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Health Sciences Clinical Professor of Pediatrics
David Geffen School of Medicine at UCLA

What is this lecture about?

- Pediatric – exclusive to or commonly seen in kids
- Not a Zebra (ie something I've either seen during my career or know has been seen in our PED)
- Not a horse either – ie something you may make it through training without seeing
- Emergency practitioner can make the diagnosis or at least suspect it
- Emergency practitioner *should* make the diagnosis or at least suspect it, and can make a difference by either getting diagnostic studies, appropriate consultations, and starting initial management or by not doing unnecessary work-up

Quick info in 3 slides

- Classic case – build on illness scripts to reinforce when you should suspect this entity
- What should make you suspect this diagnosis
- Basics of diagnosis and ED management
- You can look it up for more detail, but you can't look it up until you at least suspect it
- FOAM resources for additional readings

How to use this lecture

- After the initial case presentation, think about the differential diagnosis
- Helpful framework: SPIT
  - *What is the most Serious diagnosis?*
  - *What is the most Probable diagnosis?*
  - *What is the most Interesting diagnosis?*
  - *What is the most Treatable diagnosis (ie what diagnosis should the EP do something about ASAP)?*
- Write down what you think is the diagnosis – commit!
  - *At the end, see how many you got right*

11 year old girl with back pain

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- She complains of abdominal pain and low back pain
- VS: temp 37.5, HR 120, RR 20, BP 95/45
- Seatbelt ecchymosis on lower abdomen
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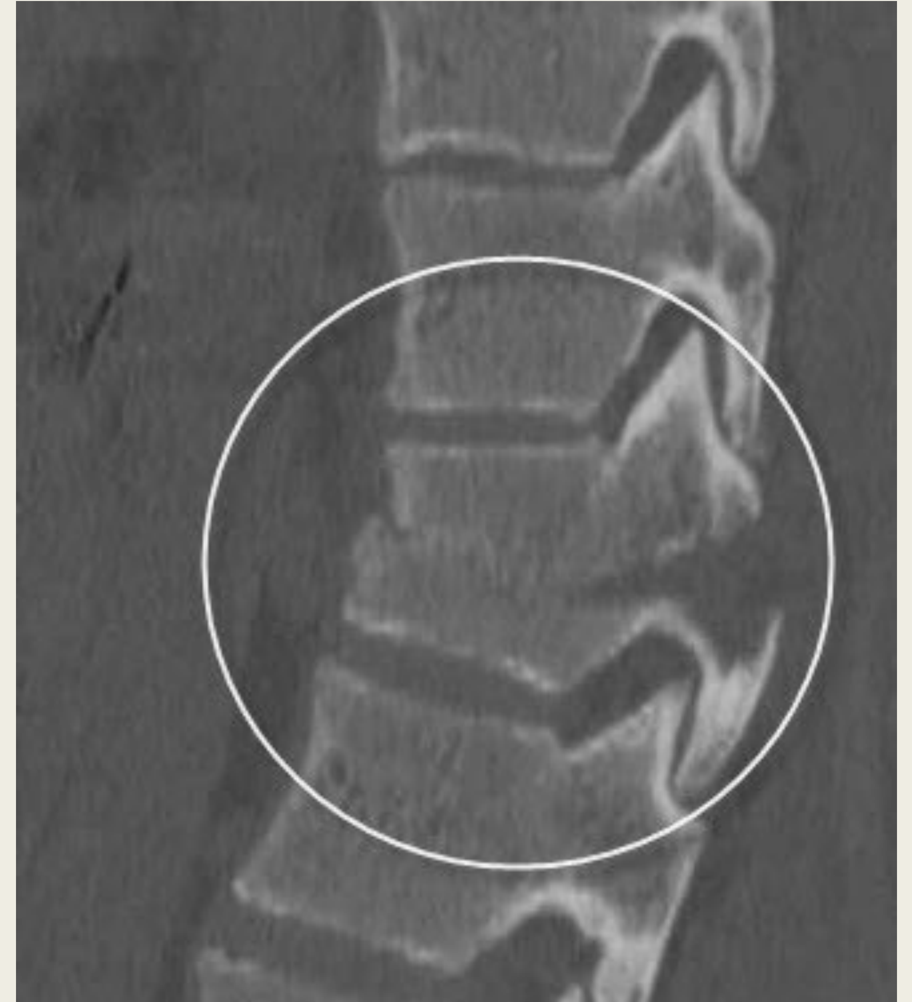

boneandspine.com

12 year old girl with painful red lumps on soles of feet

- 12yo girl with one day of painful red lumps on the soles of her feet
  - *Pain makes it difficult to ambulate*
  - *Started with a few erythematous nodules and has spread to more*
- History of attending a water park and wearing wet tennis shoes all day 2 days ago
- Temp 37.5, HR 75, RR 18, BP 94/54
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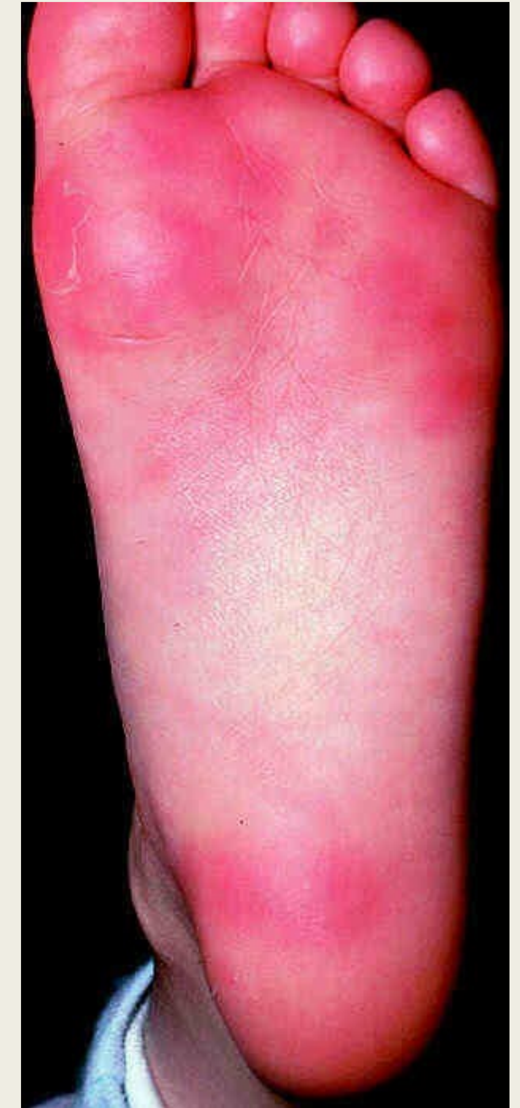

http://www.aocd-grandrounds.org/case_22.shtml

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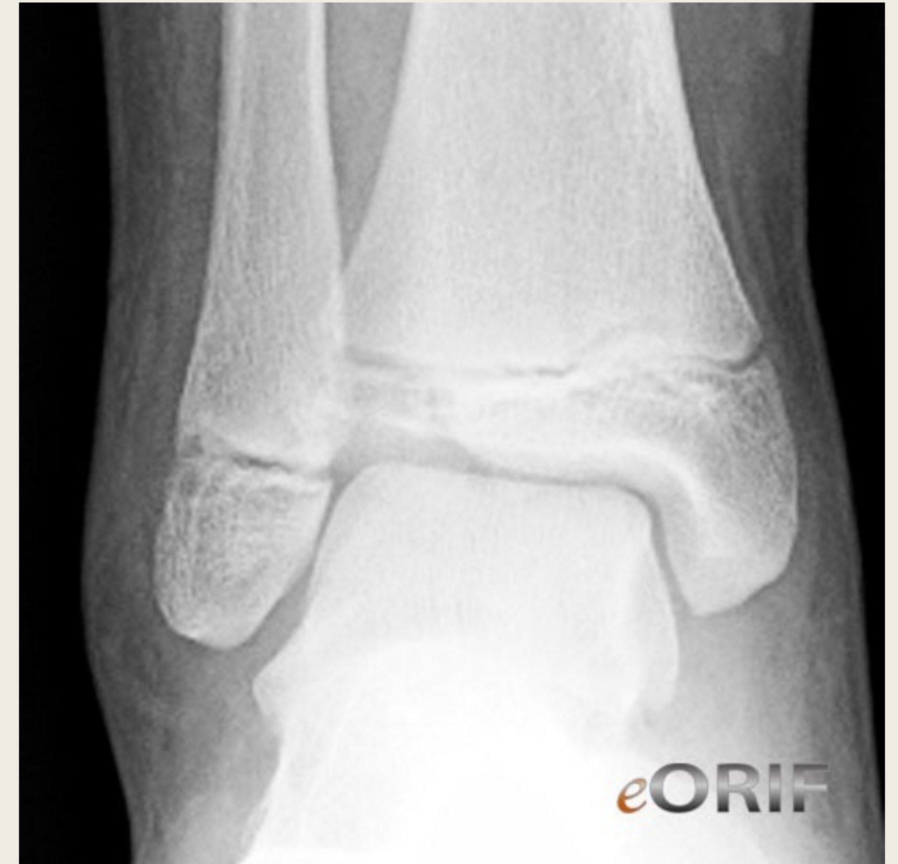

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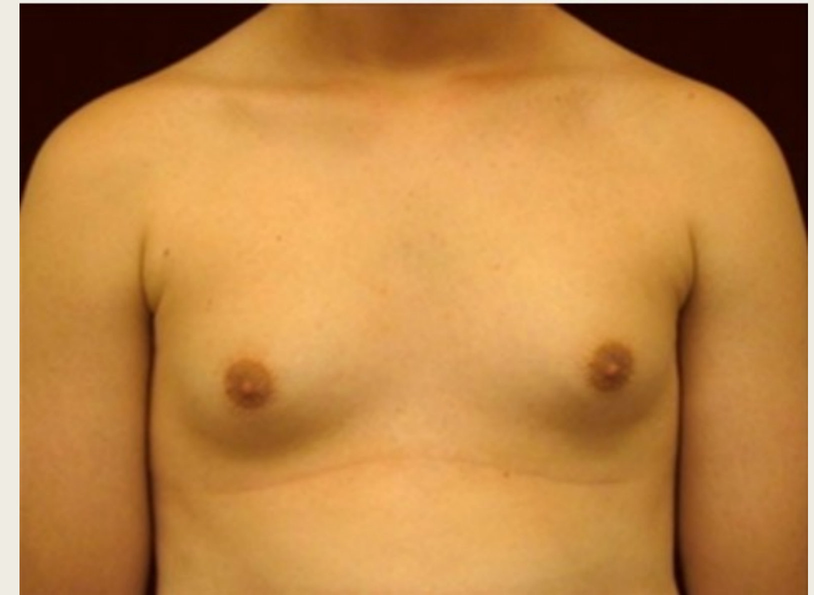
- 13yo overweight boy with gradual onset over a few months of limp favoring left side
- He fell 3-4 weeks ago while playing soccer
- He was wrestling with his little brother a last month – doesn’t recall details, but did note some knee pain after that
- Complains of left knee pain, particularly with activity
- Walks with an antalgic gait, favoring left side
- No deformities, swelling, signs of trauma to left lower extremity
- Knee full range of motion, nontender to palpation, no evidence of effusion

13 year old girl with intermittent abdominal pain

- 13 year old girl presents with dull abdominal pain, periumbilical and bilateral lower quadrant for 2 days
  - *She has had previous similar episodes a couple of months ago and once before that as well*
  - *No fever, vomiting, diarrhea, ill contacts, previous medical history, not yet menarchal*
- On exam temp 37.6, HR 80, RR 18, BP 95/44, O2 sat 100%
- Comfortable appearing, nontoxic, lungs clear, heart RRR no murmur, abdomen soft, nontender to palpation but palpable mass infraumbilical to suprapubic area, no guarding, no rebound, no hepatosplenomegaly
- What examination will be diagnostic?

13 year old boy with breast mass

- 13yo boy presents with bilateral breast enlargement for the last month
- No fever, redness, tenderness, nipple discharge, family history of breast cancer
- Physical exam: temp 37, HR 80, RR 18, BP 100/58, wt 80 kg, BMI 30
- Bilateral breast enlargement with a thin 1cm rim of glandular tissue palpable around each areola, no redness, nontender, no nipple discharge, no axillary lympadenopathy
- Tanner stage III genitalia



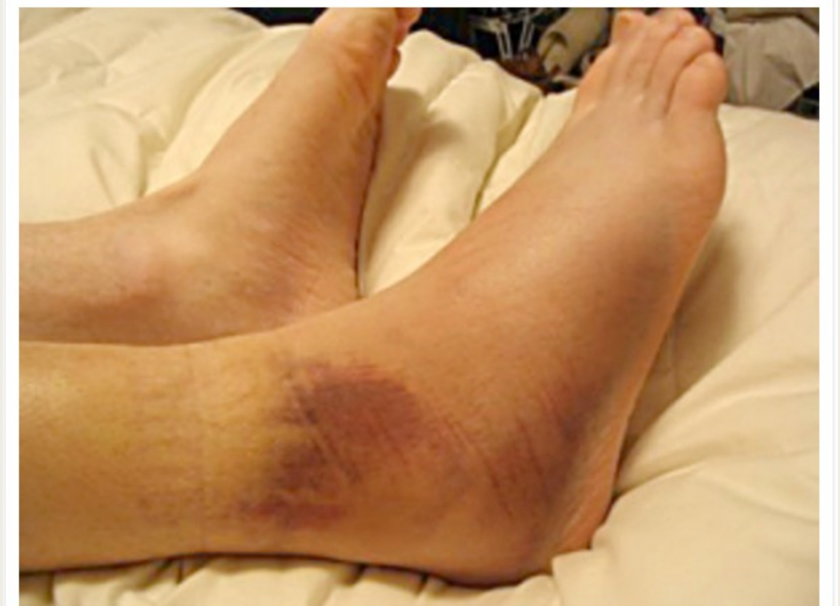
https://gynecomastia-specialist.com

13 year old girl with hypotension

- 13yo girl comes in for 3rd ED visit in 4 days
- Tripped and fell, sustaining minor trauma - hit her right thigh on a cement bench at school 3 days ago, no skin break, able to walk but c/o pain
  - *Seen in ED and diagnosed with contusion, XR negative, d/c on NSAID*
- Returned yesterday with increased pain and mild swelling, same dx
- Now with pain out of proportion to physical exam, diffuse thigh swelling, mild erythema, warmth in area of contusion
- Temp 39, HR 175, RR 28, BP 80/50. Mentating okay, no nuchal rigidity, lungs clear, tachycardic but no murmur, abdomen benign, no rash, no bullae, no crepitance
- Chart review shows seen in clinic for sore throat 1 week prior

14 year old boy with right ankle pain

- 14yo boy was skateboarding and attempted a trick
- Doesn’t recall mechanism but does say his foot everted relative to his leg
- Presents with immediate pain and rapid onset swelling of his ankle, unable to bear weight



A gnarly swollen ankle

www.foamem.com

14 year old boy with cough x 1 month, worsening SOB

- 14yo boy with barking cough x 1 month, intermittent tactile fever
  - *Went to PMD in first week of illness and received Rx for azithromycin which he completed without improvement*
  - *Returned to PMD last week and noted to be wheezing and received Rx for MDI and 5 day course of prednisone*
  - *Just finished prednisone course 2 days ago and much worsened SOB*
  - *Mom also thinks his face and neck look swollen*
- VS temp 37.8, HR 120, RR 35, BP 95/36, O2 sat 94% room air sitting
  - *Severe respiratory distress when lain supine*
  - *Stridor at rest*
  - *Lungs with bilateral wheezes*

14 year old boy with penile swelling x 24 hours

- 14yo boy presents with penile swelling & pain x 24 hours
- He is not sure why it is swollen and mostly shrugs his shoulders to your questions
- He thought it would go away and when it didn't, he told his parents
- He is uncircumcised and has no significant past medical history
- PE: afebrile, nontoxic, remainder of exam besides penis normal

www.ers4kids.com

Did you write down what you thought the answers were? Answers on following slides

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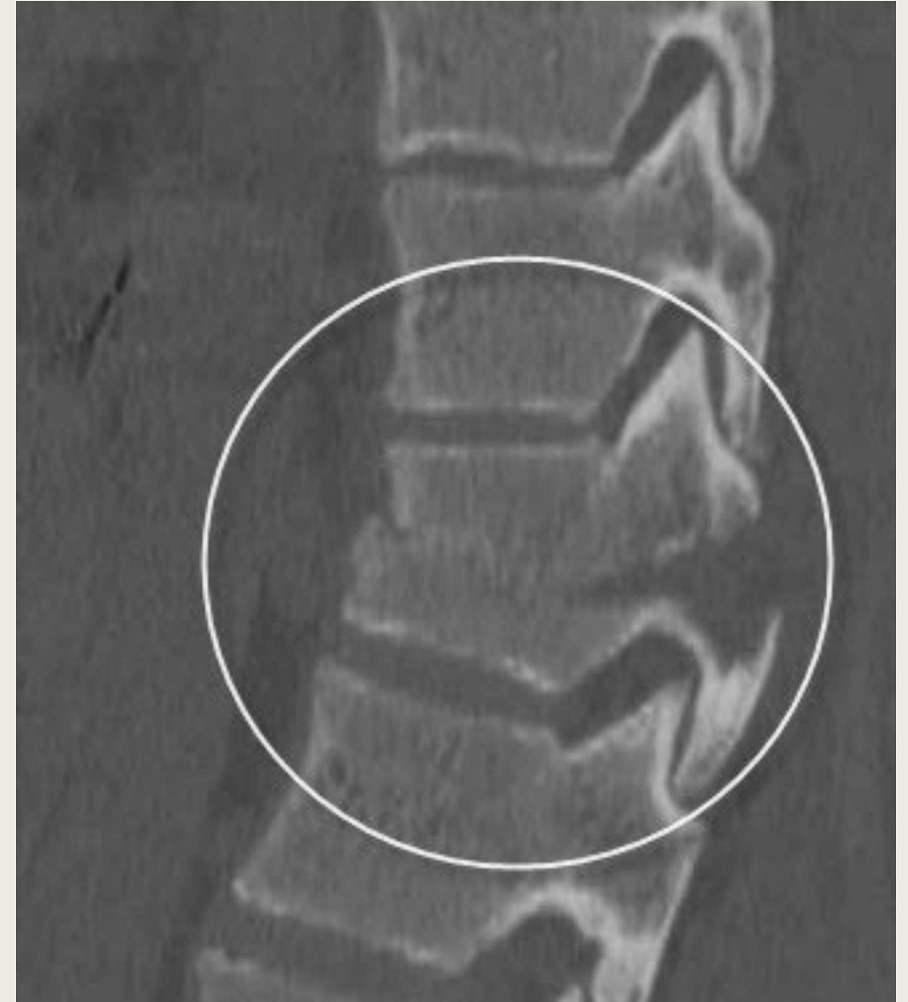
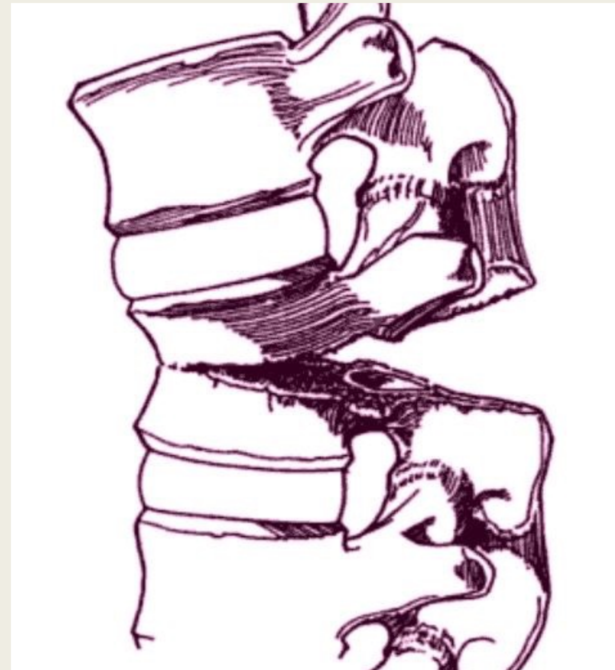


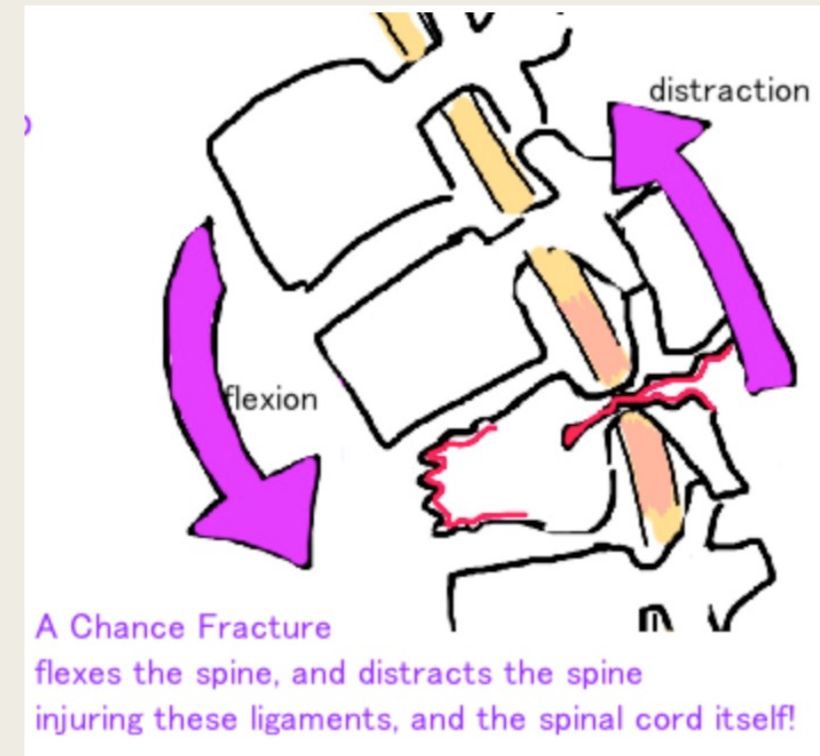
boneandspine.com

Chance fracture – suspect it

- Bony injury extending from posterior to anterior
- From flexion-distraction forces (eg hyperflexion when lap belt only and sudden stop)
- Associated with lap belt ecchymosis, small bowel injury
- Often unstable



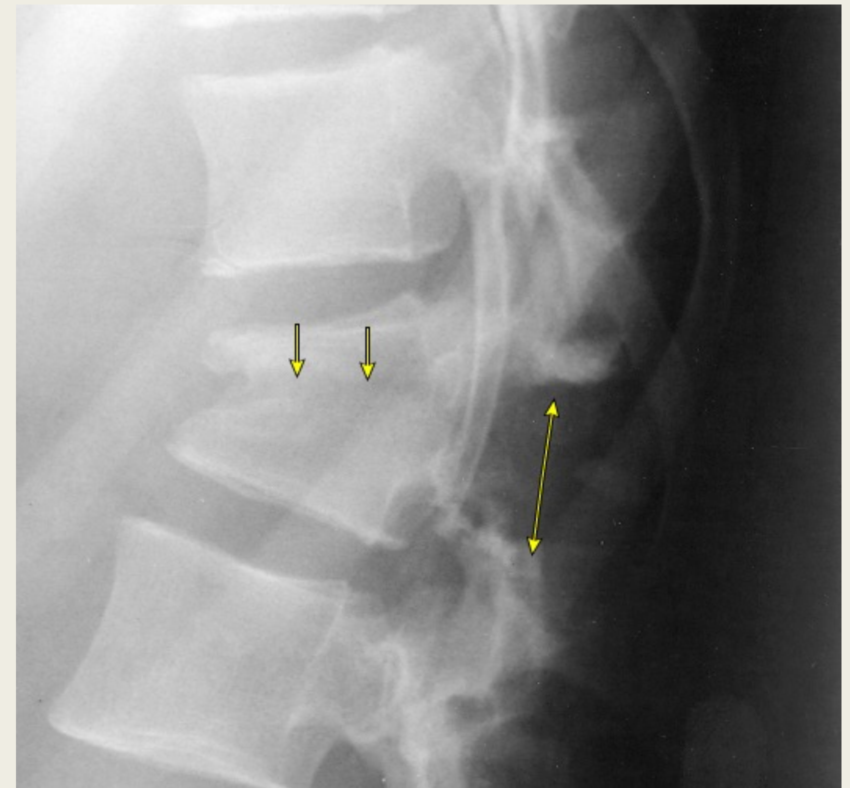
scientificspine.com



bonetalks.com

Chance fracture – diagnose and manage it

- Usually visible on plain radiography, but CT scan generally obtained
- Evaluate closely for associated injuries such as abdominal injury, spinal cord injury
- Keep patient's spine in alignment
- Consult with orthopedist, neurosurgeon
- For more info: http://www.bonetalks.com/spinechancefx/ and https://radiopaedia.org/articles/chance-fracture



http://s0www.utdlab.com

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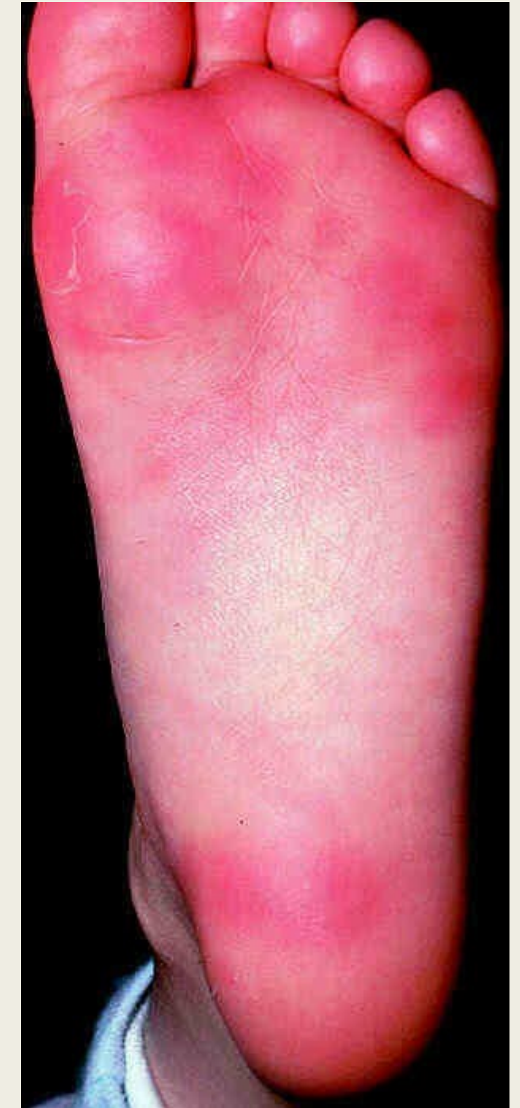
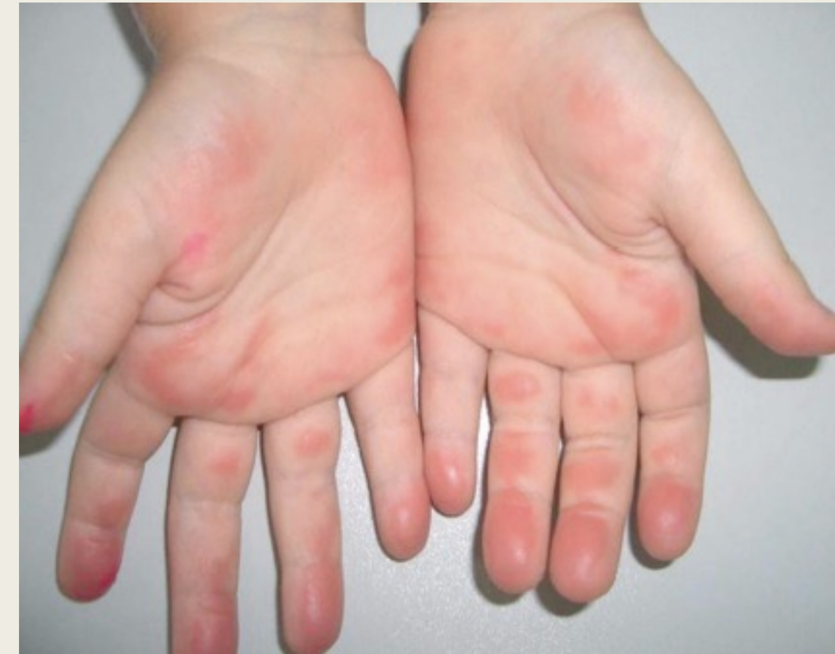


http://www.aocd-grandrounds.org/case_22.shtml

Idiopathic palmoplantar hidradenitis – suspect it

- Painful erythematous to violaceous nodules on the soles of feet and/or palms of hands
- Painful and tender, may have low-grade fever
- Association with water exposure or excessive sweating / exercise
  - *Beach outings, water parks, hot tub, sauna, swimming pool, wet footwear, sweaty socks after exercise*



http://cientegz.blogspot.com/

Idiopathic palmoplantar hidradenitis – diagnose and manage it

- Clinical diagnosis based on history and physical exam
- Resolves spontaneously over 1 to several weeks
- Symptomatic care with rest, analgesics
- Prevention recommendations: change sweaty socks to dry ones immediately, do not walk in wet footwear
- For more information: http://www.pediatricsconsultantlive.com/articles/idiopathic-palmoplantar-hidradenitis and http://www.aocd-grandrounds.org/case_22.shtml

- Differential Dx: juvenile plantar dermatosis
  - *3-14 year olds*
  - *Also assoc w/ water exposure*
- Shiny red macules then scaling, fissuring, cracking
- For more information: http://www.aocd.org/?page=JuvenilePlantarDerm and http://www.pcds.org.uk/clinical-guidance/juvenile-plantar-dermatosis#!prettyPhoto

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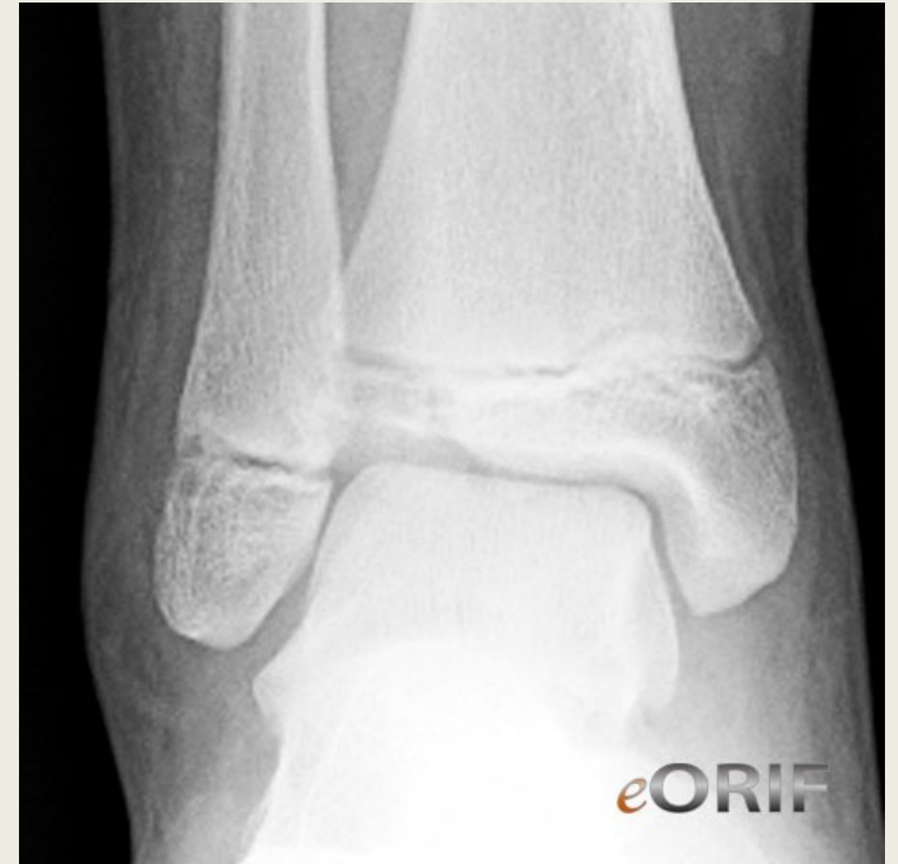
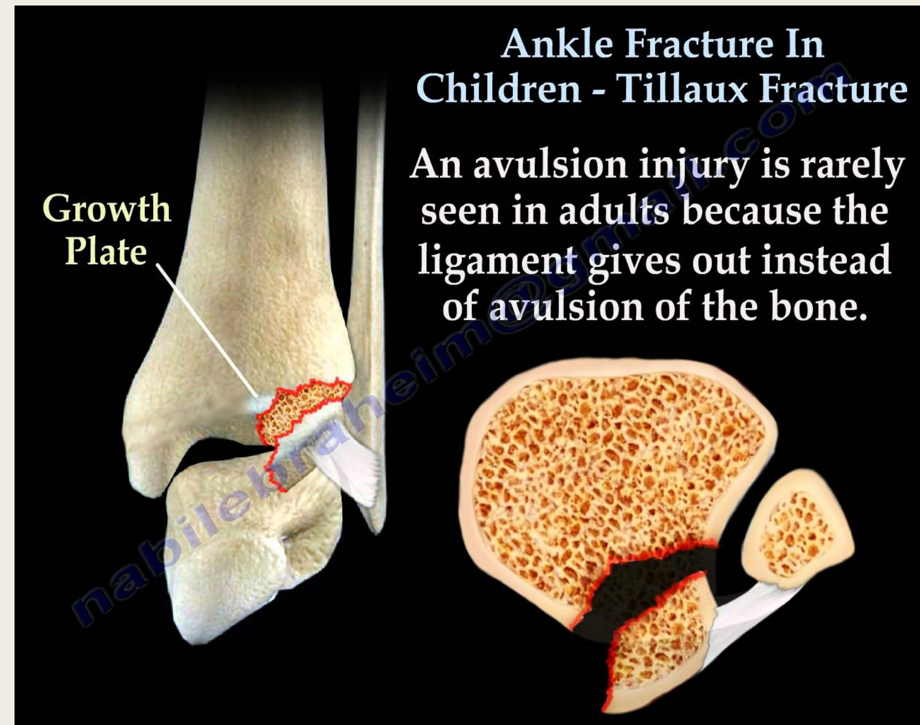


Tillaux fracture – suspect it

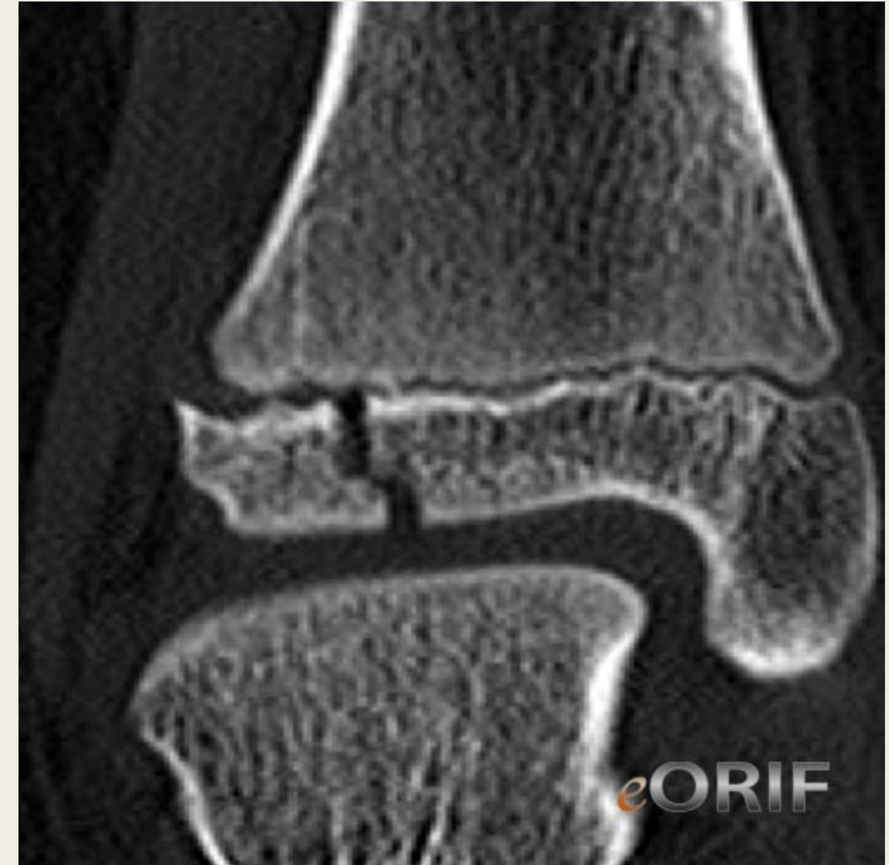
- Essentially a Salter-Harris III fracture of anterolateral distal tibia
- Occurs in partially fused growth plate (typically 1 year away from closure)
  - *Therefore, age 12-15 years more common, girls younger*
  - *Lateral aspect avulsed since growth plate fuses from medial to lateral*
- External rotation injury – ATFL ligament strong compared to growth plate – results in avulsion



https://www.youtube.com/watch?v=KiQemRqA7C0

Tillaux fracture – diagnose and manage it

- Look for it on ankle radiograph in appropriate age child / mechanism / exam
- CT scan – easier to see fracture
- Consult with orthopedist
- Open reduction, internal fixation if > 2 mm displacement
- Needs ortho f/u, complications include nonunion, arthritis, persistent pain, growth arrest (uncommon)
- For more info: https://www.youtube.com/watch?v=KiQemRqA7C0 and https://www.orthobullets.com/pediatrics/4028/tillaux-fractures



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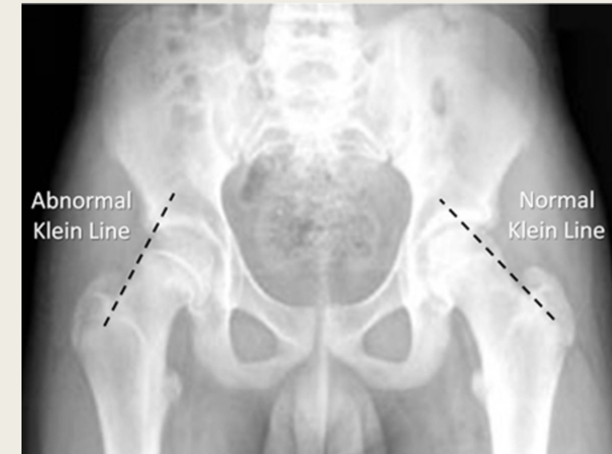
- He fell 3-4 weeks ago while playing soccer
- He was wrestling with his little brother a last month – doesn't recall details, but did note some knee and thigh pain after that
- Complains of left knee pain, particularly with activity
- Walks with an antalgic gait, favoring left side
- No deformities, swelling, signs of trauma to left lower extremity
- Knee full range of motion, nontender to palpation, no evidence of effusion
- You also examine the hip, despite c/o pain in knee, and note decreased range of motion and pain on internal rotation
  – *Remember knee or thigh pain in kids may indicate hip pathology*

Slipped capital femoral epiphysis (SCFE) – suspect it

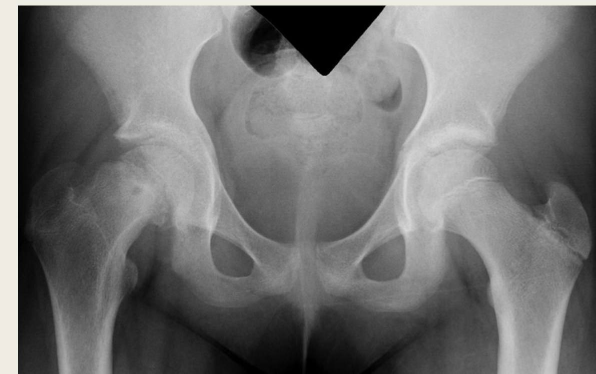
- Presents in early adolescents, often overweight or obese (but not all patients are overweight, so being thin does not rule it out)
  - *12-16 year old males, 12-14 year old females*
- Males predominate (2.4 to 1 ratio)
- 20% bilateral at presentation, and 20-40% more will progress to bilateral (typically within 18 months of first hip)
- May have an acute slip = more sudden onset after a trauma, or chronic slip = more gradual onset
- Dull pain in hip, or may c/o pain in knee or thigh (referred pain), exacerbated by activities that load the hip in flexed position (eg climbing stairs)
- May hold hip in passive external rotation
- Decreased passive range of motion and pain, especially on internal rotation
- Atypical SCFE = < 10yo, > 16yo, weight < 50th percentile, associated with renal failure, hypothyroidism, GH deficiency, Down and Rubenstein-Taybi syndromes, radiation therapy

Slipped capital femoral epiphysis (SCFE) – diagnose and manage it

- If strongly suspect, make patient non-weight bearing, even as you send patient to xray suite
- Order AP and frog-leg lateral views of the pelvis
  - *Do not order unilateral hip xrays, because you need to compare to the unaffected side*
  - *Early findings: Klein line just barely does not intersect femoral epiphysis (may be apparent only in frog-leg view)*
  - *Later findings: clear "ice cream falling off cone" appearance*
- Atypical: check renal fcn, TSH, GH
- Keep non weight-bearing (so no further slip) and consult orthopedist from ED – will need surgery
- More info: http://pedemmorsels.com/slipped-capital-femoral-epiphysis/



http://www.cmcedmasters.com/ortho-blog/slipped-capital-femoral-epiphysis



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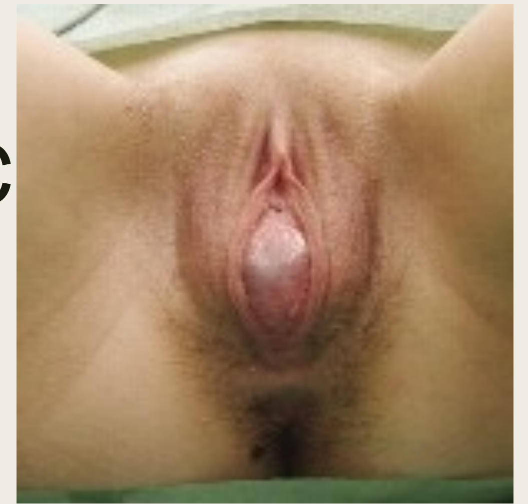
- Comfortable appearing, nontoxic, lungs clear, heart RRR no murmur, abdomen soft, nontender to palpation but palpable mass infraumbilical to suprapubic area, no guarding, no rebound, no hepatosplenomegaly
- What examination will be diagnostic? Further physical exam

Imperforate hymen with hematoc – suspect it

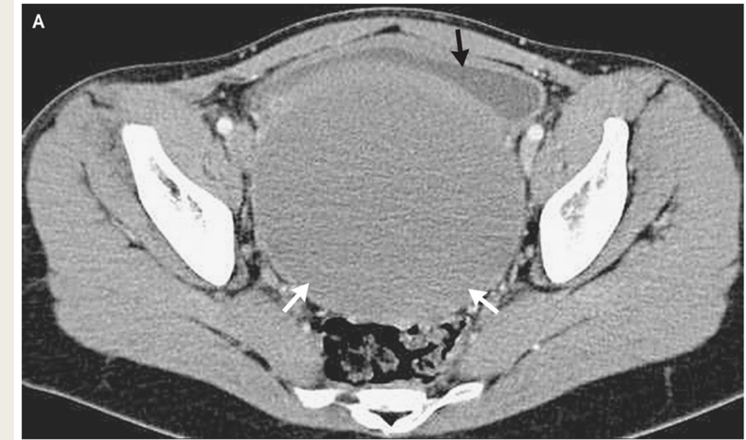


bestpractice.bmj.com

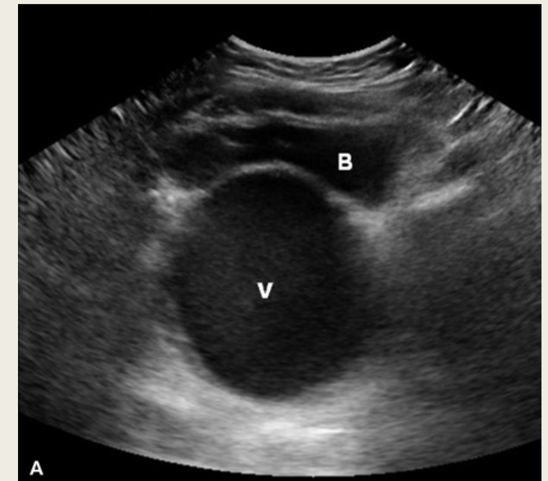
- The examination is: physical exam of the genitourinary area!
  - *Always in evaluating abdominal pain, both sexes*
- 1:1000 to 1:10,000 incidence
- May be noted on routine physical examination during well child care, but may be missed until adolescence
- As menarche begins, blood begins to collect behind imperforate hymen, resulting in hematocolpos
  - *Presents with abdominal pain (may be intermittent with each menses), abdominal mass, primary amenorrhea*
  - *May have urinary retention, constipation as hematocolpos enlarges*
- Maintain a clinical suspicion and ask about menarche / menses history in Tanner stage 3-4 patients

Imperforate hymen with hematocolpos – diagnose and manage it

- Diagnosis based on a CT scan obtained as part of abdominal pain work-up is a failure of management
  - *Unnecessary ionizing radiation exposure*
- Suspect clinically, perform physical exam, ultrasound to confirm
- Consult with pediatric gynecologist
  - *Generally, hymenotomy performed in O.R.*
  - *May suppress menstruation with oral contraceptives if operative repair not to be done immediately*
- For more Info: https://www.slideshare.net/aabuans/imperforate-hymen



www.nejm.org



jultrasoundmed.org

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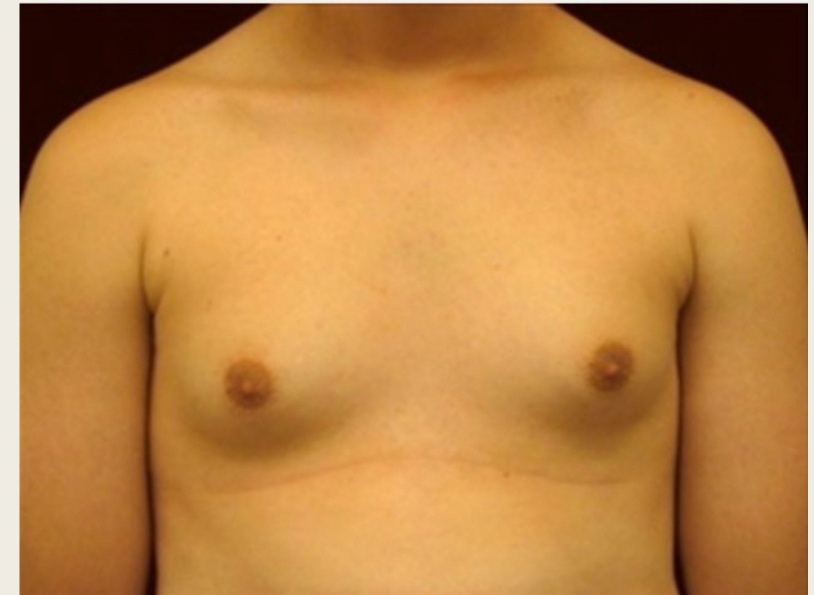

https://gynecomastia-specialist.com

Normal physiologic gynecomastia of adolescent male – suspect it

- Commonly seen in mid-puberty (up to 50% of boys!), Tanner stages 3-4, around the time of peak height velocity (12-14 years)
- Due to relative increase in Estrogen
  - *Possible link to obesity, as there is increased estrogen formation in adipose tissue*
  - *Differentiate from pseudogynecomastia (fatty tissue without any palpable glandular tissue) from obesity*
- Usually bilateral, occasionally unilateral or asymmetric
- Rubbery or firm, but not hard or fixed, no nipple discharge, no axillary lymphadenopathy

Gynecomastia of adolescent male – diagnose and manage it

- Clinical diagnosis, rule out pathologic gynecomastia
  - *Typical mid-pubertal age*
  - *No signs of mastitis, abscess, or breast cancer*
  - *No other signs of abnormal feminization or endocrine disorder*
  - *No signs of adrenal or testicular tumor or Klinefelter syndrome*
- Rule out use of medications that can cause: exogenous estrogens, steroids, marijuana, spironolactone, ketoconazole, cimetidine, tea tree & lavender oil topical
- Reassurance, tell patient not to massage or "check on it" frequently – increases risk of infection, and may lead to hyperprolactinemia and galactorrhea
- Usually resolves over months to a few years – have patient f/u with PMD
- For more info: http://emedicine.medscape.com/article/120858-overview

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- Tripped and fell, sustaining minor trauma - hit her right thigh on a cement bench at school 3 days ago, no skin break, able to walk but c/o pain
  - *Seen in ED and diagnosed with contusion, XR negative, d/c on NSAID*
- Returned yesterday with increased pain and mild swelling, same dx
- Now with pain out of proportion to physical exam, diffuse thigh swelling, mild erythema, warmth in area of contusion
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- Chart review shows seen in clinic for sore throat 1 week prior

Streptococcal toxic shock syndrome – suspect it

Streptococcal

- Pharynx, skin, vagina source, but 45% no entry portal identified
  - *Association with varicella, NSAIDs*
- Often in site of minor trauma
- Pain out of proportion to physical findings, followed by signs of deep skin & soft tissue infection
- Fever, tachycardia, hypotension, flu-like symptoms
- Sunburn-like rash in only 10%

Staphylococcal

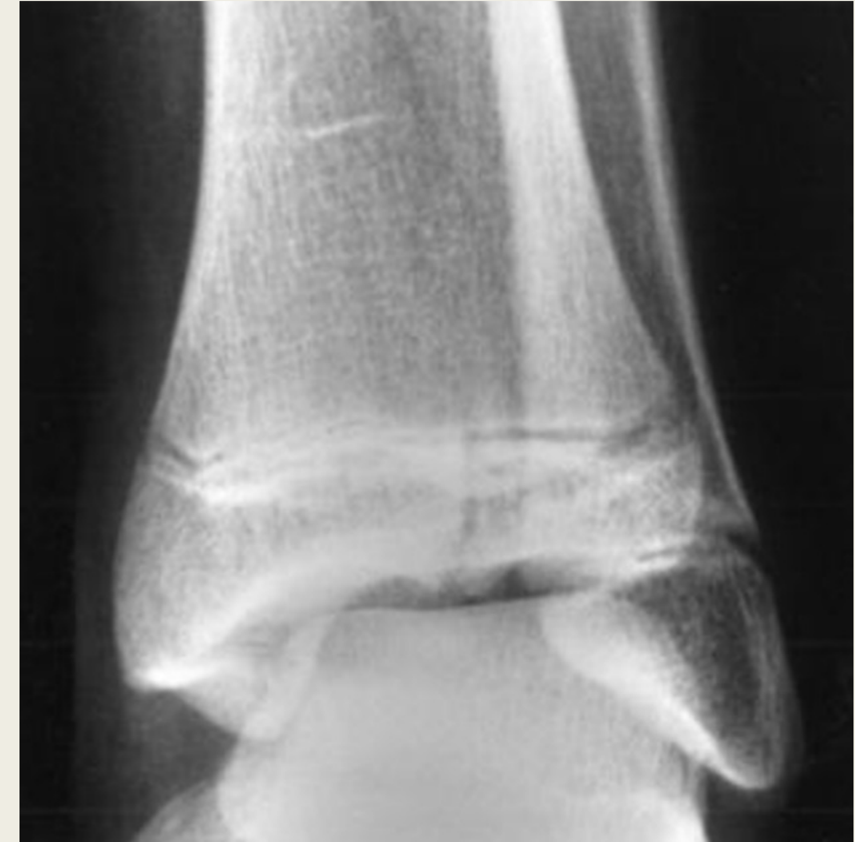
- Menstrual (50%) and non-menstrual (50%)
  - *Wounds, surgery, infections*
  - *Tampons, nasal packing*
- Fever, flu-like symptoms, N/V/D, rapid progression to shock
- Hypotension, altered mental status
- Diffuse sunburn-like erythroderma, involves palms and soles, mucosal erythema, desquamation 1-3 weeks later

Streptococcal toxic shock syndrome – diagnose and manage it

- Labs: leukocytosis, left shift, send blood culture, DIC panel, liver & renal function, swab throat or vagina as indicated
- Early recognition and treatment of shock is important
  - *Copious amounts of fluids, push-pull technique for rapid administration*
  - *May require pressors: dopamine or norepinephrine*
- Remove any foreign body
- Emergent surgery consultation for aggressive debridement of necrotizing skin and soft tissue infection; PICU admission – notify PICU or arrange transfer early
- Empiric antibiotics: Clindamycin + vancomycin (1st choice if suspect staph) or piperacillin-tazobactam or a carbapenem
- For more info: https://emcrit.org/pulmcrit/early-suspicion-of-toxic-shock-syndrome/ and https://emcrit.org/pulmcrit/toxic-shock-syndrome-management-a-tale-of-two-patients/

14 year old boy with right ankle pain

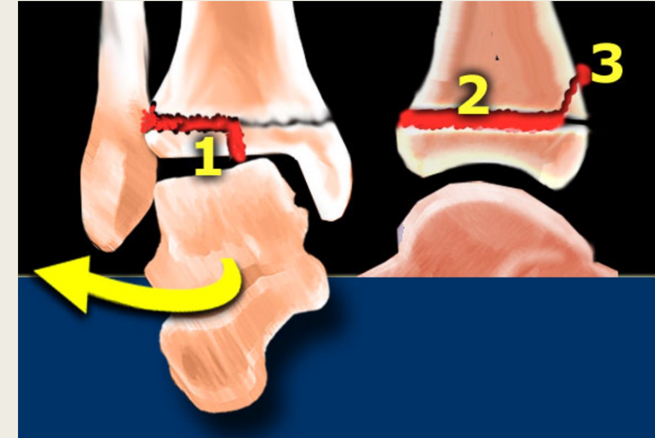
- 14yo boy was skateboarding and attempted a trick
- Doesn't recall mechanism but does say his foot everted relative to his leg
- Presents with immediate pain and rapid onset swelling of his ankle, unable to bear weight
- You get an xray… diagnosis?



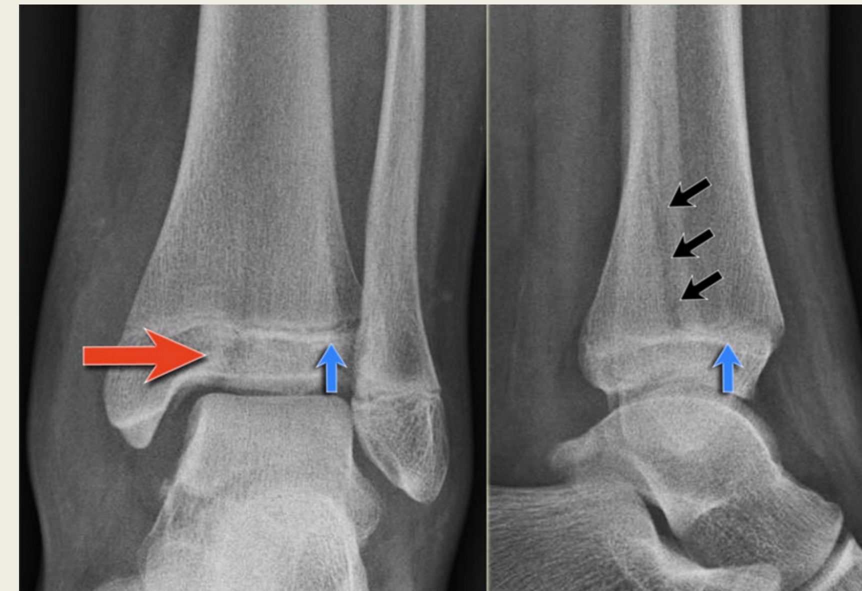
http://emedicine.medscape.com/

Triplane fracture – suspect it

- Occurs in adolescence when distal tibia growth plate is only partially fused (still open laterally)
- Occurs with eversion injury of foot on tibia
- Most common in age 12-16 years
  - *Boys peak 15-16 years old*
  - *Girls peak 13-14 years old (younger due to growth plates close earlier than boys)*
- Accounts for 5-10% of pediatric intra-articular ankle injuries
- Looks like a Salter-Harris III on AP view and SH II on lateral view

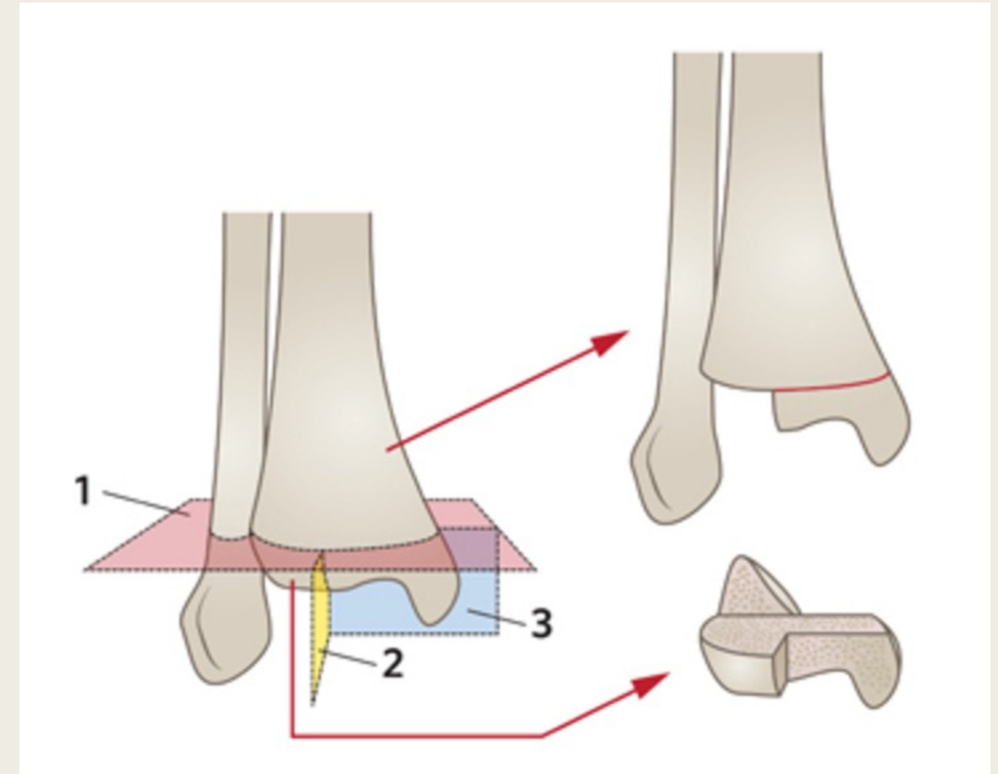


http://www.radiologyassistant.nl/



Triplane fracture – diagnose and manage it

- CT scan is generally indicated to assess complex multiplane fractures
- Consult with orthopedics
- Attend to pain management
- Make patient NPO in case of closed reduction or ORIF (done for > 2mm fracture gap)
- Elevate ankle
- Monitor for compartment syndrome
- For more info: http://pemcincinnati.com/blog/fracture-fridays-three-planes-re-post/



http://www.rch.org.au/clinicalguide/guideline_index/fractures/ankle_emergency/

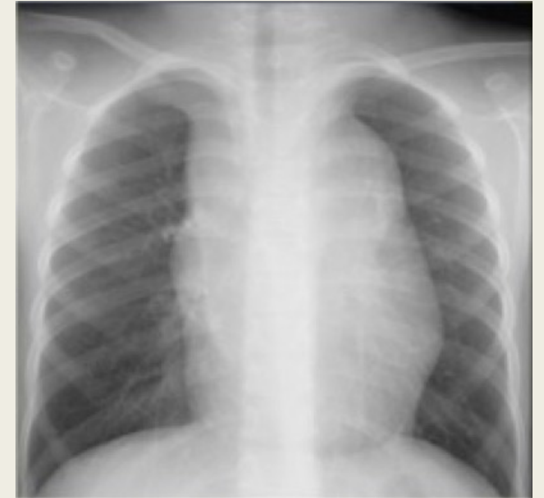
14 year old boy with cough x 1 month, worsening SOB

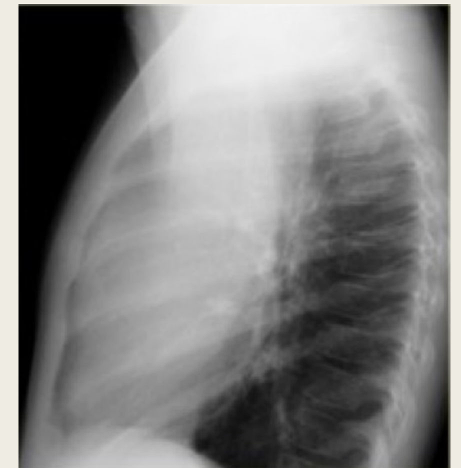
- 14yo boy with barking cough x 1 month, intermittent tactile fever
  - *Went to PMD in first week of illness and received Rx for azithromycin which he completed without improvement*
  - *Returned to PMD last week and noted to be wheezing and received Rx for MDI and 5 day course of prednisone*
  - *Just finished prednisone course 2 days ago and much worsened SOB*
  - *Mom also thinks his face and neck look swollen*
- VS temp 37.8, HR 120, RR 35, BP 95/36, O2 sat 94% room air sitting
  - *Severe respiratory distress when lain supine*
  - *Stridor at rest*
  - *Lungs with bilateral wheezes*

Mediastinal mass – suspect it

- More common in adolescents than younger children
- Prolonged / progressive respiratory symptoms, often initially mistaken for respiratory infection, asthma, bronchiolitis, croup
  - *Steroids may have been given to treat “asthma” and may temporarily ameliorate symptoms*
- Supine positioning worsens respiratory distress with anterior mediastinal mass
- SVC compression can lead to: face / neck / upper extremity swelling, plethora, headache, JVD, cough, hoarse voice, dyspnea, Horner’s syndrome

Mediastinal mass – diagnose and manage it





radiologyassistant.nl

- CXR shows mediastinal mass, widened mediastinum on AP, obliterates retrosternal air space on lateral
- Differentiating from normal thymus
  - *Normal thymus may be sail-shaped, or had undulating borders (due to anterior ribs overlying)*
  - *Although normal thymus is sometimes visible up to age 10 years, it is uncommonly prominent in adolescents*
- Keep patient in position of comfort, usually sitting up
  - *Do NOT give sedative medications*
- Consult anesthesiologist early for airway issues, oncologist; admit to PICU for further work-up and management
- For more information: http://www.pemcincinnati.com/blog/wp-content/uploads/2015/09/Ped-Onc-Emergenices.pdf (page 59) and http://www.radiologyassistant.nl/en/p4620a193b679d#i464c3e6e57921 and https://www.scitechnol.com/peer-review/paediatric-anterior-mediastinal-mass-a-night-mare-for-the-anaesthesiologist--the-need-for-a-systematic-evidence-based-approach-tow-6I8a.pdf

14 year old boy with penile swelling x 24 hours

- 14yo boy presents with penile swelling & pain x 24 hours
- He is not sure why it is swollen and mostly shrugs his shoulders to your questions
- He thought it would go away and when it didn't, he told his parents
- He is uncircumcised and has no significant past medical history
- PE: afebrile, nontoxic, remainder of exam besides penis normal

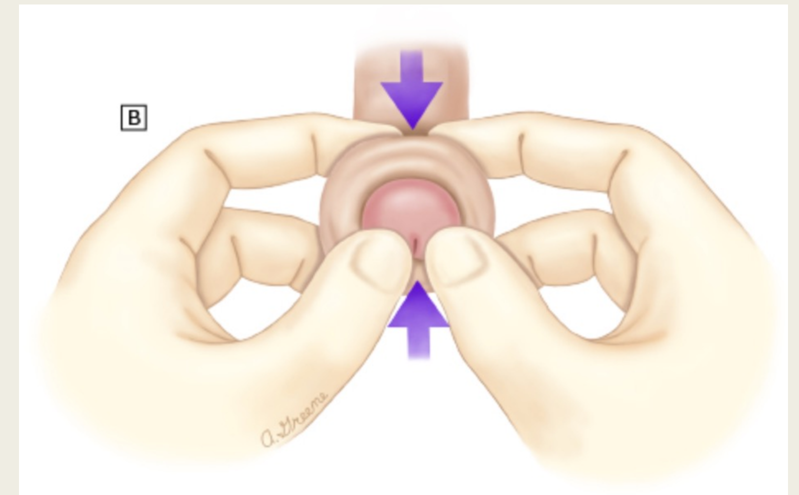
www.ers4kids.com

Paraphimosis – suspect it

- Foreskin of uncircumcised (or partially circumcised) boy stuck in retracted position
- Venous engorgement, and if left untreated, can result in compromise of arterial flow and necrosis
- May be precipitated by retracting foreskin to clean, masturbation and sexual activity, trauma
- Differential diagnosis
  - *Tourniquet, eg hair – look carefully for a constricting hair tourniquet*
  - *Balanoposthitis – generalized foreskin swelling & erythema, w/o constricting band of paraphimosis*
  - *Chigger and other insect bites – look for asymmetry, punctum of bite*
- Note: phimosis is when the foreskin cannot be retracted, and is normal up to age 5-7 years

Paraphimosis – diagnose and manage it

- Reduce ASAP to restore blood flow
- Decrease edema to improve success
  - *Manual compression / compression bandages*
  - *Ice x 15-20 minutes maximum*
  - *Fine granulated sugar (osmotic agent)*
  - *Gauze soaked in D50 or mannitol (osmotic)*
- Pain control: opiates +/- EMLA or dorsal penile block
- For more info: https://www.youtube.com/watch?v=9O43B0JWXeo



http://s0www.utdlab.com