

Review of Common Pediatric Orthopaedic Problems for the Non-Orthopaedic Provider

Thomas V Gocke, MS, ATC, PA-C, DFAAPA
President & Founder
Orthopaedic Educational Services, Inc.
Blowing Rock, NC

osteojunky@gmail.com

www.orthoedu.com

Learning Objectives:

At the end of this session participants will be able to identify the characteristics, initial diagnostic study findings and initial treatment for.....

- Pediatric Proximal Humerus fracture
- Common Pediatric Elbow injuries
- Pediatric Slater-Harris Fractures Distal Radius and Scaphoid fractures
- Common Pediatric Hip pain
- Pediatric Knee Pain
- Common Pediatric Hind foot Injuries

Faculty Disclosures

Orthopaedic Educational Services, Inc.

Financial

Intellectual Property

No off label product discussions

American Academy of Physician Assistants

Financial

Ferring Pharmaceuticals

Consultant & Speakers Bureau



Proximal Humerus Fracture

Pediatric Proximal Humerus Fracture

- Fx defined as Physis or Metaphysis
- **Good prognosis healing due to high remodeling potential**
- More common adolescent fx peak @ 15 yrs age
 - SH II: > 12 yrs age
 - SH I: < 5 yrs age
 - Metaphysis: 5-12 yrs age
- Mechanism
 - **Blunt trauma**
 - **Overuse: growth plate injury 2nd to throwing motion**

www.orthobullets.com/pediatrics/4004/proximal-humerus-fracture--pediatric

Pediatric Proximal Humerus Fracture

Physical Exam

- Inspection:
 - Swelling shoulder, Arm tucked into side
- Palpation:
 - tenderness globally Shoulder/Proximal Humerus
- ROM/Strength:
 - Limited ROM & increased pain
- Neurovascular: Usually no deficits
- Ortho Test:

www.orthobullets.com/pediatrics/4004/proximal-humerus-fracture--pediatric

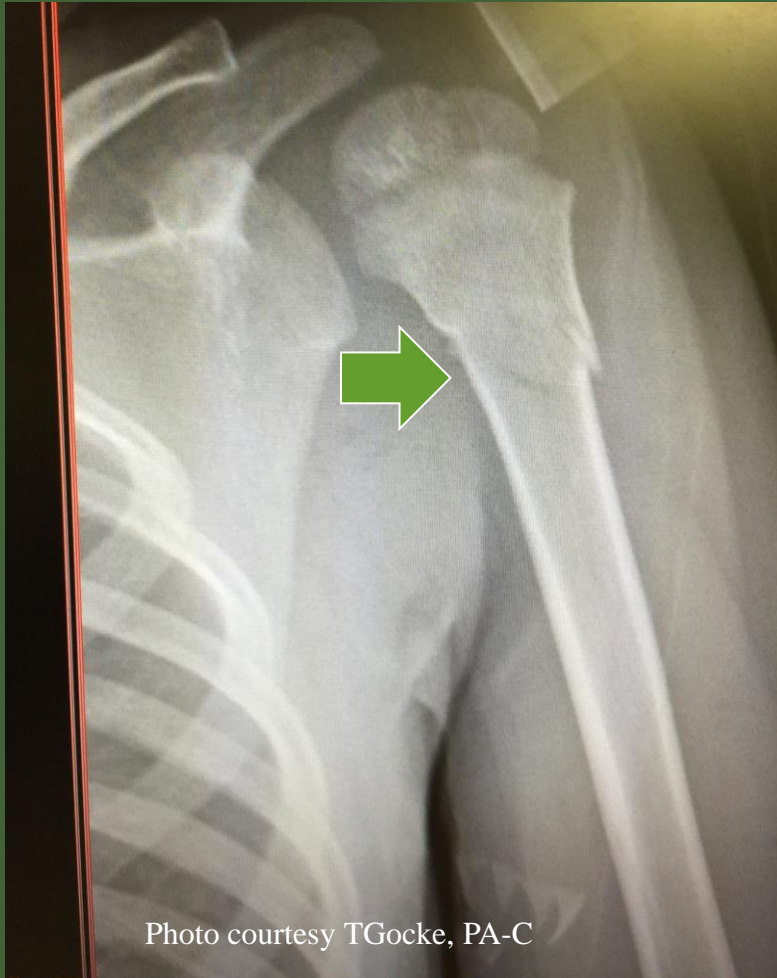
Pediatric Proximal Humerus Fracture

Radiographs

- Standard views: AP & lateral shoulder, Axillary, Scapular Y
- **Proximal Humerus Physis closes: predicts remodeling**
 - **Girls - 14-17 yrs old**
 - **Boys - 16-18 yrs old**
- **Bone displacement**
 - **Proximal Fragment Epiphysis**
 - **ABDucted - External rotated: 2nd RTC muscula**
 - **Shaft Fragment**
 - **Anterior - ADDucted - Short: 2nd to Pectoralis & Deltoid**
- **Treatment**
 - **Based on amount of Head/physis displacement on Shaft**
 - **Acceptable angulation based on remaining growth**

www.orthobullets.com/pediatrics/4004/proximal-humerus-fracture--pediatric

Pediatric Proximal Humerus Fx



Pediatric Proximal Humerus Fracture

Treatment

- Most respond well to non-operative therapy
- **Acceptable angulations**
 - **<10 yrs age - any amount angulation**
 - **10-13 yrs age - < 60° angulation**
 - **> 13 yrs age - <45° & < 2/3 shaft displacement**
- Immobilization
 - Sling vs Shoulder Immobilizer
 - Coaptation Splint & Sling
- Surgery
 - > 2/3 displaced, > 45° angulated & < 2 yrs growth left - remodeling
 - Open Fx or Intra-articular fx
 - Vascular Injuries

www.orthobullets.com/pediatrics/4004/proximal-humerus-fracture--pediatric

Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.



Elbow Pain

<https://radiopaedia.org/articles/paediatric-elbow-radiograph-an-approach>
www.orthobullets.com/pediatrics/4007/supracondylar-fracture--pediatric

Elbow Pain

General

- **Supracondylar Humerus fx** most common Pediatrics
- Radial head fx - most common Adults
- Mechanism of injury:
 - Fall out stretched hand (FOOSH)
 - Elbow Hyperextended
- Peak age 5-7 yrs old
- **Nursemaids elbow - Radial head dislocation**
 - 5% of all pediatric elbow injuries
 - typically seen in infancy and childhood
 - *mechanism*: isolated traumatic injury
 - the radial head is dislocated anteriorly

Elbow Pain

Physical Exam

- Inspection:
 - Swelling Elbow joint /radial side proximal forearm
- Palpation:
 - tenderness globally Elbow joint/ radial head
- ROM/Strength:
 - Limited ROM & increased pain w/ pronate/supinate & Elbow flex/ext
- **Neurovascular:**
 - **Anterior Interosseous Nerve (AIN - Median) - “OK” sign**
 - **Radial Nerve - Wrist/Finger extension**
 - **Brachial artery: spasm can mimic loss pulse**
- Ortho Test:

www.orthobullets.com/pediatrics/4007/supracondylar-fracture--pediatric

Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Elbow Radiology

- X-ray views
 - AP, Lateral, Oblique
- Elbow injuries have characteristic appearances
- **Fat Pad sign key to suspected elbow trauma**
- An awareness of normal elbow anatomy important to injury detection

Anterior Humeral Line

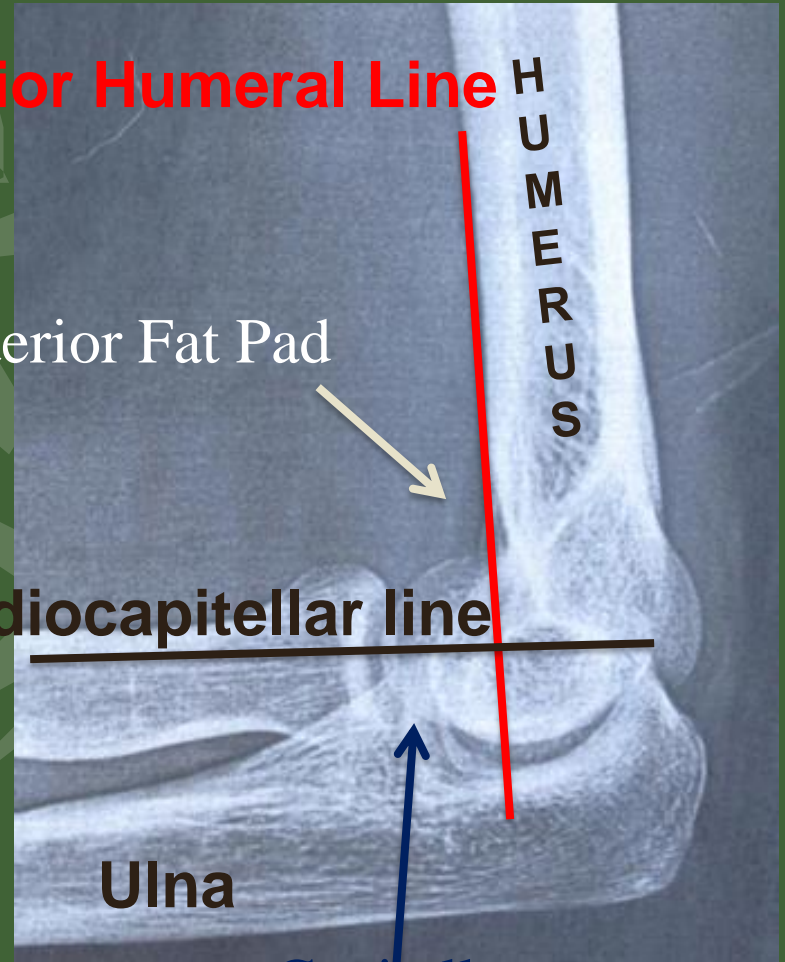
H
U
M
E
R
U
S

Anterior Fat Pad

Radiocapitellar line

Ulna

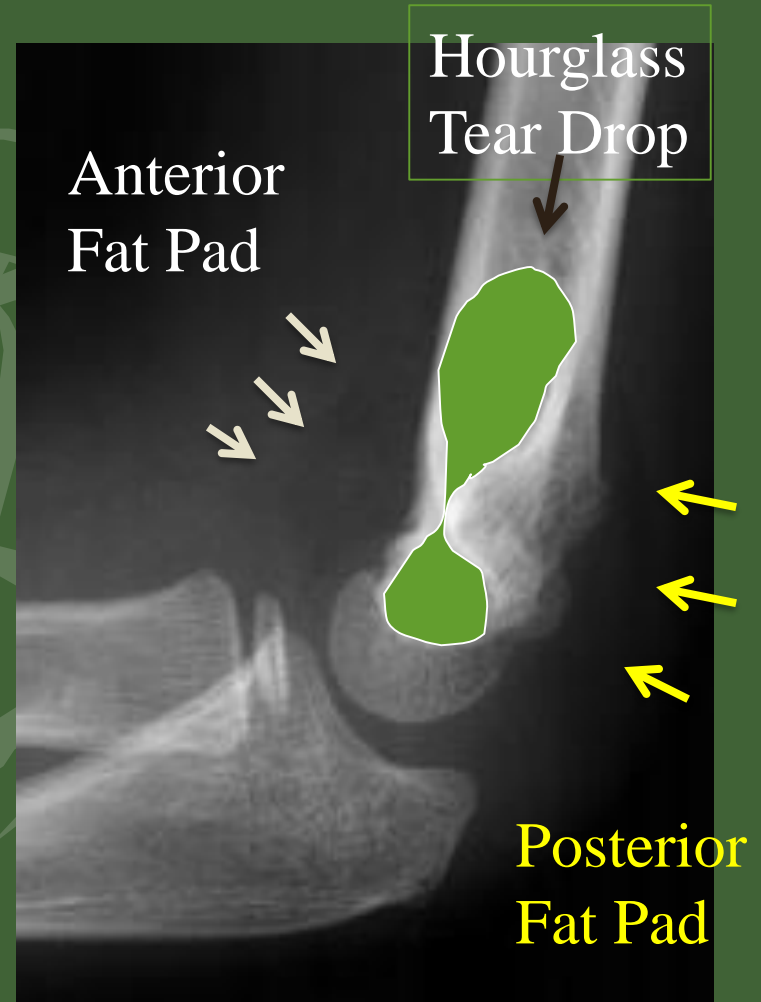
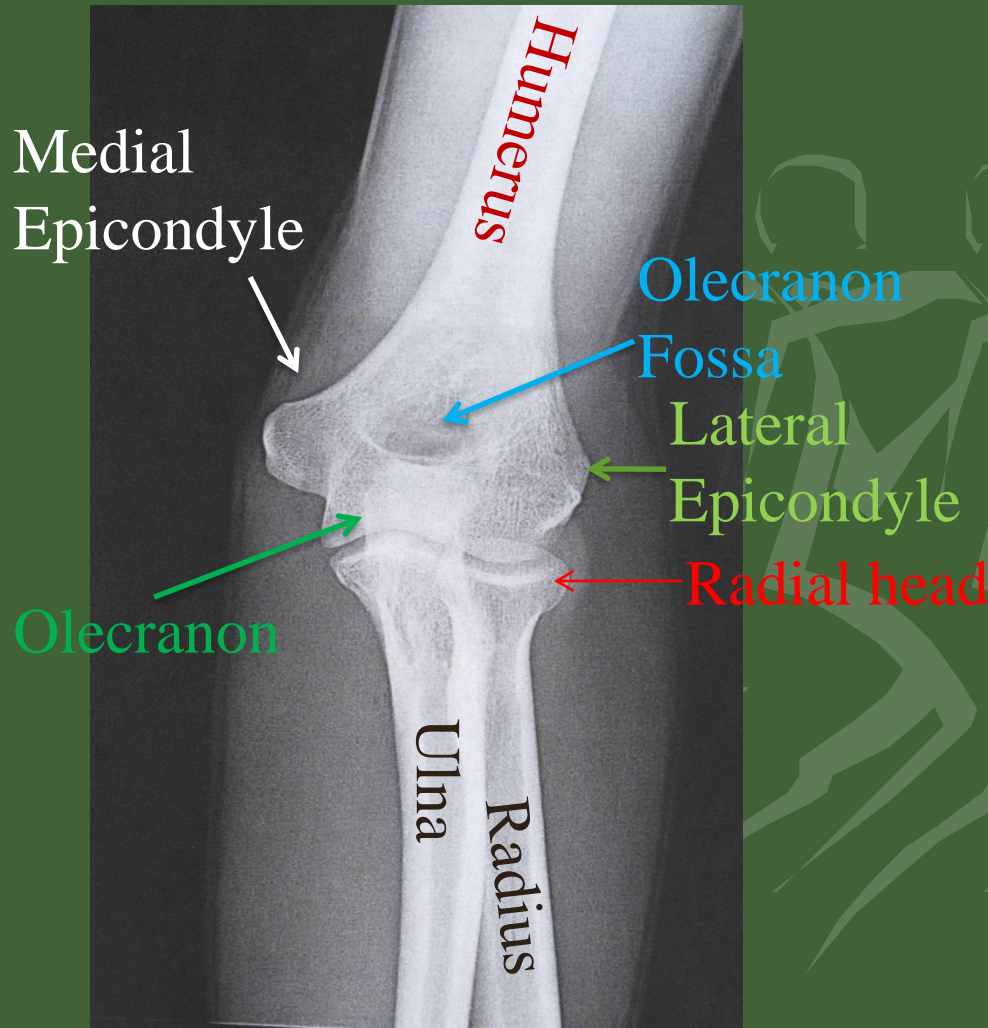
Capitellum



Orthopaedic

Educational Services, Inc.

Elbow Radiology

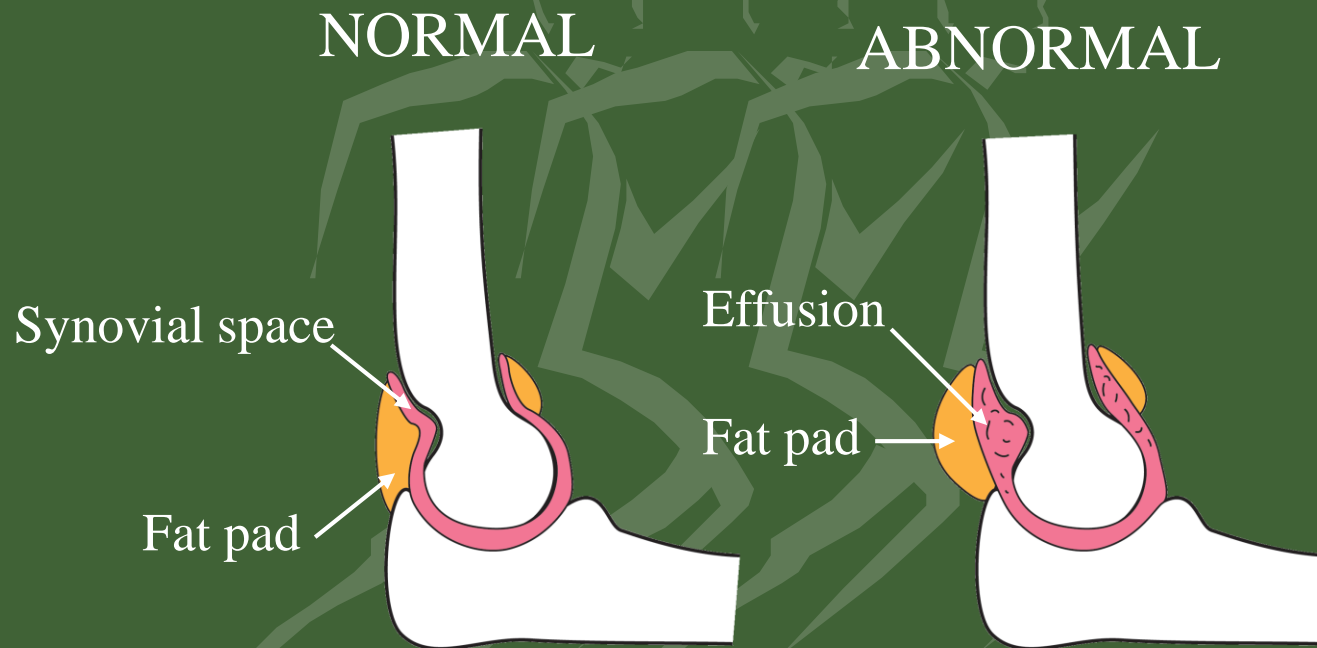


Orthopaedic

Educational Services, Inc.

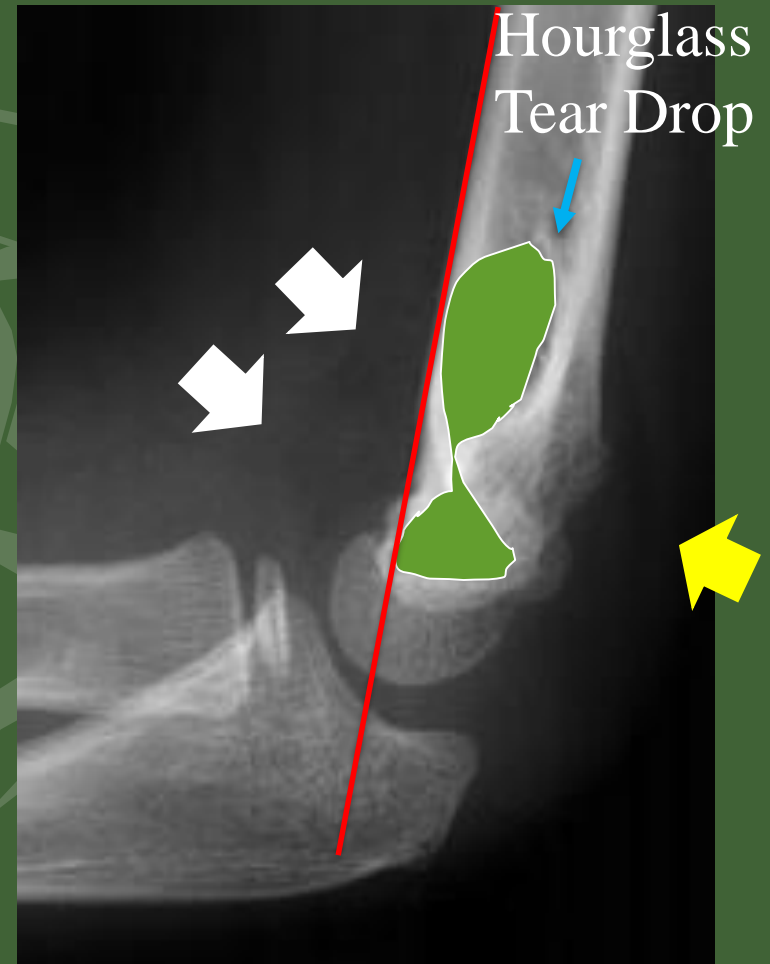
Radiology

Fat Pad Sign



Pediatric Elbow Radiology

- Normal **anterior fat pad** -small
- The **posterior fat pad** is not visible - soft tissue of the triceps muscle is not separated from the posterior edge of the humerus
- More than one third of the capitellum lies in front of the anterior humerus line
- **“True Lateral” Elbow X-ray**
 - hourglass sign or ‘figure-of-eight’



Non-displaced Supracondylar Humerus fx



Photo courtesy TGocke, PA-C



Photo courtesy TGocke, PA-C

Orthopaedic

Educational Services, Inc.

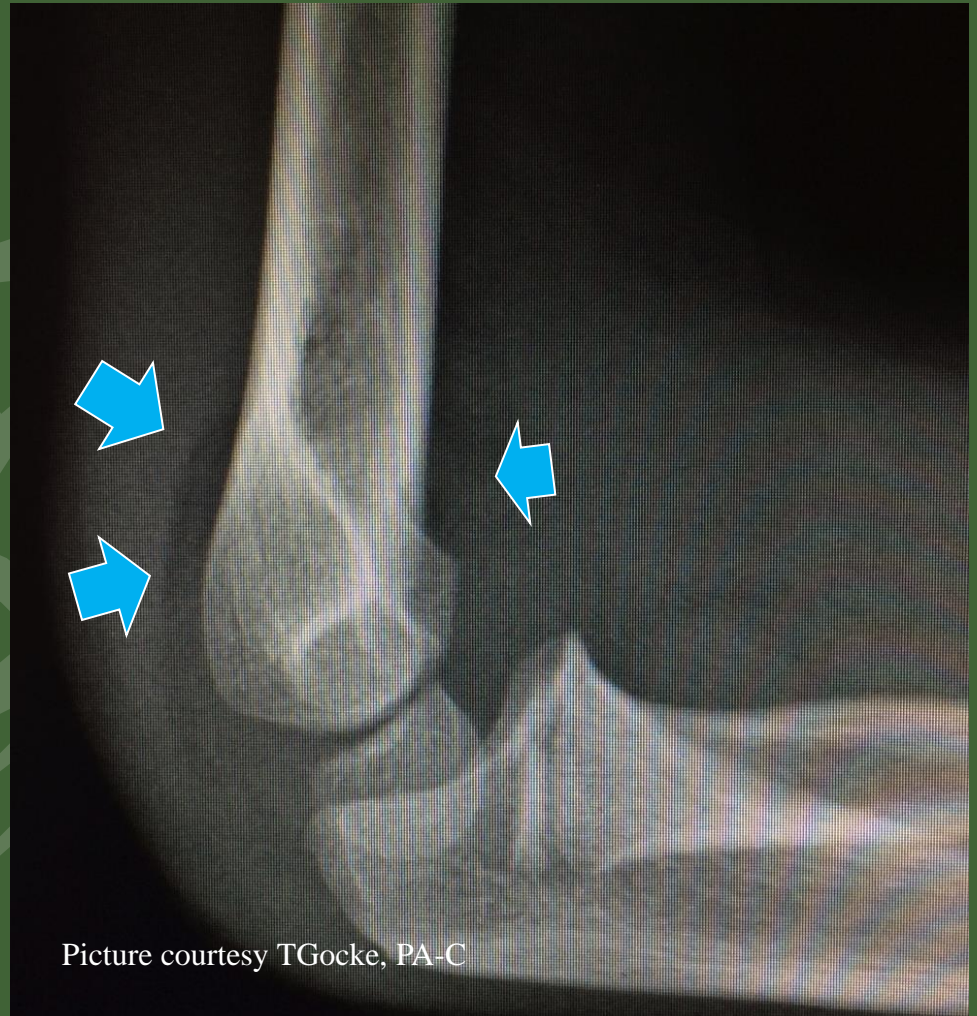
Elbow Pain

Treatment

- **Initial recognition important**
 - Suspect fx pattern/Nondisplaced fx pattern
 - Posterior Splint vs. Sling:
 - **immobilization helps with pain control**
 - < 8 yrs old consider Long arm cast/sling
 - >8 yrs old consider Posterior splint/sling
 - F/U 10-14 days
 - Minimal Increased stiffness with prolonged immobilization
 - Good long-term results majority cases identified early
 - **ALL displaced fx need to be seen same day**

Take Home message

- **Positive Fat Pad sign Kids:** think Supracondylar Humerus fracture
- **Positive Fat Pad sign Adults:** think Radial Head fracture
- Immobilize kids in splint or cast



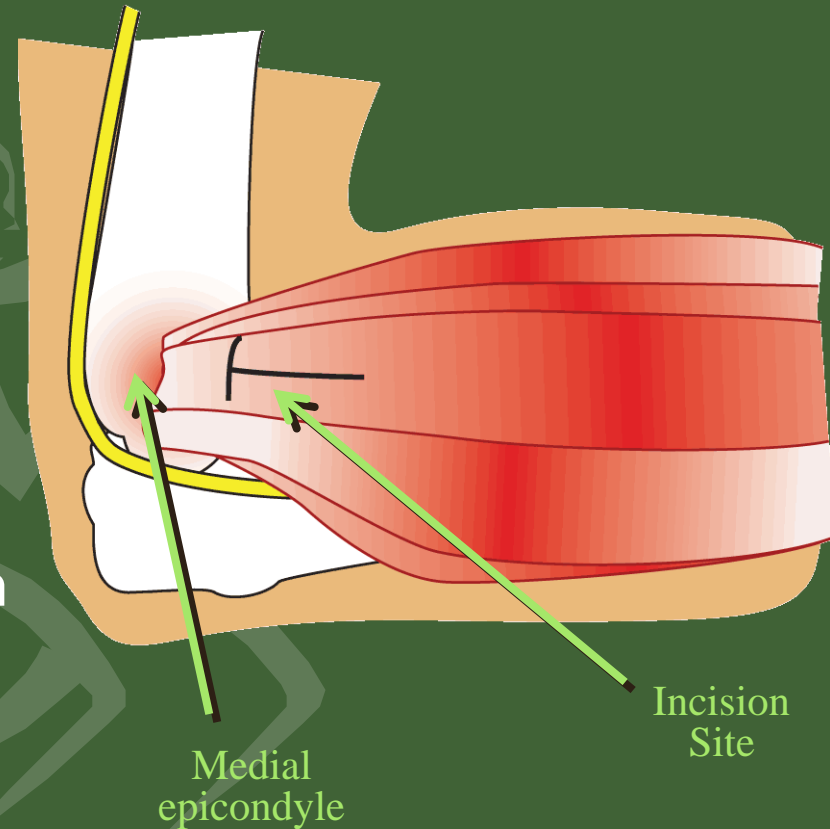
Picture courtesy TGoetze, PA-C



Medial Epicondylitis

Medial Epicondylitis

- Medial elbow pain w/ or w/o neuro changes
- Occupational hazards
 - Grounding golf club (TFCC)
 - Power tools/drills
 - Gripping
 - Throwing
- Pain usually radiates down forearm
- Active & resistive wrist flexion contribute to medial elbow pain
- Prolonged ME 2nd to failure of tendon healing



Medial Epicondylitis

- Increased stress medial elbow
 - Ligament laxity
 - Ulnar collateral ligament & capsule
 - Ulnar nerve stretched
 - Exhibit peripheral neuropathy symptoms
 - Muscle weakness CFT
 - 2nd to overuse
 - Peripheral ulnar neuropathy
- Physical Exam
 - General elbow exam
 - Ulnar collateral stress test
 - Ulnar nerve Tinel – look for associated cubital tunnel symptoms

Medial Epicondylitis

- **Diagnostic Studies**
 - X-ray not always indicated
 - U/S can look at tendon integrity
 - MRI – not necessary to make diagnosis
- **Treatment**
 - RICE
 - Support strap CFT region elbow
 - NSAIDS
 - Physical Therapy
 - Corticosteroid Injection
 - Surgery
 - Recalcitrant tendonitis that has failed conservative therapy



Pediatric Fractures Wrist/Forearm

Flynn JM, Wilson RH: Overtreatment a cause of complications with pediatric distal radius fractures
Orthopedics Today, September 2007

www.orthobullets.com/pediatrics/.../distal-radius-fractures--pediatric

www.orthobullets.com/pediatrics/.../both-bone-forearm-fracture--pediatric

Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Distal Radius Fractures

General:

- Distal Radius & Ulna fx: 40% all pediatric fxs
 - Younger patients - high energy (sports)
 - Peak occurrence
 - Girls 10-12 yrs
 - Boys 12-14 yrs
- Injury Mechanism:
 - Most common: **F**all **O**n **O**ut **S**tretched **H**and
 - Abuse fx:
 - Hx inconsistent with Mechanism
 - Multiple Injuries/bone healing various stages
 - Child affect
 - Patterns of Ecchymosis

Distal Radius Fractures

Fracture - Bone location

- **Physis: Slater-Harris growth plate fx**
- Metaphysis - Distal Radius
 - Colles fx: apex volar
 - Smith's fx: apex dorsal
 - **Torus/Buckle fx: Unicortical bone deformity**
- Diaphysis- Shaft
 - Both bone Forearm fx
 - **Radius/Ulna fxs: distal 1/3 shaft**

Flynn JM, Wilson RH: Overtreatment a cause of complications with pediatric distal radius fractures

Orthopedics Today, September 2007

www.orthobullets.com/pediatrics/.../distal-radius-fractures--pediatric

www.orthobullets.com/pediatrics/.../both-bone-forearm-fracture--pediatric

Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Distal Radius Fractures

Fracture - Bone location

- Diaphysis
 - Both Bone Forearm Fracture
 - Radius Shaft - mid-shaft
 - Ulna Shaft: mid-shaft (“night stick”)
 - **Plastic/Greenstick fx**
 - **Plastic deformity: deforming force reshapes bone (no fx)**
 - **Greenstick: bending deformity of bone with bone fracture**
 - Monteggia - Ulna shaft fx with Radiocapitellar joint dislocation
 - Galeazzi - Distal 1/3 Radius fx with DRUJ injury

Flynn JM, Wilson RH: Overtreatment a cause of complications with pediatric distal radius fractures

Orthopedics Today, September 2007

www.orthobullets.com/pediatrics/.../distal-radius-fractures--pediatric

www.orthobullets.com/pediatrics/.../both-bone-forearm-fracture--pediatric

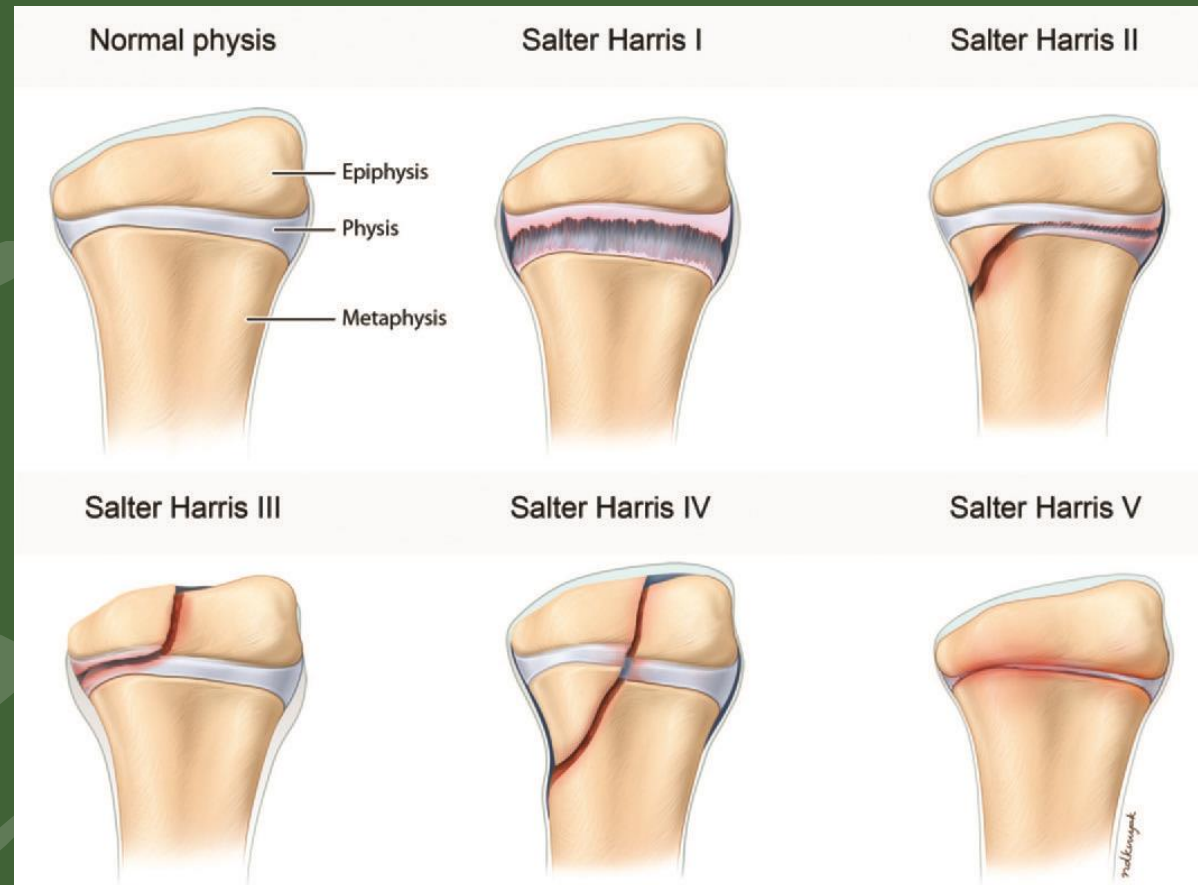
Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Salter-Harris Fracture Classification

- S 1 - Separation physis
- A 2 - Fx ABOVE physis
- L 3 - Fx BELOW physis
- T 4 - Fx THRU physis
- R 5 - Fx CRUSH physis



Little JT et al: **Pediatric Distal Forearm and Wrist Injury: An Imaging Review**, March/April 2014
pubs.rsna.org/doi/pdf/10.1148/rg.342135073

Pediatric Physis Fractures



Little JT et al: **Pediatric Distal Forearm and Wrist Injury: An Imaging Review**, March/April 2014
pubs.rsna.org/doi/pdf/10.1148/rg.342135073

Pediatric Physis Fractures

- Salter-Harris 1 vs 2



Orthopaedic

Educational Services, Inc.

Pediatric Physis Fractures



Pediatric Physis Fracture



Little JT et al: Pediatric Distal Forearm and Wrist Injury: An Imaging Review, March/April 2014
pubs.rsna.org/doi/pdf/10.1148/rg.342135073

Pediatric Physis Fracture



Salter-Harris 4

Little JT et al: Pediatric Distal Forearm and Wrist Injury: An Imaging Review, March/April 2014
pubs.rsna.org/doi/pdf/10.1148/rg.342135073

Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Pediatric Metaphysis Fractures

Torus Fracture

- Aka: “Buckle fx”
- Skeletally immature
- FOOSH mechanism
- Same symptoms adult fx
- Often overlooked on x-ray
- Unicortical Bone deformity
 - Radius and/or Ulna

Little JT et al: **Pediatric Distal Forearm and Wrist Injury: An Imaging Review**, March/April 2014
pubs.rsna.org/doi/pdf/10.1148/rg.342135073

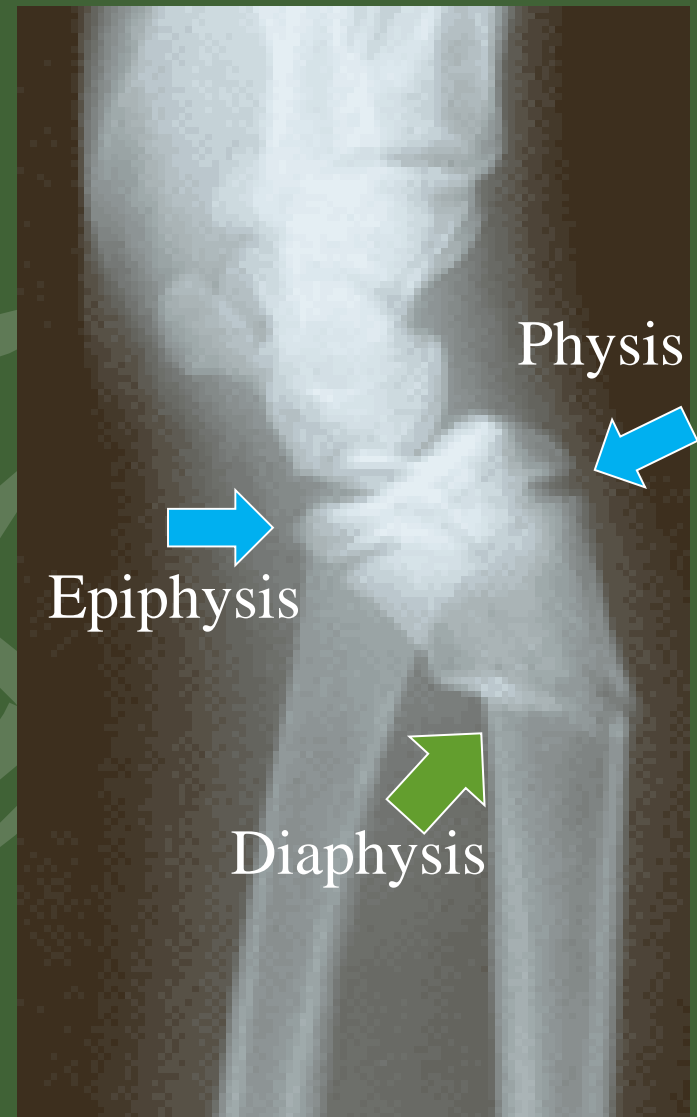
Orthopaedic

Educational Services, Inc.



X-ray courtesy Tom Gocke, PA-C Library

Pediatric Diaphysis Fractures



Distal 1/3 Radius Fractures

Treatment: **Non-displaced fx**

- **No closed reduction required**
 - Extra-articular, non-displaced
 - Minimal radial shortening
 - Dorsal angulation $<5^{\circ}$
 - Well padded sugartong vs. volar splint vs. Commercial splint
 - Arrange for same day or next day F/U Ortho appt

- **Displaced Fx - Reduction**

www.orthobullets.com/pediatrics/.../distal-radius-fractures--pediatric

www.orthobullets.com/pediatrics/.../both-bone-forearm-fracture--pediatric



Picture courtesy T Gocke, PA-C

Orthopaedic

Educational Services, Inc.



Carpal Scaphoid Fracture

Little JT et al: **Pediatric Distal Forearm and Wrist Injury: An Imaging Review, March/April 2014**
pubs.rsna.org/doi/pdf/10.1148/rg.342135073

Carpal Scaphoid Fracture

- Carpal bones have no periosteum
- NO periosteal reaction seen with bone injury/Fx
- **Anatomic Snuff box tenderness hallmark clinical sign**
- Mechanism of injury - **FOOSH**
 - Crush/compression injury distal radius and proximal pole Scaphoid
- Peds Scaphoid fx
 - **Distal pole fx most common location kids**
 - **Waist fx becoming more prevalent 2nd to higher BMI kids**
- Blood supply
 - **Solitary dorsal & volar branch from Radial artery**
- Complications:
 - Nonunion fx healing vs. Avascular necrosis

Little JT et al: Pediatric Distal Forearm and Wrist Injury: An Imaging Review, March/April 2014

pubs.rsna.org/doi/pdf/10.1148/rg.342135073

Orthopaedic

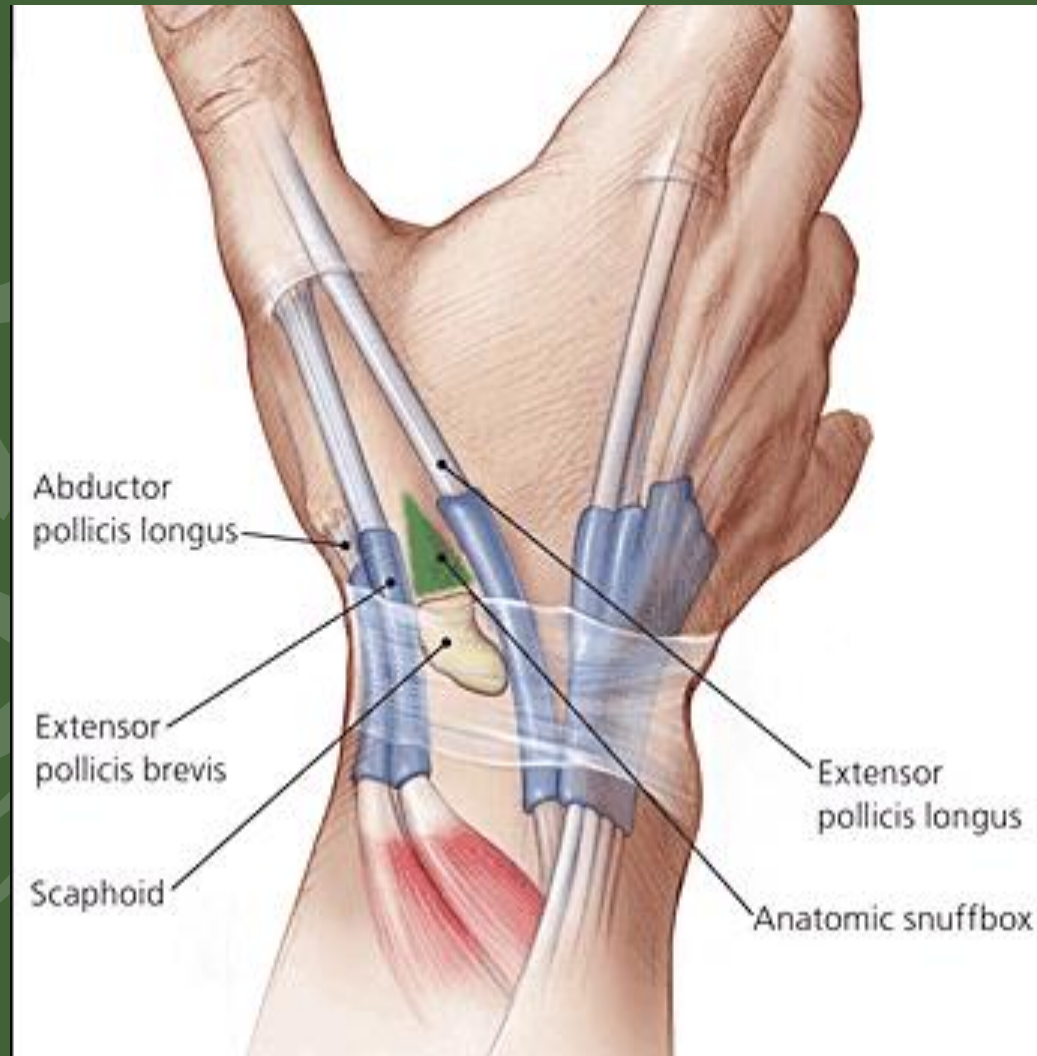
Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Anatomic Snuff Box

Radial side Wrist

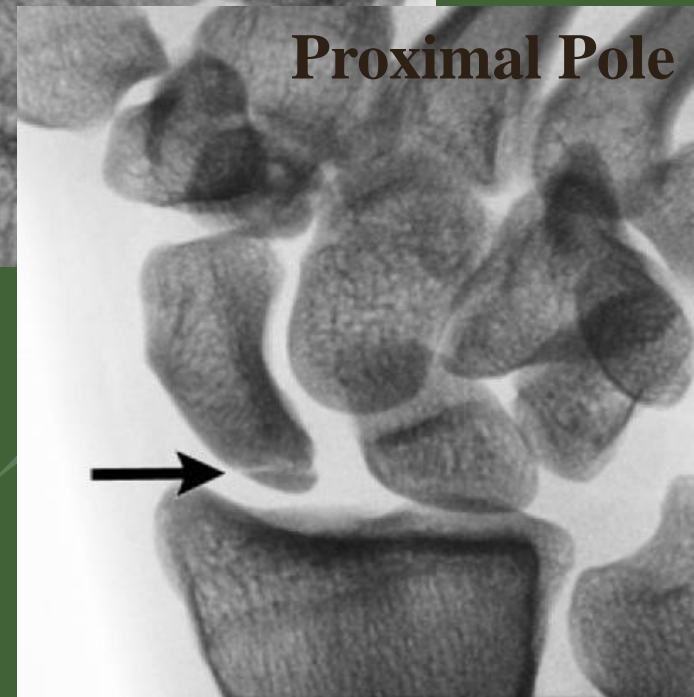
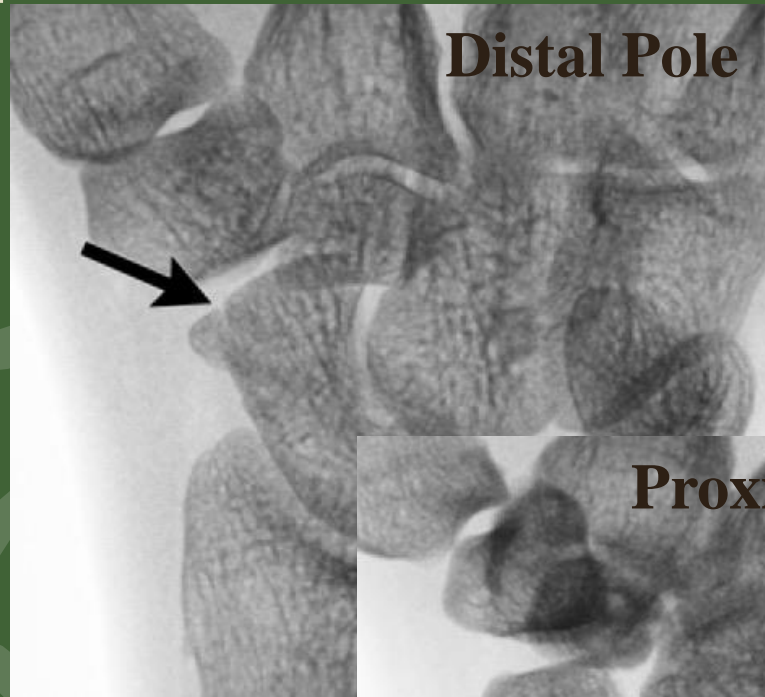
- Borders
 - ABD Pollicis longus
 - Extensor Pollicis Brevis
 - Extensor Pollicis longus



Carpal Scaphoid Fracture

X-ray

- Posteroanterior (PA), Lateral and Scaphoid view
- **Distal Pole fx most common**
- **Fx not usually seen on initial radiograph**
- MRI:
 - Most sensitive detect occult Scaphoid fx
 - Bone Contusion, TFCC & Intercarpal Ligament injury



Little JT et al: **Pediatric Distal Forearm and Wrist Injury: An Imaging Review**, March/April 2014
pubs.rsna.org/doi/pdf/10.1148/rg.342135073

Carpal Scaphoid Fracture

Treatment:

- **Recognition/Suspicion key treatment**
- Immobilize Thumb Spica Splint vs Thumb Spica Cast
- Initial X-ray
- MRI scan for ? Occult fx
- Needs ortho referral 1 week
- Limit sports/aggressive activity



Photo courtesy TGoetze, PA-C

Little JT et al: Pediatric Distal Forearm and Wrist Injury: An Imaging Review, March/April 2014
pubs.rsna.org/doi/pdf/10.1148/rg.342135073



Back Pain

Back Pain

- General
 - MSK injury : most common form back injury
 - Isolated to muscle injury
 - Complaints along various levels Thoracolumbar spine
 - Affects all ages
 - **Worse with movement & better with rest**
 - Sit-Stand-Lie: varied response
 - Sports & Labor job: repetitive motion
 - **NO radicular symptoms (beyond gluteal)**
 - **NO incontinence**

www.orthobullets.com/spine/.../low-back-pain--introduction

Back Pain

Treatment:

- **Musculoskeletal:**

- 90% of low back pain resolves within one year

- **Depends on patient response**

- NSAIDS vs. Steroid dose pack

- Muscle Relaxer

- Analgesics

- Physical therapy vs. Home Exercise Program (HEP)

- Limit activity

- Recreation

- Work

- F/U exam 1-2 weeks

- Duration: varies 1-4 weeks

Fragile period 6 weeks

Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Common Orthopaedic Problems

Pediatric Spondylolysis/Spondylolisthesis

- **Common cause Low back pain (LBP) kids**
- **Pars stress reaction/fracture**
 - Sclerosis with incomplete bone healing vs. disputation
- Spondylolysis
 - **Anatomic defect in Pars Interarticularis – bone sclerosis**
 - Defects not present at birth
 - **Usual injury mechanism – repetitive hyperextension**
 - High prevalence in gymnasts, weight lifters, football linemen

Moore D: Pediatric Spondylolysis/Spondylolisthesis –spine – Orthobullets

Cavalier R: Spondylolysis and Spondylolisthesis in Children and Adolescents: Diagnosis, Natural History and Nonsurgical Management, J Am Acad Ortho Surg 2006;14: 417-424

Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Common Orthopaedic Problems

Pediatric Spondylolysis/Spondylolisthesis

- Symptoms
 - **Spondylolysis asymptomatic**
 - Activity onset Low Back Pain and buttock pain
 - L5 radiculopathy
 - **Hamstring tightness (Quad, Hip Flexor, Achilles)**
 - Lumbar extension exacerbates symptoms

Moore D: Pediatric Spondylolysis/Spondylolisthesis –spine – Orthobullets

Cavalier R: Spondylolysis and Spondylolisthesis in Children and Adolescents: Diagnosis, Natural History and Nonsurgical Management, J Am Acad Ortho Surg 2006;14: 417-424

Common Orthopaedic Problems

Pediatric Spondylolysis/Spondylolisthesis

- Physical exam
 - Low Back Pain: worse with extension
 - Poor flexibility
 - Paraspinal muscle spasm/tenderness (unilateral vs. bilateral)
 - Frequently no neurologic deficit
 - Straight Leg Raise – positive vs. false positive (tight hamstrings)
 - Lumbar radiculopathy
 - 2nd to anterior slip or compression/traction at foramen
 - L5 most common
 - Ankle dorsiflexion weakness & L5 radiculopathy

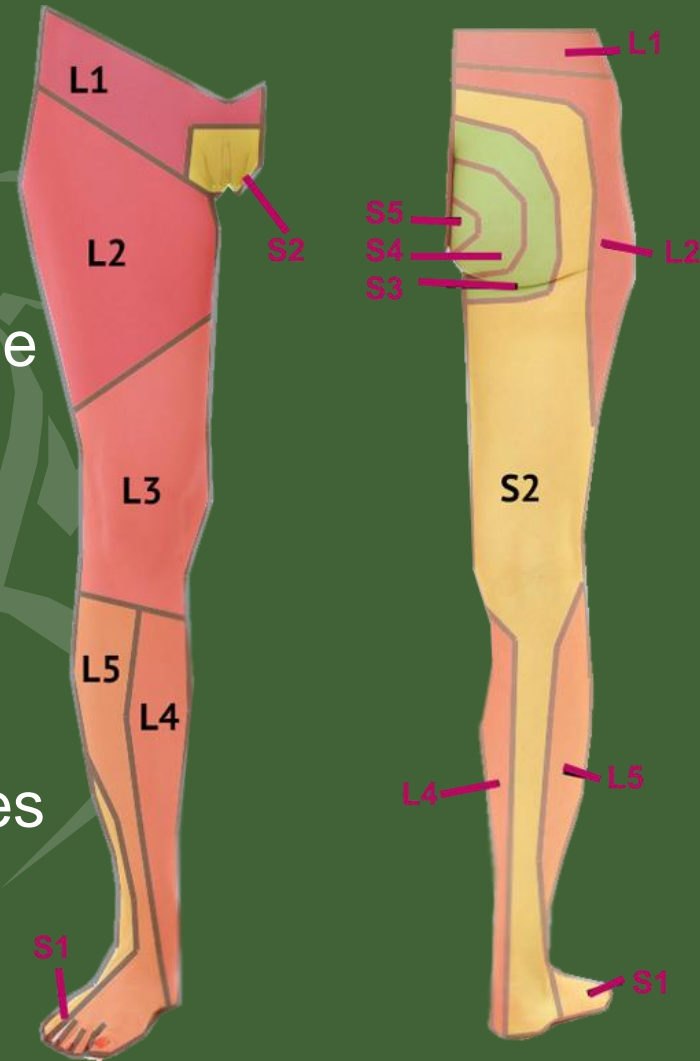
Moore D: Pediatric Spondylolysis/Spondylolisthesis –spine – Orthobullets

Cavalier R: Spondylolysis and Spondylolisthesis in Children and Adolescents: Diagnosis, Natural History and Nonsurgical Management, J Am Acad Ortho Surg 2006;14: 417-424

Lumbar Exam

Physical Examination

- Neurologic
 - Sensory Lumbar distribution
 - L3 distal thigh
 - L4 medial low leg and ankle
 - L5 Anterior low leg & dorsal ankle
 - S1 Lateral ankle
 - Reflexes
 - Patellar: L4 distribution
 - Achilles: S1 distribution
 - Babinski:
 - negative test: down going toes
 - positive test: toes flare up



Common Orthopaedic Problems

Diagnostic Imaging

- **Spondylolisthesis**

- **PA, Lateral & Oblique**

- **Oblique image shows sclerosis/elongation Pars Interarticularis (Scotty Dog sign)**

- Lateral measures slip angle and helps assess grade of slip

- Grade 1 <25%
- Grade 2 <50%
- Grade 3 <75%
- Grade 4 <100%

- **Flexion & Extension views – Assess segmental instability**

- > 4mm or 10° change slip angle

CT/MRI – further study Pars anatomy & for evaluation neurologic symptoms

Moore D: Pediatric Spondylolysis/Spondylolisthesis –spine – Orthobullets

Cavalier R: Spondylolysis and Spondylolisthesis in Children and Adolescents: Diagnosis, Natural History and Nonsurgical Management, J Am Acad Ortho Surg 2006;14: 417-424

Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Back Pain

Normal Anatomy



Picture courtesy TGocke, PA-C

Spondylolisthesis



Picture courtesy TGocke, PA-C

Orthopaedic

Educational Services, Inc.

Common Orthopaedic Problems

Pediatric Spondylolysis/Spondylolisthesis

Treatment:

- **Asymptomatic Lysis/Listhesis: NO restriction**
- Symptomatic
 - PT & restrictions in activity
 - Hamstring flexibility
 - Core strengthening
- **TLSO bracing 6-12 weeks**
 - Acute Pars stress reaction
 - Failed conservative treatment
 - Brace & activity restrictions
- All treatments fail - Surgery



Picture courtesy TGocke, PA-C



Picture courtesy TGocke, PA-C

Cavalier R: Spondylolysis and Spondylolisthesis in Children and Adolescents: Diagnosis, Natural History and Nonsurgical Management, J Am Acad Ortho Surg 2006;14: 417-424

Take Home Points

- Majority of LBP in adolescents is musculoskeletal
- Failure to respond to conservative care think Spondylolisthesis
- Low back pain symptoms exacerbated with extension are concerning for Pars Interarticularis injuries
- Diagnostic Imaging using X-ray, or CT scan will show changes in the Pars Interarticularis
- Activity modification, Hamstring flexibility and improved core body strength are first line treatment options



Hip Pain



Toxic Synovitis vs Septic Hip Arthritis

Toxic Synovitis vs Septic Hip Arthritis

General:

- Most common cause acute hip pain children
- Age onset: 3-10 yrs (4-8yrs typical)
- Males 2:1
- Causes:
 - Unknown
 - Viral vs. Bacterial (Post-Streptococcal toxic synovitis)
 - High Interferon concentrations
 - Trauma
 - Allergic reaction
- Pathophysiology: nonspecific Inflammatory process synovial lining

Toxic Synovitis vs Septic Hip Arthritis

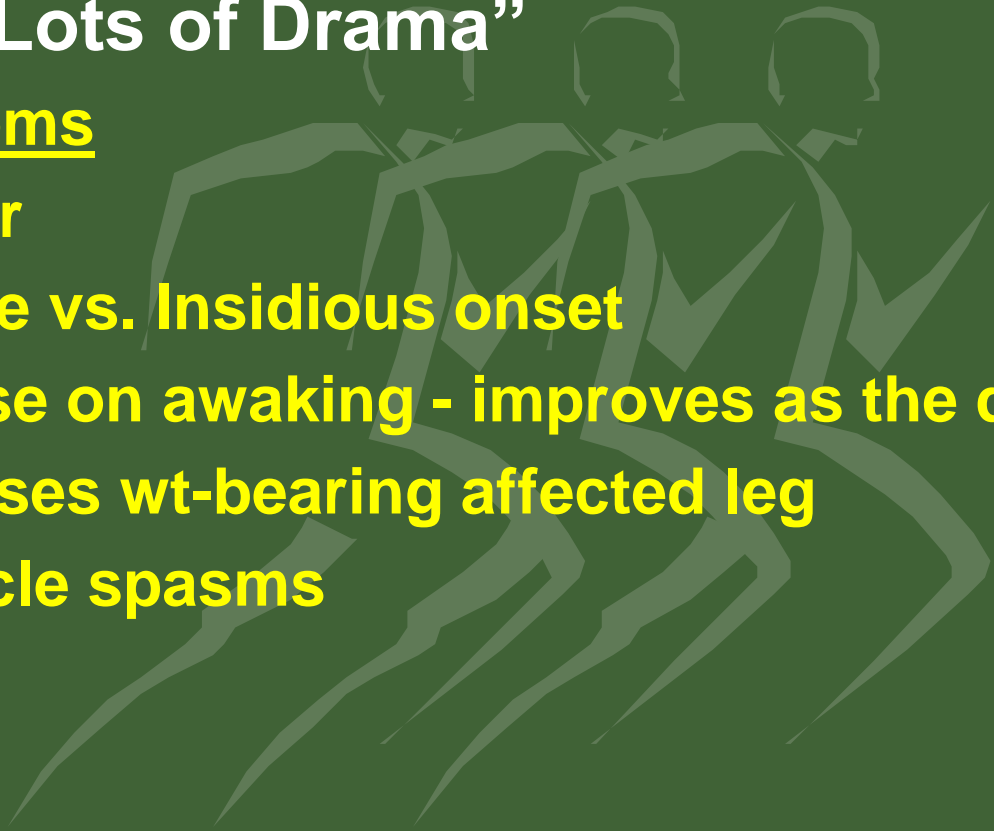
Prognosis:

- Usually benign
- **Improvement 24-48hrs; complete resolution <1 week**
- Key elements History & Exam:
 - Site: groin-hip
 - Time onset: constant vs. intermittent
 - Mechanical Symptoms
 - Associated limp
 - Constitutional symptoms
 - Recent illness/trauma

Toxic Synovitis vs Septic Hip Arthritis

Physical Exam

- **“Lots of Drama”**
- **Symptoms**
 - **Fever**
 - **Acute vs. Insidious onset**
 - **Worse on awaking - improves as the day goes on**
 - **Refuses wt-bearing affected leg**
 - **Muscle spasms**



Toxic Synovitis vs Septic Hip Arthritis

Physical Exam

- Inspection:
 - **Flexed hip, ABD, External Rotated**
 - **Lesser intracapsular tension/pressure**
 - Non-toxic appearance
- Range of Motion
 - Restricted Hip ABD:
 - Log-roll: can detect involuntary muscle spasm
 - **Painless motion: less likely septic joint**
- Neuro
 - Toe Walking/Cavus Foot/Toe Clawing: neuro causes for a limp

Toxic Synovitis vs Septic Hip Arthritis

Diagnostic

– Imaging:

- Radiographs: may show widening hip joint 2nd to fluid accumulation in joint
- Ultra-sound:
 - Best choice
 - Can detect intracapsular fluid
 - Synovial lining thickening- ? Response
- Joint Aspiration:
 - Sensitive & specific
 - » **Elevated Nucleated cells >50,000**
 - » CRP > 20mg/l most predictive
 - » ESR < 20mm/h

Toxic Synovitis vs Septic Hip Arthritis

Kocher Criteria - Septic arthritis

– 3 of 4 = 93% septic arthritis predictor

- Fever > 38.5°
- WBC > 12,000
- Unable to wt bear
- ESR > 40mm/hr

– Rule out Criteria

- Ability to wt bear
- CRP <20 mg/L

Toxic Synovitis vs Septic Hip Arthritis

Treatment:

- Suspicion:
 - Admit vs Observe
 - Lower Clinical suspicion
 - IV vs. PO NSAIDS
 - Afebrile last 24 hrs.
 - Improving ambulation
 - Kocher score < 2

Toxic Synovitis vs Septic Hip Arthritis

Treatment:

- Suspicion:

- Joint Aspiration

- High Clinical suspicion septic joint
- No response after NSAIDS
- Febrile
- Recent or Concurrent Infection (URI, UTI, OM)
- Kocher score >2
- US vs. MRI guided aspiration
- Labs, Culture, empiric ABX

Toxic Synovitis vs Septic Hip Arthritis

Treatment:

- Confirmation:

- Surgical I&D

- Documented septic joint
- Severe Systemic Infection (URI, UTI, OM)
- Kocher score 4/4
- Prolonged Infection will affect articular cartilage



Slipped Capital Femoral Epiphysis

Kuzyk PR, et al: Surgical Management of Healed Slipped Capital Femoral Epiphysis, *Am Acad Orthop Surg* 2011;19: 667-677

Slipped Capital Femoral Epiphysis

- Most common acquired hip disorder of adolescents
 - Rare < age 9
 - Boys>Girls (2.5:1)
 - Pacific Islander/African American
 - **Age: 10-15 girls & 12-16 boys**
 - **Heavier, Taller**
 - **Follows growth spurt**
 - Higher incidence June-September
 - Bilateral occurrence: 25-40%
 - Girls>Boys
 - Younger & thinner

Slipped Capital Femoral Epiphysis

- Clinical presentation
 - Anterior thigh/groin pain
 - Limp
 - Wt Bear progressing to unable to wt bear
- Physical Exam
 - Abnormal gait patterns
 - Limited ROM: hip flex and internal rotation
 - Out toeing (external rotation foot)

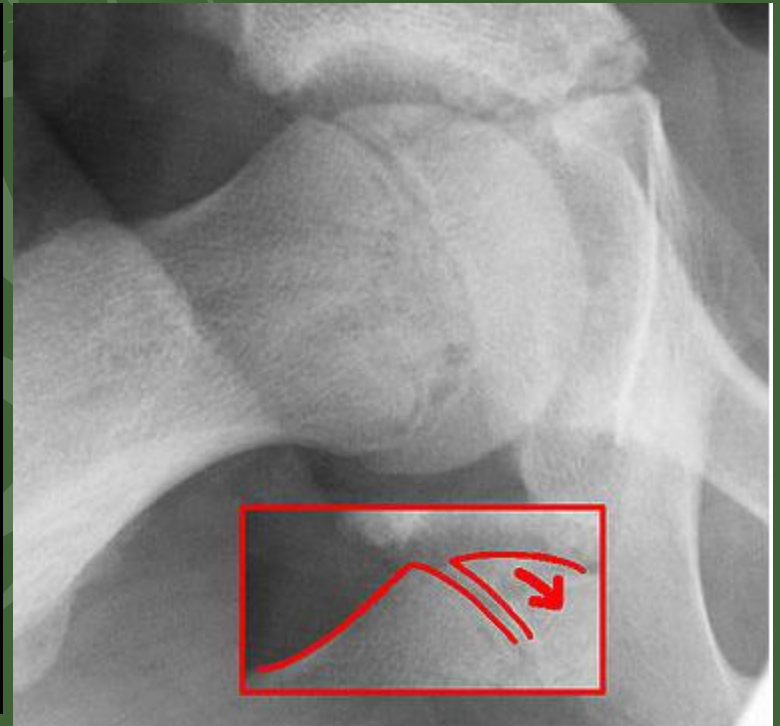
Kuzyk PR, et al: Surgical Management of Healed Slipped Capital Femoral Epiphysis, *Am Acad Orthop Surg* 2011;19: 667-677

Slipped Capital Femoral Epiphysis Radiographic exam

AP pelvis



Frog lateral



Slipped Capital Femoral Epiphysis

- Treatment options:
 - **Early diagnosis & prompt Ortho referral**
 - **Non-wt bearing affected extremity till F/U w/ Ortho**
 - **Surgery**
- Complications:
 - Degenerative arthritis
 - Avascular Necrosis'
 - Occurs 5-15%
 - Late finding 6-24 months
 - Loss of blood supply to femoral head
 - Varus deformity
 - Chondrolysis – loss articular cartilage

The background features three stylized, light-colored silhouettes of men in business suits running from left to right. They are positioned behind the main title text.

Pediatric Knee Problems

Calcaneal Apophysitis: American Academy of Foot and Ankle Surgeons

<http://www.acfas.org/Content.aspx?id=1483>

Patellofemoral Pain Syndrome: American Academy of Orthopaedic Surgeons,

<http://orthoinfo.aaos.org/topic.cfm?topic=A00680>

Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Three stylized, overlapping silhouettes of runners in a race, positioned behind the main title. The runners are depicted in a dynamic, forward-leaning posture, suggesting speed and movement. They are rendered in a light green color that blends with the background.

Osgood Schlatter's Disease

<http://radiopaedia.org/articles/osgood-schlatter-disease>

<http://www.eorthopod.com/content/osgood-schlatter-disease>

Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Osgood-Schlatter's Disease

- General
 - **Occurs 11-15 age group (rapid growth)**
 - **Boys > Girls**
 - **Overuse problem – increased demand on immature skeleton**
 - **Caused by tight hamstrings limit knee extension and increasing pull of quad/patellar tendon on tibial tubercle**
 - **Small area heterotopic ossification seen 2nd to microtrauma a the tibial apophysis**
- Clinical Symptoms
 - Swelling tibial tubercle area
 - Pain with ambulation, stair-climbing, jumping & running
 - Pain with palpation
 - Limited ROM knee 2nd to tight hamstrings

<http://radiopaedia.org/articles/osgood-schlatter-disease>

<http://www.eorthopod.com/content/osgood-schlatter-disease>

Orthopaedic

Osgood-Schlatter's Disease

- Physical Examination
 - General Knee exam
 - **Pay specific attention to age group, flexibility and location pain**
 - **Tender palpate tibial tubercle**
 - Pain with AROM & resistive AROM knee extension
- Differential Diagnosis
 - Jumper's Knee
 - Avulsion fracture tibial physis
 - Syndring-Larsen-Johansen Disease – connective tissue disorder

<http://radiopaedia.org/articles/osgood-schlatter-disease>

<http://www.eorthopod.com/content/osgood-schlatter-disease>

Orthopaedic

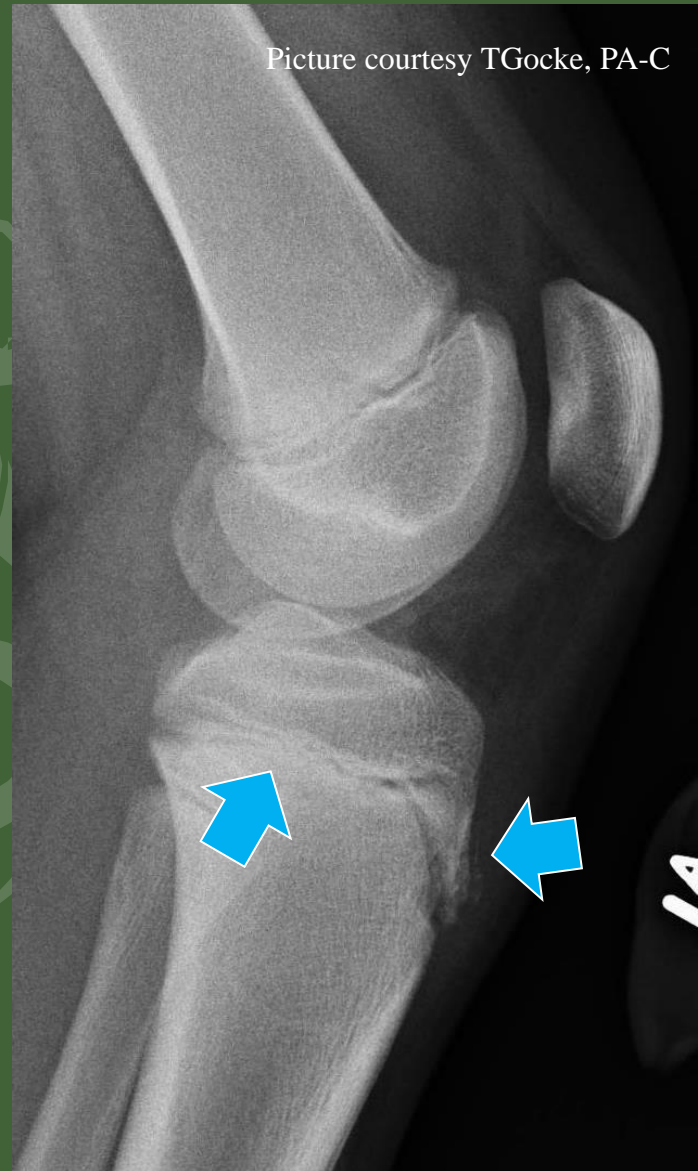
Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Osgood-Schlatter's Disease

- Radiographs:
 - AP, Lateral, Sunrise
 - AP - Normal
 - Lateral
 - **Bony changes noted at tibial tubercle**
 - **May need comparison view contralateral knee**
 - Sunrise – check patella position in trochlea

Picture courtesy TGocke, PA-C



<http://radiopaedia.org/articles/osgood-schlatter-disease>

<http://www.eorthopod.com/content/osgood-schlatter-disease>

Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Osgood-Schlatter's Disease

- Treatment:
 - **Symptomatic care**
 - ICE
 - NSAIDS
 - Knee pad or sleeve: decrease pain from contact pressure
 - **Immobilize for recalcitrant symptoms or poor patient compliance**
 - **Change activity up to 2-3 months**
 - **May need longer for more severe cases**
 - Surgery to correction for rupture/bony fracture - rare

<http://radiopaedia.org/articles/osgood-schlatter-disease>

<http://www.eorthopod.com/content/osgood-schlatter-disease>



Patellofemoral pain

BronsteinDR, et al: Physical Examination of the Knee: Meniscus, Cartilage, and Patellofemoral Conditions, J Am Acad Orthop Surg 2017;25:365-374

Patellofemoral Pain Syndrome: American Academy of Orthopaedic Surgeons, <http://orthoinfo.aaos.org/topic.cfm?topic=A00680>

Fulkerson JR: **Patellofemoral Pain Disorders: Evaluation and Management**; J Am Acad Orthop Surg 1994;2:124-132

Patellofemoral pain

- Occurs for many reasons
 - Overuse
 - Poor strength
 - Poor flexibility
 - Anatomy
 - Obesity
- Affects all ages
 - Adolescent
 - Mid-Lifers vs. “Old Teenagers”
- **Anterior Knee Pain**

Patellofemoral pain

- Characteristics
 - **Stairs/Stand/Sit/Squat Kneel & Crawl**
 - Ache
 - Pain comes 2nd to soft-tissue inflammation & bone
 - Articular cartilage wears down - **Chondromalacia**
 - Swollen/Stiff
 - Vague symptoms
- Overuse
 - Repetitive activity
 - Increased frequency vs. intensity vs. duration
 - **Flexibility/strength**
 - Improper foot wear or training techniques

Patellofemoral pain

Malalignment

- Patellofemoral trochlea mismatch
 - **Abnormal contact pressure patella-trochlea**
 - **Leads to Chondromalacia & soft tissue inflammation**
 - **Abnormal tracking Patella**
- Contributing Factors
 - Patella Aligns lateral : lateral tethering
 - Patella Aligns medial : “squinting patella”
 - Patella too High – Alta (Baha to low)
 - **Soft-tissue Imbalance**
 - **Weak Quads**
 - **Tight retinaculum**
 - **Hamstrings/Patella tendon tight**
 - Improper foot wear or training techniques

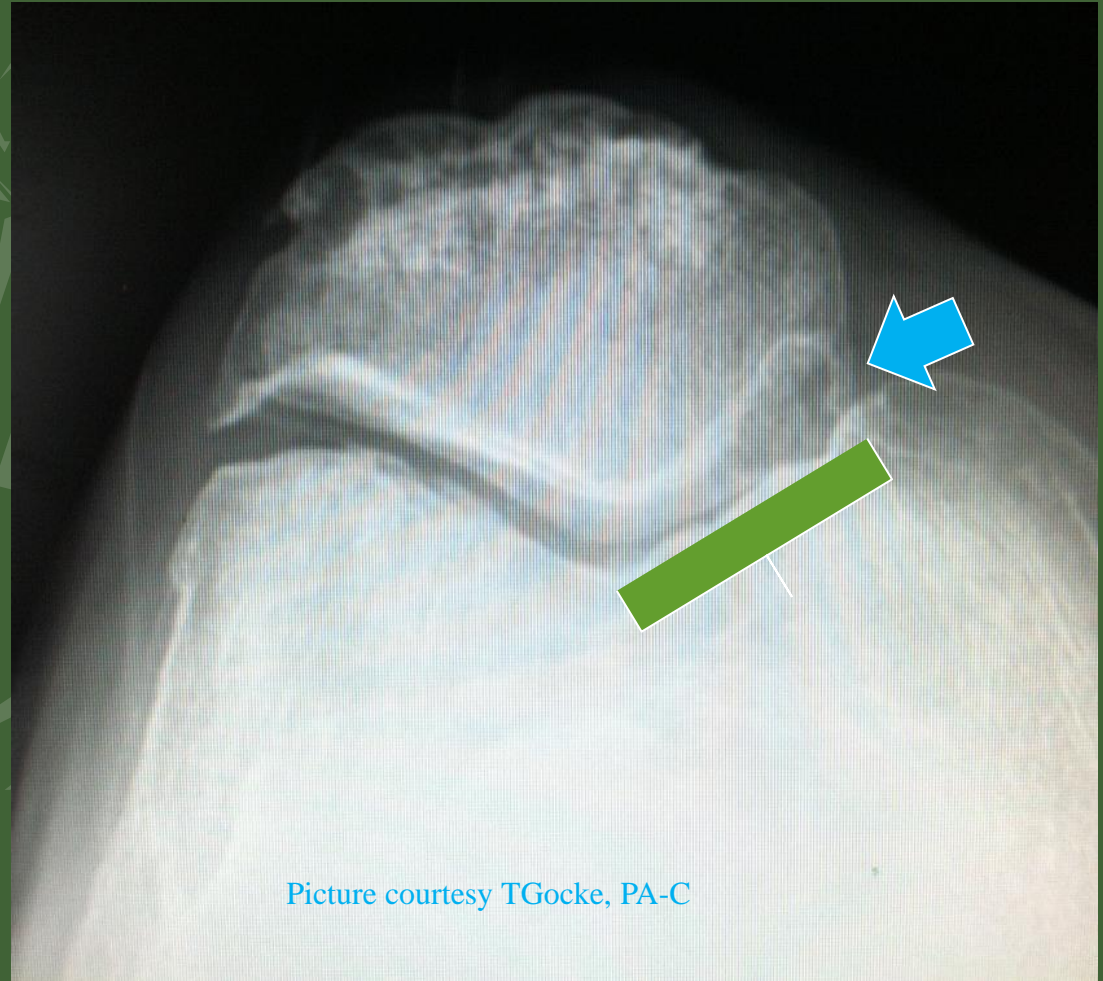
Patellofemoral Pain

- Physical Exam
 - Inspection:
 - **Patella alignment**
 - Gait changes based on acuity of symptoms
 - Palpation:
 - **Lateral retinaculum tenderness**
 - **Tenderness Medial & Lateral facets**
 - Range-of-Motion (ROM):
 - **limited by pain/crepitation**
 - J move
 - Lateral tracking
 - **Strength: weak quads/poor flexibility**
 - Neuro/Vascular: no changes
 - Ortho Tests



Radiographs

- Sunrise View
- Merchant View
- Tangential View
 - All look at articular surface of patella
 - Position of patella
 - Compression points patella



Picture courtesy TGocke, PA-C

Radiographs

Patella Alta:



Picture courtesy TGoetze, PA-C

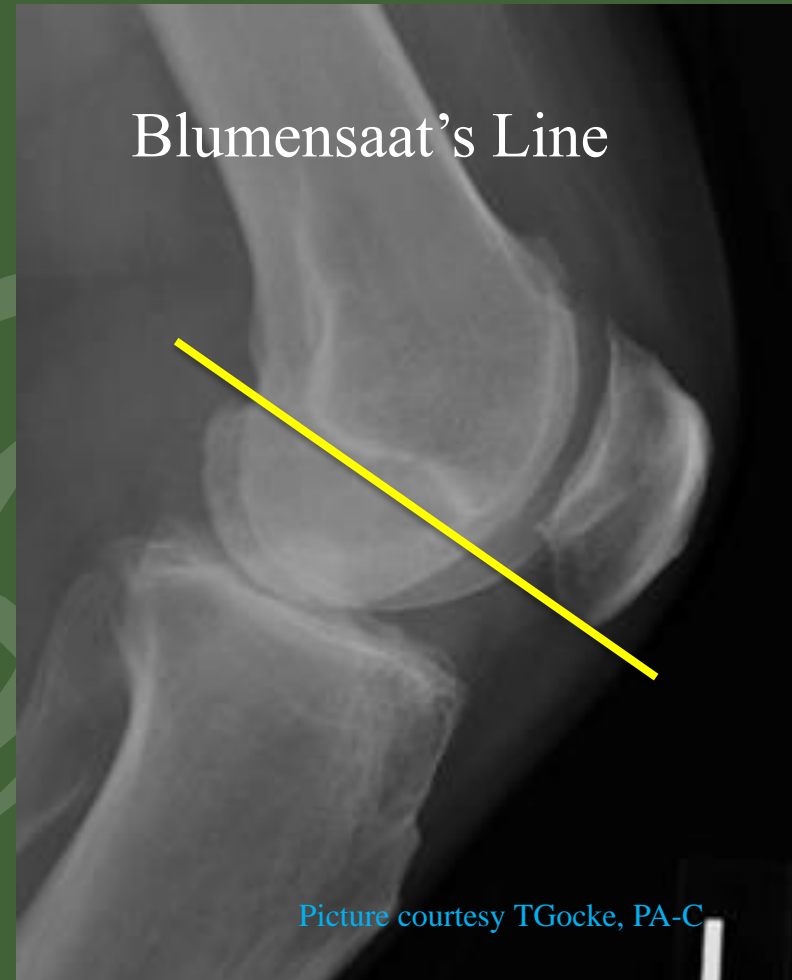
Patella Baja:



Picture courtesy TGoetze, PA-C

Radiographs

- Patella Height: (Blumensaat's Method)
 - Knee flexed to 30 degrees
 - Draw a line thru the roof of the Intercondylar notch
 - Line should touch the inferior pole of the patella
- Normal height - inferior pole patella touches Blumensaat's line
- Patella Alta – inferior pole patella above line
- Patella Baja – Inferior pole patella below line



Blumensaat's C: Die Lageabweichungen und Verrekungen der Kniescheibe;
Ergebnisse der Chirurgie und Ortho 228(31):149-223.

Patellofemoral pain

Treatment

- **Recognize condition**
- **Assess flexibility and strength**
- **Modify activities**
- **Improper foot wear or training techniques**
- ICE/Heat
- NSAIDS: Oral – Topical – Injectable
- Surgical
 - Arthroscopy
 - Chondroplasty
 - Lateral Release
 - Tibial Tubercle Transfer
 - Realign patella tendon with bone repositioning

Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Three stylized, overlapping silhouettes of runners in a race, rendered in a light green color against a dark green background. The runners are in a dynamic, forward-leaning pose, suggesting speed and movement. The central runner is the most prominent, with two others slightly behind and to the sides, creating a sense of depth and a group effort.

Foot Pain

Calcaneal Apophysitis

- **AKA: Sever's Disease**
- Ages 8-14
- Results from repetitive stress activity
- Stressors cause inflammation @ Calcaneal Physis
- Pain worse with activity better with rest
- Causes:
 - Tight Achilles
 - Obesity
 - Foot biomechanics
 - Pes Planus w/ rear-foot valgus vs. Cavus foot

Calcaneal Apophysitis: American Academy of Foot and Ankle Surgeons

<http://www.acfas.org/Content.aspx?id=1483>

– sports
Orthopaedic

Educational Services, Inc.

© 2017 Orthopaedic Educational Services, Inc. all rights reserved.

Calcaneal Apophysitis

- Symptoms
 - Localized heel pain (pressure)
 - Gait change
 - Limping
 - **Toe walking - NOT assoc with Sever's dz**
 - Pain after running/jumping
 - Swelling/redness variable
 - Avoidance of activities
 - Growth spurts – shoes and pants

Calcaneal Apophysitis

- Physical Exam

- Inspection:

- Variable swelling/redness
 - **Gait changes based on acuity of symptoms**

- Palpation:

- **Lateral calcaneal pain/Achilles tenderness**
 - Tenderness based on acuity of symptoms

- Range-of-Motion (ROM):

- limited by pain
 - **Knee bent Dorsiflexion vs. Knee Extended Dorsiflexion**

- Strength: usually normal

- Neuro/Vascular: no changes

- Ortho Tests

Calcaneal Apophysitis

Radiographs

- AP- Lateral
- Harris Heel
 - Radiographs helpful in refuting other bone injuries

Typically see fissuring of Calcaneal epiphysis

Calcaneal Apophysitis: American Academy of Foot and Ankle Surgeons

<http://www.acfas.org/Content.aspx?id=1483>

Orthopaedic

Educational Services, Inc.

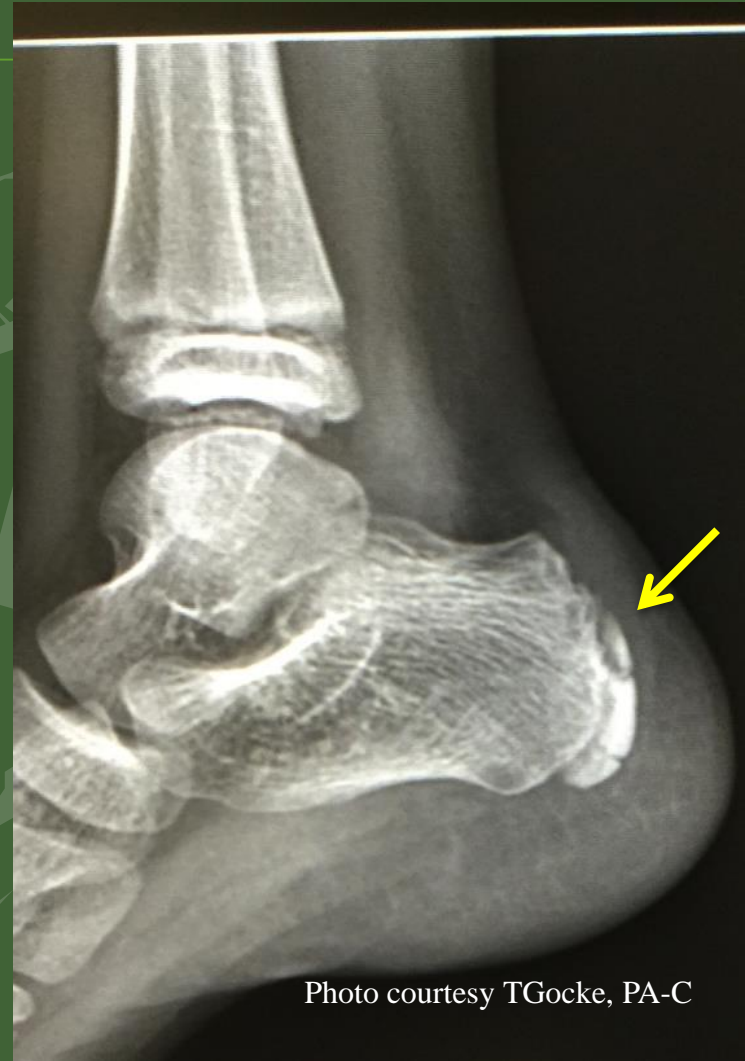
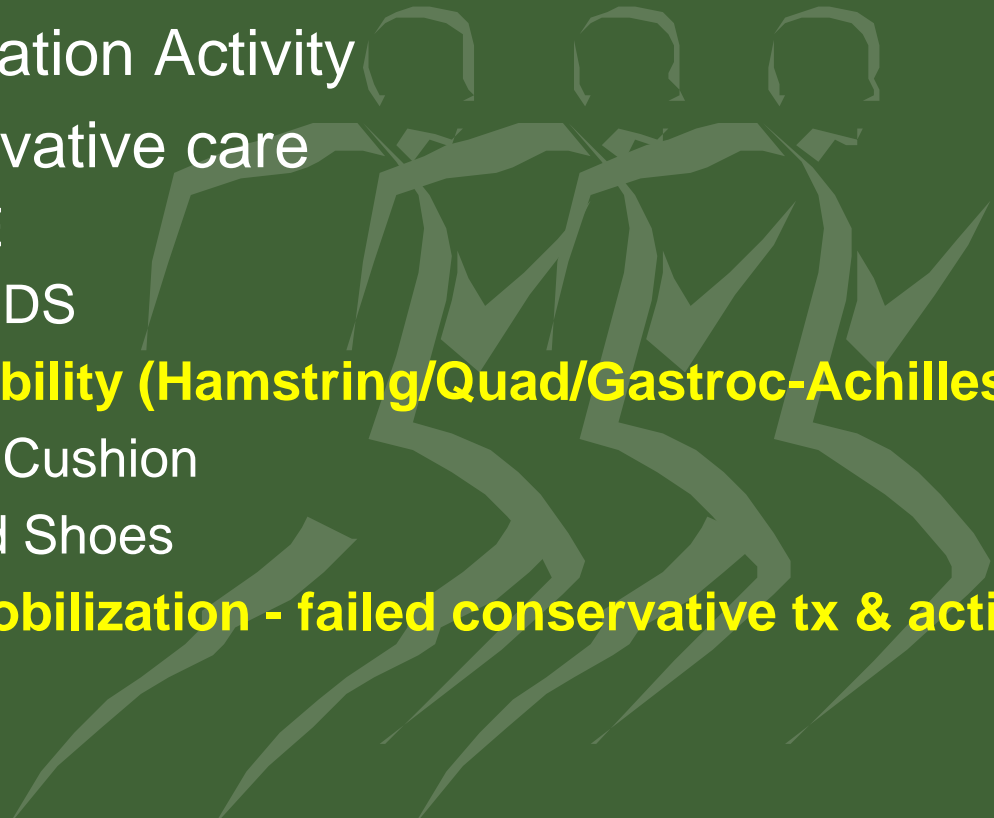


Photo courtesy TGocke, PA-C

Calcaneal Apophysitis

Treatment

- **Recognition of complaints**
- Modification Activity
- Conservative care
 - RICE
 - NSAIDS
 - **Flexibility (Hamstring/Quad/Gastroc-Achilles)**
 - Heel Cushion
 - Good Shoes
 - **Immobilization - failed conservative tx & activity modification**



Calcaneal Apophysitis: American Academy of Foot and Ankle Surgeons <http://www.acfas.org/Content.aspx?id=1483>



Ankle Sprains

Ankle Sprains

- Most common injury in athletics or physical activity
- **Plantar flexion & inversion mechanism**
- Limited disability
- Frequently re-injury
- Often under treated & most under rehabbed injury in non-athletic population
- **Skeletally immature: Slater-Harris 1 fx more common vs. sprain**
- **Swelling no indication of severity**
- Acute inflammatory response last 7-10 day

Ankle Sprains

- **Symptoms:**
 - Swelling
 - Ecchymosis: lateral heel, deltoid & MTP joints
 - Ankle & foot pains
 - 5th metatarsal base
 - Lateral Malleolus tenderness vs. Ligament tenderness
 - Ligament Laxity
 - Decreased ROM
 - Weakness 2nd to generalized ankle pain

Ankle Sprain

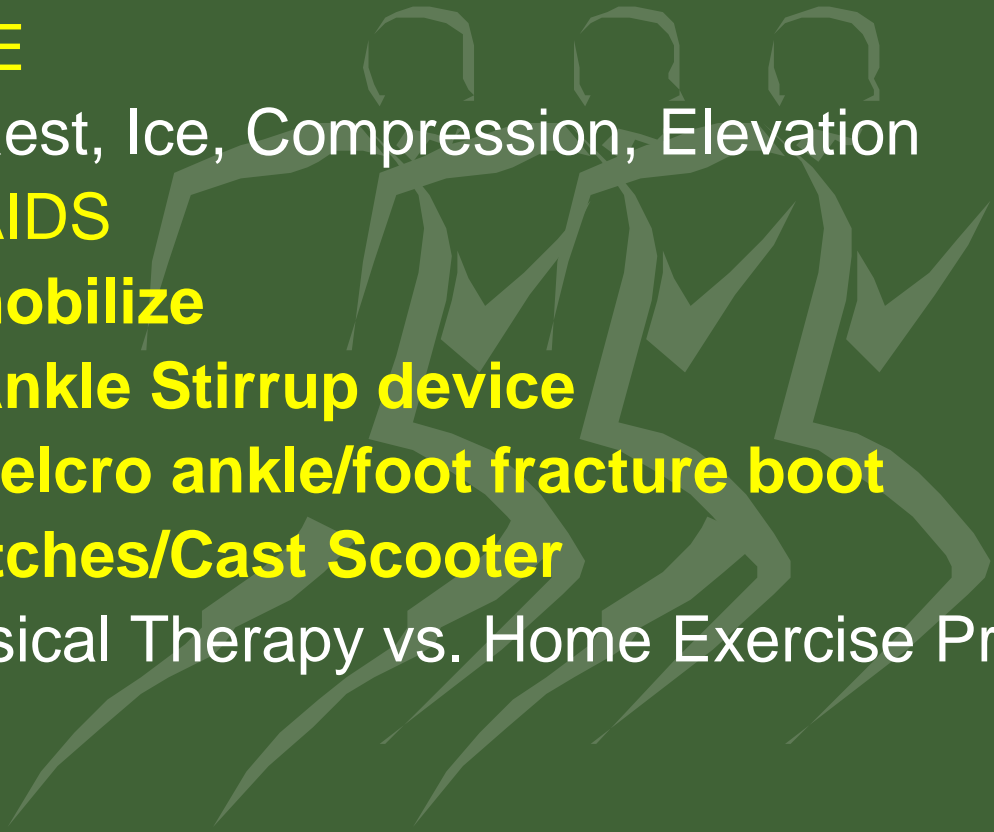
- Physical Examination
 - Inspection
 - Look for deformities and amount of swelling
 - Swelling is NOT an indication of severity of fracture
 - Palpation: appropriate bony landmarks
 - **More tenderness over lateral malleolus vs ATFL**
 - Range-of-motion (ROM) & Strength
 - limited 2nd to pain and swelling
 - Neuro/Vascular
 - Orthopaedic Tests
 - Anterior Drawer
 - Talar Tilt Test
 - Squeeze Test

Ankle Sprains

- Radiographs: X-ray or Not?
 - AP Lateral and Mortise views
 - Location maximal tenderness guides x-ray selection
 - Lateral ankle ligaments vs. S-H fx distal fibula
 - S-H 1 fx looks normal on x-ray
 - Diagnosis of suspicion
 - Always consider foot x-ray to evaluate for base 5th MT fx

Ankle Sprains

- Treatment:
 - **RICE**
 - Rest, Ice, Compression, Elevation
 - **NSAIDS**
 - **Immobilize**
 - **Ankle Stirrup device**
 - **Velcro ankle/foot fracture boot**
 - **Crutches/Cast Scooter**
 - Physical Therapy vs. Home Exercise Program





Apophysitis 5th Metatarsal Base

Apophysitis 5th Metatarsal

- AKA: Iselin's disease
- Traction Apophysitis at base 5th Metatarsal
- Repetitive activity pull Peroneus Brevis base 5th Metatarsal
- Peak ages 8-13 yrs M = F
- Activity specific - Soccer, Basketball, Dancers
- Worse with activity - better Rest
- Physical Exam
 - Base 5th Metatarsal tenderness
 - Isolated swelling base 5th Metatarsal

<https://www.orthobullets.com/pediatrics/4073/iselins>

Apophysitis 5th Metatarsal

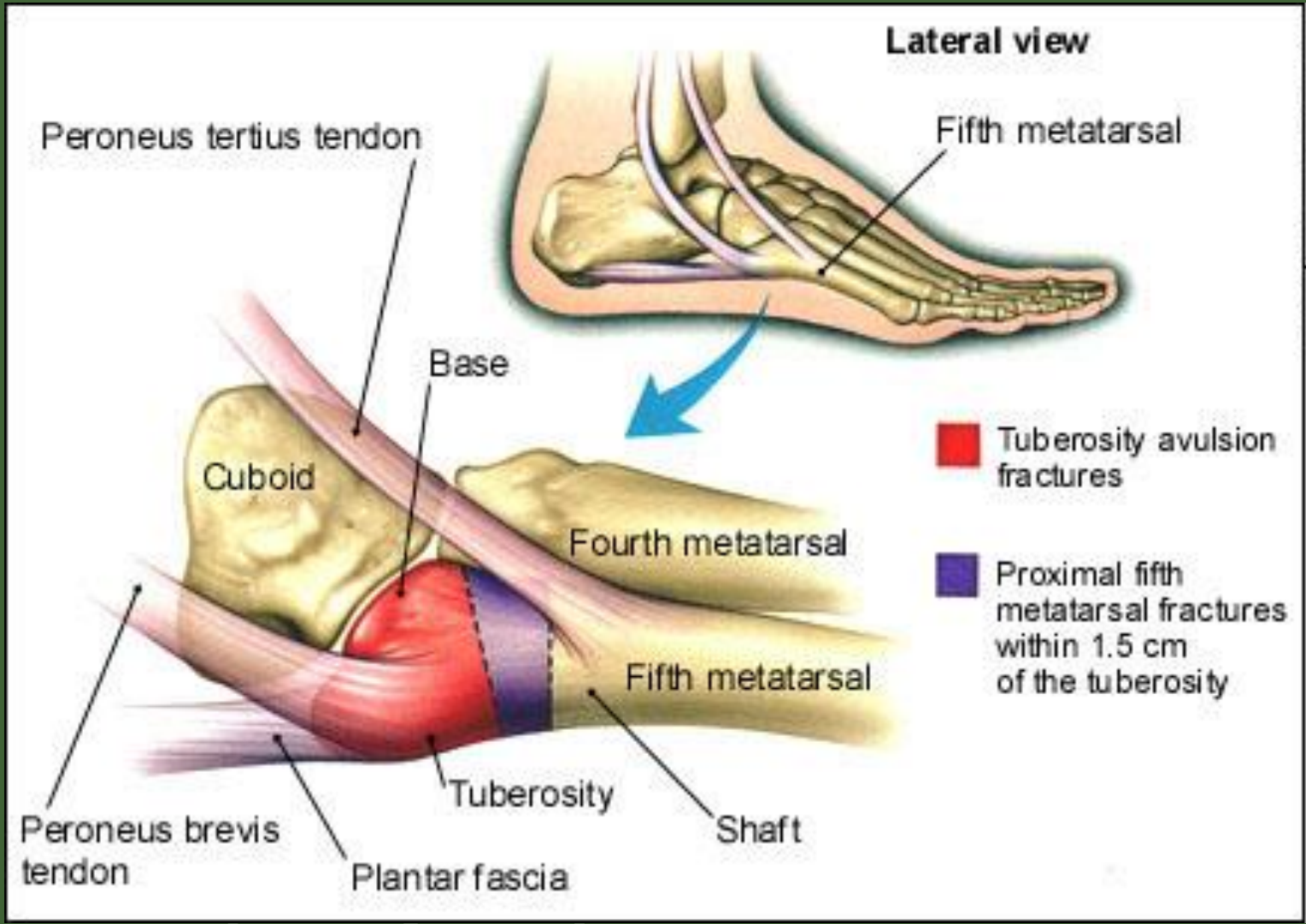
- Radiographs
 - Wt bearing AP, LAT, Oblique
 - Apophysis runs parallel to shaft 5th MT
 - Lateral-Inferior margin of 5th MT tubercle
- Treatment
 - Recognition
 - Rest/activity modification
 - Immobilize - symptomatic

Normal Apophysis



Photo courtesy TGoetze, PA-C

www.orthobullets.com/pediatrics/4073/iselins



Strayer SM: Fractures of the Proximal 5th Metatarsal; Am Fam Physician. 1999 May 1;59(9):2516-2522



www.orthoedu.com

Thunder Hill Overlook, Blue Ridge Pkwy
Blowing Rock NC
Photo Courtesy TGocke, PA-C