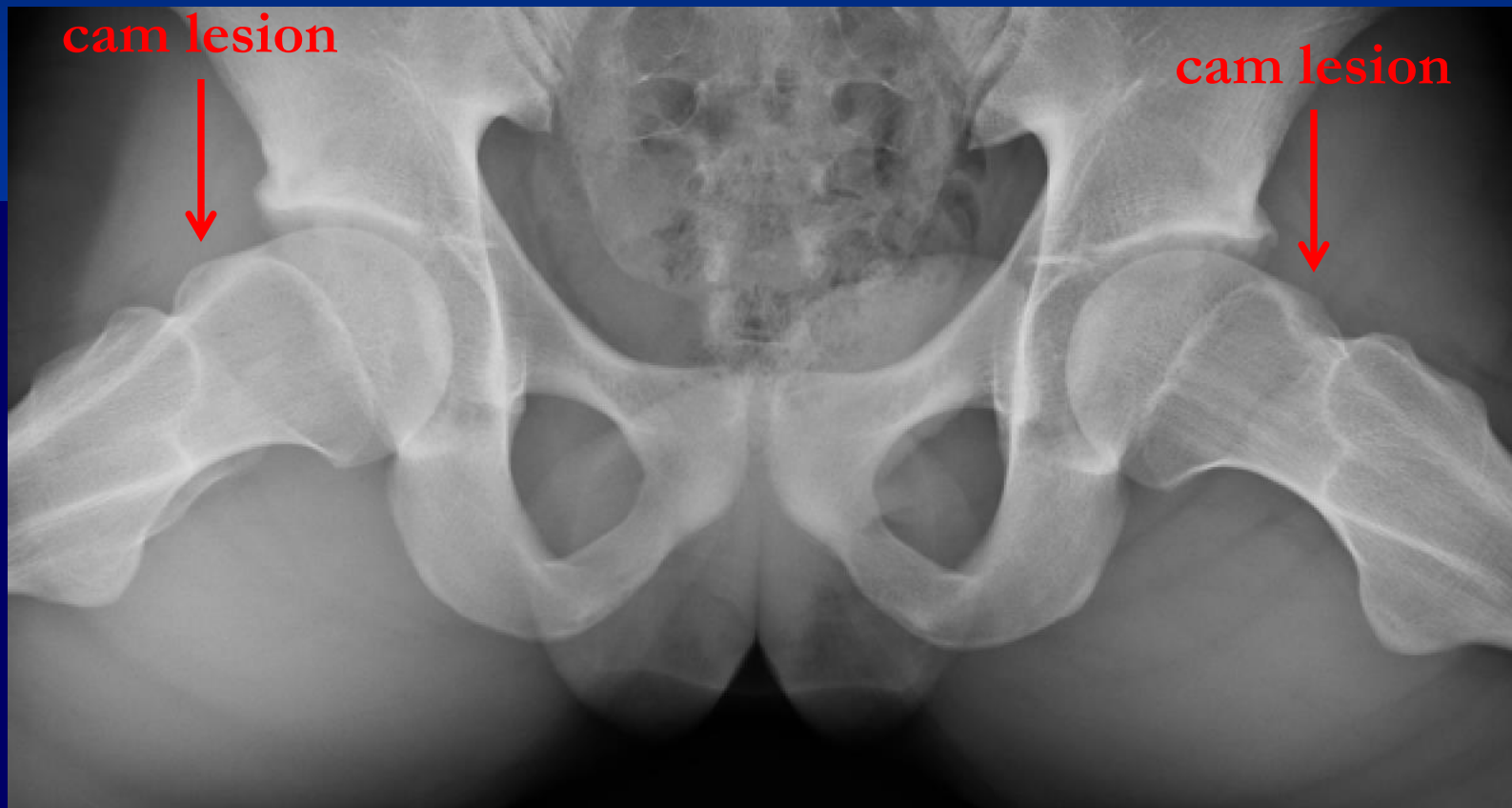
Treatment

- Therapy will be less effective
 - Surgery is the best option
- 
- The bottom right portion of the slide features a decorative graphic consisting of several overlapping, wavy, horizontal bands in various shades of blue, creating a sense of motion or depth.

Surgery



Surgery



Surgery

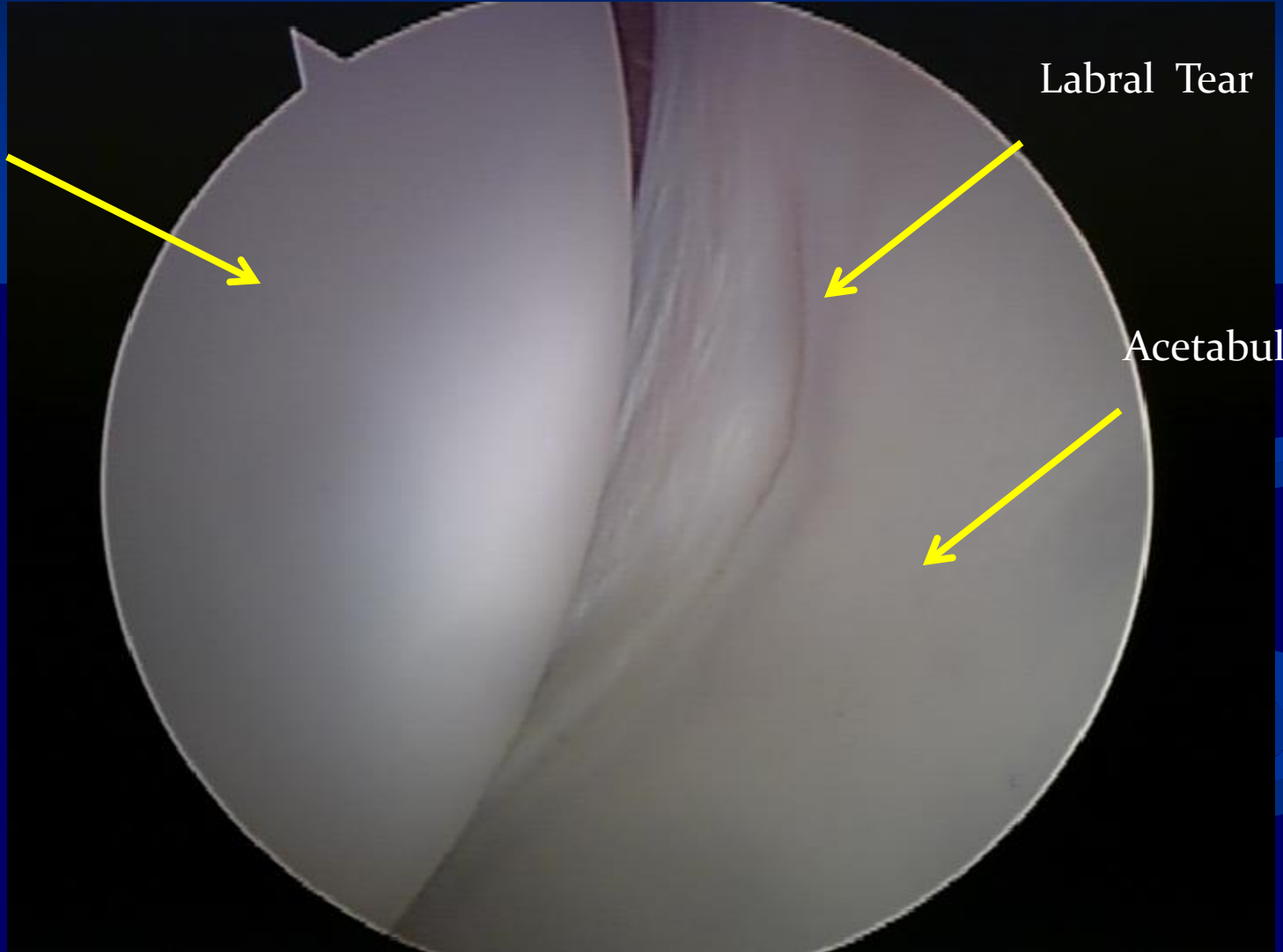
Restored femoral neck

Restored femoral neck



16 year Old Boston Hockey Player

Femoral Head

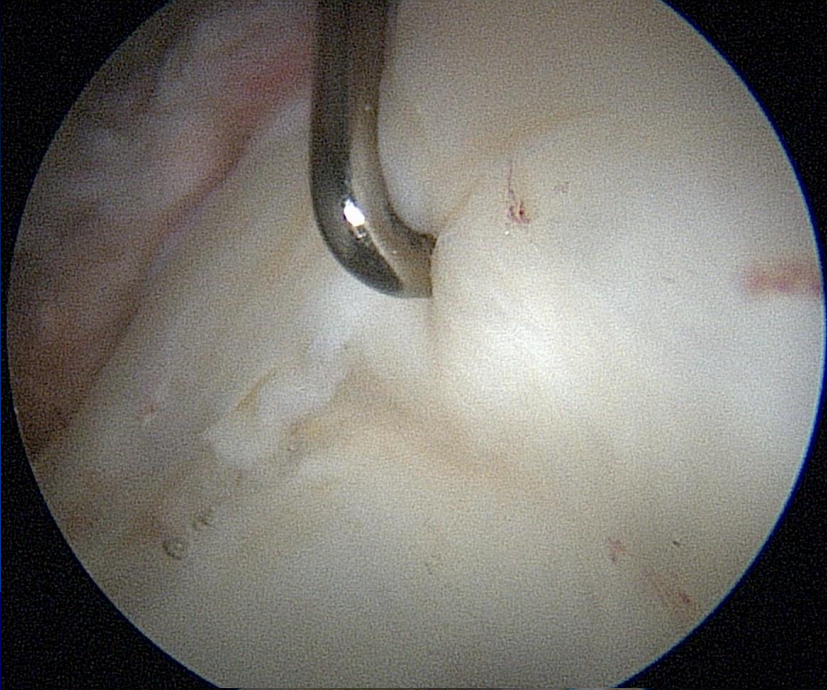


Labral Tear

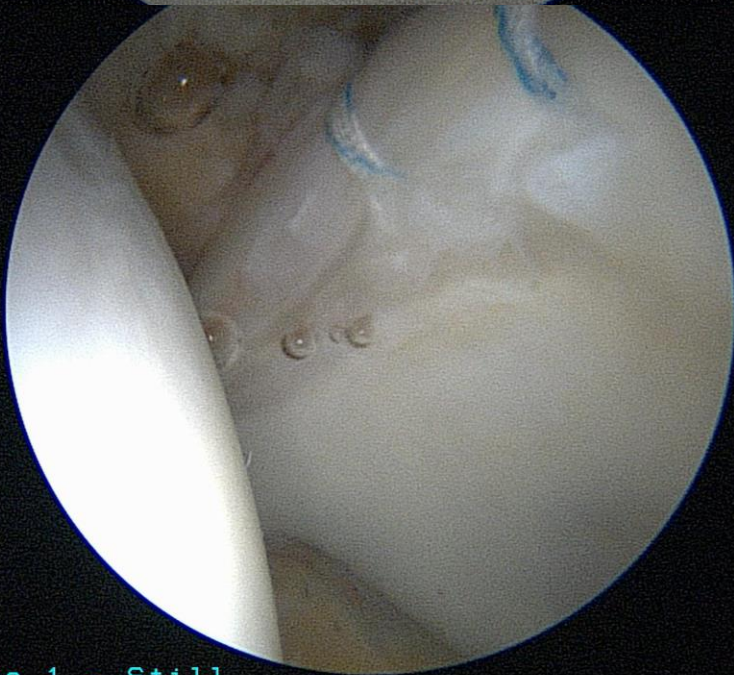
Acetabulum

Labral Debridement

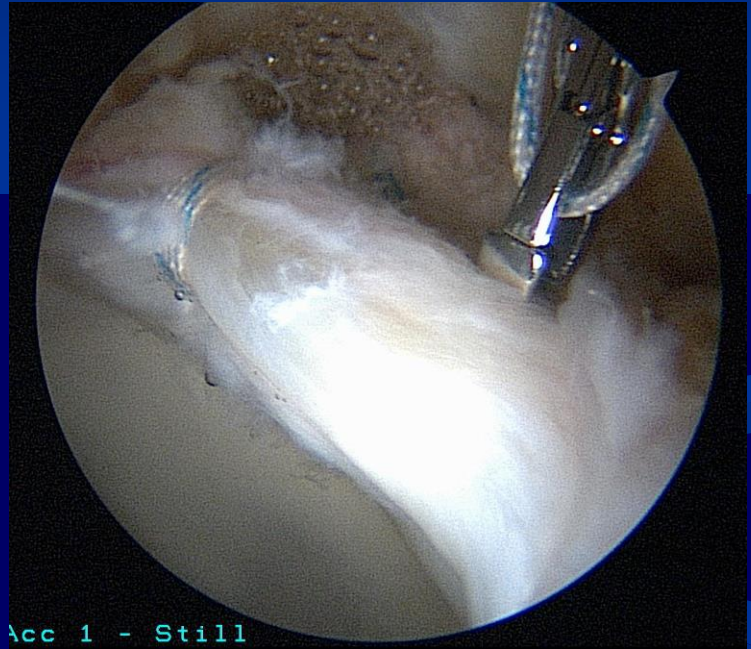




acc



acc 1 - Still



acc 1 - Still

Pelvic Avulsion Fractures

- Most common in boys between age 12-14 years
- Mechanism : forceful contraction (sprinting, kicking, jumping)
 - Often an eccentric load (landing)



Pelvic Avulsion Fractures

- Localized tenderness on physical exam
- Pain with stretch of affected muscle
- Antalgic Gait, Limping, Pain worse with activity
- Radiographs are diagnostic



R
X30

Iliac crest



Anterior
Superior
Iliac Spine



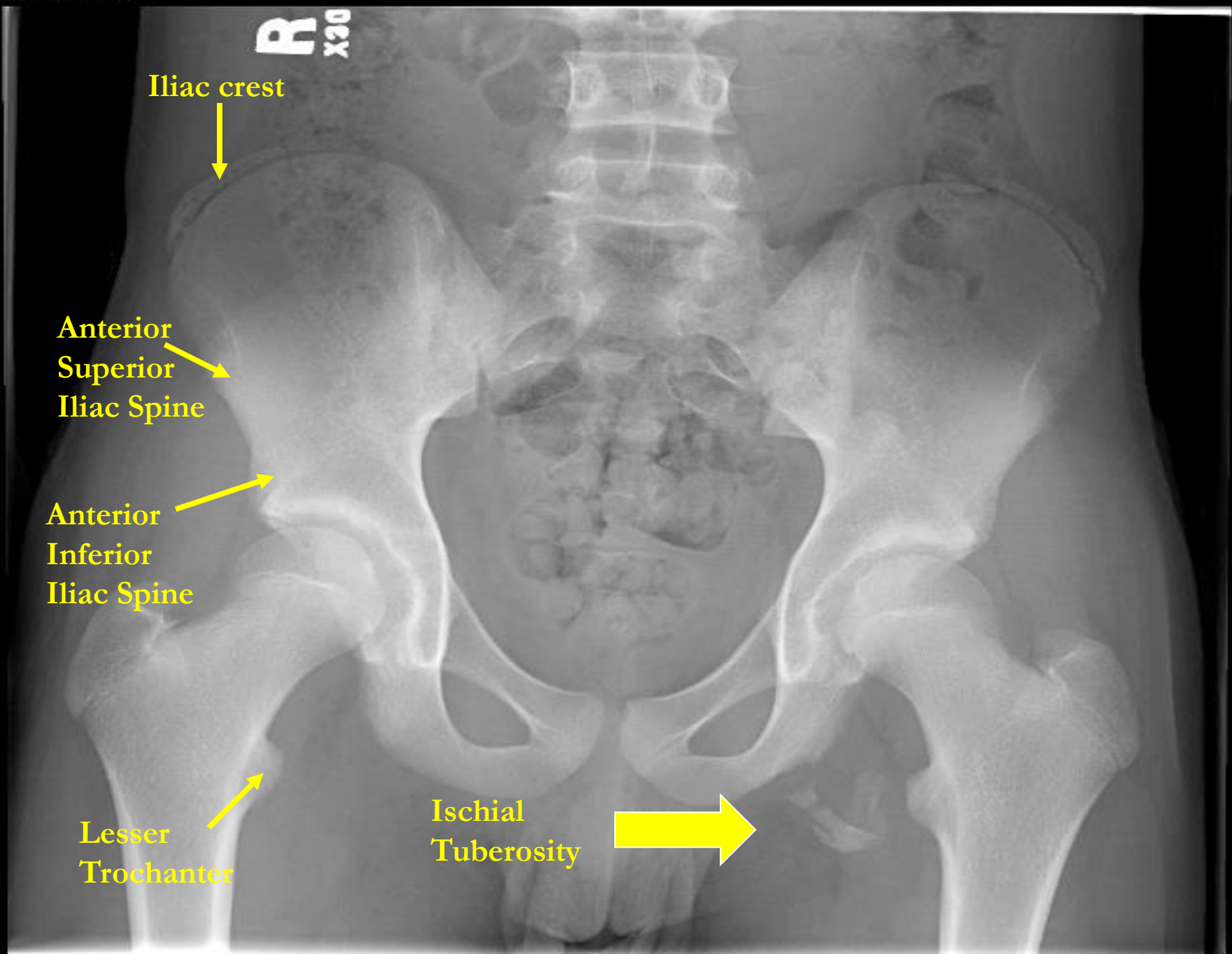
Anterior
Inferior
Iliac Spine



Lesser
Trochanter

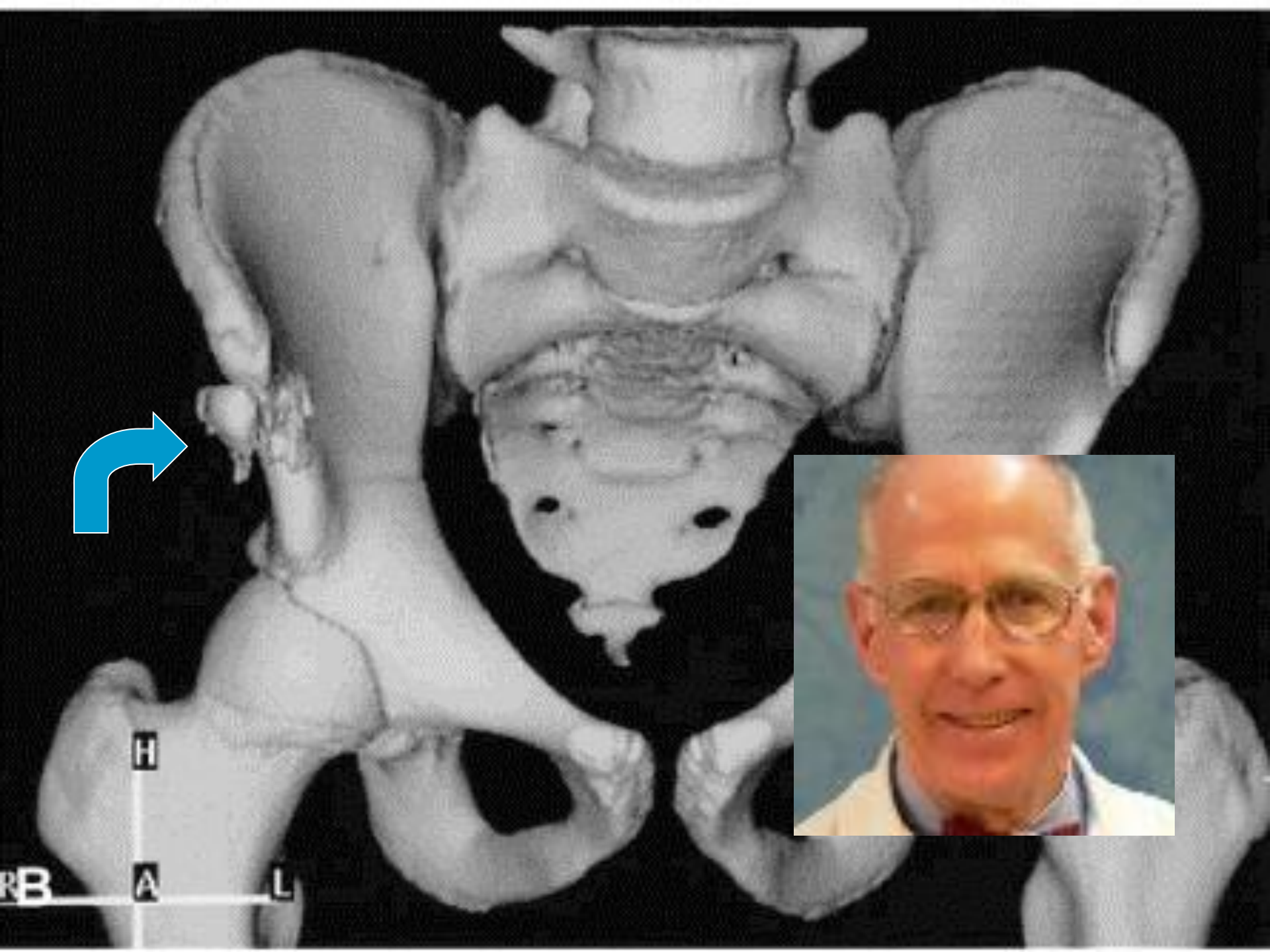


Ischial
Tuberosity



Iliopsoas Avulsion Fracture





H

A

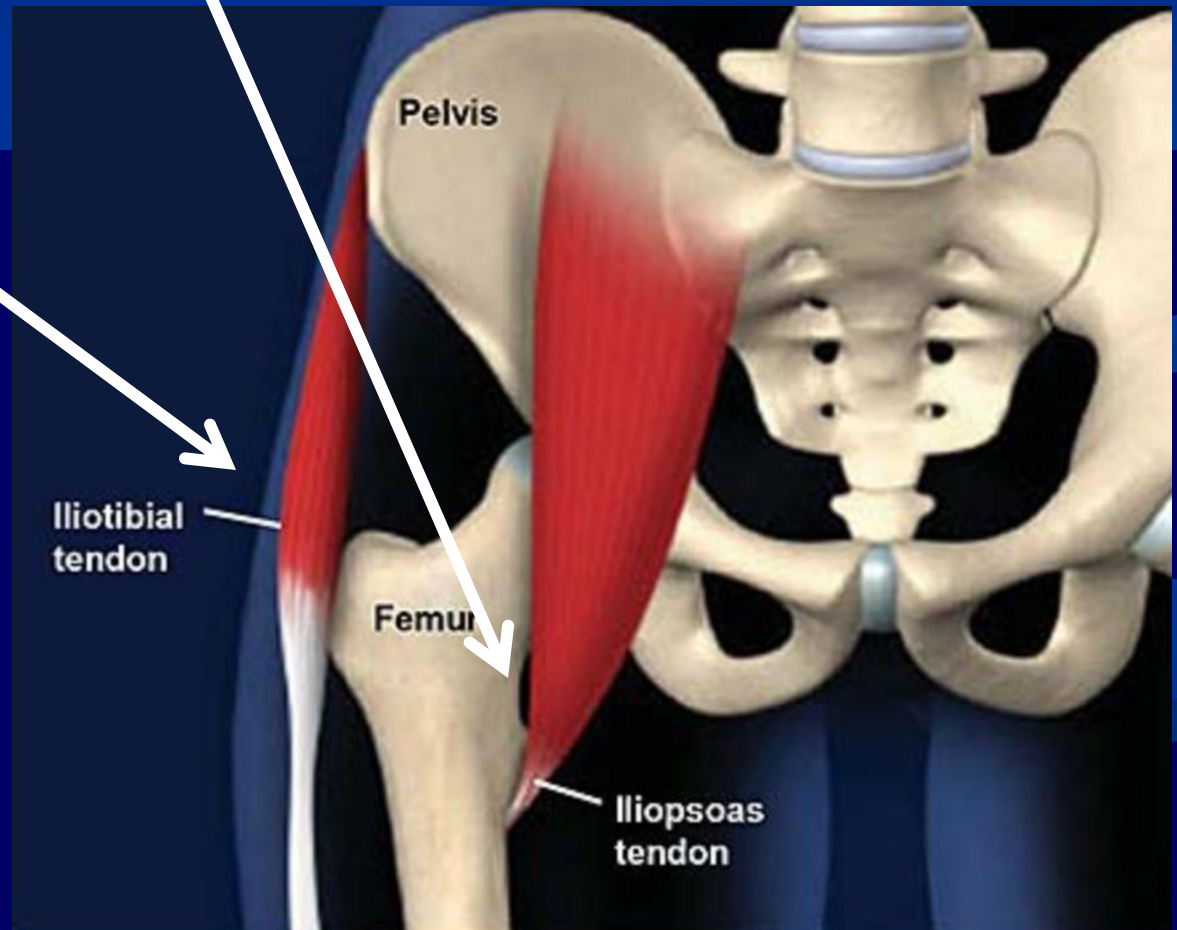
L

R

B

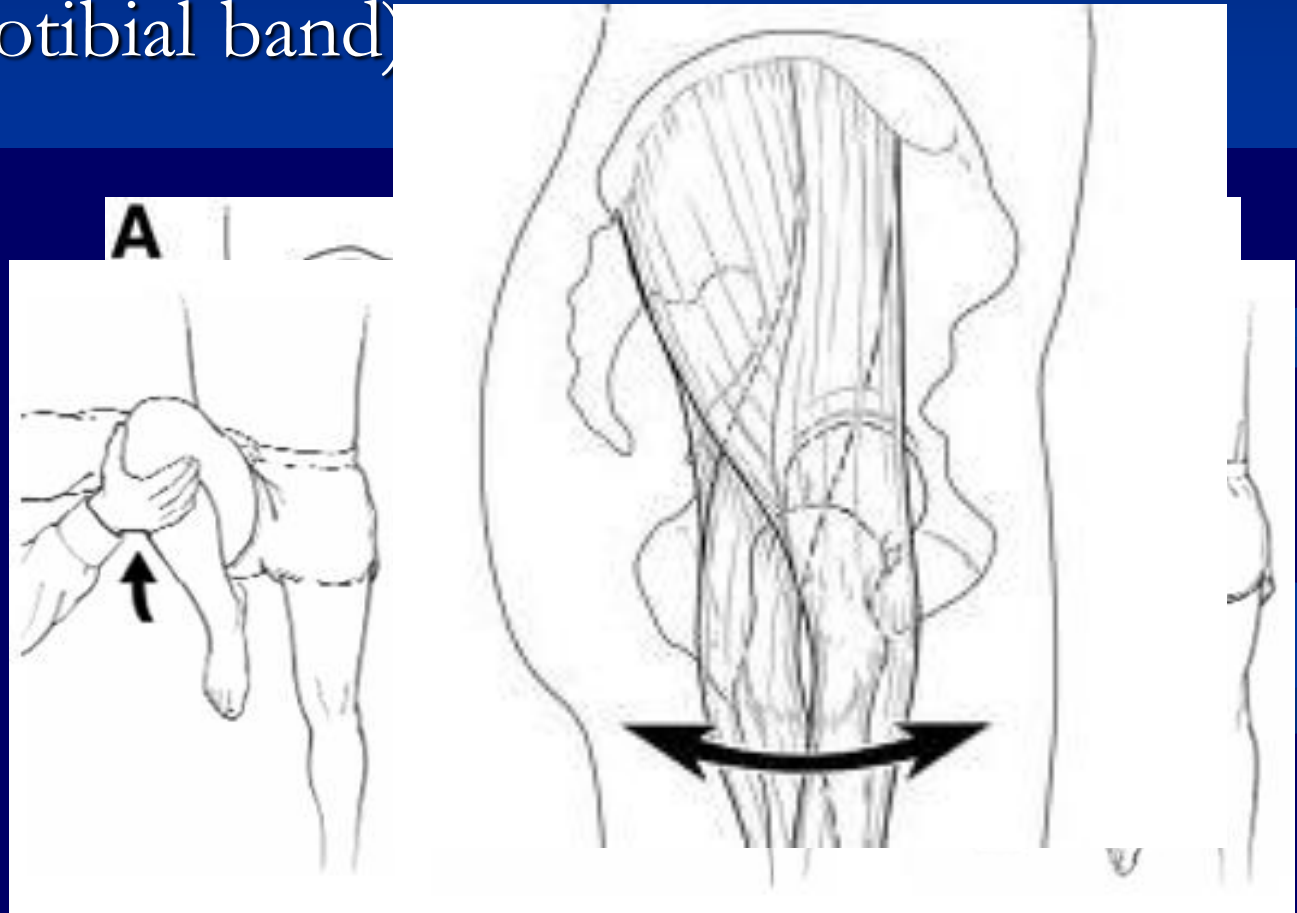
Snapping Hip

- Internal (iliopsoas)
- External (ITB)



Snapping Hip

- Internal (iliopsoas)
- External (iliotibial band)
- Palpate





Trochanteric Bursitis and Iliopsoas Band tendinitis

- Even if it doesn't snap, these areas can be pain generators

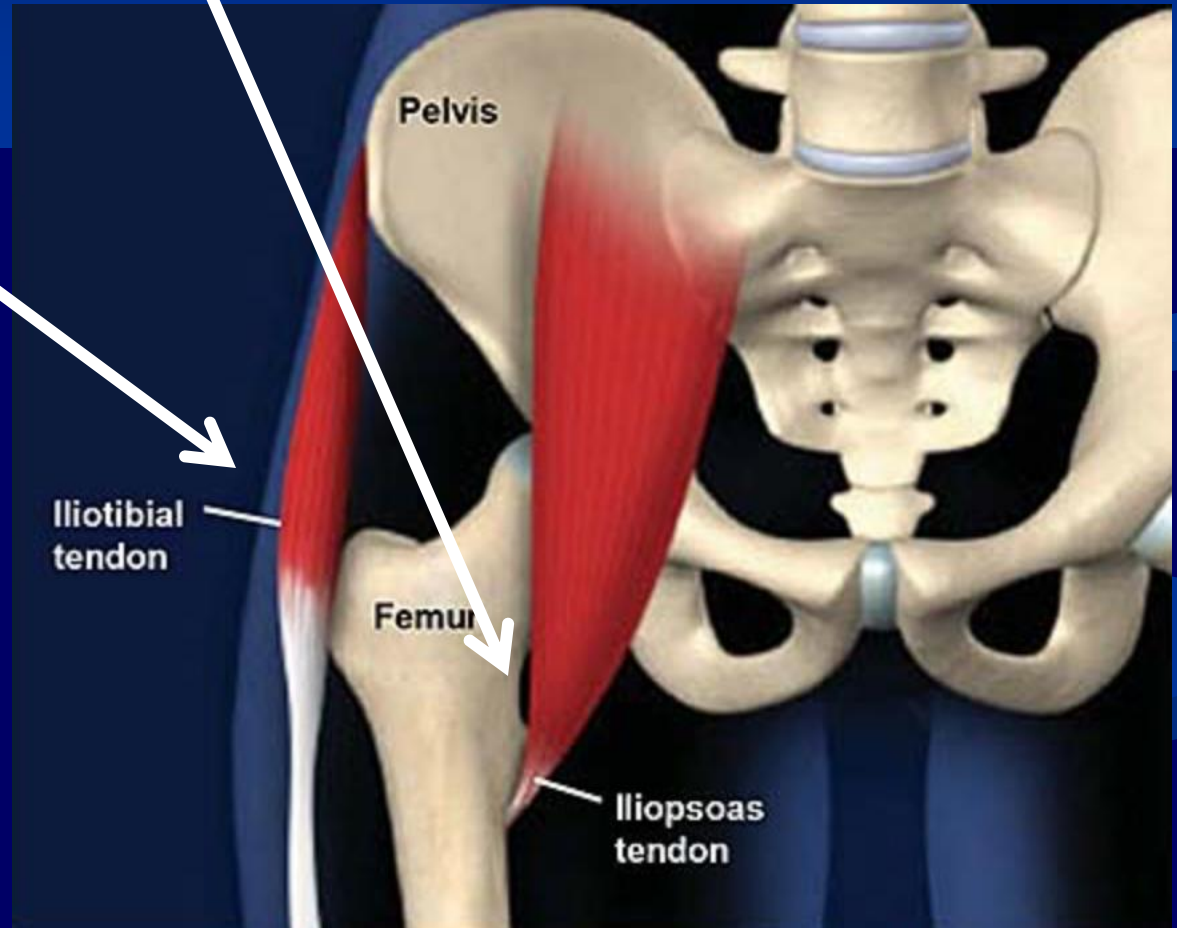


Trochanteric Bursitis and Iliopsoas tendinitis Treatment

- Even if it doesn't snap, these areas can be pain generators
- 
- A decorative graphic consisting of several overlapping, wavy, blue lines that flow from the bottom right towards the center of the slide. The lines vary in thickness and create a sense of movement and depth.

Trochanteric Bursitis and Iliotibial Band tendinitis

- Flexor Tendinitis
- Trochanteric Bursitis



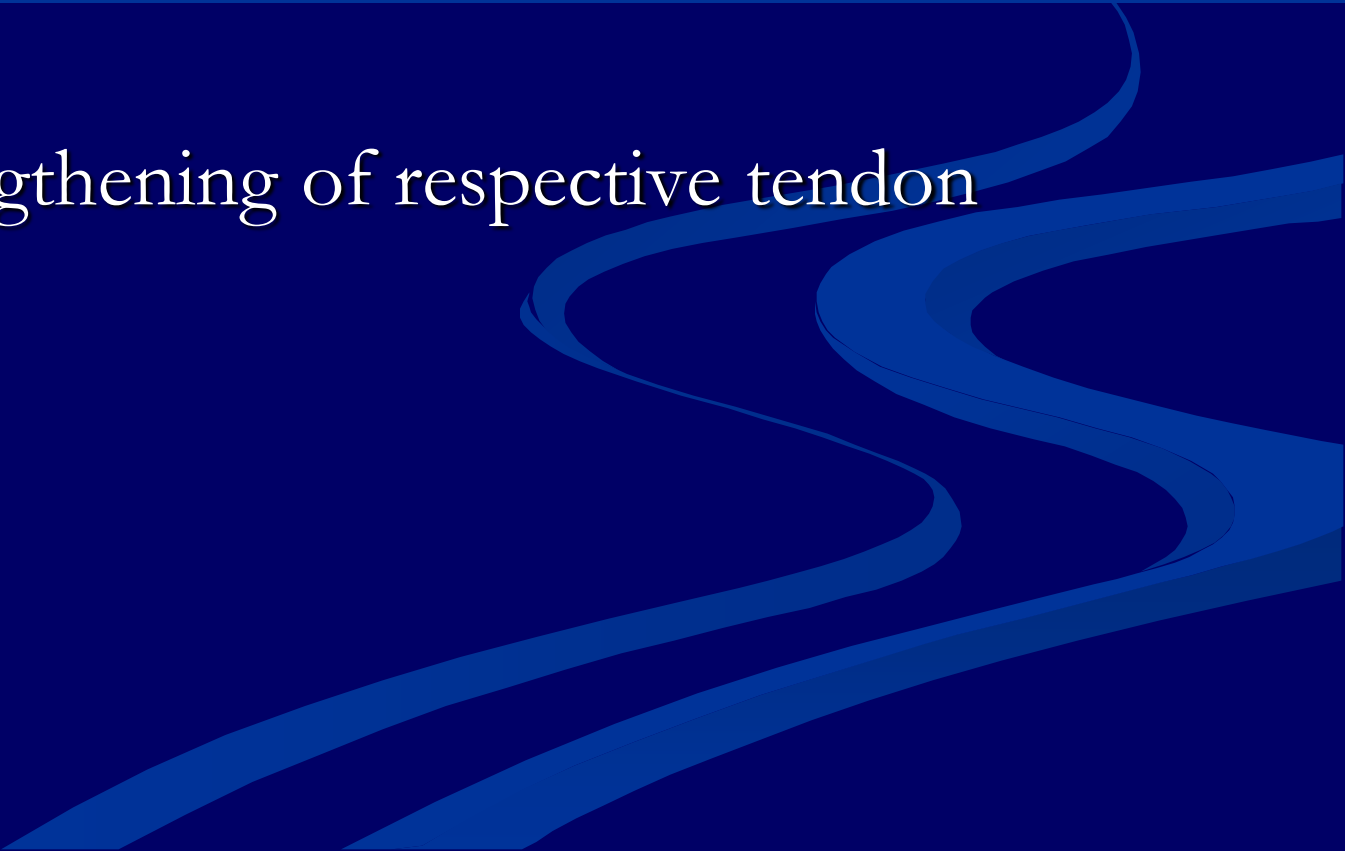
OBER TESTING- Iliotibial Band Problem



Iliopsoas Tendinitis Testing Thomas Test (Tight Iliopsoas)



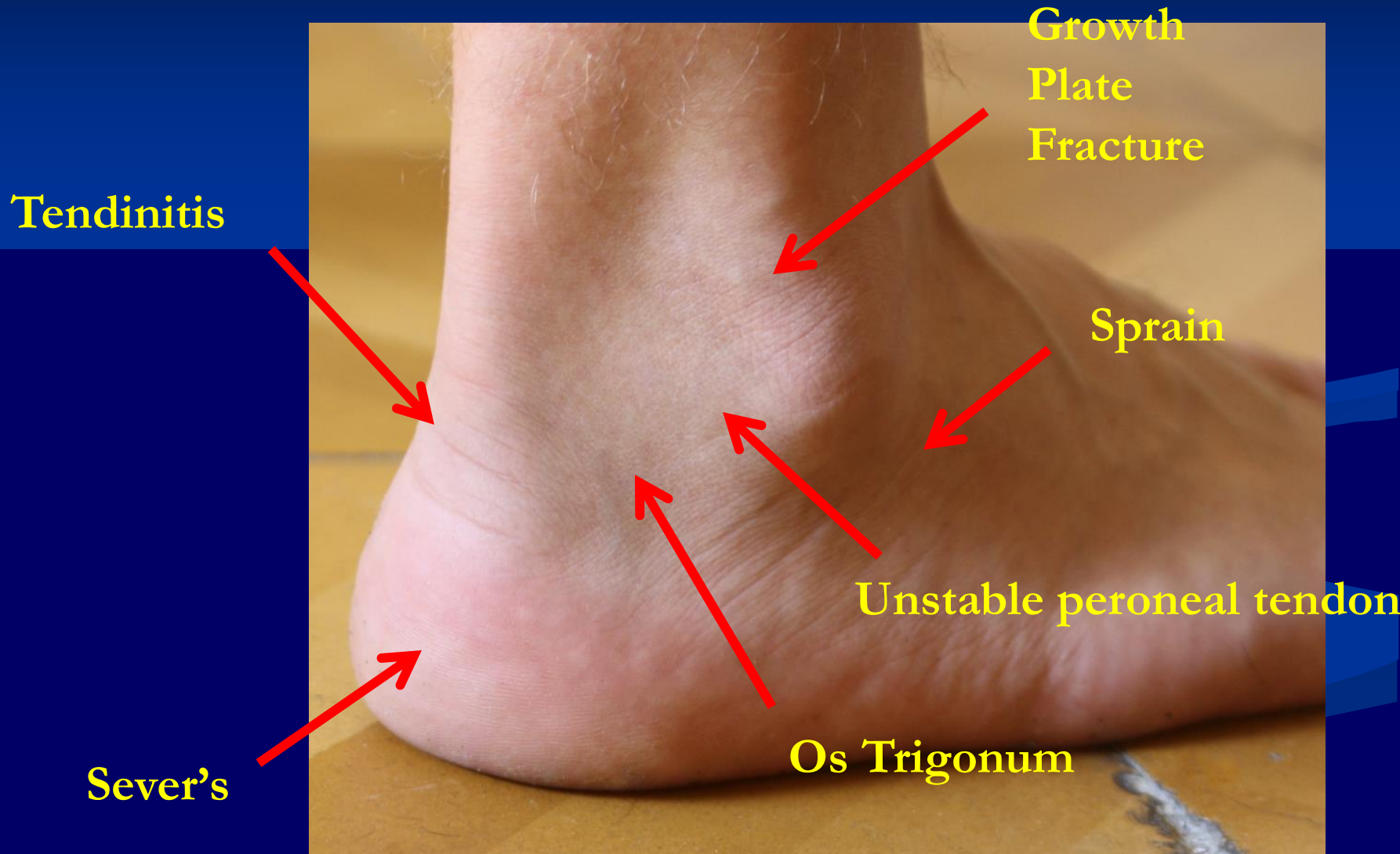
Trochanteric Bursitis and Iliopsoas tendinitis Treatment

- Physical Therapy
 - Injections
 - Surgical lengthening of respective tendon
- 
- A decorative graphic consisting of several overlapping, wavy, blue lines that flow from the bottom left towards the top right, set against a dark blue background.

Foot and Ankle Problems



Location of Pain- Lateral Ankle

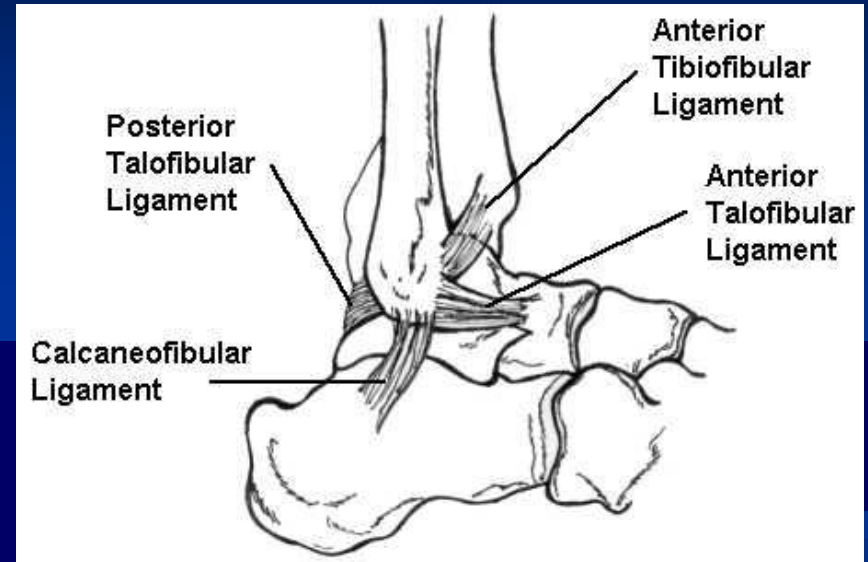


Location of Pain Ankle/Foot



Common Ankle Injuries in Children

- Common in young athletes
- Sprains are difficult to distinguish from growth plate injuries in children
- Primary ligamentous support for ankle includes 3-part lateral ligament complex and 5-part medial (deltoid) ligament complex
- Lateral ankle sprains by far more common



Physical Examination of the Ankle

- May be very limited exam due to swelling and pain
- Inspect, palpate ligaments sequentially
- Push on growth plate to see if most tender over bone



Anterior Drawer & Talar Tilt Tests of the Ankle



**Anterior Drawer Test: Assesses stability of anterior talofibular ligament
[Often very difficult to assess secondary to significant swelling and pain]**

Differential Diagnosis: Ankle Sprain



- Proximal fibula fracture
- Syndesmotic disruption (High Ankle Sprain)
- Base of 5th metatarsal avulsion fracture
- Physeal (Growth plate) fracture

Ankle Rehabilitation

- **R-Rest**
- **I-Ice**
- **C-Compression**
- **E-Elevation**



- **Splints, Casts, Crutches: Depend on severity of injury**
- **Early weight bearing as tolerated, AVOID prolonged immob.**
- **Home or formal PT**

Ankle Rehabilitation: Phase III

- Functional conditioning with proprioception, agility, and endurance training
- Gradual return to play
- Maintenance exercises and protection



High Ankle Sprain

- Rotational injury
- Pain more proximal
- Recovery twice as long
- Treatment
 - Cam Boot
 - Therapy





Take very seriously

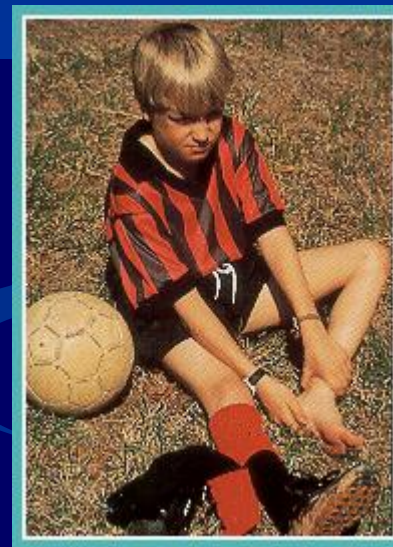
Heel Pain: Sever's Disease

- Traction Apophysitis of the calcaneus: Activity related/Overuse
- Most common cause of heel pain in adolescents
- Most common in active males 10-13 years of age
- Heel tenderness at calcaneal apophysis



Severe's Treatment

- Reassurance
- Heel cups
- Stretching
- Short term immobilization if acutely symptomatic (rare)
- Self-limited disorder: will not have pain after physcal closure



Os Trigonum

- Accessory bone in the posterior ankle
- Non-tendon posterior Pain



Location of Pain- Lateral Ankle



Os Trigonum Treatment

- Observation
- Casting
- Injection
- Occasional surgery



Pes Planus “Flat Feet”

- Arches Change over time



Pes Planus “Flat Feet”

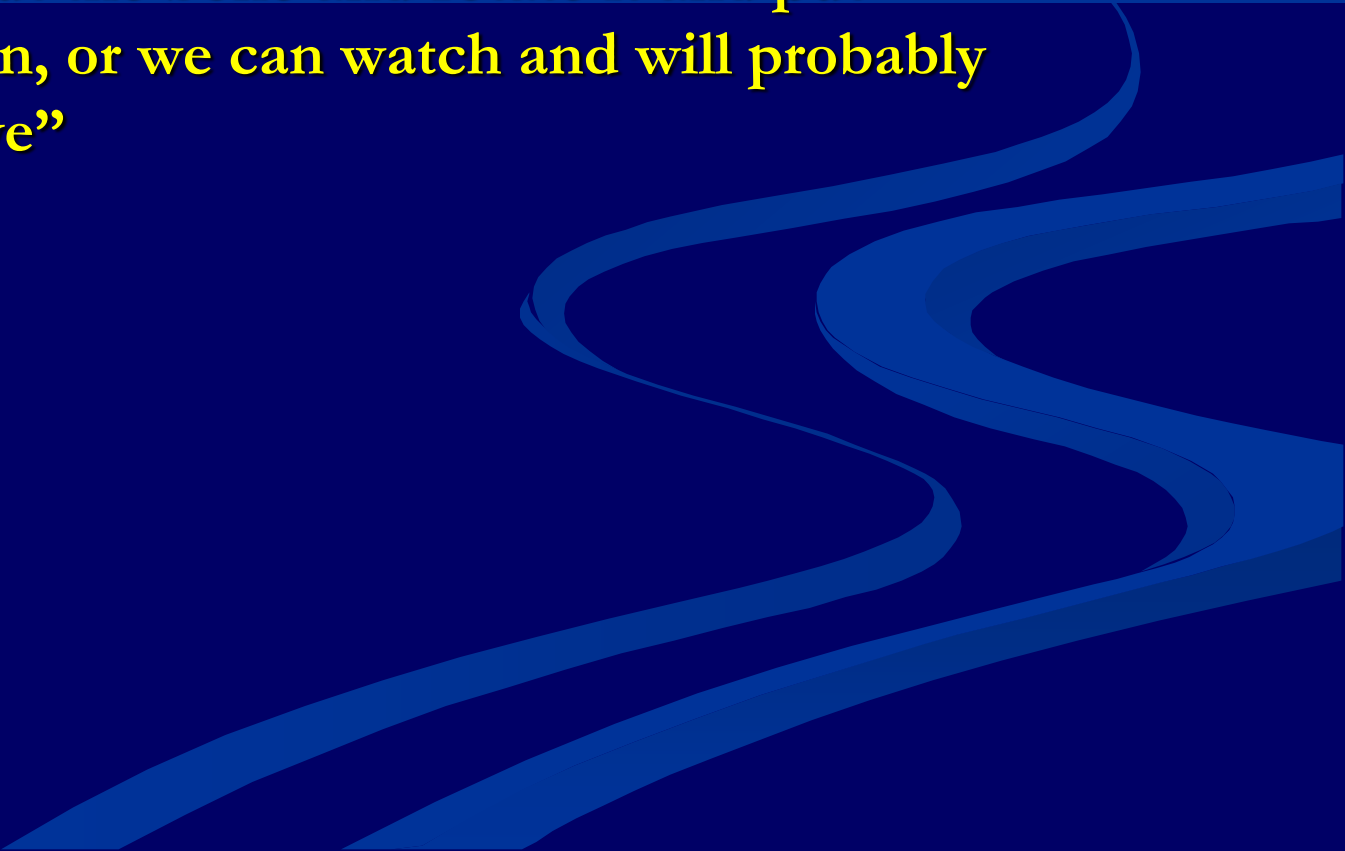
- Orthotics??
 - Only in the painful child



“The Introer”



The Introer

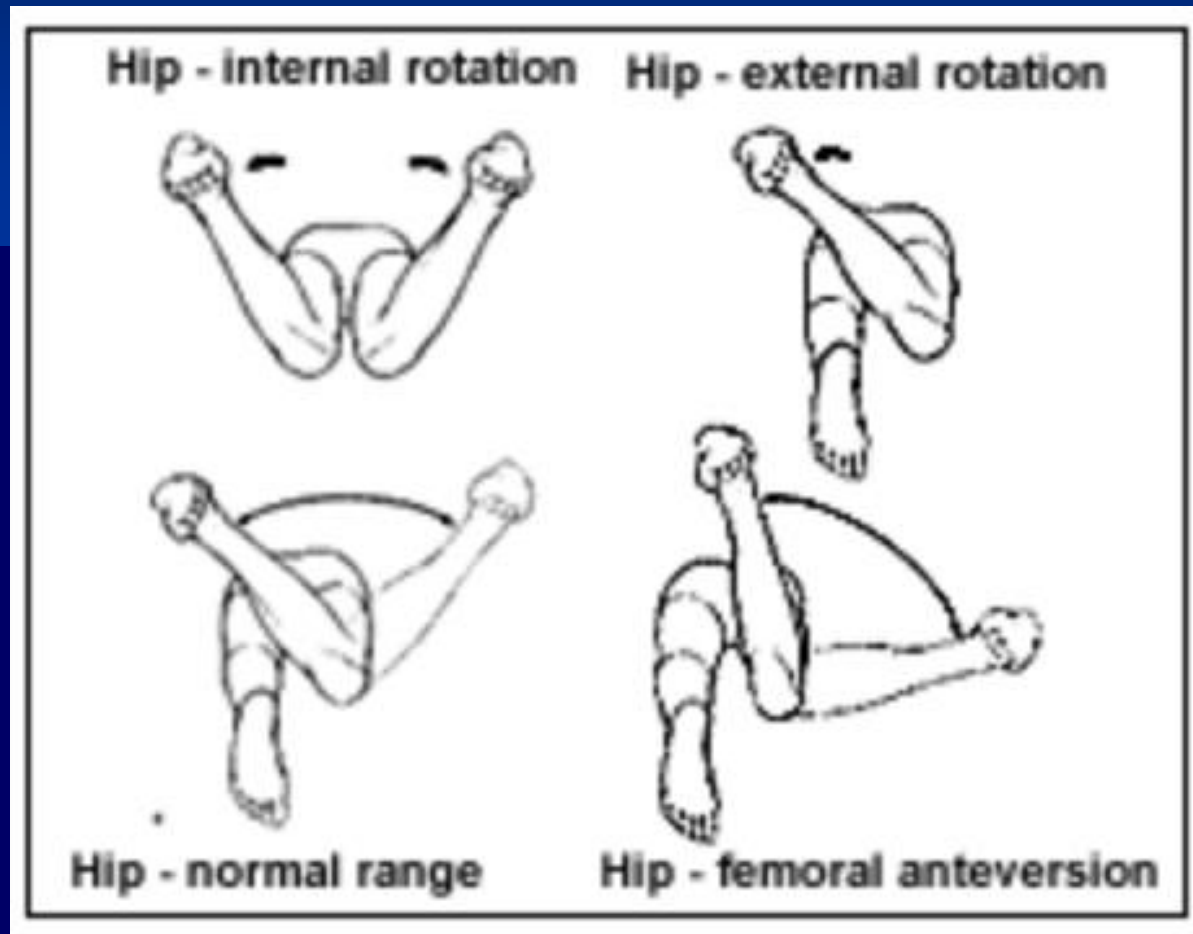
- Most important part of treatment???
 - Acknowledge there is intoeing
 - “We can cut the bone and rotate it and put hardware in, or we can watch and will probably fully resolve”
- 

The Intoer

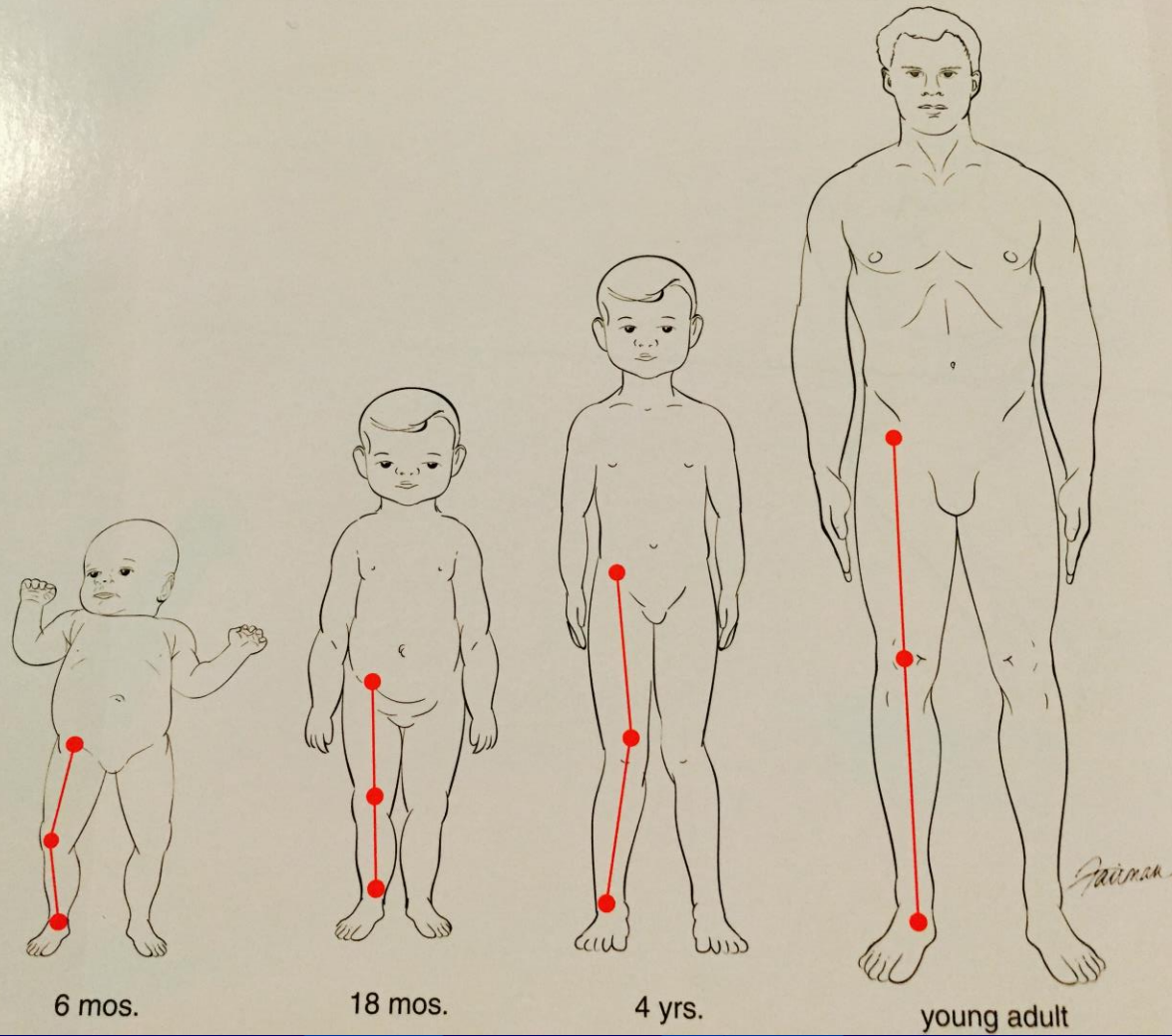
- Evaluate patient with knees pointing forward
- Most of the problem comes from tibial torsion



Rotational Alignment



Bow legged



Questions?

