

Osteochondroses

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6-year-old boy was jumping on a bed at home 2 days ago when he fell and landed on his right foot. He developed immediate pain. He was seen later that evening in an Urgent Care Center and was placed in a posterior splint and given crutches. He has felt comfortable in the splint. There is no history of any previous injuries to the foot or ankle. He is not describing any numbness or tingling of the foot.

Past medical and past surgical history are negative.

Current Medications: None.

Well-nourished boy in NAD

Ht 48 inches, Wt 54 pounds.

Right leg demonstrated no defects, deformities, atrophy, or asymmetry.

No masses appreciated. Achilles tendon was nontender and intact. The ankle demonstrated full range of motion. No soft tissue swelling seen. No TTP. The ligaments were stable.

Hind foot - no tenderness over the calcaneus.

Mid foot - TTP dorsal aspect of the navicular. No TTP over the medial aspect of the navicular. Posterior tibialis tendon was NTTP and intact. MTs nontender. Sensation was intact. Distal pulses were intact.

X-Rays Right Foot



Left Foot Comparison



1 Month Follow Up



Osteochondroses

- Spectrum of disorders that involve disruption of endochondral ossification (chondrogenesis and osteogenesis) in bone that was formerly normal
- More than 50 eponyms
- Multiple classification systems



Osteochondroses

- Most common among 3-12 year olds
- Can be diagnosed in adults
- M > F except Freiberg's
- Can be bilateral
- Variations of normal endochondral ossification well known
- Diagnoses based upon symptoms and abnormal imaging

Osteochondroses

- Paget 1870 “quiet necrosis”
- König 1888 “osteochondritis dissecans”
 - Loose bodies
 - w/o OA, trauma

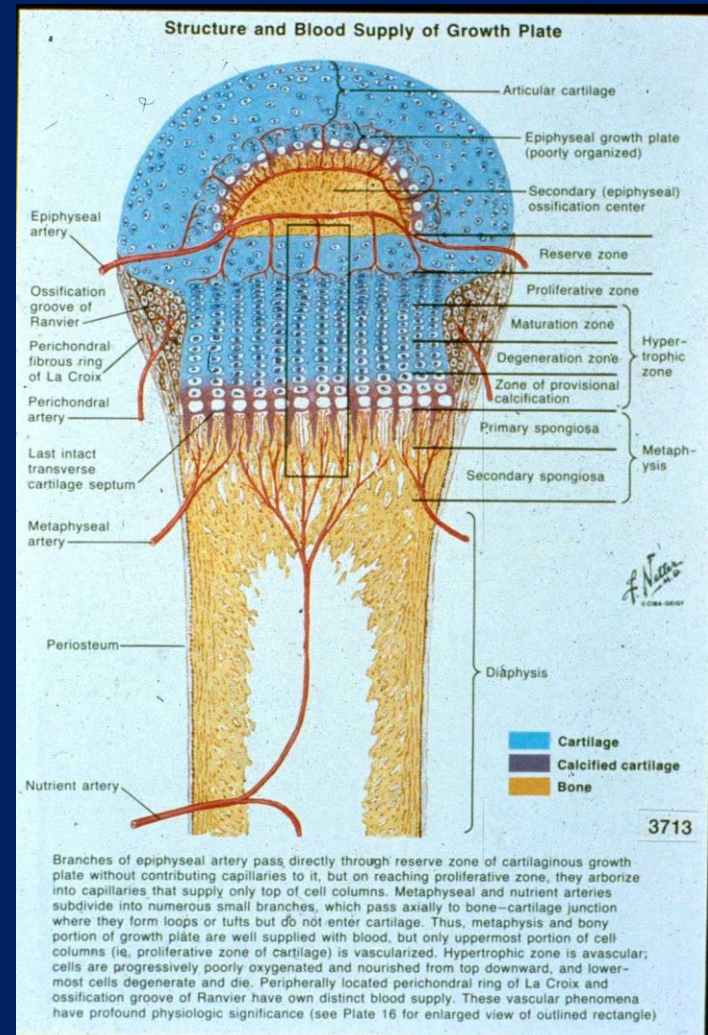


Osteochondroses

- Osteochondroses thought to represent **disorder of endochondral ossification**
- Endochondral ossification
 - Mechanism in which cartilage is transformed into bone.
 - Chondrocyte proliferation, matrix production, calcification, ossification
- However, normal endochondral ossification may not be uniform

Osteochondroses

- Epiphyseal artery
 - Chondrogenesis
 - Osteogenesis
 - Germinal layer (reserve zone)
- Metaphyseal artery
 - Longitudinal growth
 - Angulation



Osteochondroses

- Specific etiology unknown, likely multifactorial
 - Trauma
 - Ischemia
 - Genetic factors
 - Idiopathic



Pathogenesis

- Early necrosis –
condensation
- Revascularization with
bone deposition and
resorption –
fragmentation
- Bone healing -
reorganization
- Residual deformity



Classification

- Articular

- Primary – articular and epiphyseal cartilage and subjacent endochondral ossification
- Secondary – articular and epiphyseal cartilage due to AVN of subjacent bone

Examples

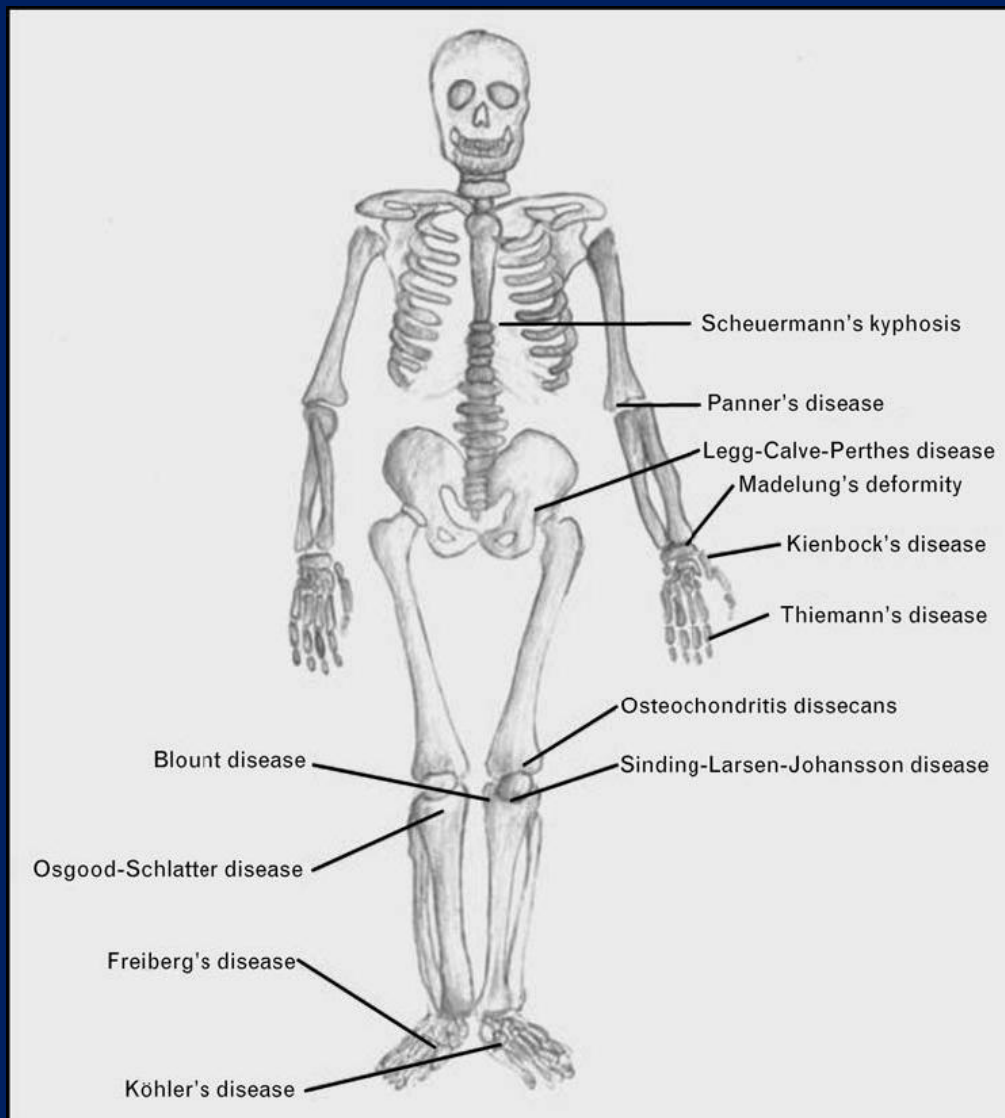
- Panner's - capitellum, Freiberg's , Iselin's – MT
- LCP, Kohler's- navicular, Keinbock's – lunate, OCD
- Osgood-Schlatter, Sever's, LL elbow
- Tibia vara (Blount's), Scheuermann's

- Non-articular

- Tendon, ligaments, impact sites

- Physeal

- Long bones
- Vertebrae



From Doyle SM, Monahan A. Curr Op Ped 2010;22:41-46.

Clinical Classification

- Osteochondroses
- Osteochondritis dissecans – focal area of subchondral bone undergoing necrosis with splitting into fragments
- Traction apophysitis



Clinical Features

- Localized pain, swelling
- Often insidious onset
- Sports participation (repetitive loading)
- Acute trauma
- TTP, swelling



Clinical Features - OCD

- Adolescent age group
- Sports setting
- Mechanical symptoms
- Pain, swelling, stiffness
- TTP, effusion, decreased ROM
- Sites
 - Medial femoral condyle
 - Talus
 - Capitellum
 - Patella



Diagnosis

- Radiographs display characteristic findings
- MRI – may predict prognosis in some cases (OCD)



Treatment

- Non-articular (traction apophysitis)
 - Relative rest
 - Rehab – strengthening
 - Education



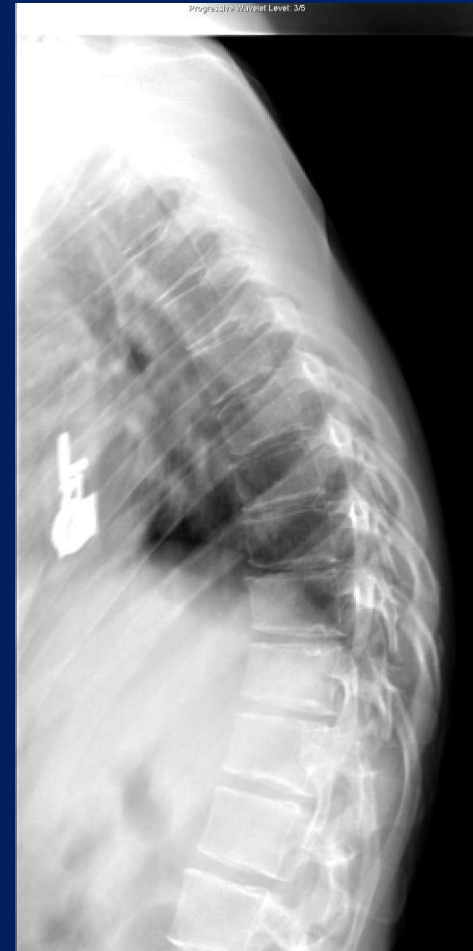
Treatment - Physeal

- Blount's
 - Proximal tibial physis
 - Varus, flexion, IR
 - < 4-6y
 - Obese, early walking
 - Bilateral
 - Bracing vs surgery
 - > 4-6 yrs
 - Unilateral
 - Tibial osteotomy



Treatment - Physeal

- Scheuermann's (adolescent kyphosis)
 - $> 45^{\circ}$, wedging 3 consecutive vertebrae
 - $< 50^{\circ}$ Rehab ?
 - $> 50^{\circ} < 70^{\circ}$ Brace
 - $> 70^{\circ}$ fusion with instrumentation



Panner's

- 7-12y (peak 9y)
- +/- Sports related
- Full ROM
- No locking, catching
- Flattening and patchy sclerosis of most of capitellum
- No loose bodies
- Self limited
- No long term sequelae

OCD Capitellum

- 11-16y
- Gymnasts, pitchers
- Limited ROM
- Catching/locking can occur
- Focal lesion
- Loose bodies
- May require intervention
- Residual deformity/disability

Treatment – Primary Articular

- Freiberg's
 - Rest, immobilization 6-12wks
 - If persistent symptoms: tx depends on age
 - Debridement, dorsiflexion osteotomy, shortening osteotomy, Smillie procedure (debridement and bone grafting)
- Panner's
 - Complete rest
 - Serial radiographs
 - Rehab



Treatment – Secondary Articular

- Kohler's
 - Cast immobilization
 - – 6-8wks
- Kienbock's
 - Surgical procedures depending on stage – modified Stahl's classification
 - (radial shortening/ulnar lengthening, lunate excision with prosthesis, arthrodesis, proximal row carpectomy)



Stahl's classification

- I. Lucent line
- II. Sclerosis
- III. Collapse
- IV. Pancarpal arthrosis

Treatment – Secondary Articular

- Legg-Calve'-Perthes
 - 4-8yr, M>F
 - Bilateral (20%), but not simultaneous
 - Genetic – Factor V Leiden
 - 2 year time course depending on age
 - Goal – maintain position of femoral head w/in acetabulum, ROM , prevent deformity
 - Best outcome if <6y, <50%
 - PT
 - Containment
 - Bracing
 - Surgery -osteotomy



Treatment - OCD

- Depends on site and stage
 - Stage with MRI
 - Stage I – thickening of articular cartilage
 - Stage II – low signal rim=fibrous
 - Stage III- high signal behind fragment =fluid – unstable
 - Stage IV – loose fragment
 - If stable – rest, observe
 - Unstable – arthroscopy - removal of loose fragments, debridement



Thank you