Youth and Adolescent Sports: Benefits, Risks, and Injury Management

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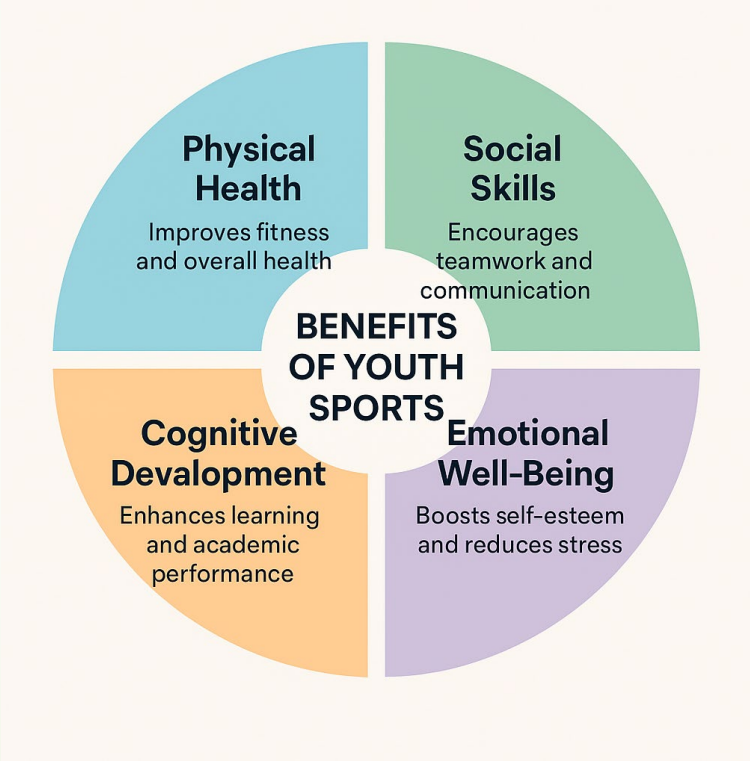
Definition and Types of Children's Sports

- Recreational and competitive sports
- Individual and team sports
- "The importance of sports in child development; increasing participation; significance of injuries."
- "Sports offer tremendous benefits, but the injury risks for a growing body are unique."

Benefits of Sports – Physical Health

- Improved cardiovascular condition, strength, coordination.
- Prevention of obesity: recommended 60 minutes of activity per day.



Benefits of Sports – Mental and Social Health

- Reduction in anxiety and depression; increased self-confidence.
- Team spirit, discipline, social skills.

Epidemiology of Childhood Sports Injuries

- 30–40% of injuries are sports-related.
- Peak age: 11–18 years.
- High-risk sports: football (soccer), gymnastics, basketball.

Why Are Children More Susceptible to Injuries?

- Immature skeletal structure (growth plates).
- Muscle imbalances, ligament laxity.
- Rapid growth phases increase risk.

Why Is Children's Sports Medicine Important?

- The role of physical activity in children's development
- Health benefits (cardiovascular system, metabolism, mental health)
- Sports and chronic disease prevention
- Physiological characteristics of children in sports

Impact of Growth and Development on Physical Performance

- Muscle and bone development
- Cardiovascular adaptation
- Respiratory system characteristics

Energy Utilization and Nutrition in Children

- Macronutrient requirements
- Importance of hydration
- Sports nutrition and dietary supplements

Physiological Differences Between Children and Adults in Sports

- Thermoregulation
- Anaerobic and aerobic capacity
- Differences in thermoregulation stem from physiological development; adults are more efficient at handling temperature changes, whereas children are still developing this ability. In terms of anaerobic capacity, child athletes generally perform lower than adults due to their developmental stage and lack of physiological maturity.

Injury Prevention and Health Risks in Children's Sports

- Most common sports injuries in childhood:
  - Muscle and joint injuries
  - Overuse injuries (e.g., growth plate injuries)
  - Concussions and the use of protective headgear

Injury Prevention and Rehabilitation

- Importance of warm-up and stretching
- Balanced training programs
- Role of recovery and rest

Specific Health Risks

- Mental burdens on young athletes
- Overtraining and burnout
- Hormonal changes and risks of early specialization

Chronic diseases and sports:

- Asthma, diabetes, epilepsy
- Special recommendations for affected children

Sports Injuries in Childhood

- General considerations:
  - Recent American studies show that 40% of emergency treatments for children aged 5–14 are sports-related.
  - Childhood sports injuries often have more severe consequences than those in adults, including growth and developmental disorders, bad habits, or future health issues.
  - The most common childhood sports injuries fall into two categories: acute injuries and overuse injuries.

Anatomical and Physiological Differences Between Child and Adult Bones

- Children's bones have higher fluid content and less mineral content.
- Thicker periosteum in children.
- Greater blood supply to bones.
- Growth plates.
- Cartilage structures are weaker than bones.
- Tendons are functionally stronger than bones in children, leading to more frequent fractures.

Overuse Injuries (Resulting from Repetitive Movements)

- Tendinitis – caused by excessive strain on tendons.
- Periostitis – common in runners and jumpers.
- Stress fractures – micro-cracks in the bone due to prolonged strain.
- Osgood-Schlatter disease – inflammation of the patellar tendon (common in young athletes).
- Sever's disease – inflammation of the heel growth plate, typically found in soccer players and gymnasts.

Head Injuries and Concussions

- Minor head injuries – caused by impact or falls.
- Concussions – may be accompanied by loss of consciousness; proper rest is essential.

Skin Injuries

- Abrasions – results of falls or slides.
- Cuts, wounds – caused by sharp objects or collisions.
- Blisters – due to repetitive friction, e.g., from running or shoe rubbing.

Low-Risk Injuries – Heal Well with Conservative Treatment (e.g., rest, reduced strain)

- Medial shin
- Fibula
- Lower femur
- Certain parts of the pelvis (e.g., pubic bone)

High-Risk Injuries – High Probability of Improper Healing or Complications, Often Requiring Surgery

- Anterior tibia
- Femoral neck
- 5th metatarsal
- Hip bone (around the acetabulum)

Injury Types by Location

- **Foot and Ankle**:
  - Metatarsal fractures – particularly in the 2nd and 3rd metatarsals in long-distance runners.
  - Heel bone (calcaneus) – common in jumping sports.
  - Around the ankle – occurs in sprinters and dancers.
- **Lower Leg**:
  - Tibia and fibula – common in runners and gymnasts.
- **Thigh and Hip**:
  - Femoral neck stress fractures – observed in long-distance runners, military trainees.
  - Pelvic bones (e.g., pubic bone, ischium) – frequent in long jumpers, sprinters.
- **Spine**:
  - Vertebral stress fractures, spondylolysis – common in gymnasts, weightlifters.

Primary On-Field Injury Care

- **Safety and Situation Assessment**:
  - Ensure that neither the injured person nor the responder is at risk.
  - Assess injury severity (loss of consciousness, severe pain, deformity, etc.).
  - Call for emergency assistance if needed (e.g., severe fracture, unconsciousness, severe head or spinal injury).

PRICE Protocol (For Acute Injuries):

- **P** (Protection) → Avoid further strain on the injured area.
- **R** (Rest) → Immediately stop sports activities.
- **I** (Ice) → Apply ice for 15–20 minutes (not directly on the skin).
- **C** (Compression) → Use an elastic bandage for mild pressure to reduce swelling.
- **E** (Elevation) → Elevate the injured limb above heart level to reduce swelling.

Performance-Enhancing Sports Nutrition and Doping in Children's Sports

- **Doping Includes**:
  - Use of prohibited substances (e.g., anabolic steroids, growth hormones, stimulants).
  - Application of banned methods (e.g., blood doping, gene manipulation).
  - Unauthorized use of medications for performance enhancement.

Sports Nutrition for Performance Enhancement:

- Essential nutrients: proteins, carbohydrates, healthy fats, vitamins, minerals.
- Importance of hydration: replenishing water and electrolytes.
- Sample diet plan for a young athlete.

Prevention and Awareness

- Role of parents and coaches in educating children.
- Importance of fair competition and ethical standards.
- Role of official controls and anti-doping organizations.

Considered doping:

- ✓ Use of prohibited substances (e.g., anabolic steroids, growth hormones, stimulants). • ✓ Use of prohibited methods (e.g., blood doping, gene manipulation). •
- ✓ Taking unauthorized drugs for performance enhancement purposes.
- The WADA (World Anti-Doping Agency) updates the list of prohibited substances and methods annually, which every athlete must adhere to.
- In youth and amateur sports, doping is particularly dangerous because it can harm the developing body and lead to long-term health issues.

Paediatric sport injuries

Outline

- - Background
- - Cases & presentations of common pediatric sports medicine injuries
- - Physical exam findings
- - Imaging
- - Treatment
- - Prevention

Anatomical and physiological differencies n ypong athlete sjkeletals

- Different of musculosceletal system
- Pediatric bone has a higher water content and lower mineral content
- Thick periosteum in children
- Rich blood supply in children
- The physis (growth plate)
- Cartilagenous structure is weaker than bone
- Lighamets in children is funcionally stronger than bone therefore chodren are most likely has a fracture

Pediatric Sports Medicine

- - Estimated that over 30-45 million children ages 6-18 participate in athletics annually
- - Nearly ¾ of US households have at least one child that participates in organized sports
- - Sports participation is more accessible with increased variety
  - Increasing sports specialization
  - More year round and concurrent sports
- - Drive for success, college scholarships, going professional
  - NCAA stats demonstrate that less than 0.5-1.6% of high school athletes will earn partial scholarships to D1 schools
  - 1% of college athletes go professional

Pediatric Sports Medicine

- - Over ½ of children under age 14 who seek medical care for injuries are due to overuse injuries
  - Most common injuries
    - Sprains, strains, bone or growth plate injuries, repetitive motion and overuse injuries, heat related illness
  - 62% of injuries occur during practice

- - Over 1 in 10 will have an emergency room visit for a sports related injury

Case 1

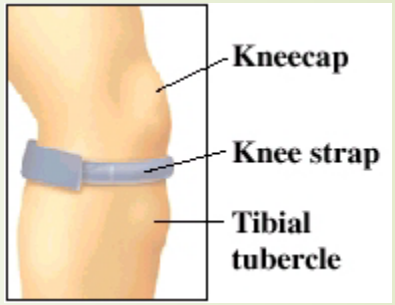
- - 16 year old male with L knee pain x 1 year
- - Pain is located over anterior knee
- - Hurts more with running, jumping, squatting
- - Front of knee seems swollen at the area of pain

Tibial Tubercle Apophysitis (Osgood Schlatter)

- - Cases & Common Presentations
  - Ages 11-15 years old
  - Males>females
  - Occurs with running, jumping or increase in physical activity
  - Worsens if hits/bangs/falls on tender area
- - Physical exam
  - Tenderness on palpation of tibial tubercle
  - May have prominence/swollen appearance of tibial tubercle

Osgood Schlatter

- - Imaging
  - Xrays demonstrate an open tibi
  - Xrays are not necessary
    - Help to exclude tibial tubercle ction
- - Treatment
  - Rest, activity modification
  - Ice
  - Patellar tendon strap
  - Increase flexibility of hamstrings & quadriceps
  - Closure of apophysis



Case 2

- - 10 year old female with anterior knee pain x 2 weeks
- - Pain occurs with running, kneeling, climbing
- - Pain is located at inferior aspect of patella (superior to tender area in Osgood Schlatter)

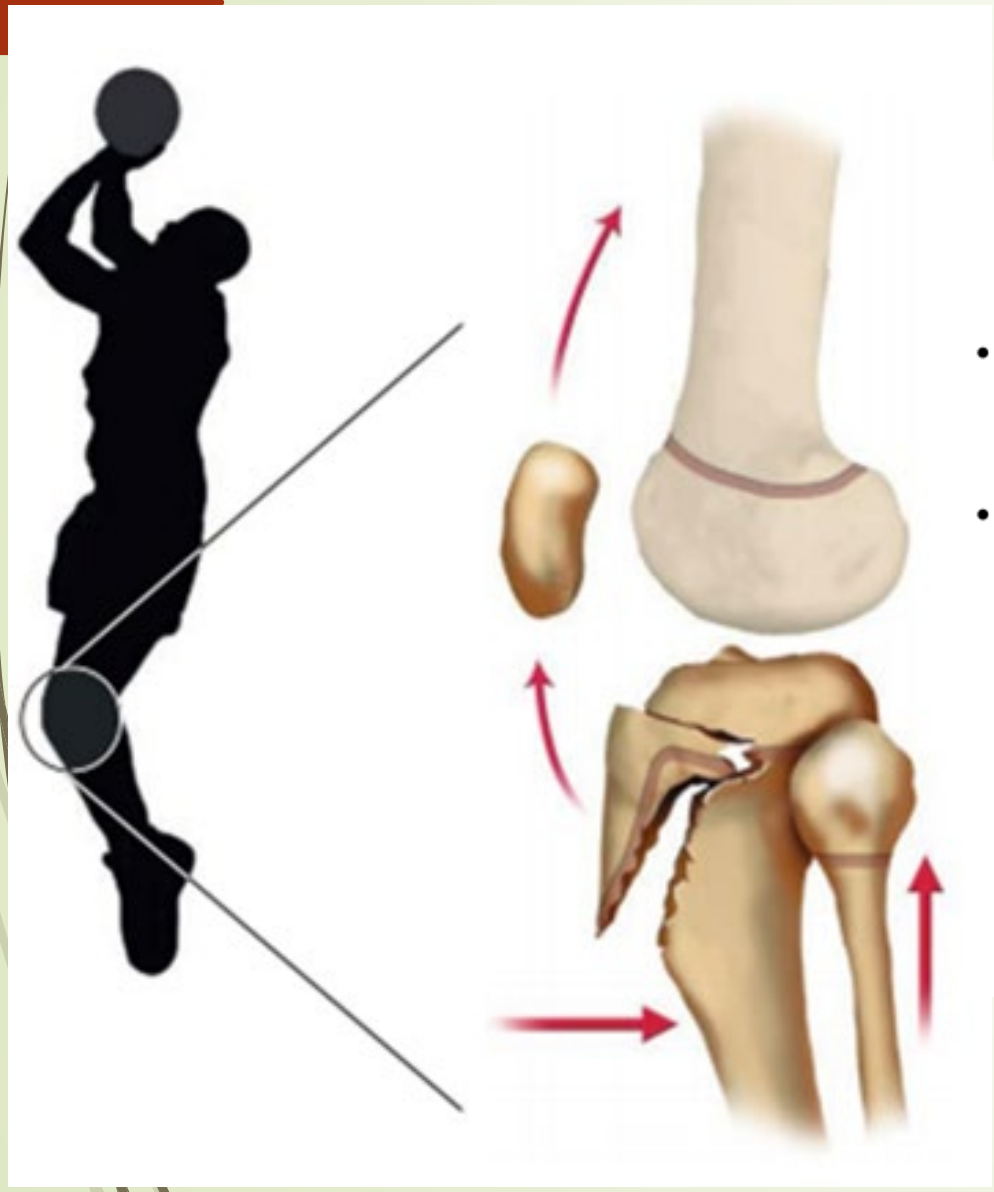
Patellar Apophysitis (Sinding Larsen Johanssen)

- - Cases & Common Presentations
  - Ages 10-13 years old
  - Pain present/worse with running, jumping, climbing, kneeling
- - Physical Exam
  - Tenderness over inferior pole of the patella
- - Imaging
  - X-rays not necessary
  - May demonstrate irregular calcification at inferior pole of the patella

Patellar Apophysitis (Sinding Larsen Johanssen)

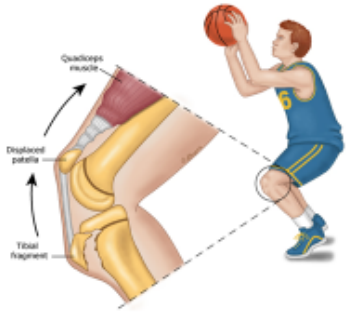
- - Treatment
  - Same as for Osgood Schlatter
  - Rest/activity modification
  - Ice
  - Patellar tendon strap
  - Flexibility of hamstrings & quadriceps
  - Time to close growth plate
- - Prevention?
  - Good flexibility
  - Gradual increase in activity

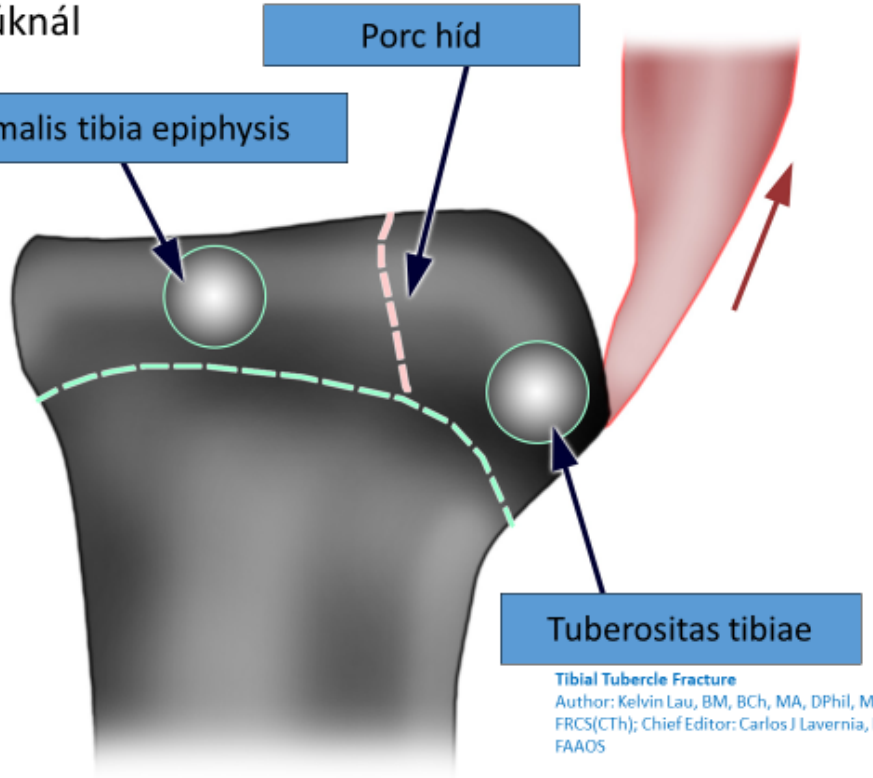
Tibial tuberosity fracture, mechanism



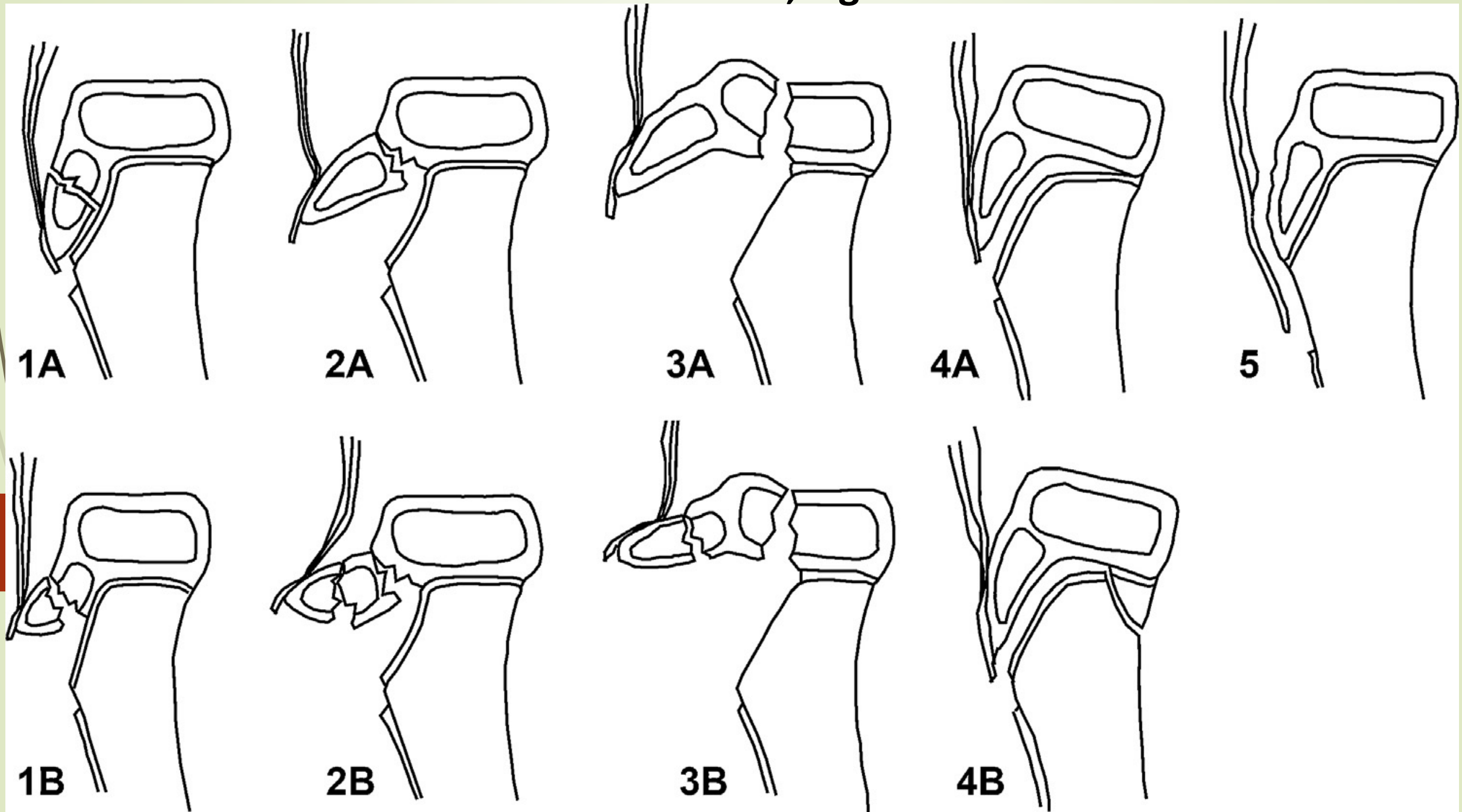
Serdülő (13-17év) sportolók fiúknál

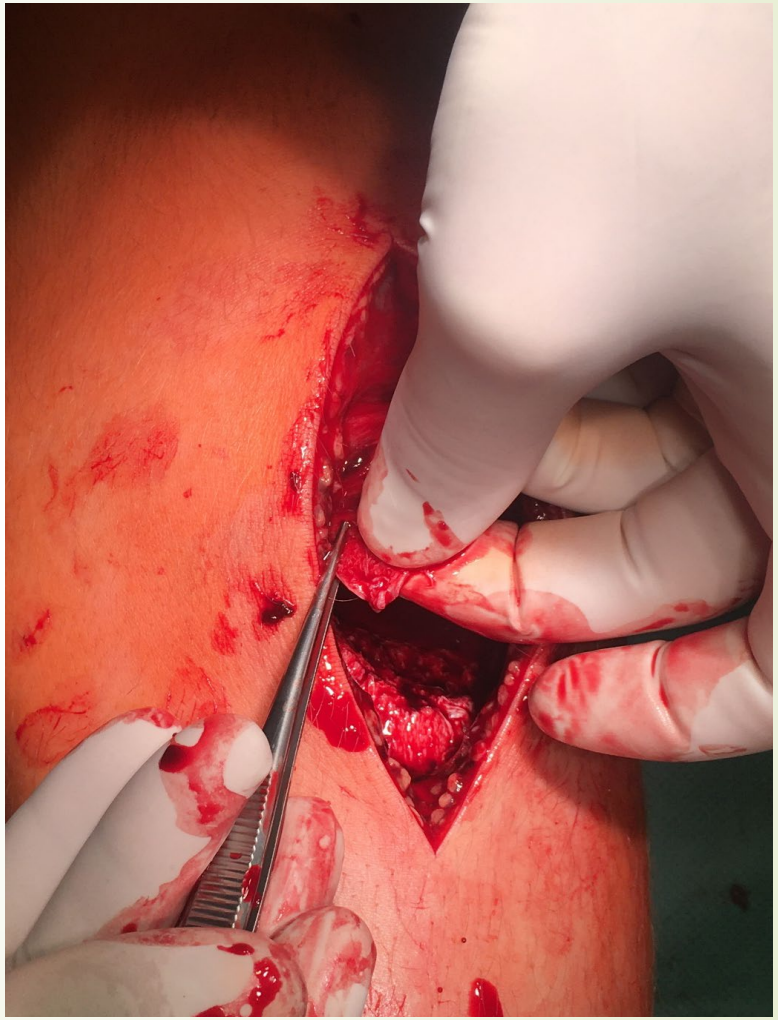
- A porc ellenállása a húzóerővel szemben kicsi
- Túlfejlett quadriceps izomzat az elrugaszkodás pillanatában kiszakítja a tuberositas tibiaet

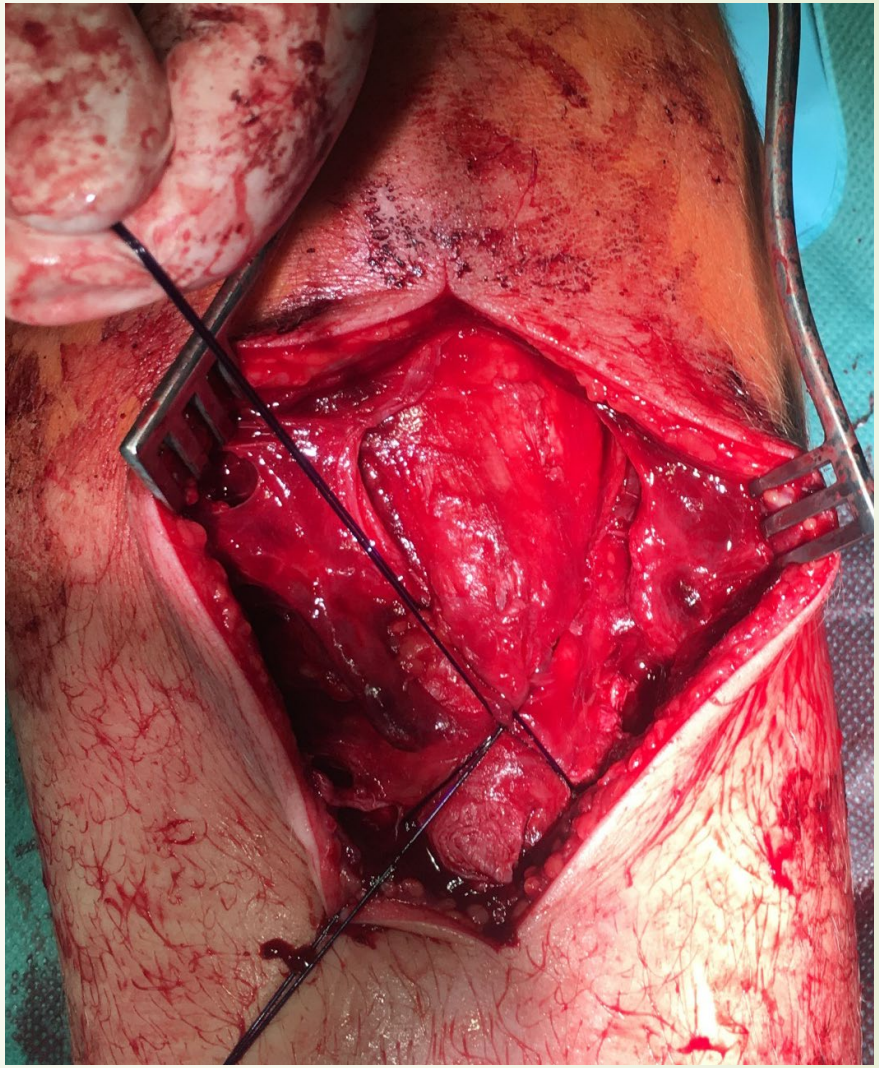


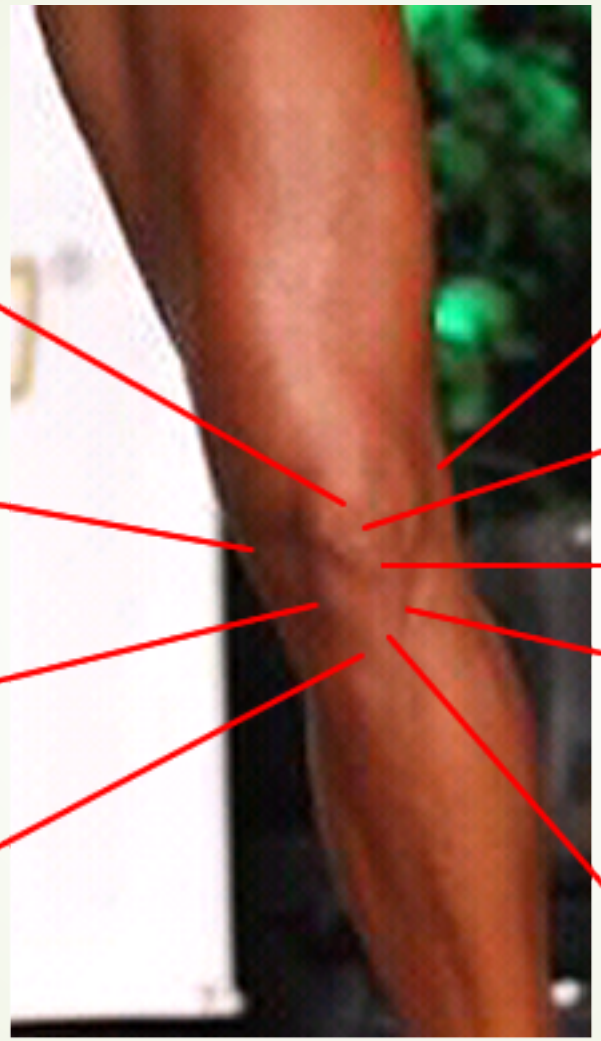


Modified classification of Watson–Jones, Ogden et al.

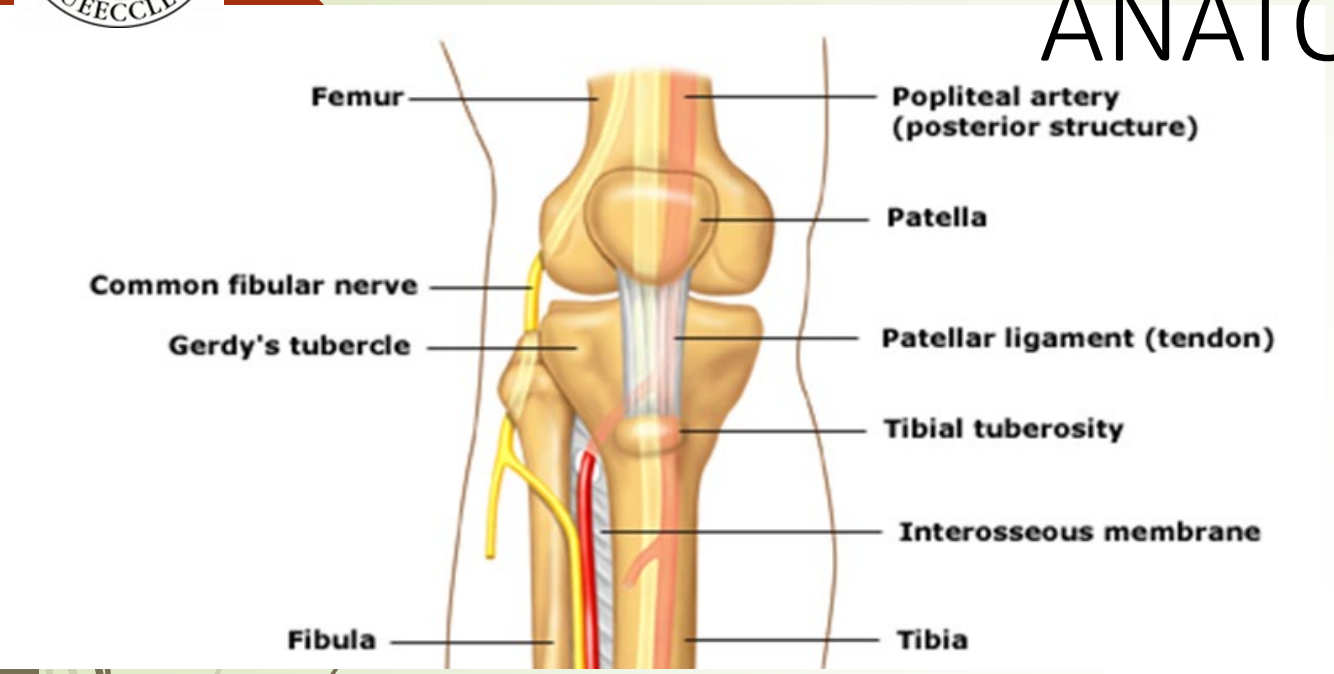


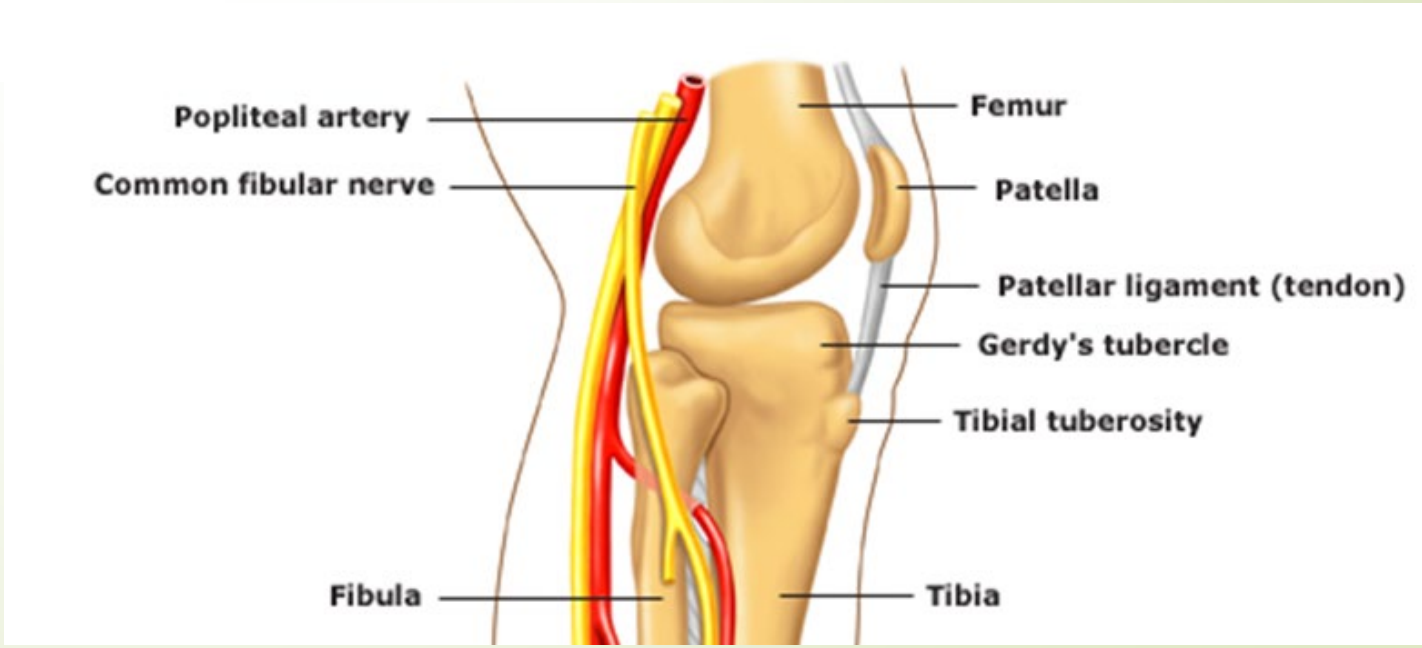





Patellofemoral Pain
Medial Collateral Ligament
Meniscal Injury
Osgood-Schlatter's Lesion
Lateral Collateral Ligament
Fracture of the Patella
Sinding-Larsen-Johansson
Fat Pad Impingement
Patellar Tendinopathy

ANATOMY


Femur
Popliteal artery
(posterior structure)
Patella
Common fibular nerve
Gerdy's tubercle
Patellar ligament (tendon)
Tibial tuberosity
Interosseous membrane
Fibula
Tibia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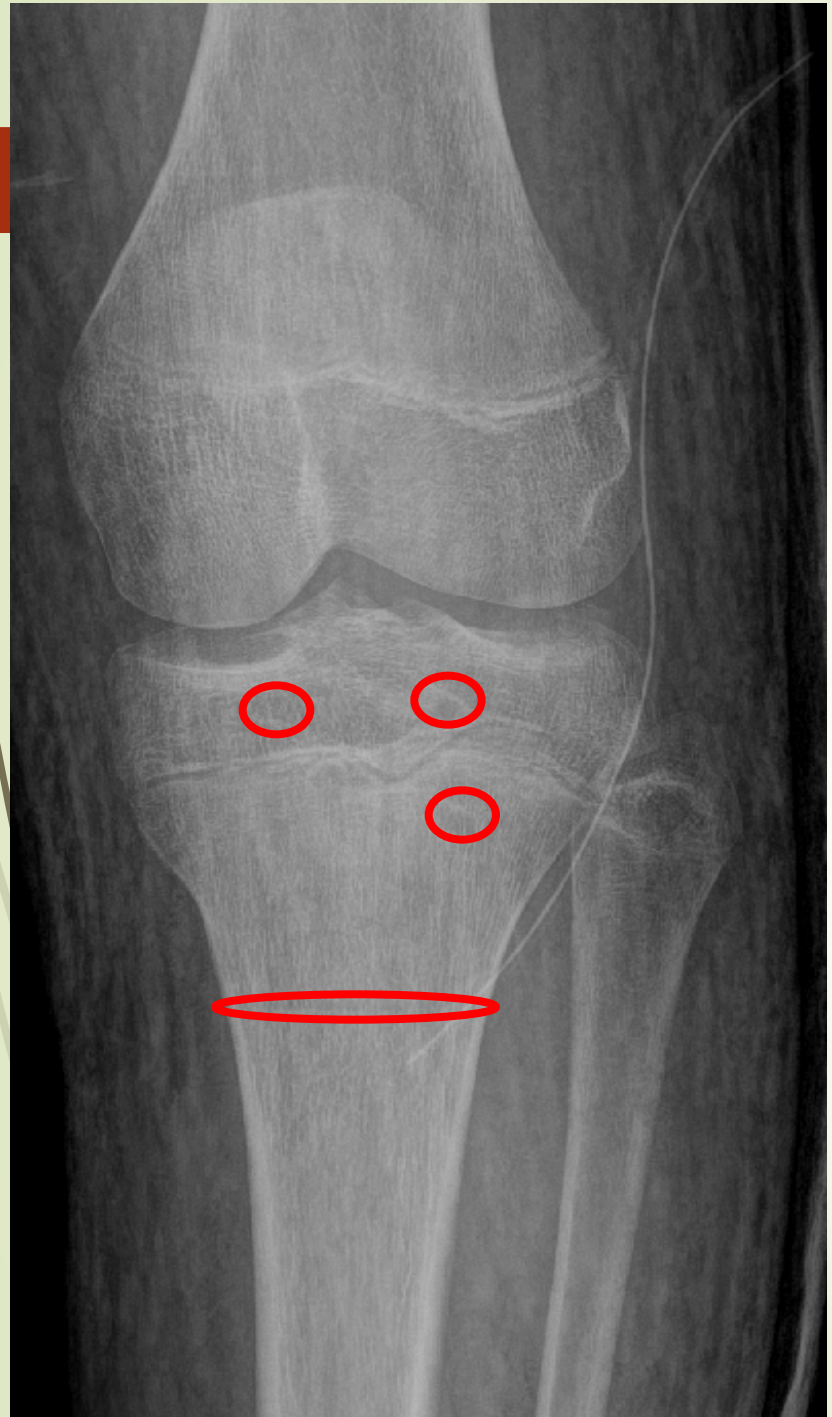

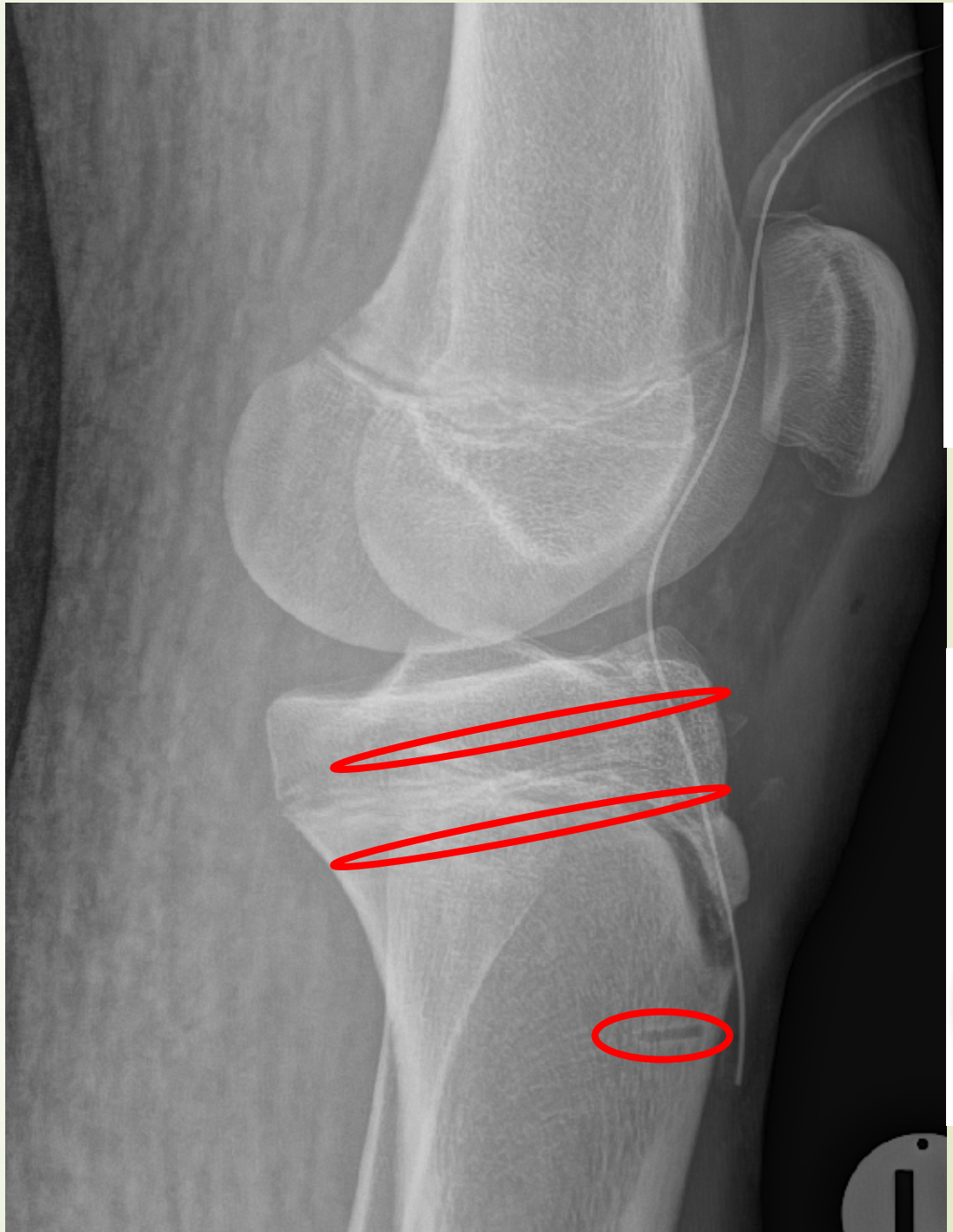


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36" (90 cm)
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PDS*II
(Polydioxanone) Suture
VIOLET MONOFILAMENT
CT-1
ETHICON

Pts	Kor (év)	Nem	Watson-Jones szerinti beosztás	Érintett oldal	Terápia	Funkció (fok)	Nyomonkövetés (hónap)
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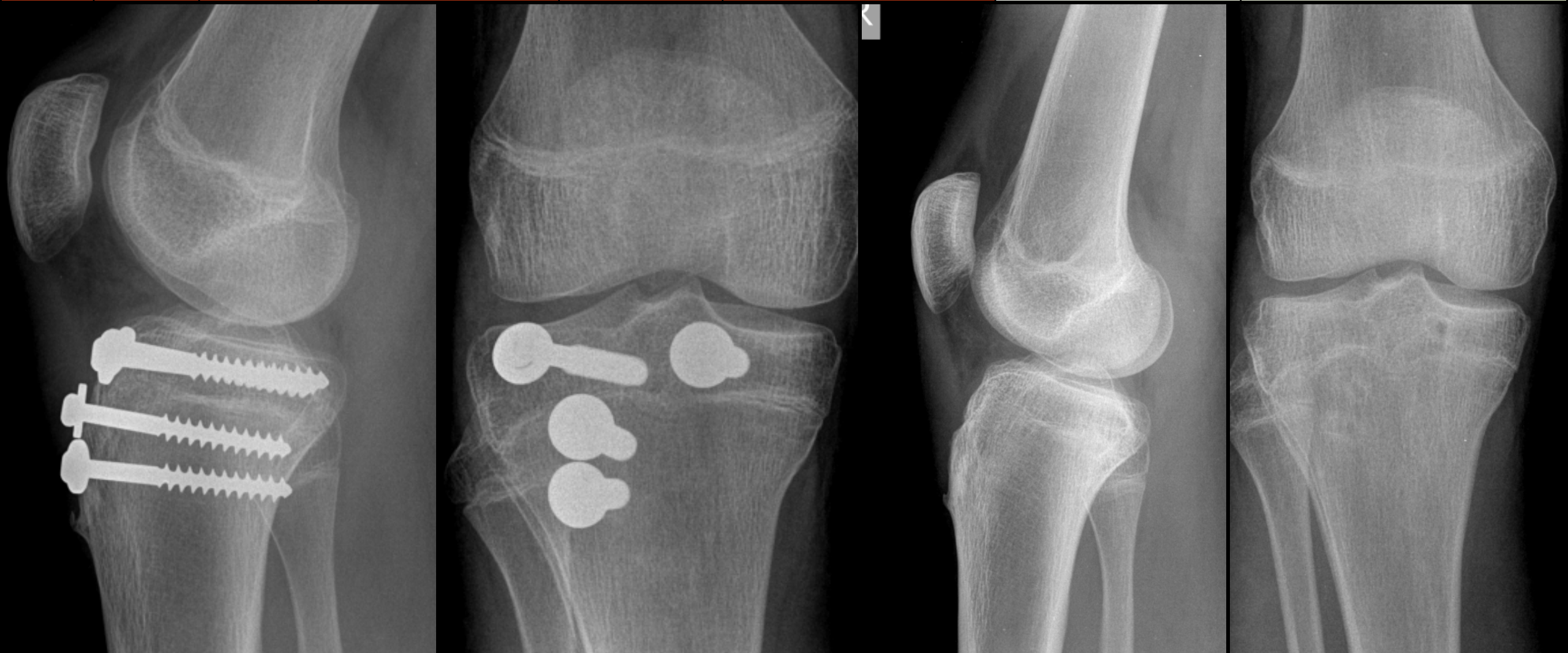
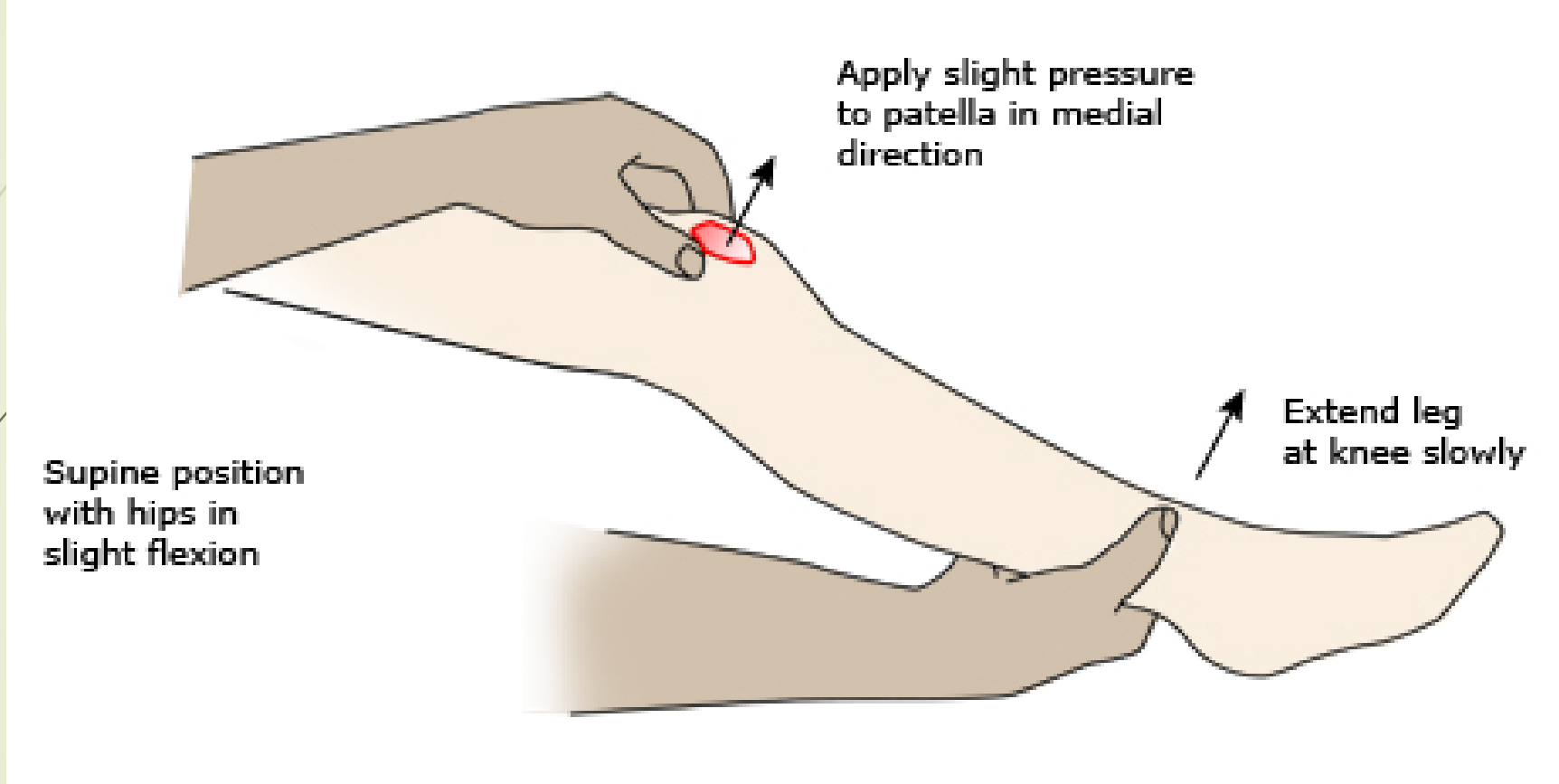
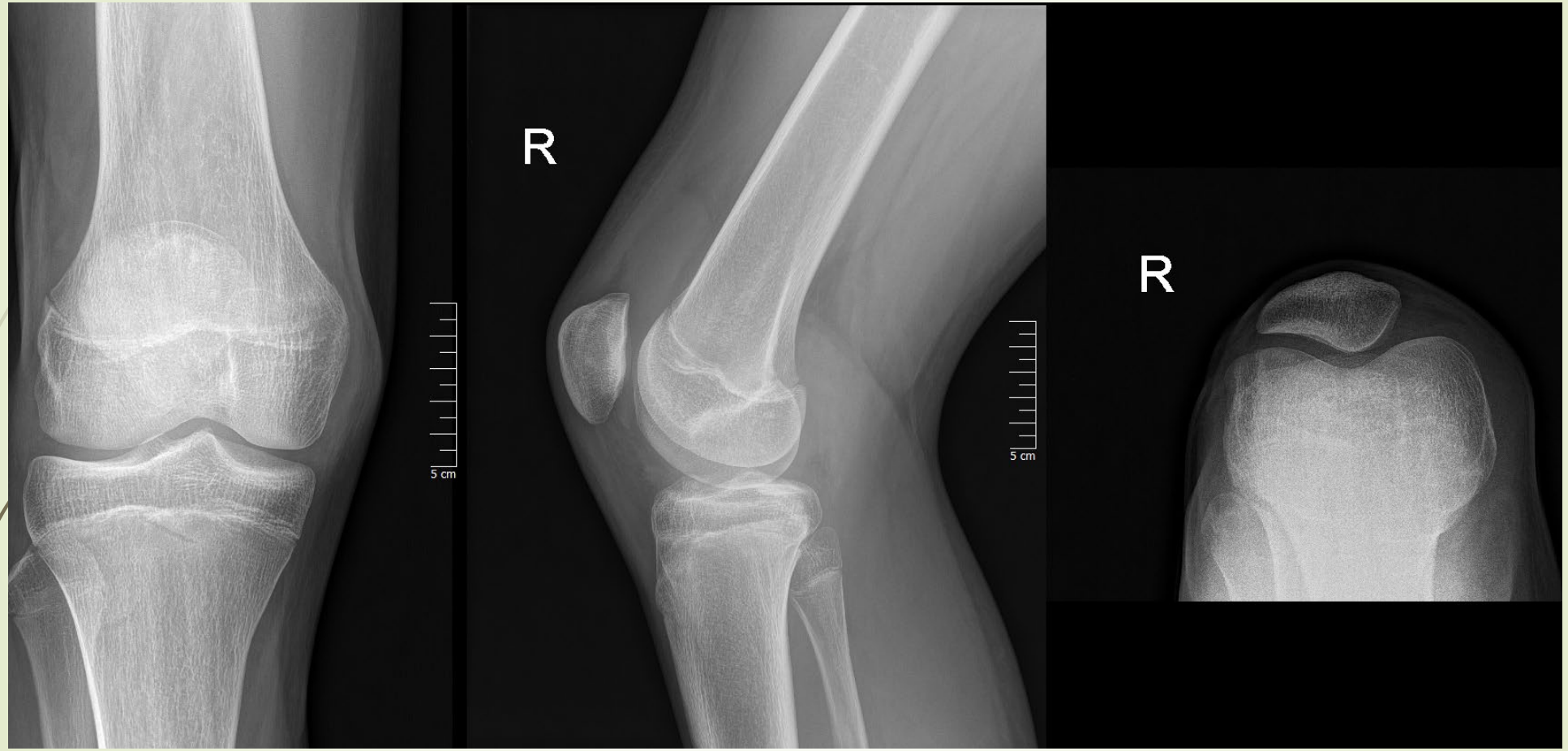


Patellar luxation


R


Apply slight pressure
to patella in medial
direction
Extend leg
at knee slowly
Supine position
with hips in
slight flexion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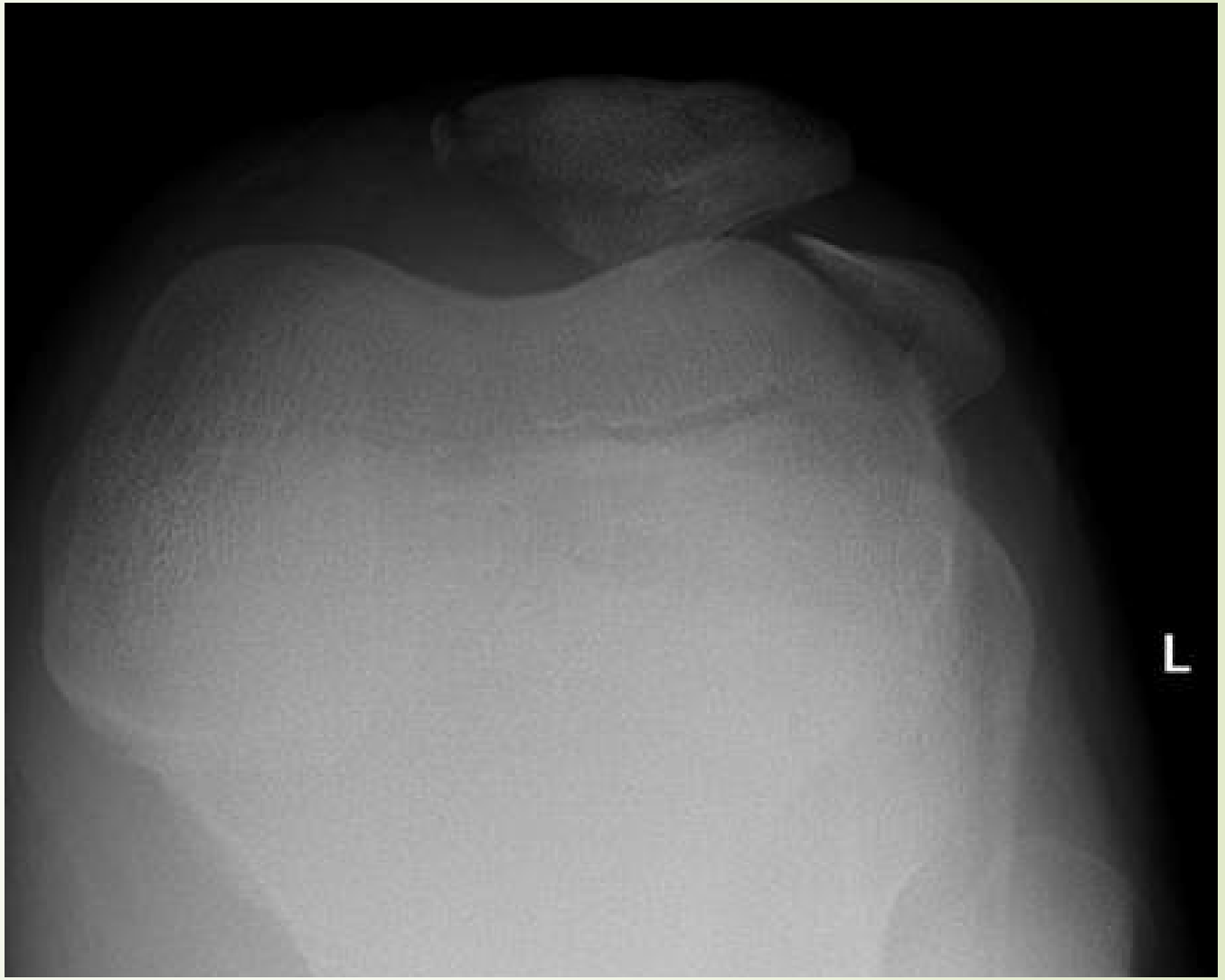
Osteochondral fracture of Patella


L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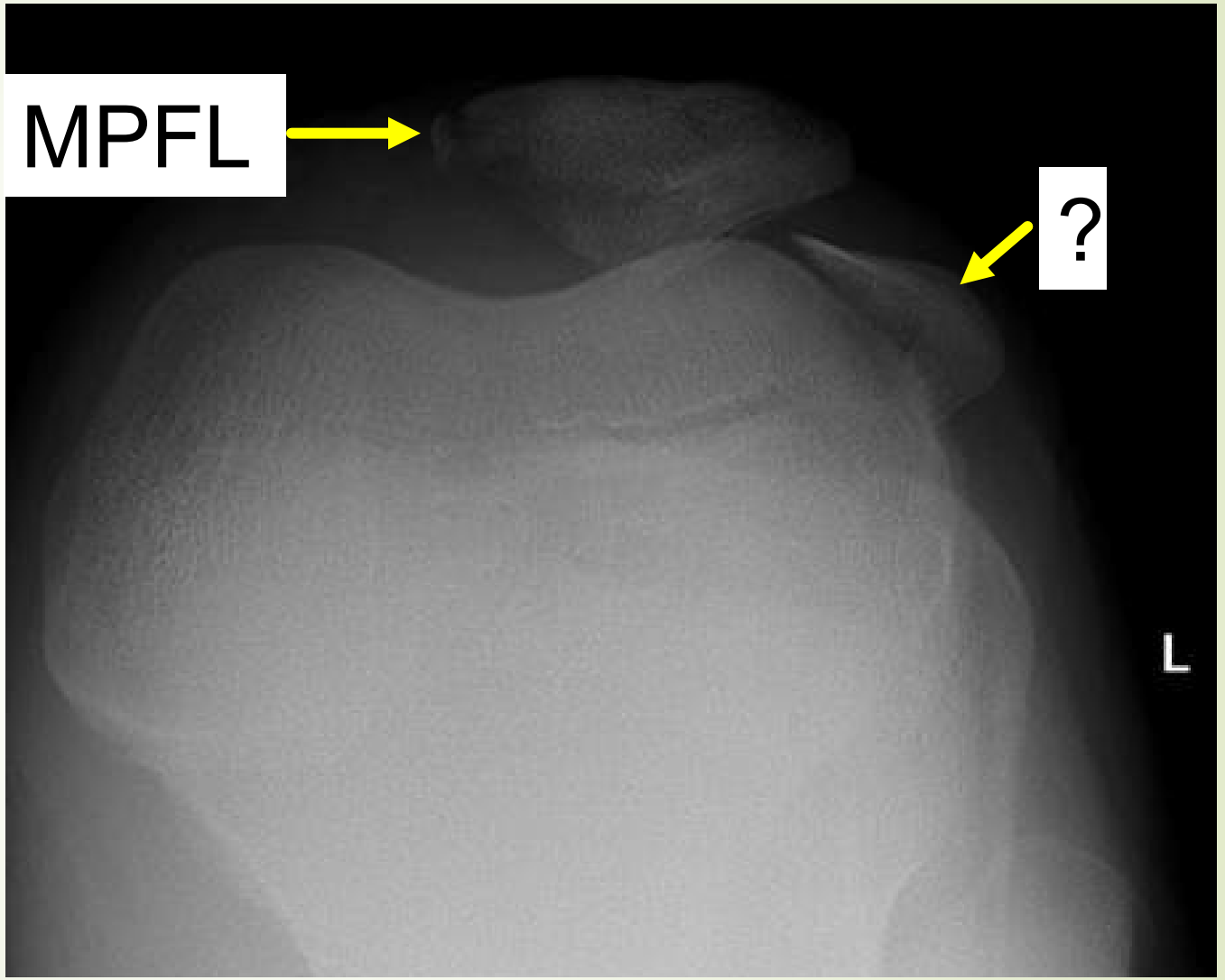

MPFL
?
L

Case 3

- - 8 year old male soccer player with bilateral heel pain
- - Has been present for 2 years and is getting worse
- - Occurs with activity and patient will limp at the end of the game

Calcaneal Apophysitis (Sever's Disease)

- - Cases & Common Presentations
  - Ages 8-15
  - Can be unilateral or bilateral
  - Usually occurs after physical activity but as worsens will occur during physical activity and at rest
  - May cause limping
  - Most common in running and high impact activities
  - Worse with cleats, flat feet
  - Pain at insertion of Achilles tendon and plantar fascia

Calcaneal apophysitis

- - Physical Exam
  - Tenderness on palpation of medial & lateral aspect of calcaneus
  - + Calcaneal squeeze
  - May have tight calves, flat feet
- - Imaging
  - Clinical diagnosis
  - Xrays demonstrate open physis
    - Often look irregular

Calcaneal apophysitis

- - Treatment
  - Rest/activity modification
  - Ice
  - Heel cups
    - Cushion, 3/8" heel lift
  - Insert for arch support
    - May build up back to lift heel
  - Activity as tolerated, no limping allowed
- - Prevention
  - Achilles flexibility
  - Arch support

Case 4

- - 12 year old male football player who sprained his ankle during practice
- - Wasn't able to walk off the field
- - Has bruising and swelling of ankle
- - Pain with weightbearing
- - Pain mainly located over lateral ankle and tenderness on palpation of distal fibula

Salter Harris 1. Fracture of Distal Fibula

- - Cases & Common Presentations
  - Usually inversion ankle injury
  - Swelling
  - May have pain with weightbearing
  - Ankle injury in skeletally immature patient
    - Most occur ages 8-15 years old
    - Physis is the weakest link
  - Often missed and treated as ankle sprain
- - Physical Exam
  - Tenderness on palpation of distal fibular physis (1cm above distal tip of the fibula)

Salter Harris 1 Fracture of Distal Fibula

- - Imaging
  - Obtain WEIGHTBEARING ankle xrays (AP, late
  - Xrays often normal
    - May demonstrate soft tissue swelling or wideni
    - Still treat for a SH 1 fracture if xrays normal

- - Treatment
  - Tall walking boot & weightbearing as tolerated (use crutches if still has pain while in the boot)
  - Repeat exam in 3-4 weeks
  - Refer displaced fractures to ortho

Case 5

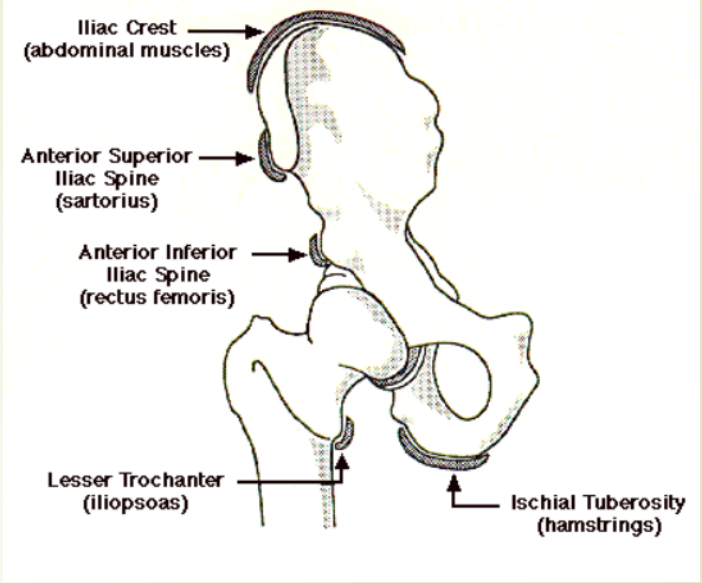
- - 15 year old male soccer player was kicking a soccer ball
- - Felt and heard a pop from his hip
- - Fell to the ground and had difficulty bearing weight
- - Has bruising and swelling of his hip
- - Tenderness on palpation of anterior hip
- - Decreased strength & flexibility

Hip Avulsion

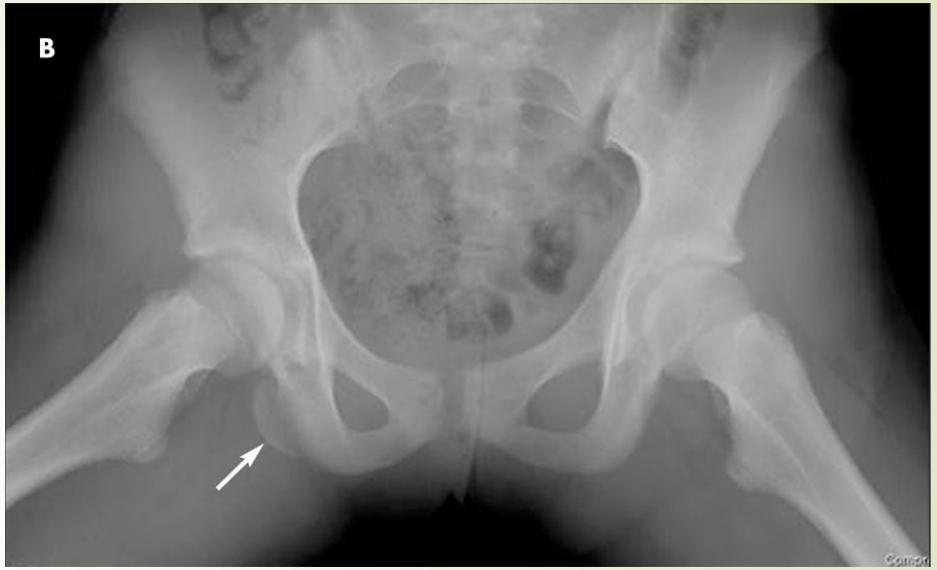
- - Cases & Common Presentations
  - Mechanism of injury is sudden forceful contraction of muscle
    - Kicking, sprinting, jumping
  - Most common at ASIS, AIIS, ischial tuberosity
  - Also can occur at iliac crest, lesser trochanter, pubic symphysis
  - Usually occurs between ages 14-18 years old

Hip Avulsion

- - Muscle attachments and mechanisms of injury
  - ASIS (Sartorius) & AIIS (Rectus femoris)
    - Kicking, coming out of starting blocks
  - Lesser trochanter (iliopsoas)
    - Sprinting, hip flexion
  - Ischial tuberosity (hamstring)
    - Hurdles, splits, high kick
  - Iliac crest (abdominal muscles)
    - Abrupt trunk rotation
    - Change of direction with running

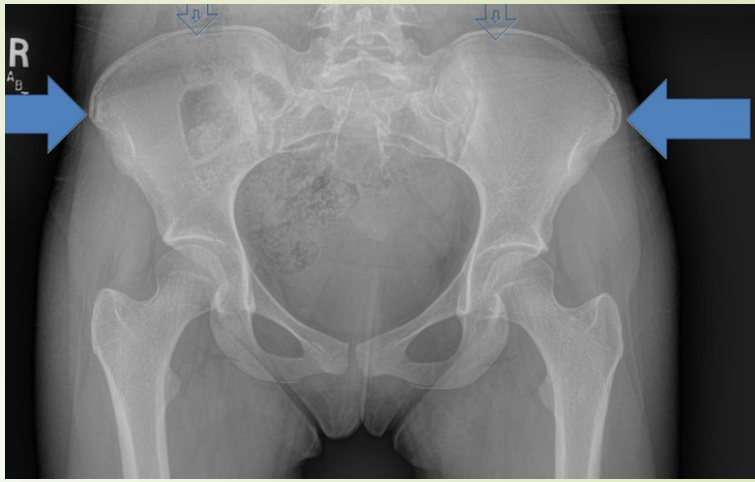


Avulsion of the Hip



- - Physical Exam
  - May have bruising & swelling
  - Tenderness on palpation over a growth plate
  - Pain with motion and manual resisted testing
  - Antalgic gait
- - Imaging
  - Xray AP pelvis & frogleg lateral
- - Treatment
  - If > 2cm displacement refer to ortho
  - Acute: rest, crutches, ice, analgesics
  - Subacute: Physical therapy-> ROM, stretching, strengthening, then gradually guide back activities

Hip Apophysitis



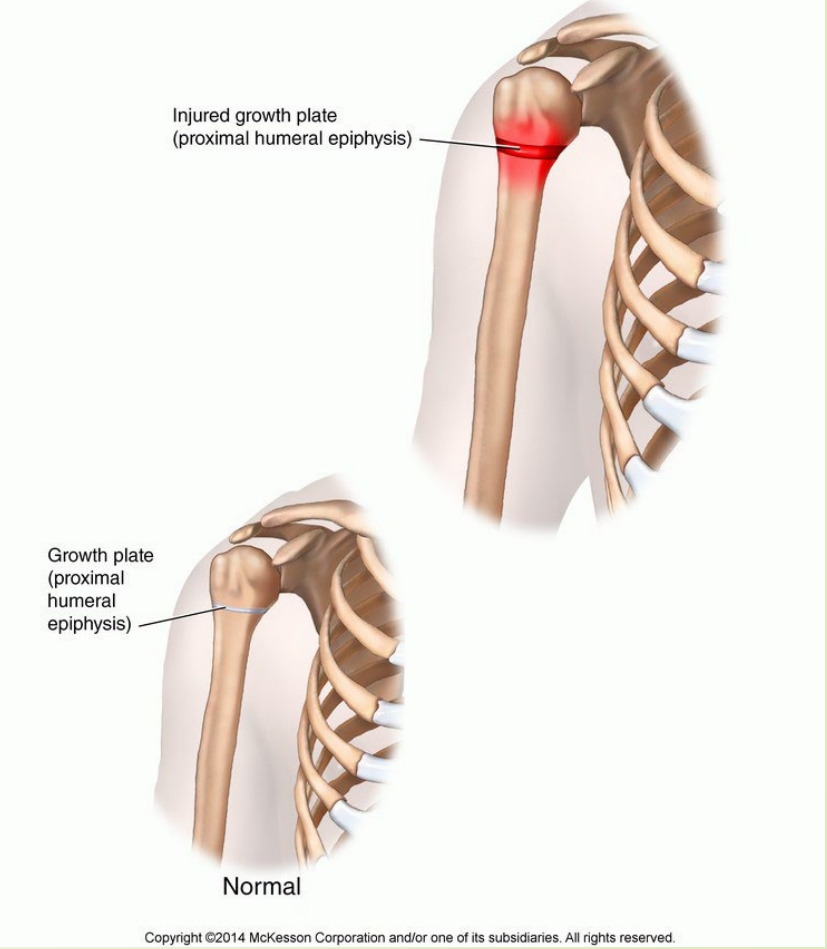
- - Common Presentations
  - Gradual onset pain of pelvis/hip without specific trauma
  - Due to chronic traction at growth plate where tendon inserts
  - Skeletally immature
- - Physical Exam
  - Tenderness on palpation at site of tendon insertion
- - Imaging
  - Xray AP pelvis & frogleg lateral often normal
- - Treatment
  - Rest x 4 weeks, physical therapy, gradual return to play

Case 6

- - 12 year old left hand dominant baseball pitcher has 2 weeks of left shoulder pain
- - Hurts when throwing, particularly if trying to throw hard
- - Has been icing and taking ibuprofen but pain is still present
- - Had pain at the end of last season that went away when the season finished

Humeral Epiphysitis (Little League Shoulder)

- - Common Presentations
  - Ages 11-16 years old
  - Mechanism of injury: Repetitive torsional stress
- - Physical Exam
  - Tenderness over proximal humerus
  - Usually will have positive impingement signs
- - Imaging
  - Xray Shoulder (AP, axillary, scapular Y views) may show widening of the proximal humeral epiphysis
- Treatment:
  - Rest & Rehabilitation: Usually 3 or more months
  - Gradual return to throwing program



Case 7

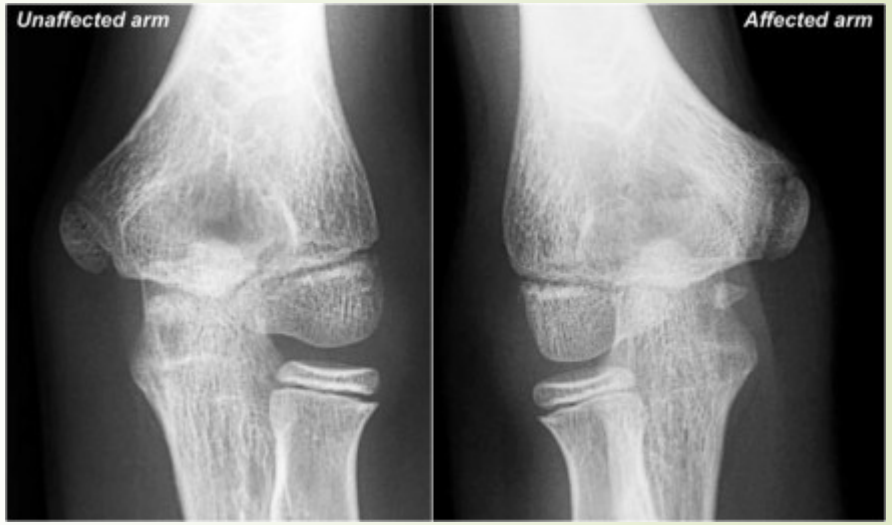
- - 12 year old right hand dominant baseball catcher with right elbow pain
- - 2 months of elbow pain that is getting worse
- - Initially was a pitcher but stopped due to pain and now catching but continues to have pain

Medial Condyle Apophysitis (Little League Elbow)

- - Common Presentations
  - 8-15 years old
  - Usually no trauma
  - May complain of weak & ineffective throws
  - Most common in pitchers, followed by catchers, 3rd base, SS, outfield
  - Mechanism of injury= repetitive valgus stress on elbow from overhead throwing
- - Physical Exam
  - Tenderness over medial epicondyle
  - Pain with resisted wrist flexion & forearm pronation

Little League Elbow

- - Imaging
  - Bilateral Elbow xrays (AP, lateral & oblique views)
  - May see widening of physis
- - Treatment
  - Rest, ice, NSAIDs, immobilization (rarely)
  - Physical therapy: ROM, strength (elbow, shoulder, trunk, lower extremity)



Upper Extremity Injury Prevention

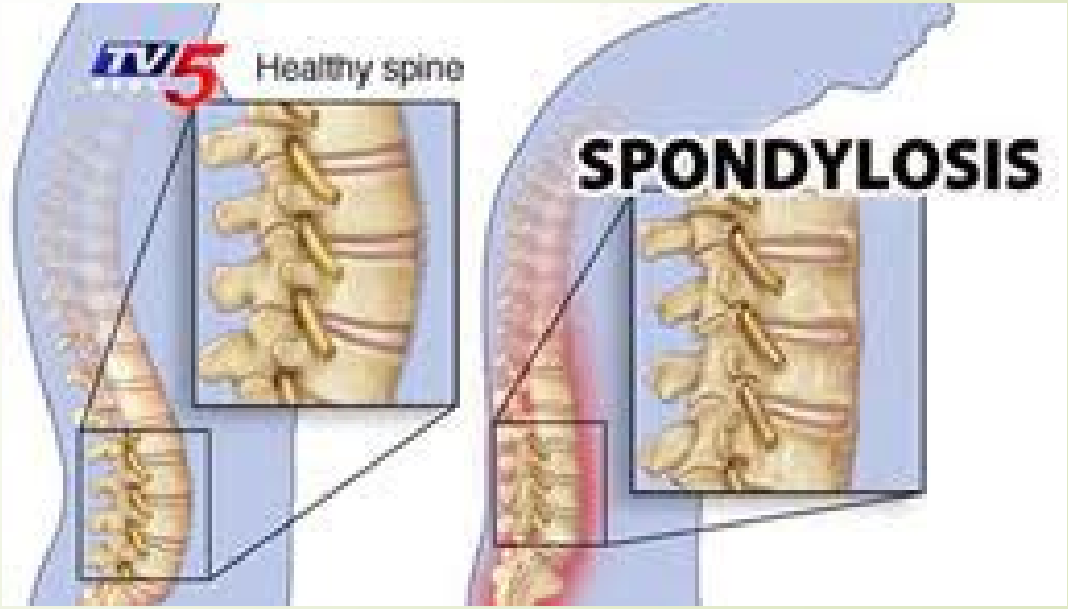
- - Prevention
  - Preseason strengthening and graded return to throwing program at least 6-8 weeks prior to 1st practice
  - Focus on scapular stabilizing, rotator cuff, hip, trunk, & lower extremity strengthening
  - Address deficits in the off season
  - Rest from overhead throwing at least 3 months out of the year
  - Follow pitch counts & rest days
    - Monitor all teams
  - Proper mechanics
    - Close attention to technique & monitored by coaches
    - No high velocity (>80mph), curve balls or sliders until skeletally mature (~14 years old)
  - Stop if having pain & get evaluated promptly

Case 8

- - 15 year old gymnast with right sided low back pain
- - Bothers her with bending forward but worsens with backward bending
- - Improves with rest

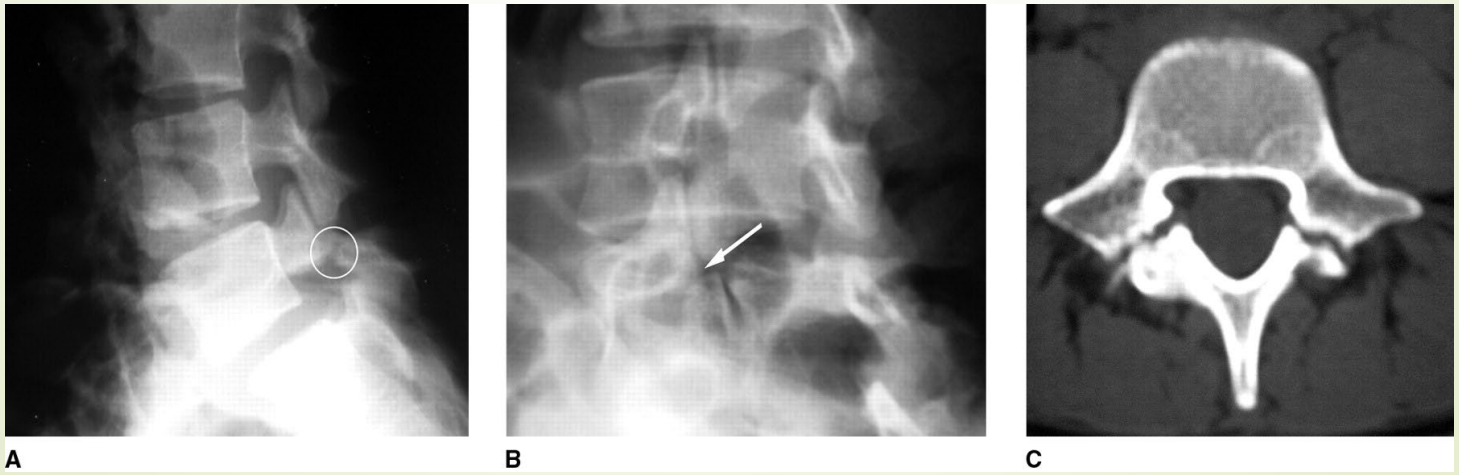
Spondylolysis (Stress fracture of pars interarticularis)

- - Common presentation
  - Athletes with repetitive extension or rotation of spine
    - Gymnasts, dancers, figure skating, football linemen, rowing
  - Risk factors are family history and spina bifida
  - Most common at L5 followed by L4
    - May be seen in higher lumbar vertebrae but much less frequent
- - Physical Exam
  - Midline tenderness
  - Pain with lumbar extension
  - Positive stork test
  - Tight hamstrings

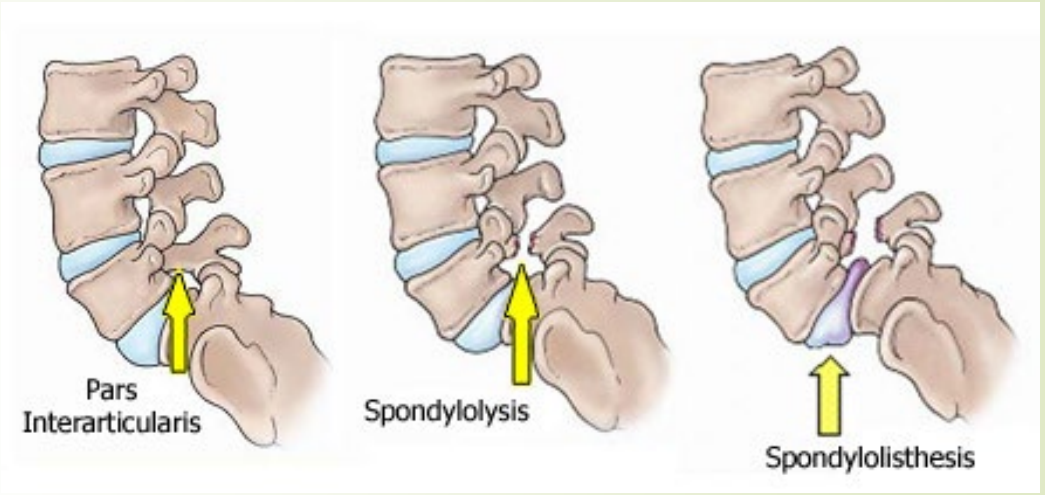


Spondylolysis

- - Imaging
  - Xrays AP and lateral lumbar spine
    - No obliques
  - MRI/CT lumbar spine
    - Determine what is best at your facility & be sure to talk with radiology



Spondylolysis



- - Treatment
  - Rest
    - Bracing controversial
  - Physical therapy
    - Avoid extension
    - Core strength, lower extremity flexibility
- - Complications
  - Spondylolithesis: subluxation of upper vertebrae of lower vertebrae at site of bilateral spondylolysis
  - Chronic low back pain
  - Neurologic symptoms
  - Surgery for worsening spondylolithesis and chronic symptoms

Thank You