Musculoskeletal Concerns in the Younger Athlete

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Summa Health System
Saturday, February 24th, 2018

Agenda

-How is the younger athlete different from adult athletes

-Physeal fractures

-Apophyseal avulsion

-Osgood-Schlatter and Sinding-Larsen-Johansson disease

-Sever’s disease

Young athletes are unique...

-The younger athlete may be particularly vulnerable to injury

-Injury risk factors unique to the young athlete (Caine & Maffulli, 2005):

-immature skeleton

-nonlinearity of growth

-maturity-associated variation

-adolescent growth spurt

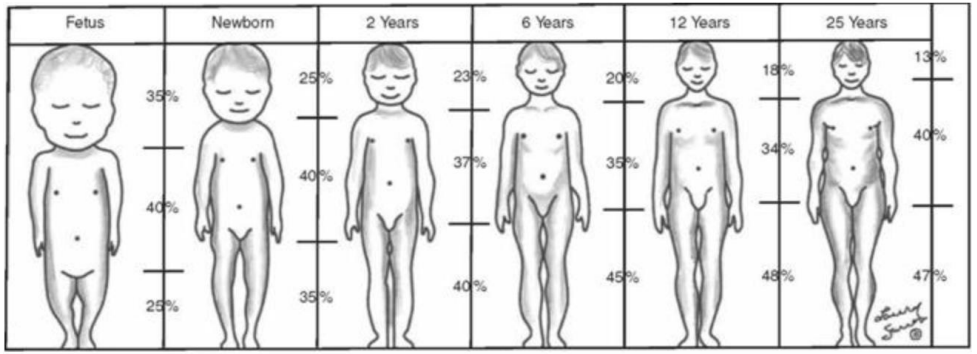
-response to skeletal injury

Nonlinearity of growth

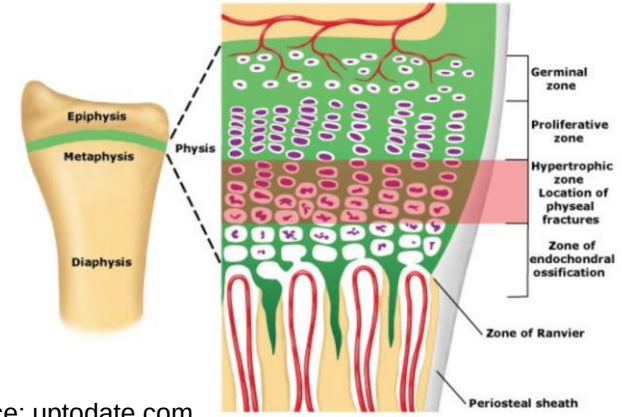
-body segments grow at different rates

-in each segment of the young person's skeleton, the contribution to growth of distal and proximal segments is not equal

-the highly metabolically active epiphyseal growth plates may make the immature athlete more susceptible to overuse injuries

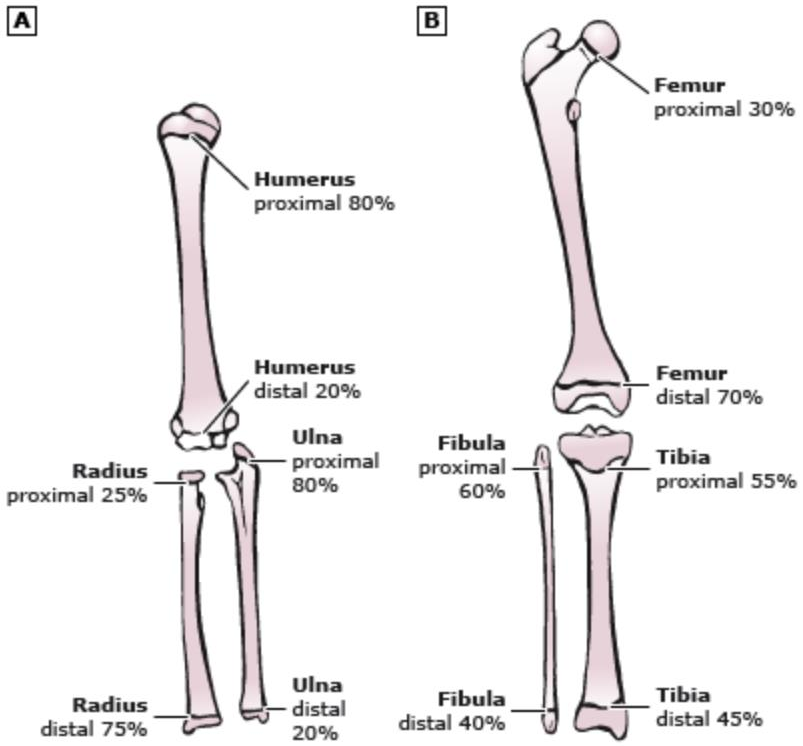


Proportions of the body as they change during growth. (Source: Lowrey GH. Growth and Development of Children. 6th ed. Chicago, IL: MYB; 1973.



Source: uptodate.com

Longitudinal bone growth of the upper and lower extremities by physis



Flynn, John M., David L. Skaggs, and Peter M. Waters. *Rockwood & Wilkins Fractures in Children Print*. Lippincott Williams & Wilkins, 2014.

Maturity-associated variation

-depends on the sex of the young athlete

-chronological age adds another dimension

-”A matching system based on physical attributes, although logistically difficult to implement, may be beneficial to equalizing competition, to maintaining interest in participation, and for reducing the potential for injury.” (Beunen & Malina, 2008)

Unique response to skeletal injury

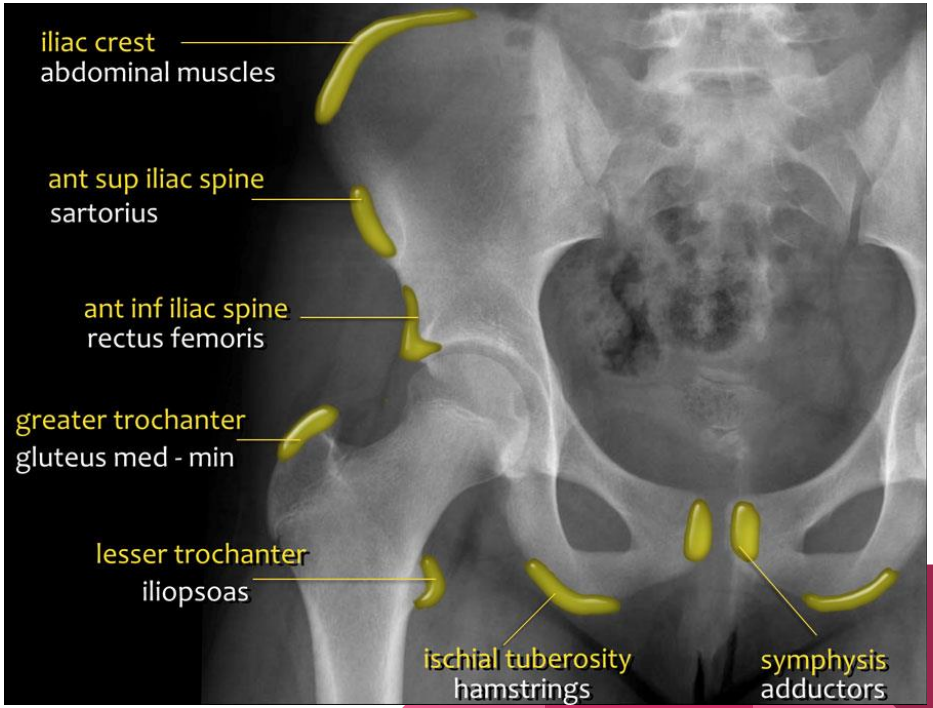
-types of injuries sustained in younger athletes are different than adults due to differences in structure of growing bone compared with mature bone:

-thicker periosteum in growing bone

-thicker articular cartilage in growing bone

-jct between epiphyseal plate and metaphysis is vulnerable to disruption

-weaker apophyses in growing bone



Source: www.radiologyassistant.nl

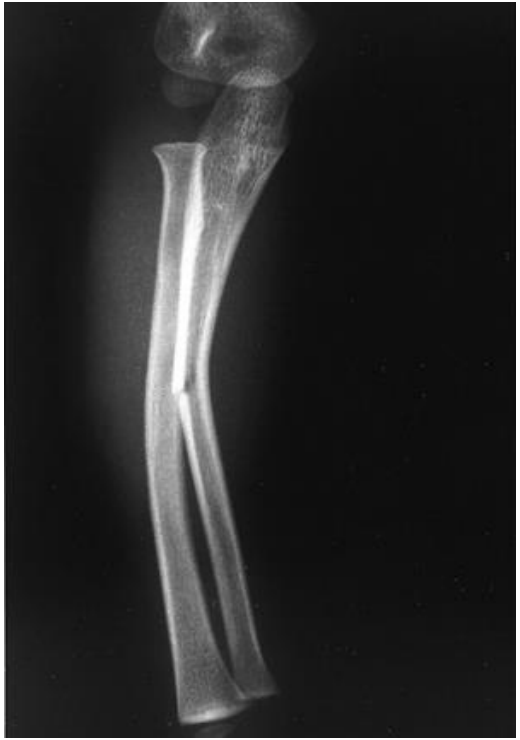
Unique response to skeletal injury

-types of injuries sustained in younger athletes are different than adults due to differences in structure of growing bone compared with mature bone:

-more elastic cortex of growing long bones

-thicker and more fragile epiphyseal plate during adolescent growth spurt

-these differences lead to different injuries with same MOI as compared to adults



Physeal Fractures

-approx 15% of all fractures in children (Ogden, 2006)

-of particular concern because of the risk of interruption to the growth process via injury to zone of hypertrophy

-physeal injuries occur in 21-30% of pediatric long bone fractures (Mann et al., 1990)

-in girls most common between 9-12 yo, in boys most common between 12-15yo (Peterson et al., 1994)

-approx 30% cause growth disturbance (Carson et al., 2006)

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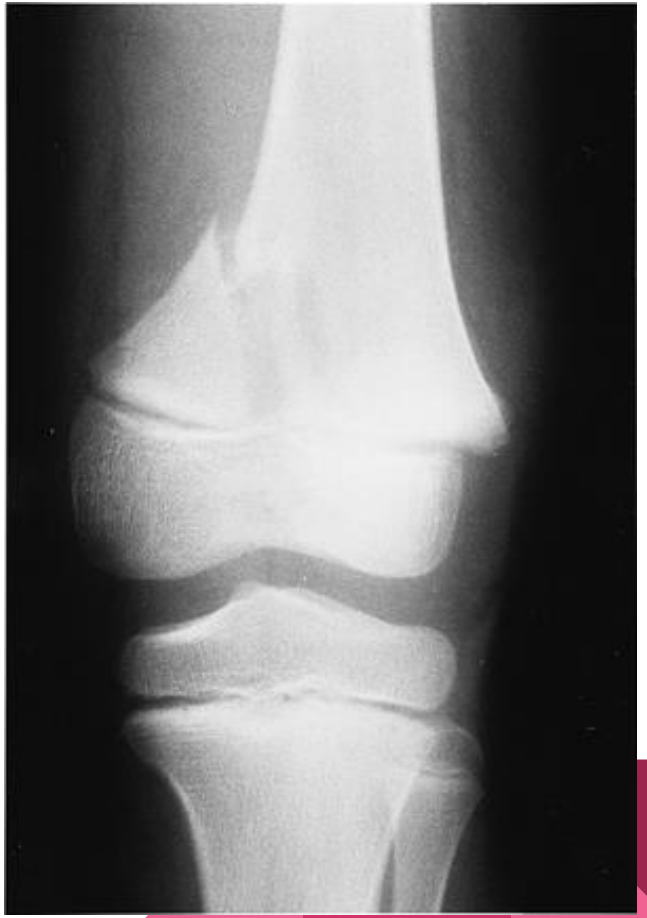
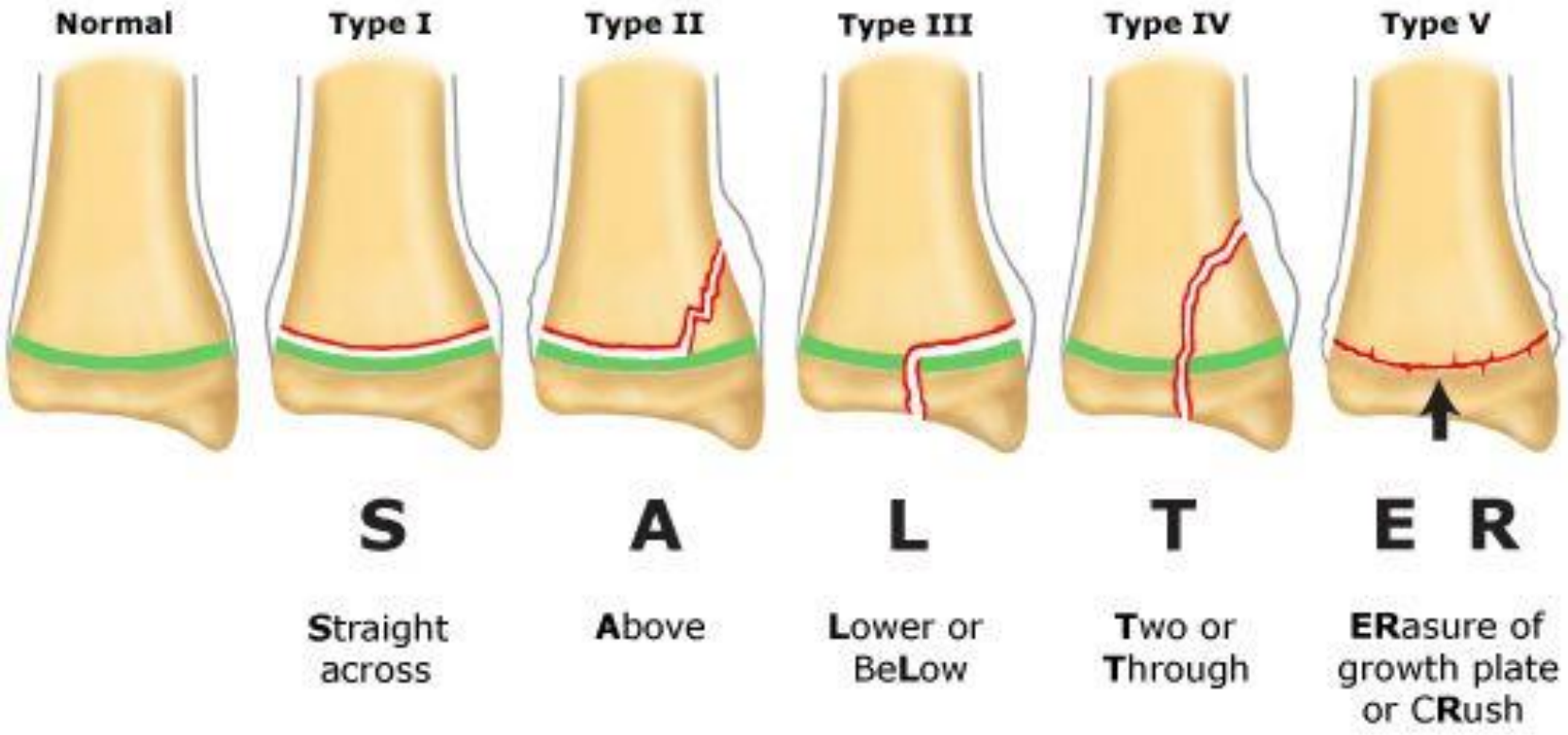
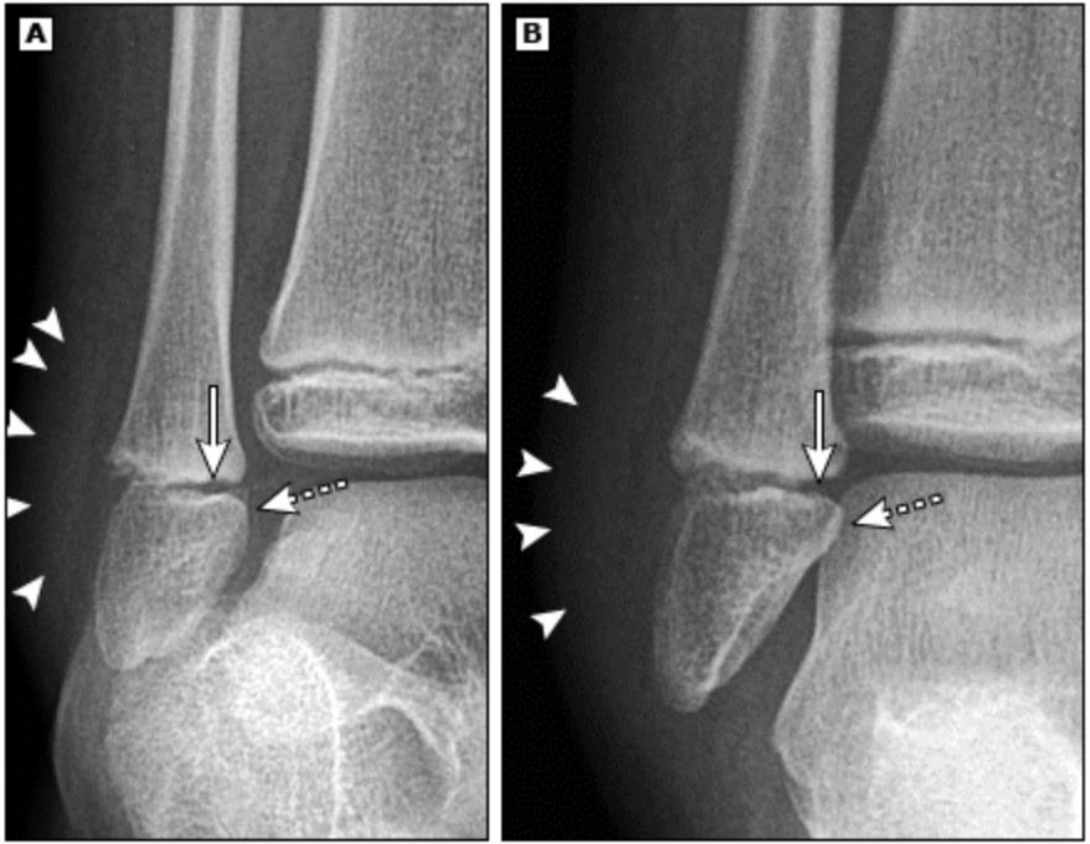


Salter-Harris classification



Salter I fracture



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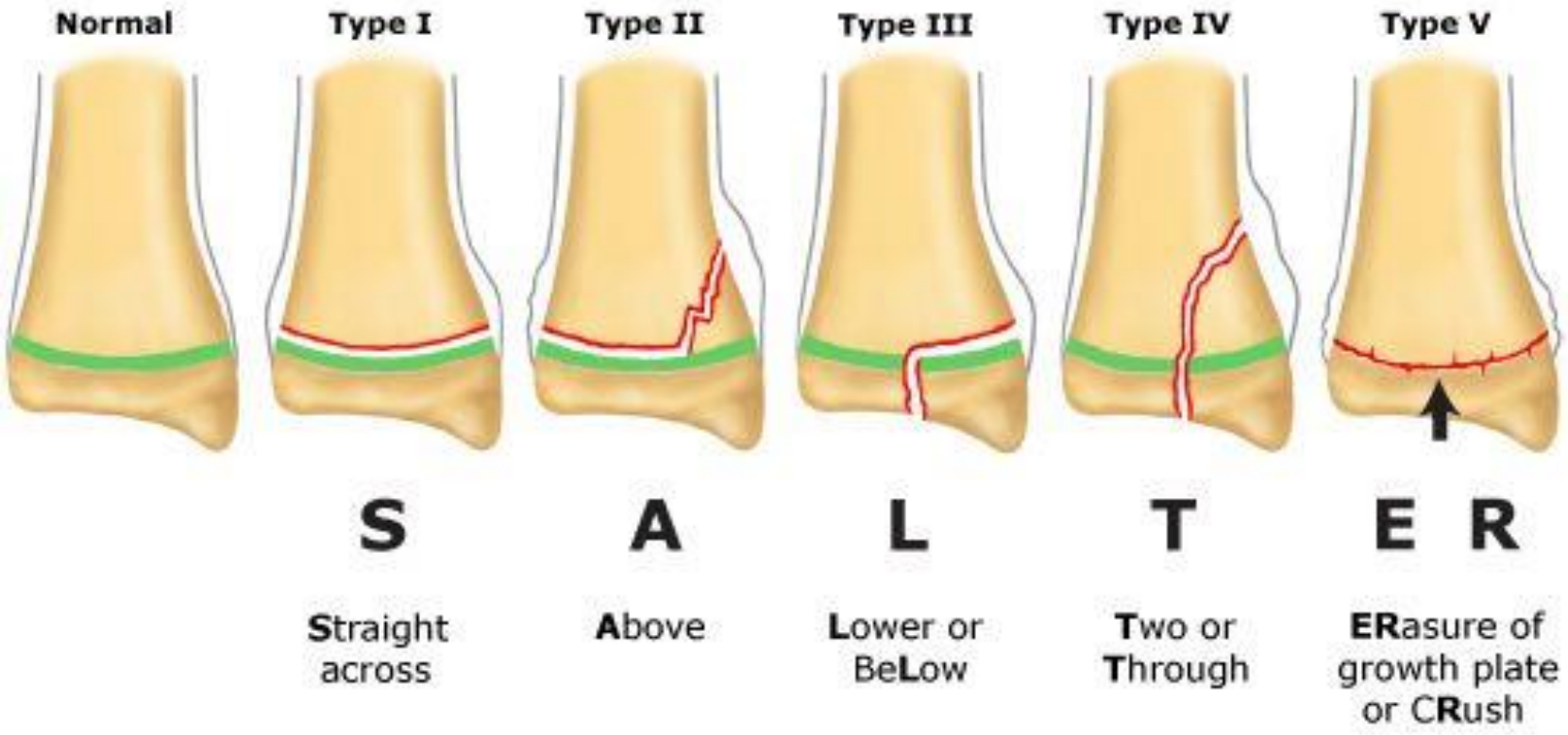

Salter II fracture

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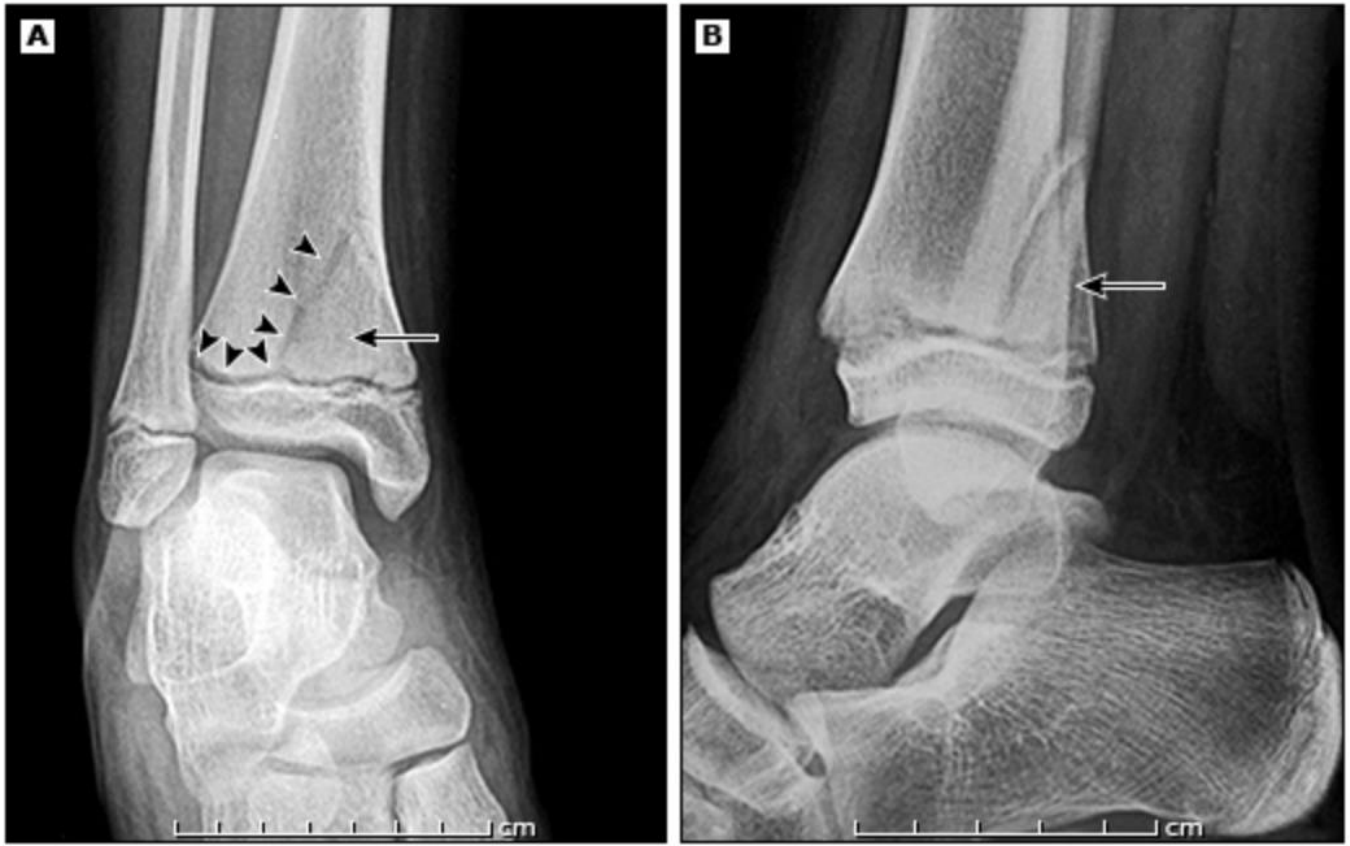

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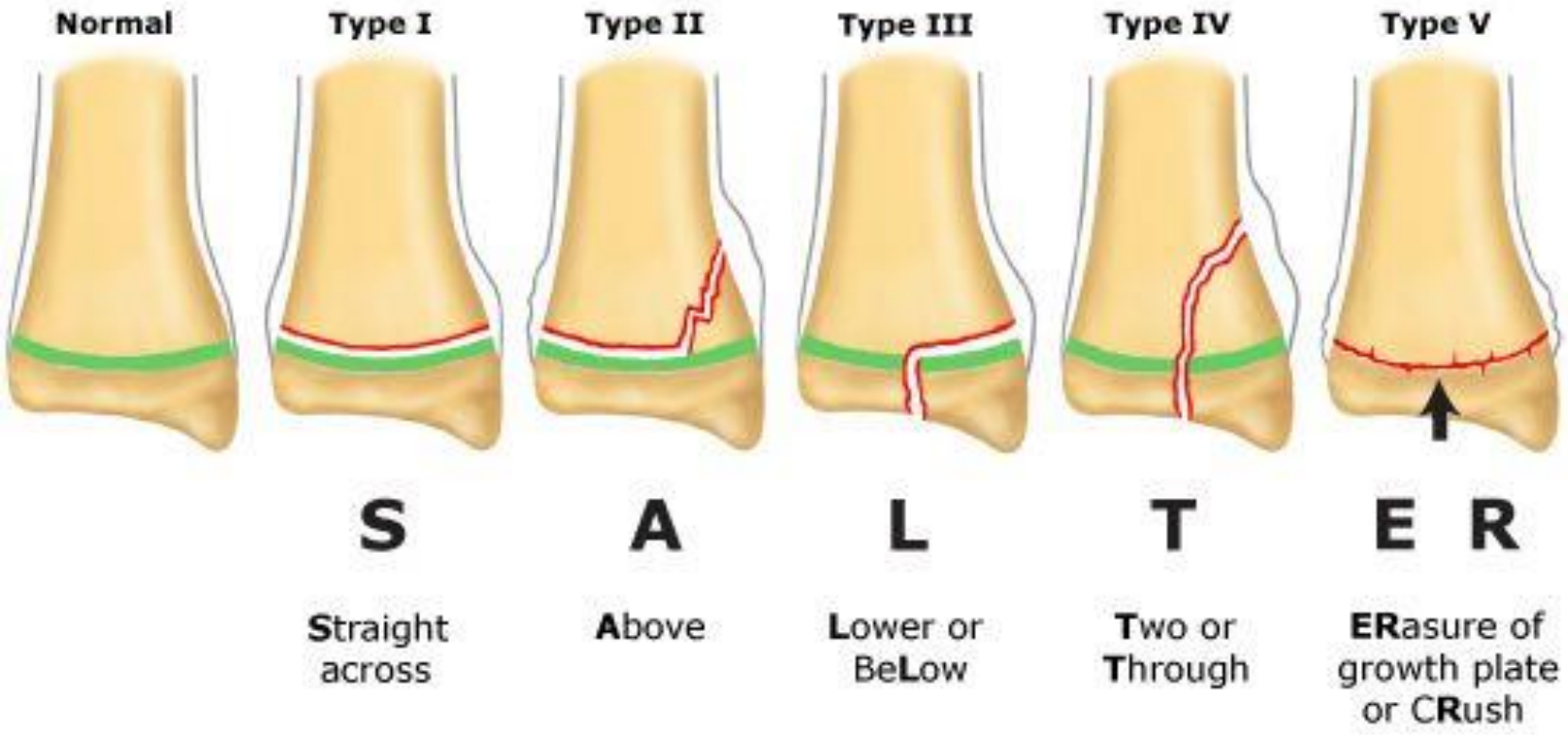

Salter III fracture

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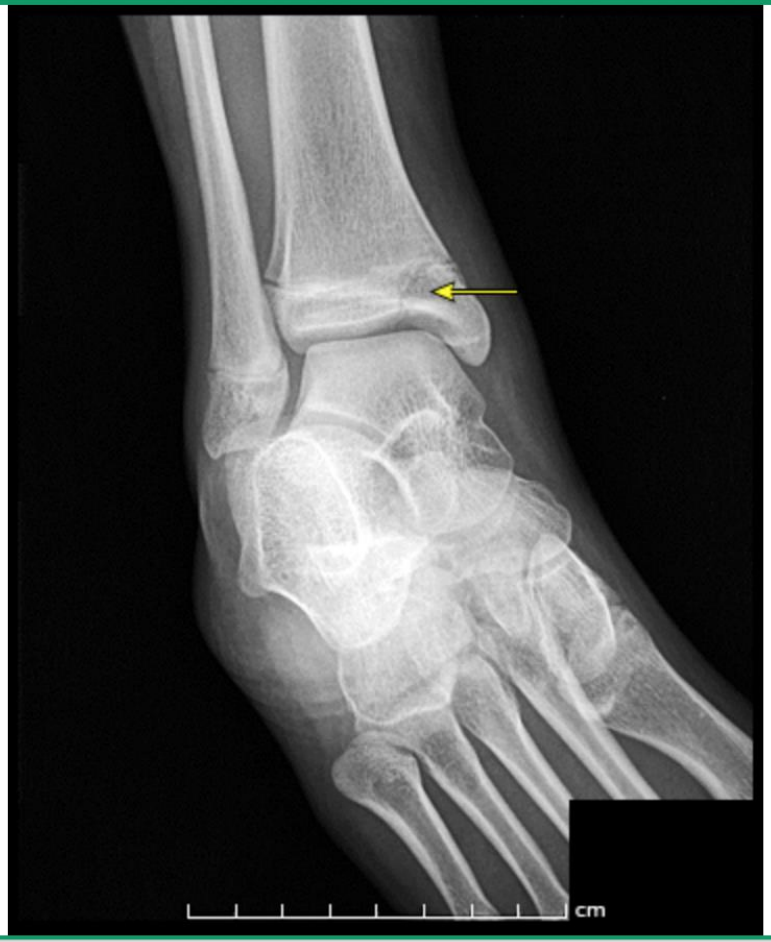

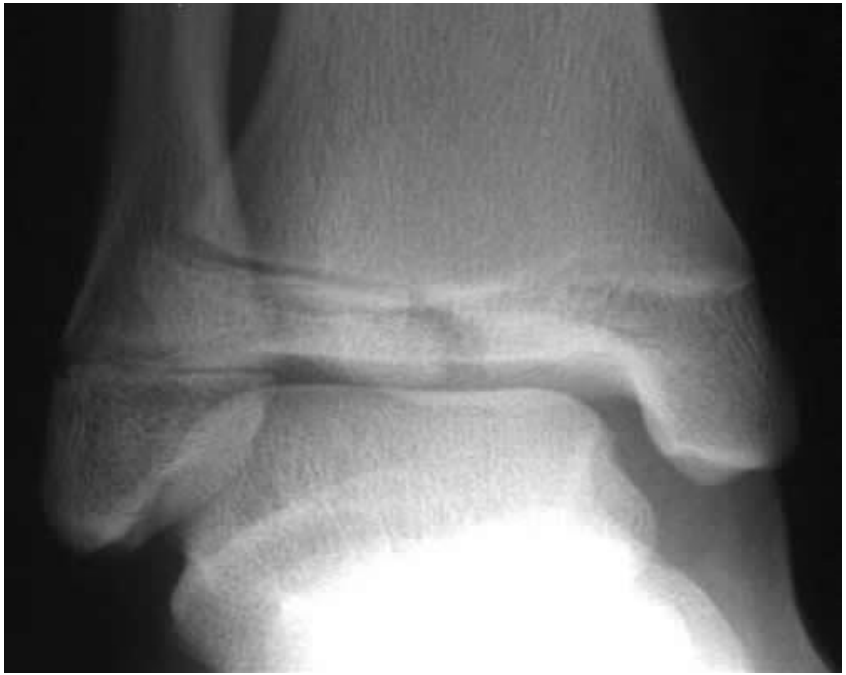

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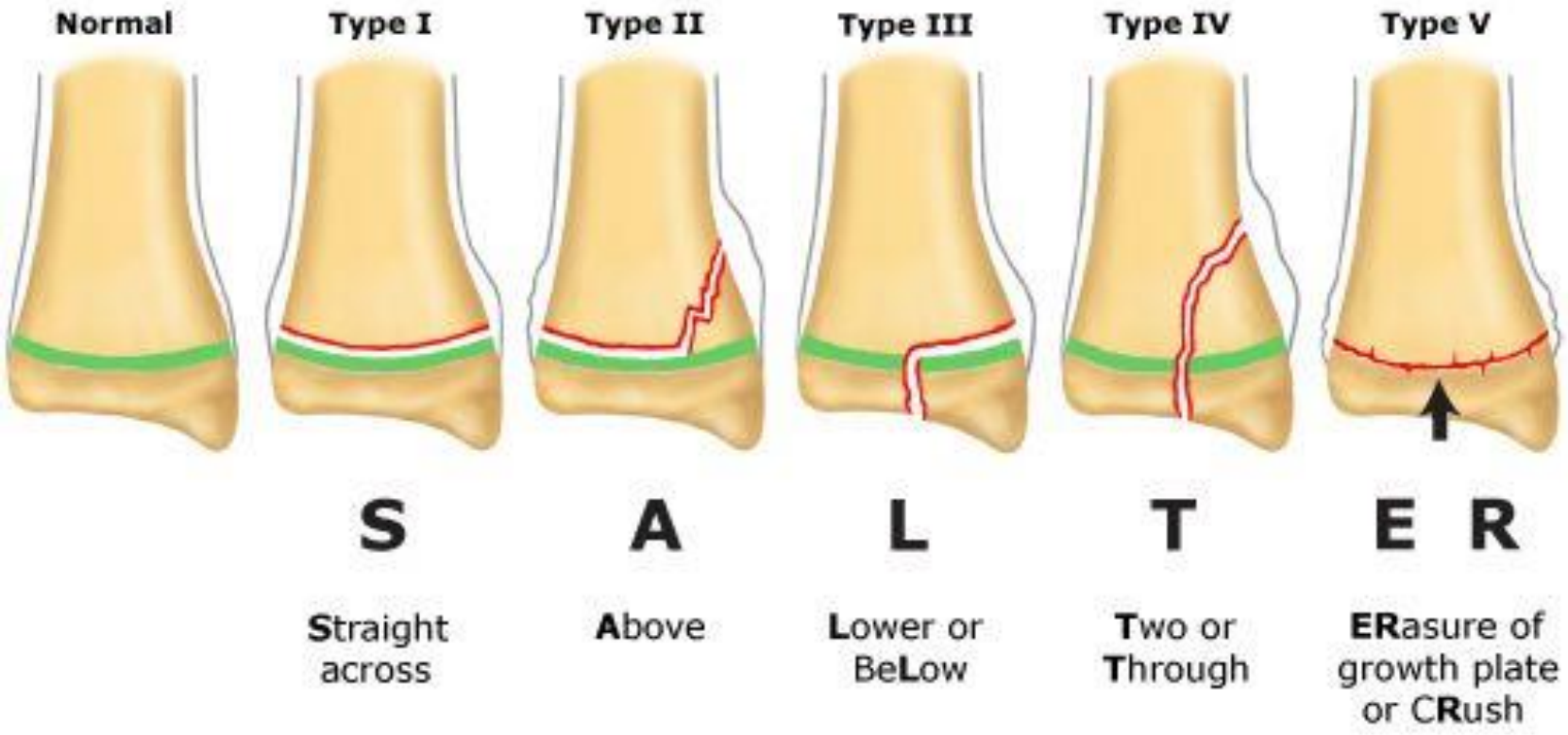
Salter-Harris classification



Salter IV fracture

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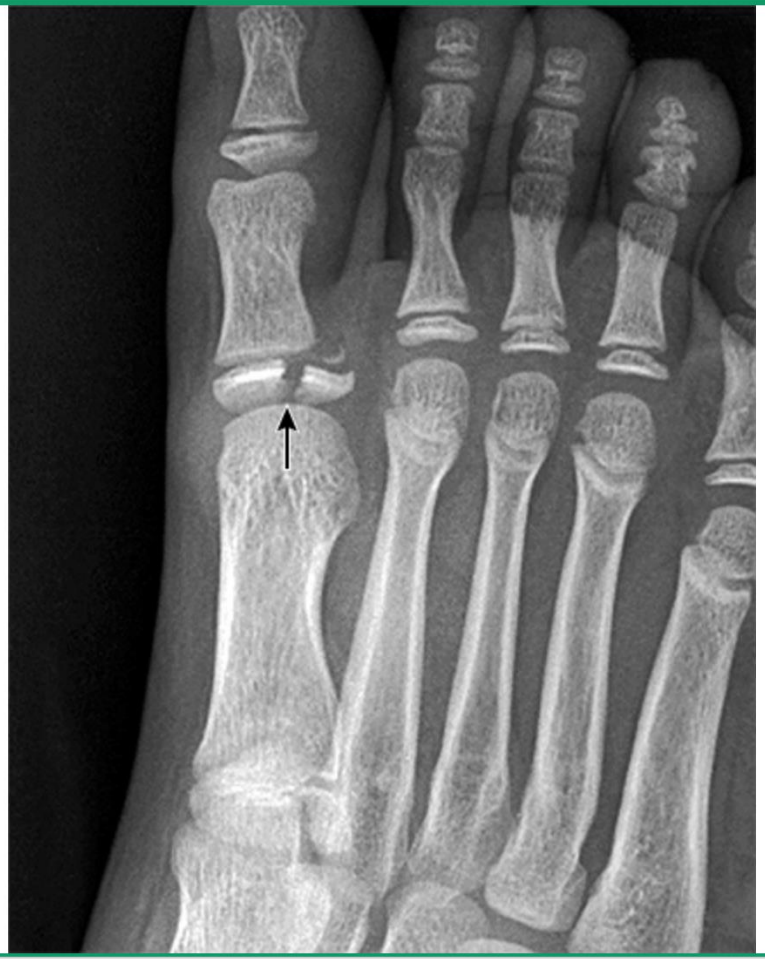

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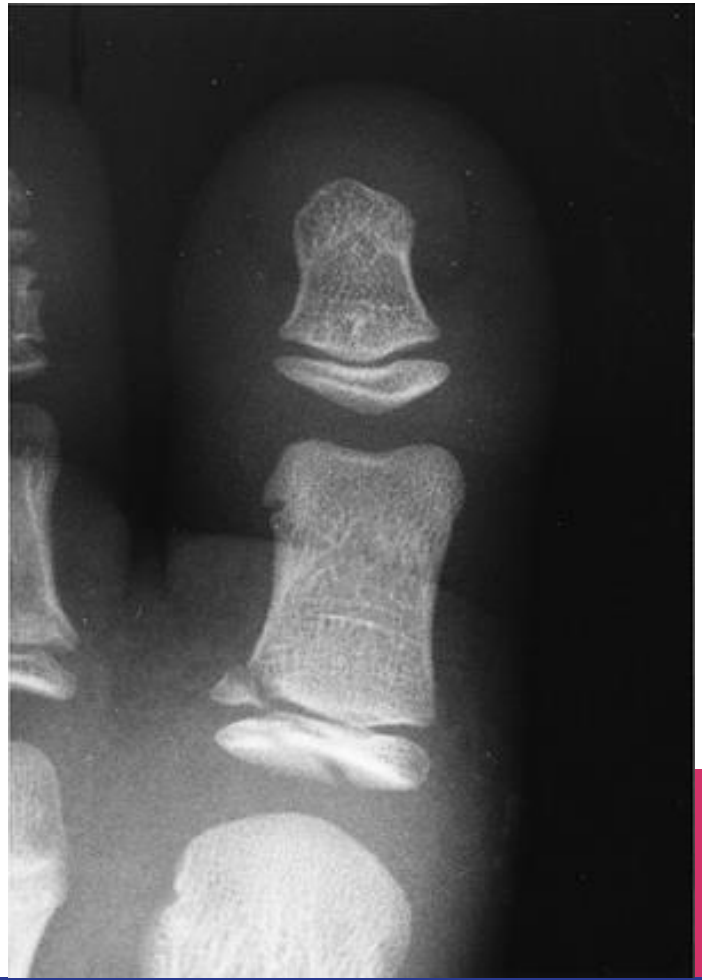

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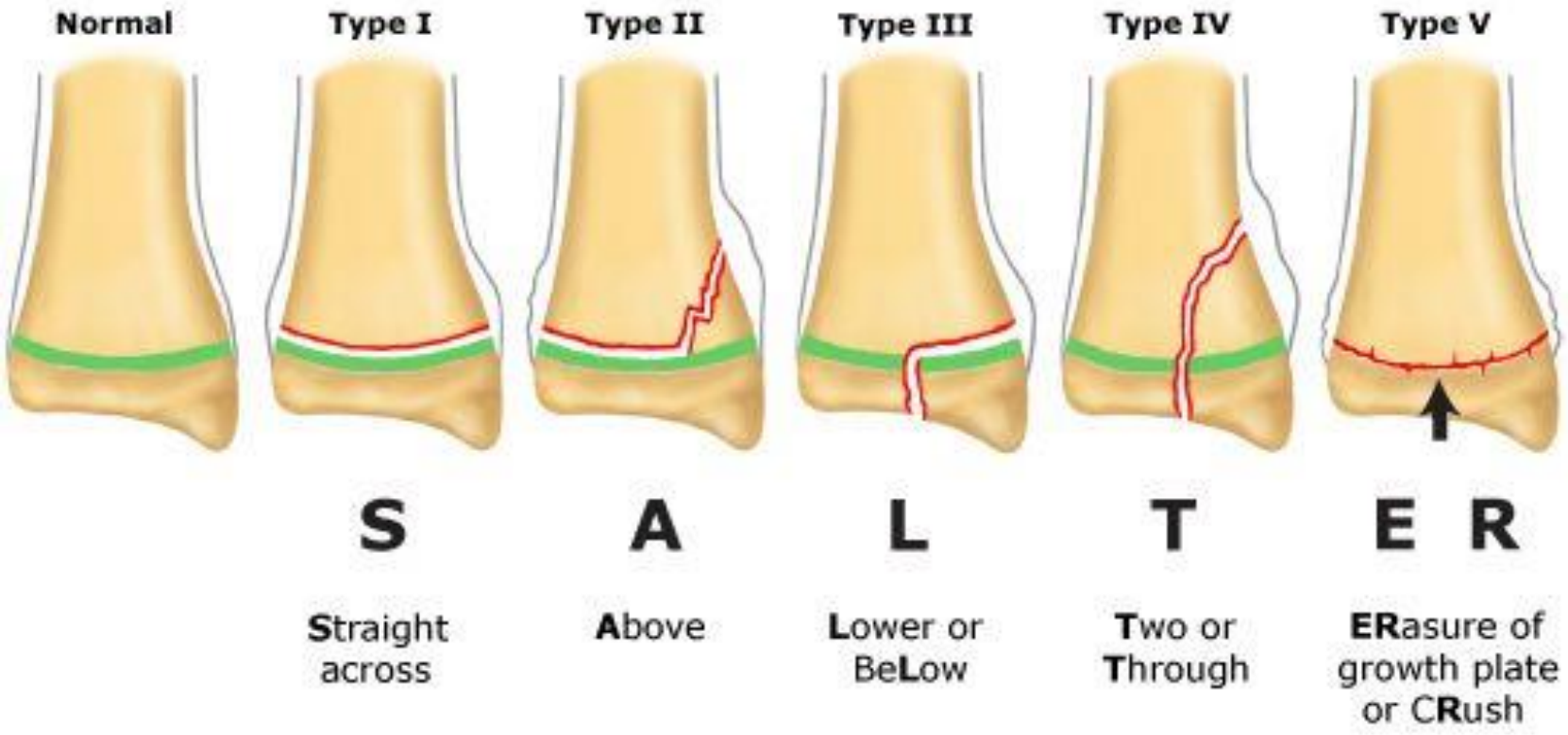


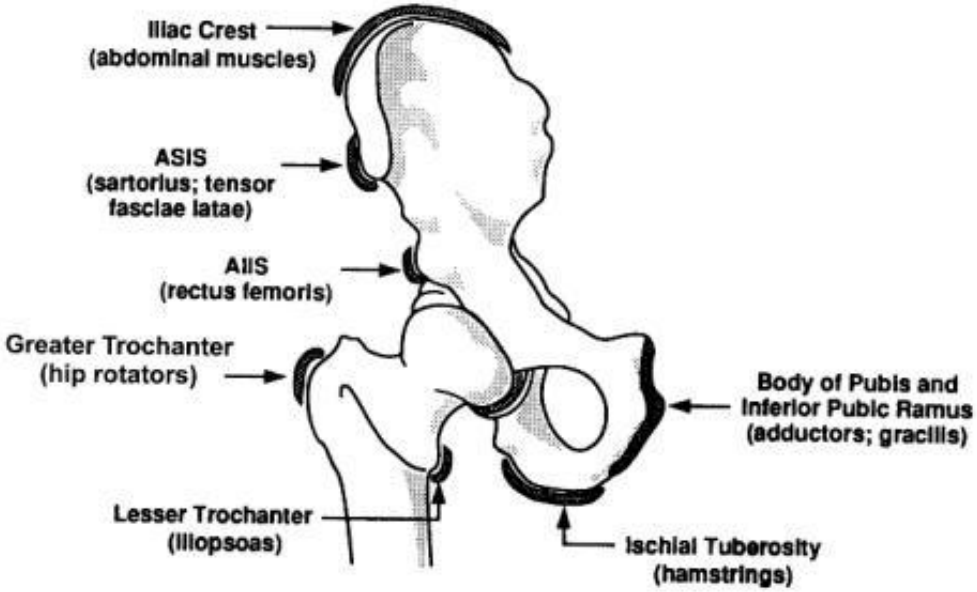
Apophyseal Avulsion

-occur at the attachments of large musculotendinous units

-equivalent to muscle strains in adults

-usually do not interfere with growth unless severe

-most common site: attachment of patellar tendon at tibial tubercle (Osgood-Schlatter)



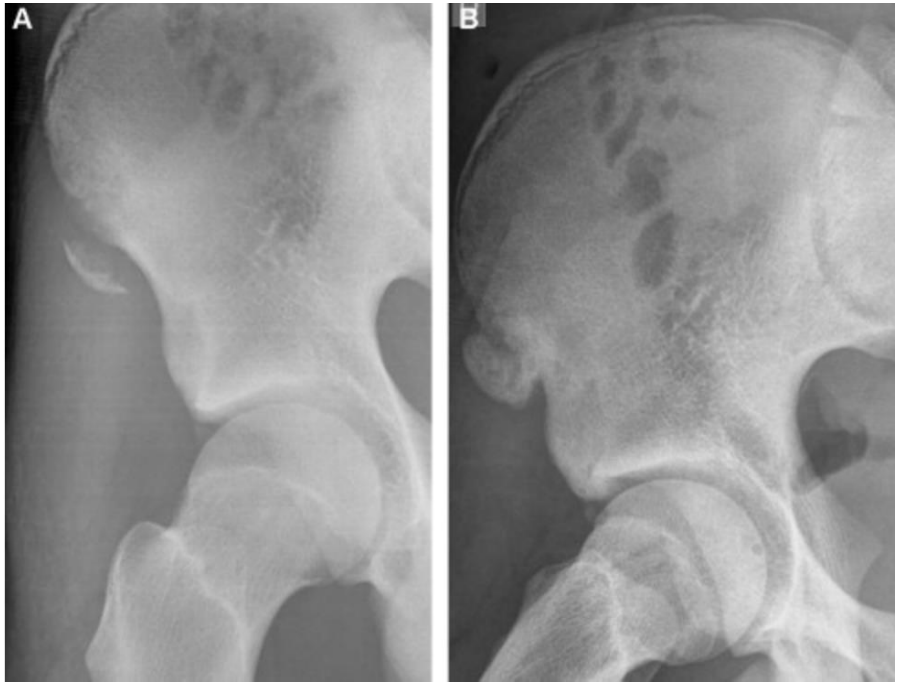
Apophyseal Avulsion

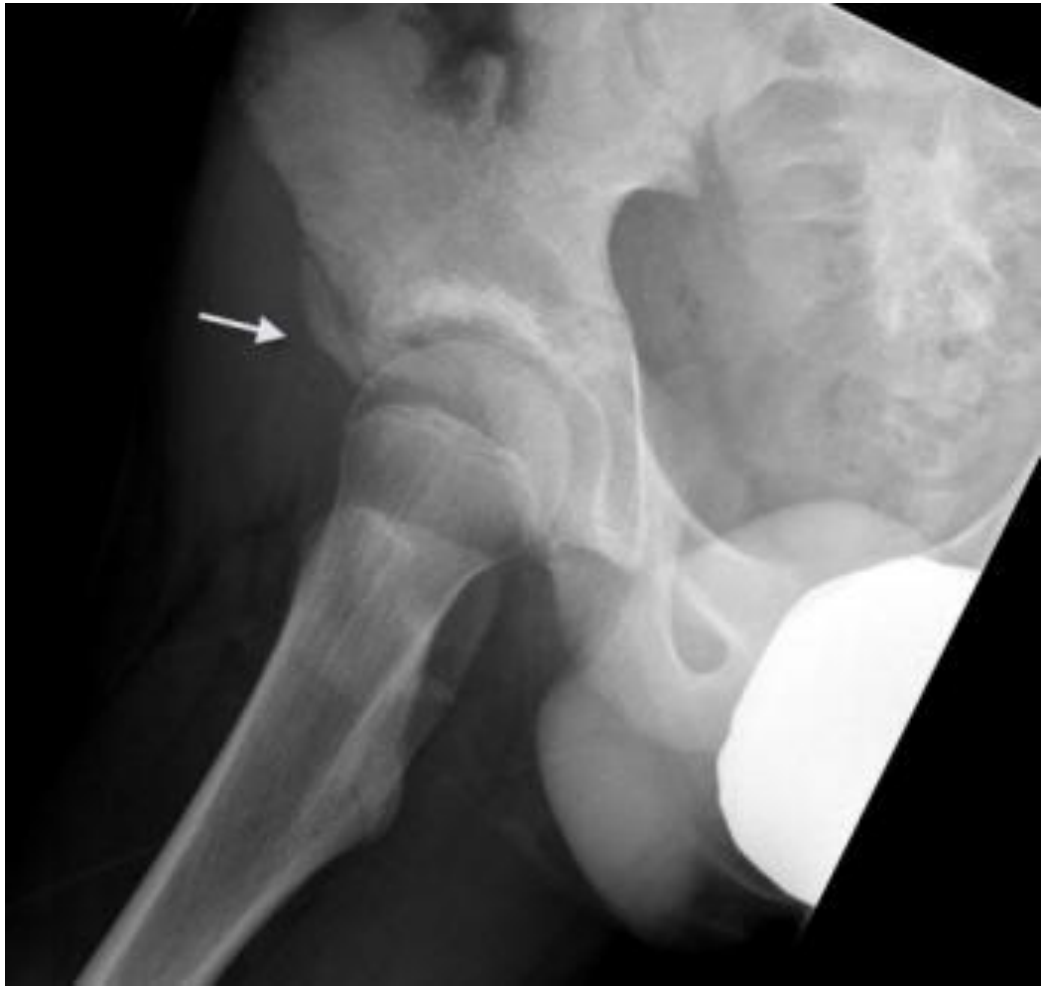
-tend to occur in the skeleton towards the end of maturation when powerful muscles are often shortened (Launay, 2015)

-usually seen well on standard radiographs

-management depends on degree of displacement

(Launay, 2015)





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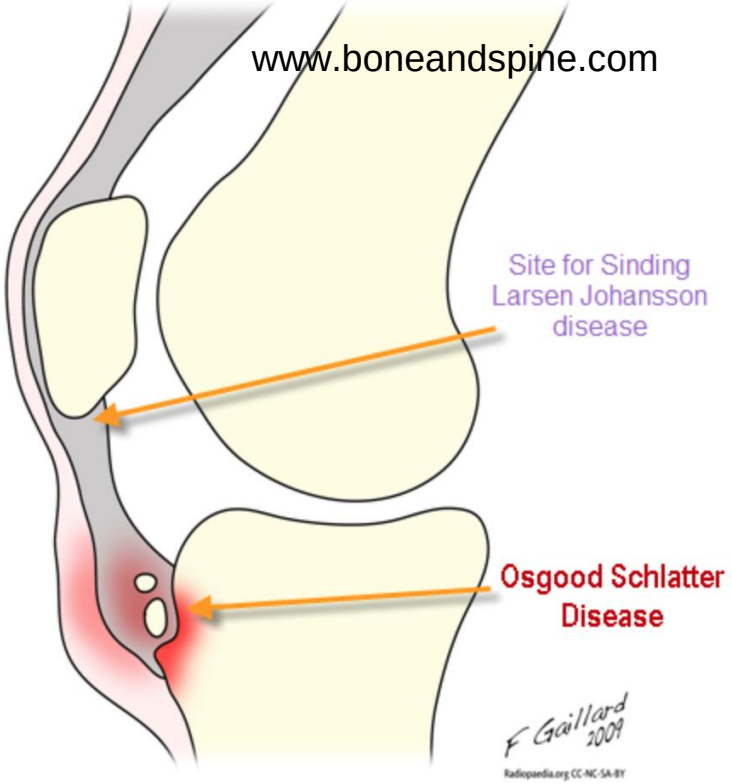
Osgood-Schlatter + Sinding-Larsen-Johansson disease

-osteochondrosis of the tibial tubercle (OSD) or inferior patellar pole (SLJ)

-boys more than girls

-in approx 20% of athletes vs 5% in non-athletes (Kujala et al, 1985)

-more common in sports that involve running, cutting, jumping (Willis RB, 2006)

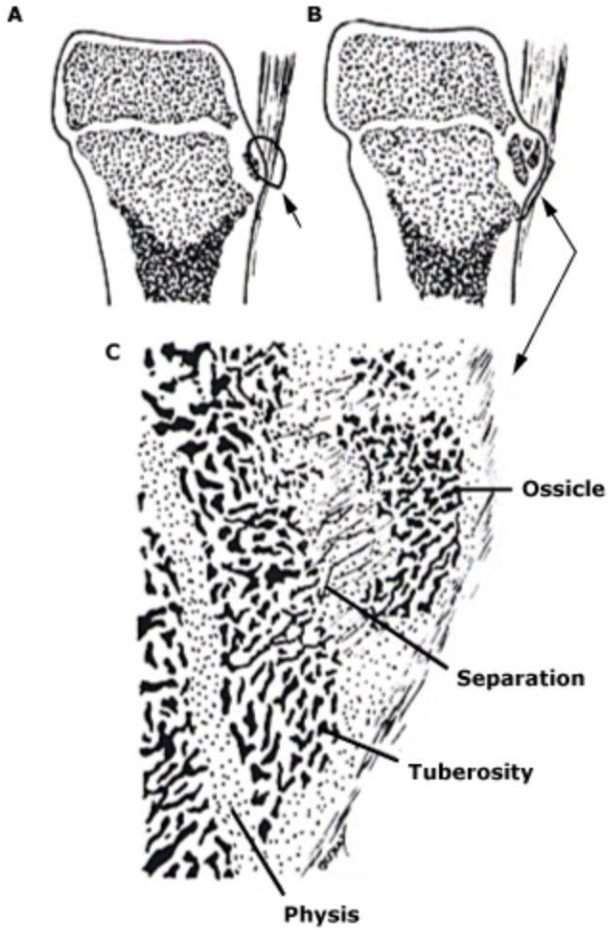


OSD + SLJ: Pathogenesis

-repetitive strain causing chronic avulsion of the secondary ossification center

-as callous is laid down, tubercle may become markedly pronounced

-other risk factors: more proximal attachment of patellar tendon and attachment to broader area of tibia (Demirag et al, 2004), and history of calcaneal apophysitis (Kujala et al, 1985)



Ogden, J. Skeletal Injury in the Child, 3rd ed, Springer-Verlag, New York 2000. p.1018

OSD + SLJ: Diagnosis

-gradually increasing anterior knee pain

-exacerbated by direct trauma, kneeling, running, jumping, squatting

-relieved by rest

-enlarged tender tibial tubercle

-provocative test: resisted knee extension

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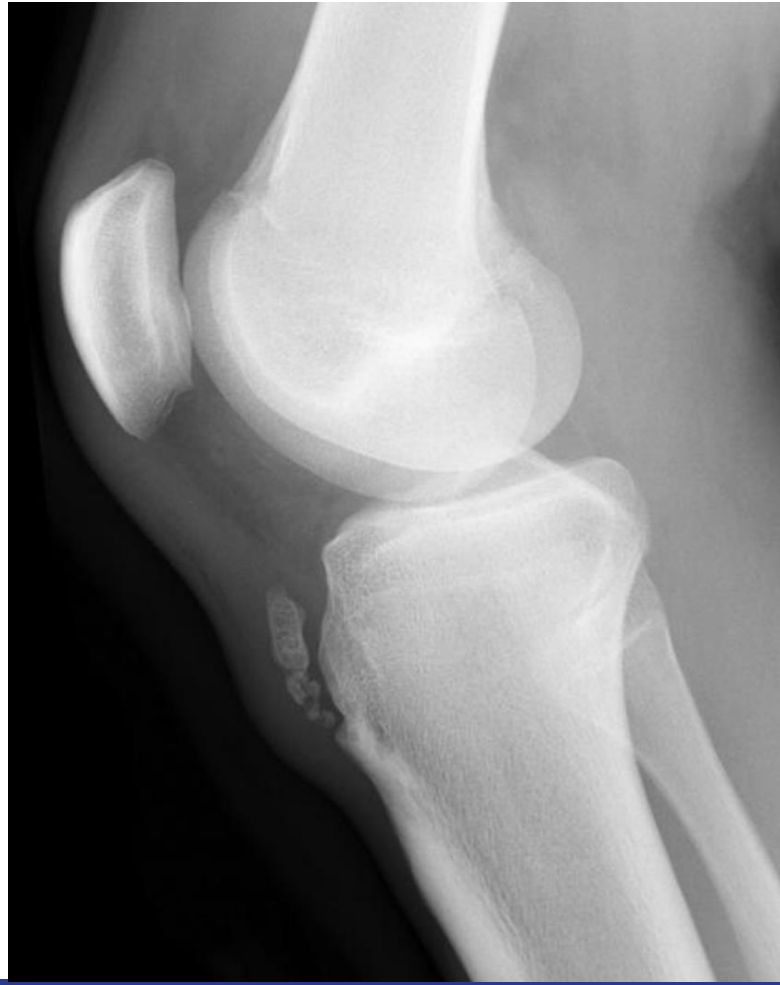


OSD + SLJ: Imaging

-plain radiographs: lat view of knee

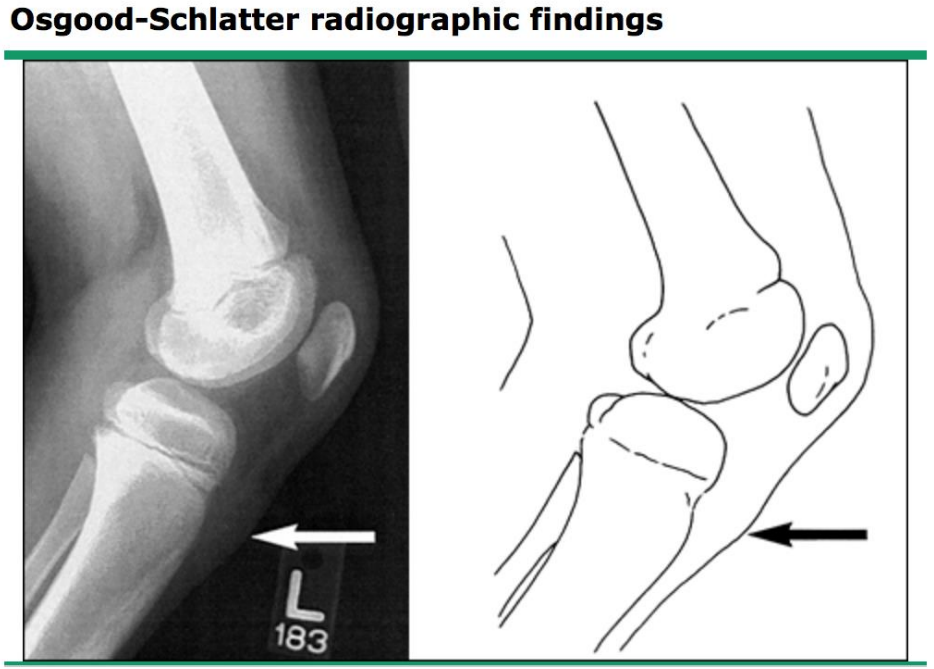
-possible findings:

-Elevation of the tubercle away from the shaft.

-Irregularity, fragmentation, or increased density of the tubercle.

-A superficial ossicle in the patellar tendon

-Calcification within or thickening of the patellar tendon.



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OSD + SLJ: Imaging

MRI: usually not indicated

Findings on MRI: soft tissue swelling, thickening and edema of inferior patellar tendon, fragmentation and irregularity of ossification center

Ultrasonography: Blankstein et al (2001) support a classification system defined in 1989 by De Flaviis et al.

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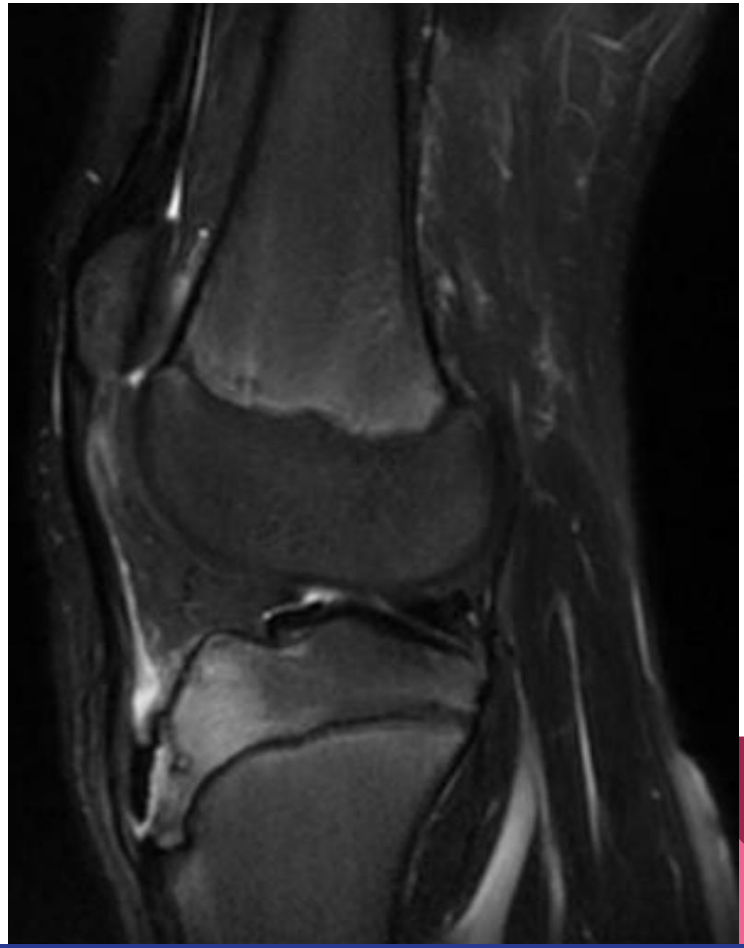

OSD + SLJ: Treatment

-benign and self-limiting condition

-90% will have complete resolution of symptoms with conservative management

-control pain and swelling

-continue activities as tolerated

-physical therapy

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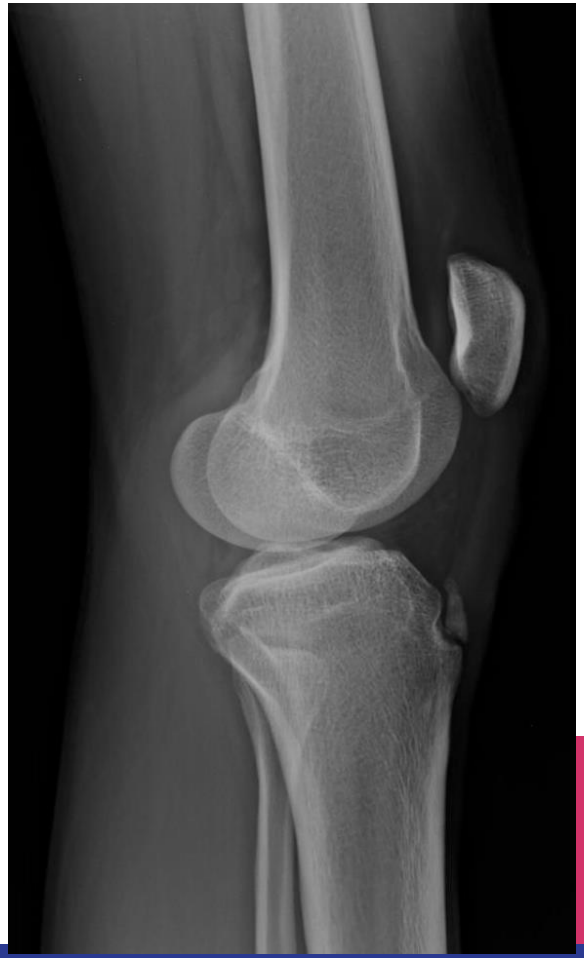

Sever’s Disease (calcaneal apophysitis)

-common cause of heel pain in children/adolescents

-originally described as a self-limiting inflammatory condition to the apophysis (Sever JW, 1912)

-Risk factors: running/jumping sports, boys>girls, mean age of presentation 8-12 yo, bilateral in up to 2/3

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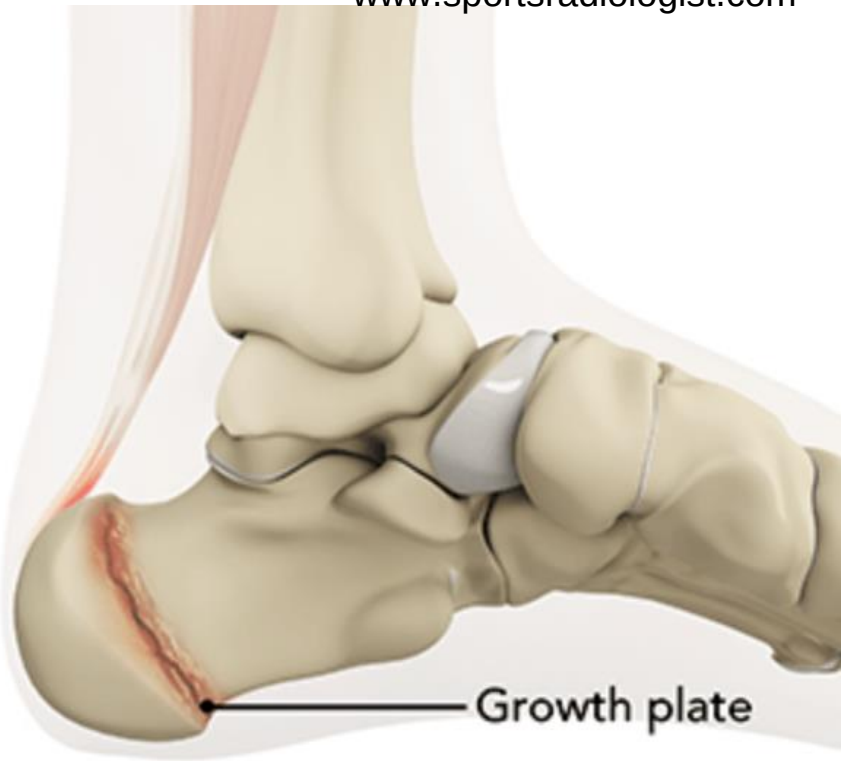


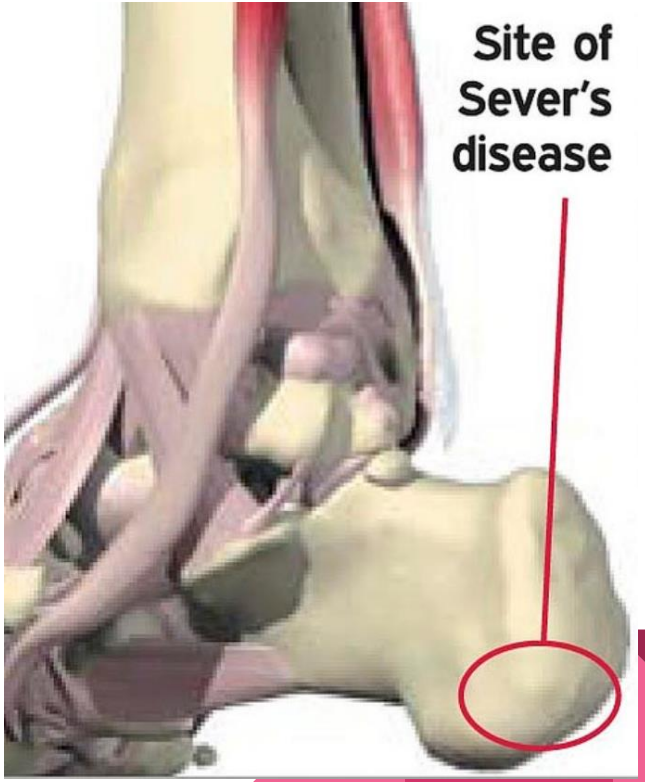
Sever's Disease (calcaneal apophysitis) : Presentation

-insidious onset chronic heel pain related to activity (Elengard et al., 2010)

-may see warmth, swelling, erythema

-possibly exacerbated by wearing footwear without heel cushioning or athletic wear with heel cleats

-stretching gastroc-soleus may worsen pain



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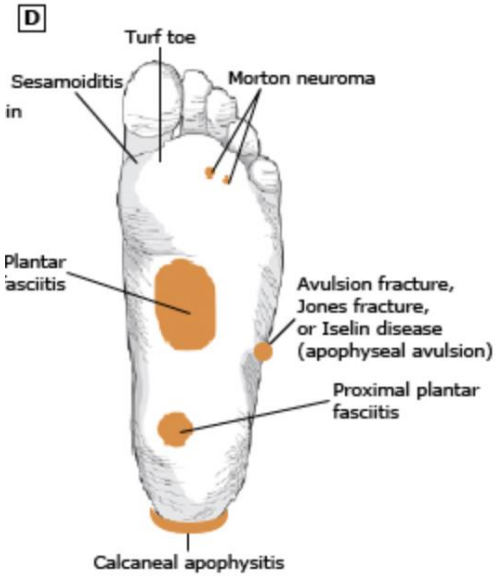
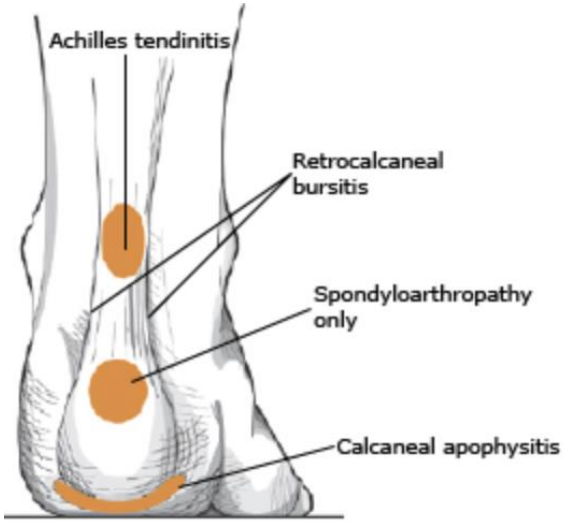
Sever's Disease (calcaneal apophysitis) : Physical Exam

-tenderness to palpation over apophysis

-positive calcaneal compression test

-may see decreased gastroc-soleus flexibility, increased pronation, arch abnormalities (Elengard et al., 2010)





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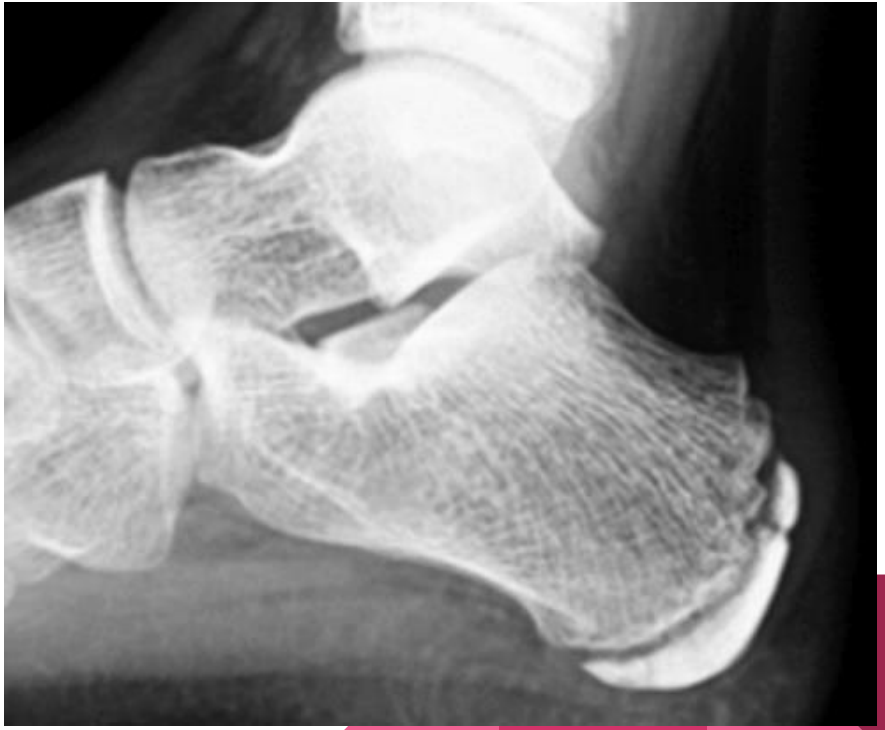
Sever’s Disease (calcaneal apophysitis) : Imaging

-clinical diagnosis

-plain radiographs may be beneficial to rule out other causes of heel pain if presentation is atypical or if patient fails conservative management

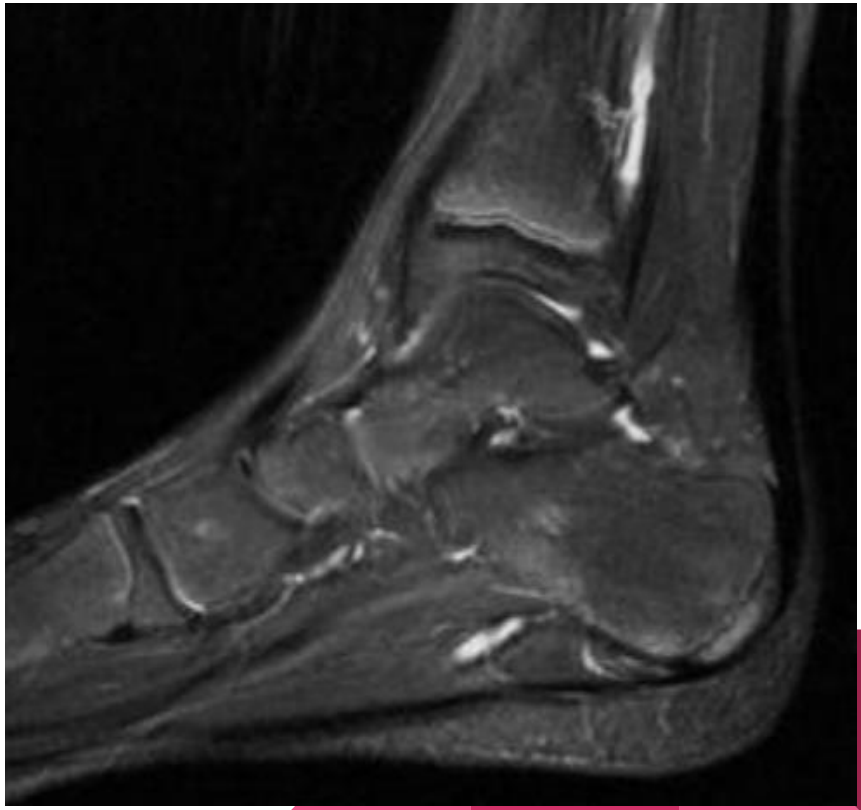
-possible x-ray findings: sclerosis, widening of growth plate (Kose O, 2010)



Sever’s Disease (calcaneal apophysitis) : Imaging

-MRI: helpful in those with normal radiographs and atypical presentation or those who fail 4-8 wks of conservative management (Kose O, 2010)

-may demonstrate stress fracture of calcaneal metaphysis in these patients (Ogden JA, 2014)



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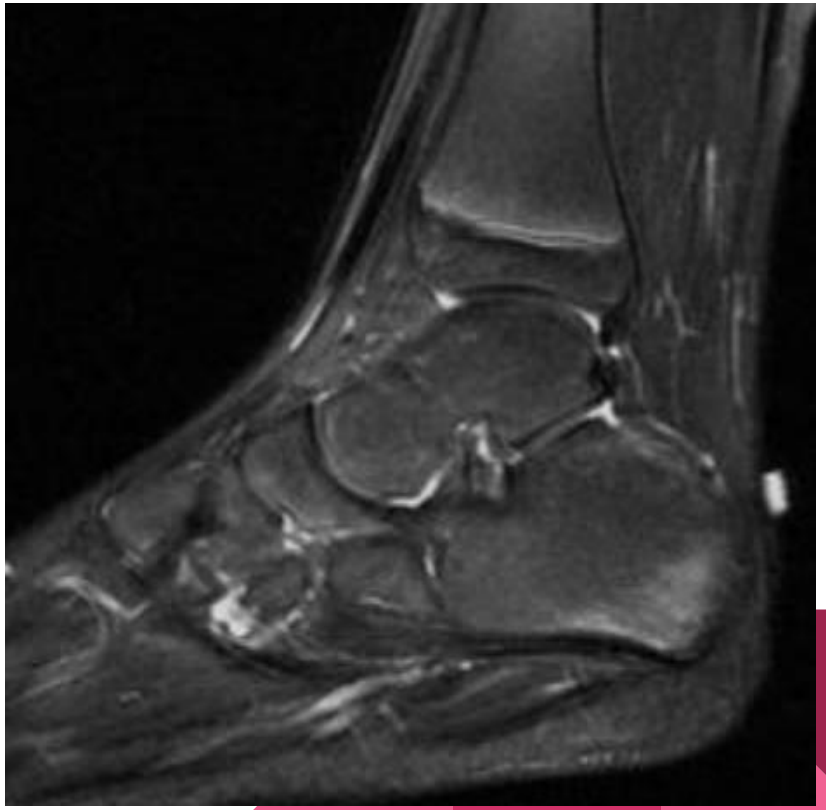

Sever’s Disease (calcaneal apophysitis) : Treatment

-self-limiting

-heel cup or heel lift (Perhamre S et al., 2011)

-activity modification until pain-free

-daily ice

-gastroc-soleus stretching/strengthen

-NSAID’s PRN*

Thank You !


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"We won't know until the MRI, but I'm certain that it's either an 'ouchie' or a 'boo-boo' ..."

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