Pediatric Injuries at School

GROWING BONES
PEDIATRIC & NEUROMUSCULAR
ORTHOPAEDIC INSTITUTE

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DISCLOSURES

- Growing Bones Pediatric & Neuromuscular Orthopaedic Institute is a private practice owned and operated by Dr. Justin Connor, MD.

- No financial affiliations with the information presented

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photo: www.bayhealth.org

Kids Are Unique

- Not just “small adults”
- Some conditions are unique only to children
- Some conditions are time sensitive
- Different expectations and tolerances at different ages
- Remodeling potential

Common Injuries and mechanisms

- Fractures
- Sprains
- Contustions
- Shin Splints
- Knee/Ankle Injuries
- Nursemaid's Elbow
- Concussion
- Gym/PE
- Sports
- Slips, Trips & Falls

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Diagnosis

What is the most important part of any examination?

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Diagnosis

- History/mechanism
  - Clear narrative of the problem, location, quality, severity, timing, frequent and associated manifestations
    - Acute Injury
    - Chronic Condition
  - Medical History
    - Deformity

- Exam Findings
  - Observation (Hands off)
    - Ability to bear weight
    - Spontaneous use
  - Anatomically relevant exam (Hands on)
    - Significant swelling/bruising
    - Deformity

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Triage

- Emergent – immediate transfer
- Urgent – stabilize and transition
- Chronic - symptomatic treatment / observation
- Treatment Factors
  - Correlate history with mechanism
  - Available medical equipment
  - Provider comfort with injury
  - Social/Family Environment

The Difference: Growth Plates

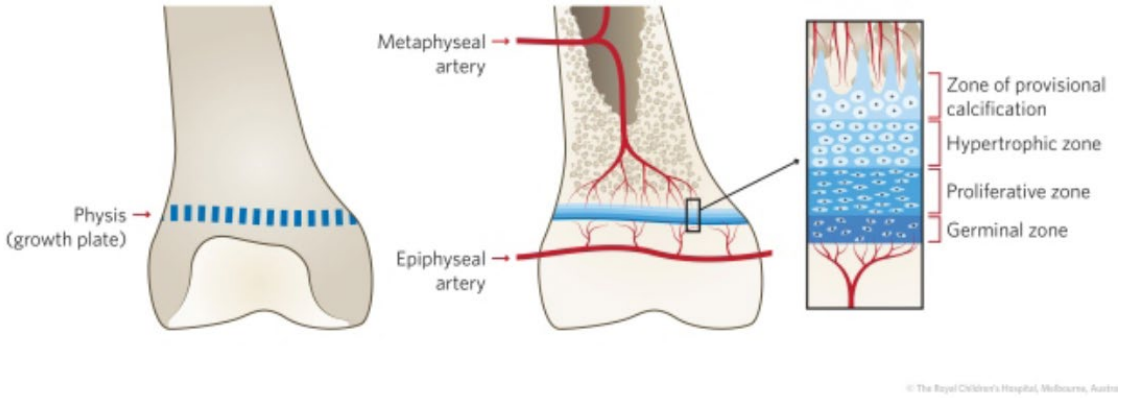
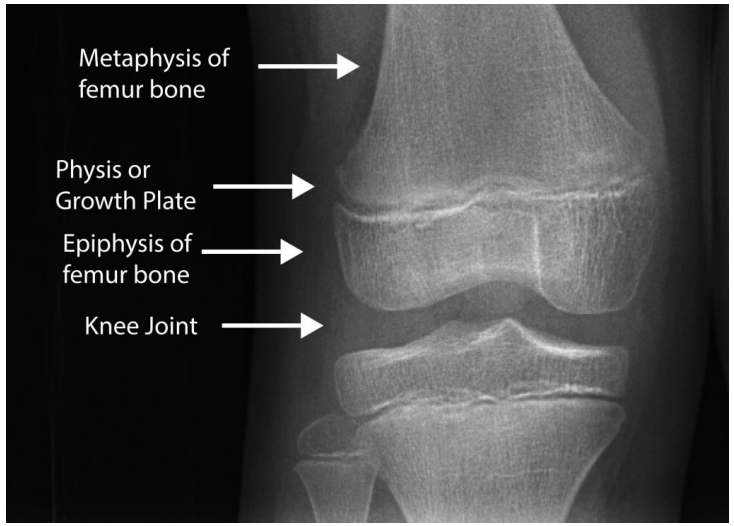
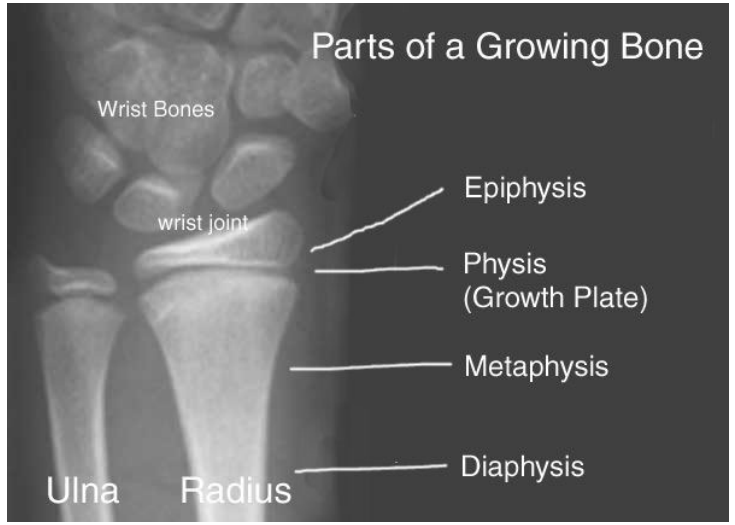


Figure 10: Anatomy of the physis (growth plate).

- Longitudinal Growth
- Cartilage is converted to bone
  - Weaker than the surrounding bone
  - Metabolically active
- Ends of Long Bones
- Mechanical & Hormonal Stimulus





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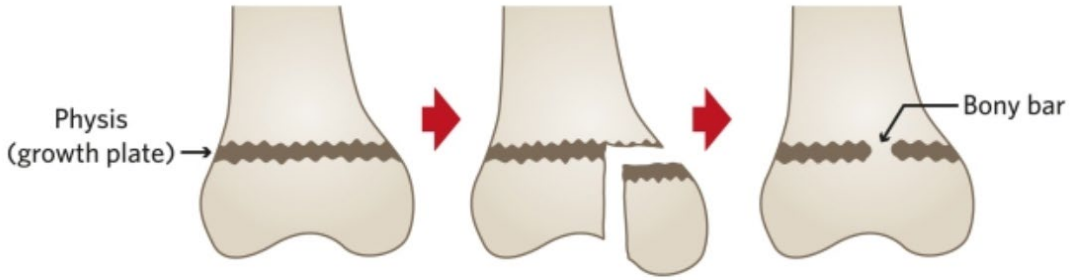

Growth Plate Fractures

- 15 to 30% of all pediatric fractures involve the growth plate
- Potential to affect growth
- Incidence peaks in adolescence
- Reduction is time-sensitive

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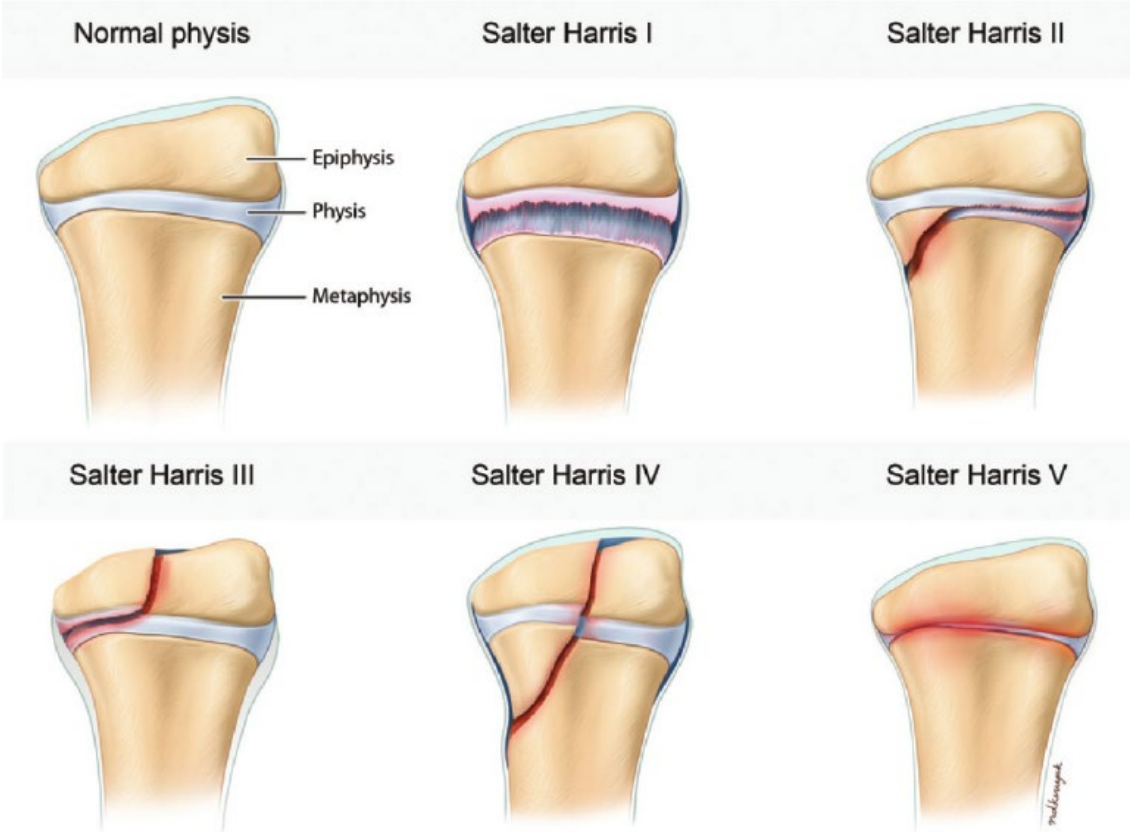
Fracture Classification

- Salter Harris Classification most common
- Describes the extent of the break
- Fractures give clues about mechanism and traumatic energy
- Different complications



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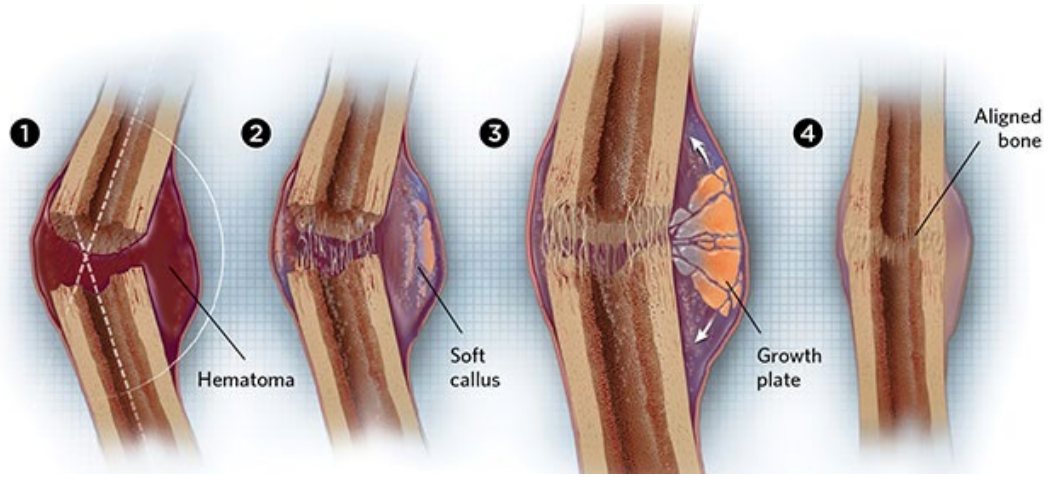
What happens to crooked bones?

They get better (Remodeling)

- Progressive alignment improvement of a fracture
- Increased potential in skeletally immature
- Average improvement 1 deg per month

They get worse (physeal arrest)

- Limb length discrepancy
- Progressive or persisting deformity



https://www.the-scientist.com/the-literature/straighten-out-36144

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Fracture Remodeling

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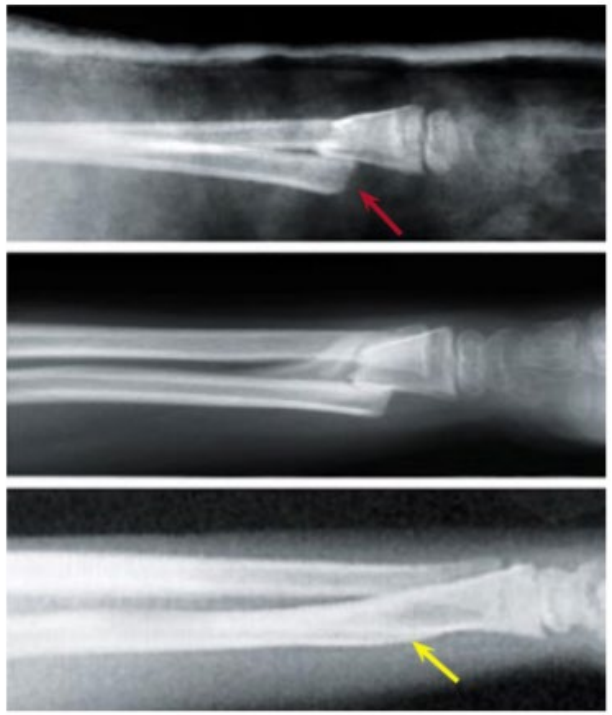
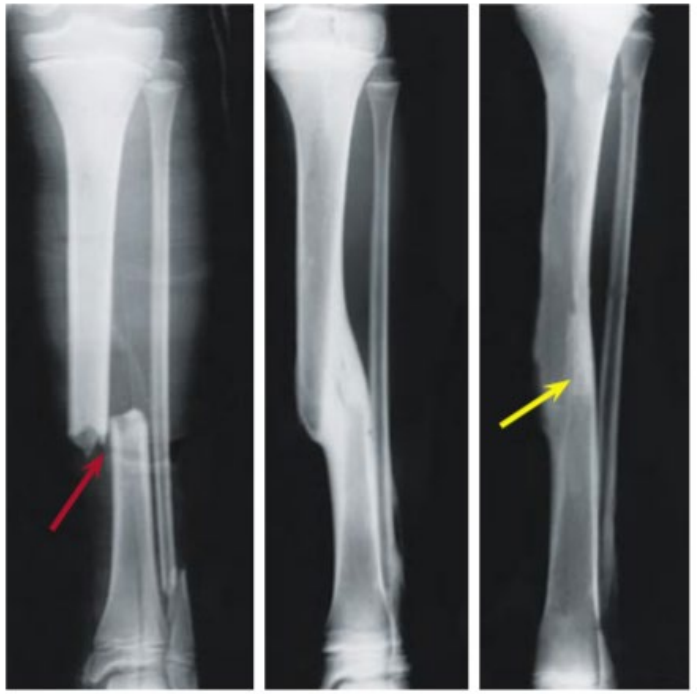


Remodelling of the forearm
This fracture (red arrow) could not be reduced by manipulation and was left with side-to-side alignment. Remodelling corrects the deformity in 18 months (yellow arrow).



Remodelling of side-to-side apposition
This 8-year-old child sustained this fracture, which was aligned but not reduced (red arrow). Over a period of 2 years, tibia remodelling resulted in a good outcome (yellow arrow).

Poster created by L. Staheli, MD
Contribution: upper left – Edison Forlin, Curitiba, Brazil
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Sprains

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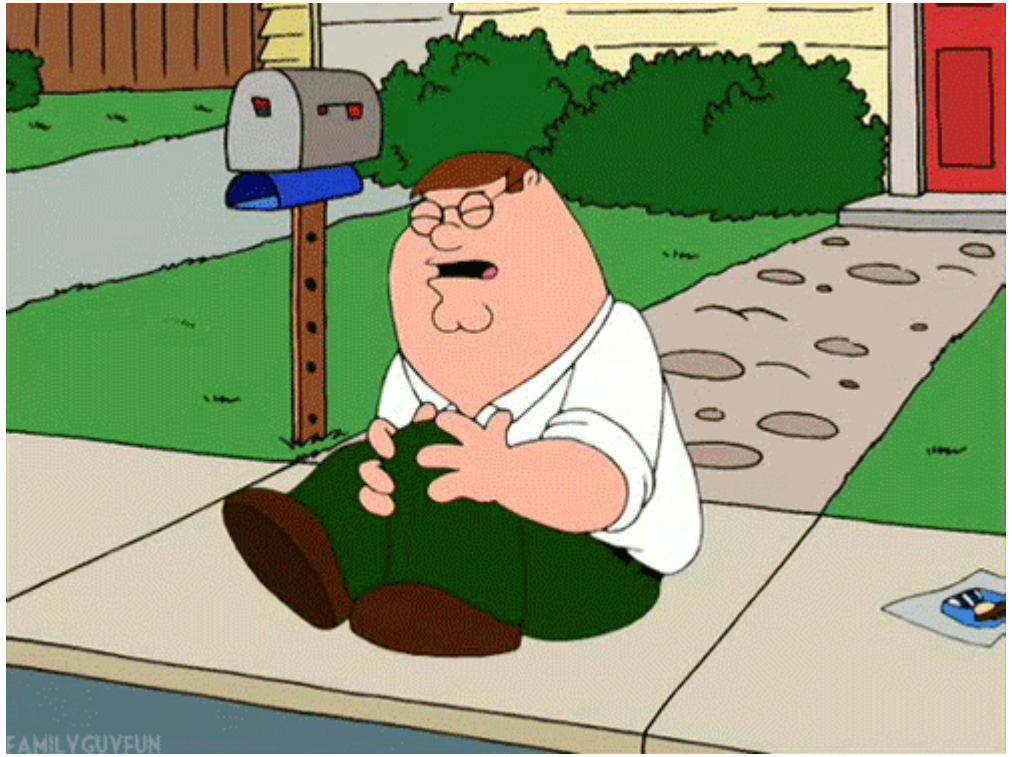
A sprain is a stretch and/or tear of a ligament, a strong band of connective tissue that connects the end of one bone with another. Ligaments stabilize and support the body's joints.

•Grade 1 sprain (mild): Slight stretching and some damage to the fibers of the ligament.

•Grade 2 sprain (moderate): Partial tearing of the ligament. There is abnormal looseness (laxity) in the joint when it is moved in certain ways.

•Grade 3 sprain (severe): Complete tear of the ligament. This may cause significant instability



Strains

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- A strain is an injury to a muscle and/or tendon. Tendons are fibrous cords of tissue that attach muscles to bone.
- Similar to a sprain, a strain may be a simple stretch of your muscle or tendon, or it may involve a partial or complete tear of the muscle and tendon. Symptoms of a strain may include pain, muscle spasm, muscle weakness, swelling, inflammation, and cramping.
- The recommended treatment for a strain is the same as for a sprain: rest, ice, compression and elevation. This should be followed by simple exercises to relieve pain and restore mobility.

QUESTION

What is the difference between a splint and a cast?

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Splinting Principles

Immobilization
Splints
Buddy Taping/Splinting
Splinting in the position of Function

- Splinting involves subsequent application of a noncircumferential support held in place by an elastic bandage.
- Splints are faster and easier to apply; allow for the natural swelling that occurs during the acute inflammatory phase of an injury; are easily removed for inspection of the injury site; and are often the preferred tool for immobilization in the acute care setting.
- Disadvantages of splinting include lack of patient compliance and increased motion at the injury site.

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SPLINTING TECHNIQUES

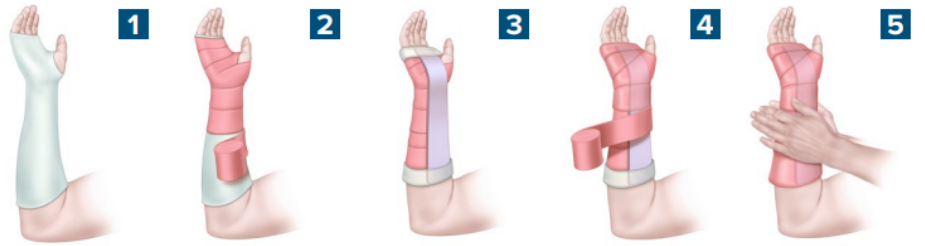
BASELINE MATERIALS

- Stockinette
- Splinting material
- Plaster
  - Upper extremity: 8–10 layers
  - Lower extremity: 10–12 layers
- Fiberglass
- Padding
- Elastic bandaging
- Bucket/receptacle of water (the warmer the water, the faster the splint sets)
- Trauma shears

BASELINE PROCEDURE

Measure and prepare the splinting material.

- Length: Measure out the dry splint on the contralateral extremity
- Width: Slightly greater than the diameter of the limb



1 Apply the stockinette to extend 2" beyond the splinting material.

2 Apply 2–3 layers of padding over the area to be splinted and between digits being splinted. Add an extra 2–3 layers over bony prominences.

3 Lightly moisten the splinting material. Place it and fold the ends of stockinette over the splinting material.

4 Apply the elastic bandaging.

5 While still wet, use palms to mold the splint to the desired shape.

6 Once hardened, check neruovascular status and motor function.

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https://www.emra.org/globalassets/emra/publications/reference-cards/emra_sportsmedicine_splint_guide.pdf

Guidelines for proper cast/splint application

- Use appropriate amount of padding
- Properly pad bony prominences and high-pressure areas
- Properly position the extremity before, during, and after application
- Avoid wrinkles in the material

Complications of Cast/Splint Immobilization

- Compartment Syndrome
- Ischemia
- Pressure Sores/Skin Breakdown
- Infection
- Dermatitis
- Joint Stiffness
- Neurologic Injury

American Family Physiscian. “Principles of Casting & Splinting” Jan 1, 2009. 79(1): 16-22. https://www.aafp.org/afp/2009/0101/p16.html

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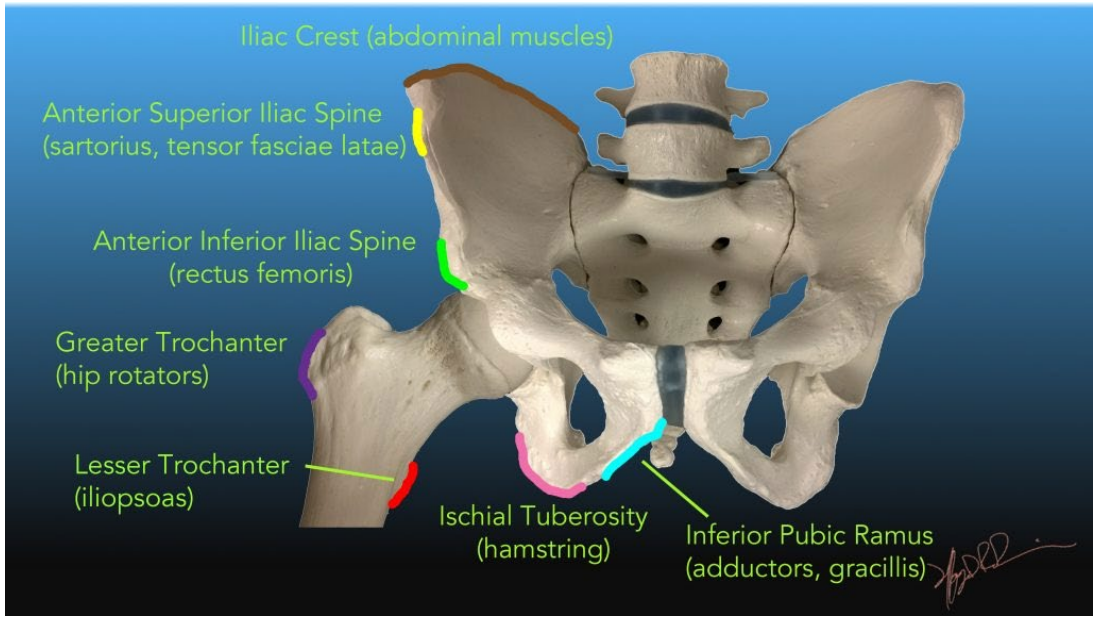
Splinting Warning Signs

- Increased pain and the feeling that the splint or cast is too tight. This may be caused by swelling.
- Numbness and tingling in your hand or foot. This may be caused by too much pressure on the nerves.
- Burning and stinging. This may be caused by too much pressure on the skin.
- Excessive swelling below the cast. This may mean the cast is slowing blood circulation.
- Loss of active movement of toes or fingers. This requires an urgent evaluation by your doctor.

Avulsion Fractures



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Growing Pains

- Lower extremity pain in the afternoon, evening or at night after activity
- Child may wake at night with pain complaints
- Most often bilateral
- Can range from mild ache to severe pain
- Clinical exam, x-rays and laboratory studies normal
- Symptoms resolved by morning
- Observation, local modalities, and occasional over the counter medications as needed
- Responds to conservative management
- Resolves with skeletal maturity

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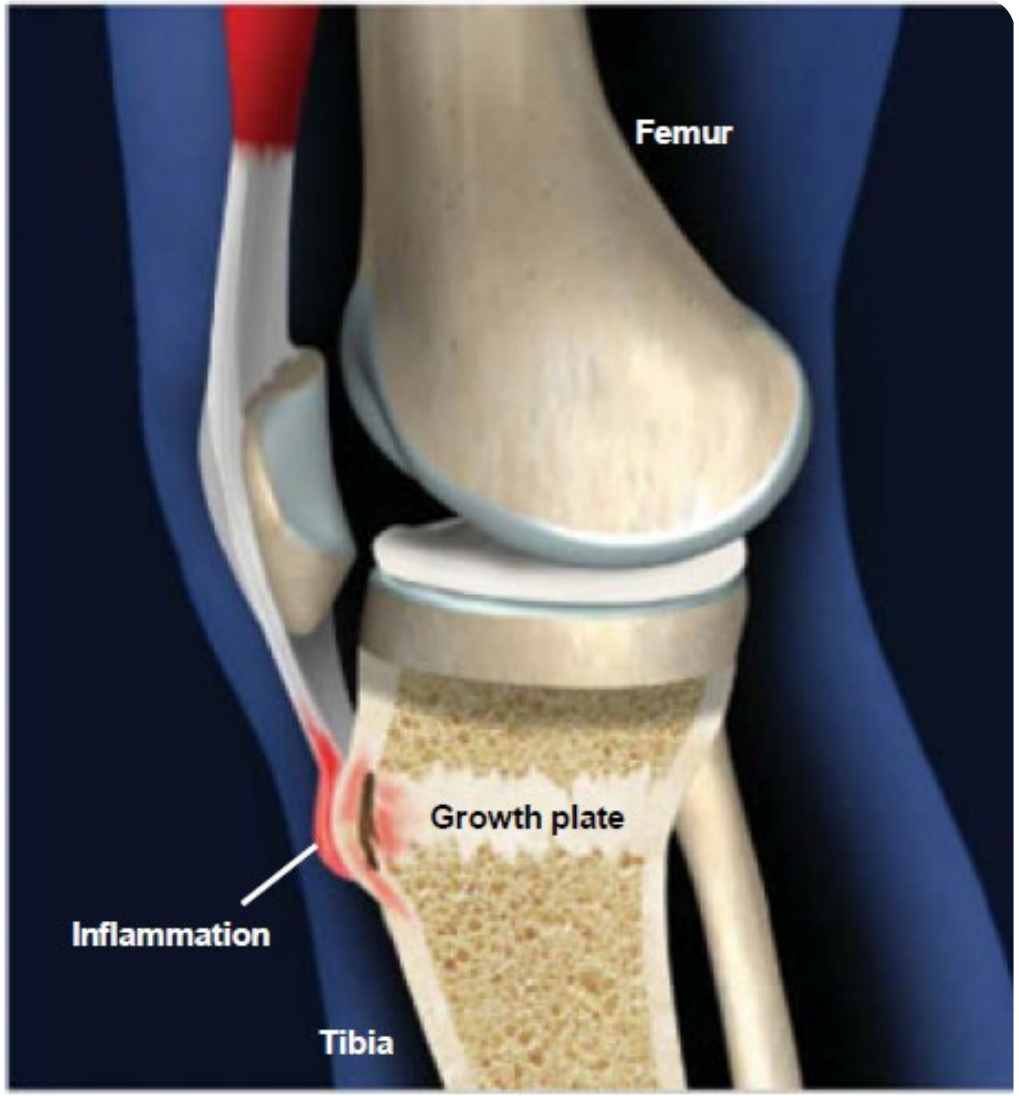
Apophysitis

- What is apophysis?
  - Bony site where muscle is inserting (pulling) at a growth plate
- Apophysitis
  - Injury or irritation of a growth plate due to muscle traction
- Locations
  - Any location in which a muscle inserts near a growth plate



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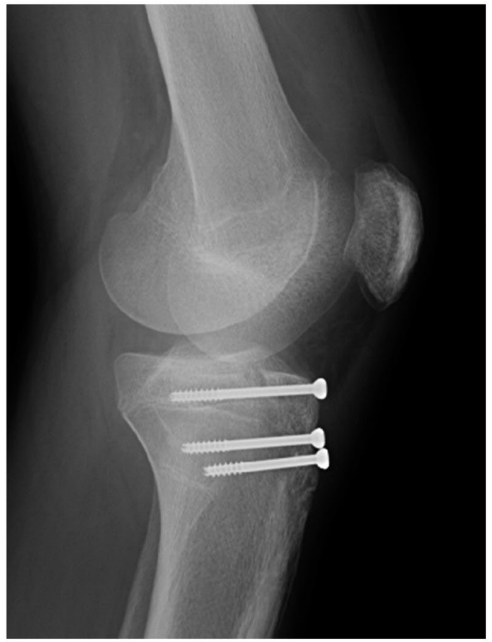

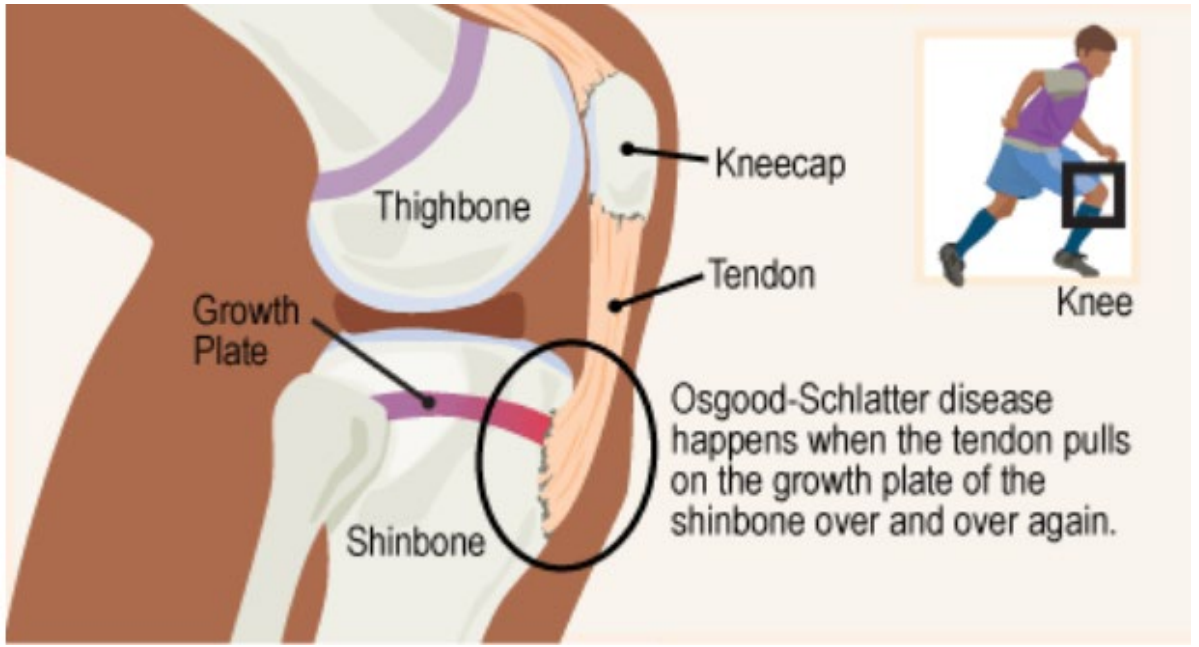

Osgood-Schlatter and Tubercle Fractures

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Calcaneal Apophysitis (Sever's Disease)

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Other common causes of pain in growing children: Calcium & Vitamin D

- Essential in calcium absorption
- Building lifelong stores
- FDA Recommendation
  - 0-12 mo: 400 IU
  - 1-70 yrs: 600 IU
- 15% Estimated Prevalence of Deficiency
- Symptoms of Deficiency
  - Moans, groans, achy bones

5 – 30 mins of sunlight (10a – 3p) 2x weekly is estimated to generate sufficient Vitamin D independently

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Source: https://ods.od.nih.gov/factsheets/VitaminD-HealthProfessional/

Follow up care and Communication

- Urgent cares
- Radiology
- X-Ray, CT or MRI
- Making Referrals

Resources

National Institutes of Health
Office of Dietary Supplements

orthoKids
PEDIATRIC ORTHOPAEDIC SOCIETY OF NORTH AMERICA

AAOS
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Torticollis and the Benefits of Therapy

Seen most often in infants, congenital muscular torticollis (CMT) is a postural condition typically characterized by a head tilt to one side and head rotation to the opposite side. The sternocleidomastoid is the muscle in the neck mainly responsible for this condition, often tight on one side and weak on the other side. It is...

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Questions?

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