

The Annual General Pediatric Review & Self Assessment



Nicklaus
Children's
Hospital

RADIOLOGY

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Nicklaus Children's Hospital

Miami, Florida



The Annual General Pediatric Review & Self Assessment

Disclosure of Relevant Relationship

Dr. Park has not had (in the past 24 months) any relevant conflicts of interest or relevant financial relationship with the manufacturers of products or services that will be discussed in this CME activity or in his presentation.

Dr. Park will support this presentation and clinical recommendations with the “best available evidence” from medical literature.

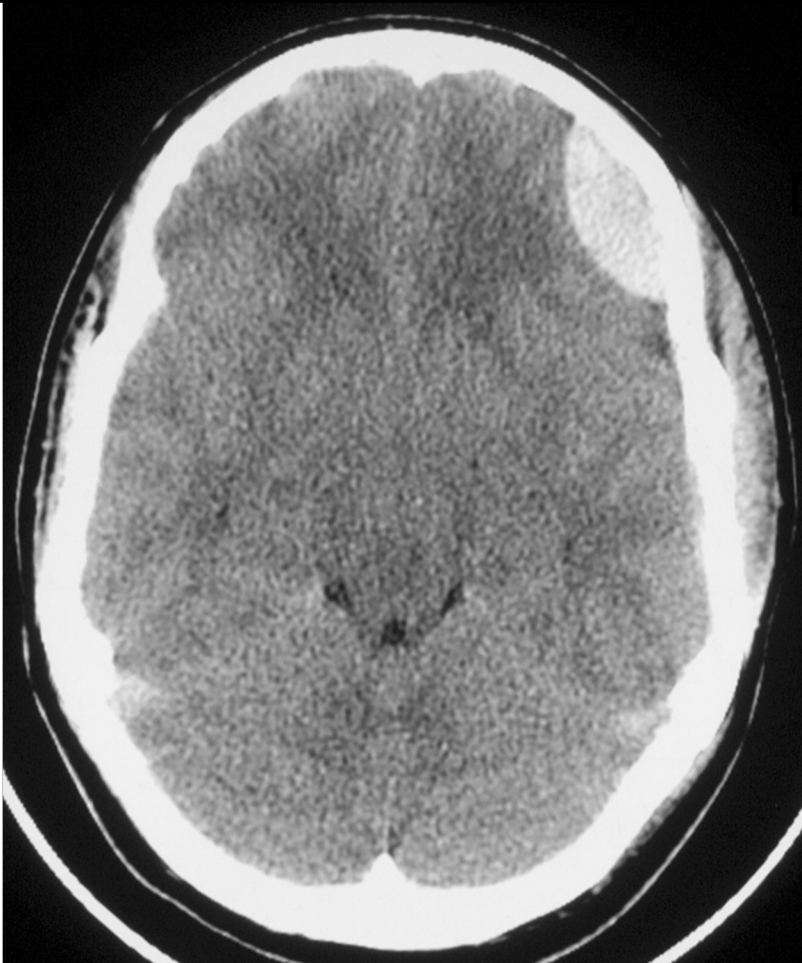
Dr. Park does not intend to discuss an unapproved/investigative use of a commercial product/device in this presentation.

Diagnostic Imaging for the Pediatrician

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May 2023

Many thanks to Dr. Rachel Pevsner and Ricardo Restrepo

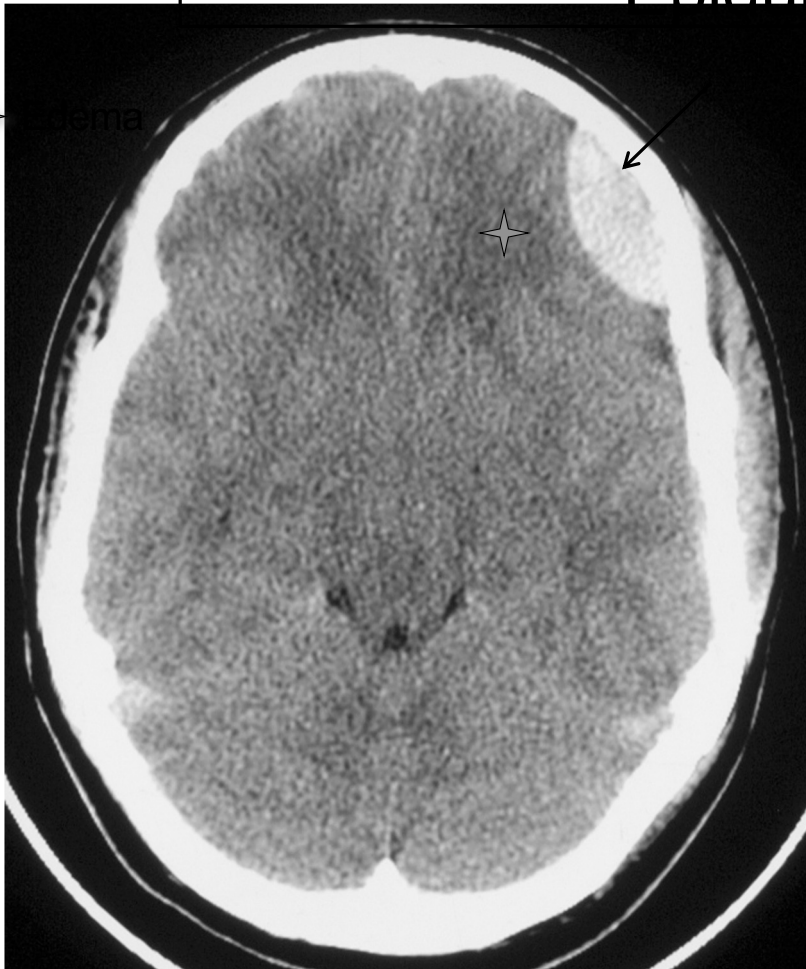
Case 1: 14y M lethargic 2 days, fall off bicycle



Diagnosis?

- A. Subdural Hematoma
- B. Epidural Hematoma
- C. Subarachnoid hemorrhage
- D. Hemorrhagic contusion
- E. Subdural abscess

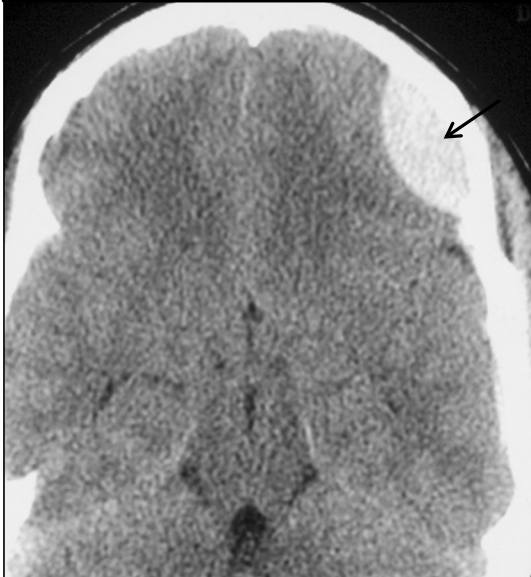
Case 1: Diagnosis? Epidural Hematoma



- ⊗ Lenticular shape on CT
- ⊗ Arterial bleed usually middle meningeal a.
- ⊗ Associated with skull fracture
- ⊗ Acute blood is bright on CT (but $< Ca^{++}$)
- ⊗ Calcium is bright on CT
- ⊗ CSF is black on CT
- ⊗ Can be venous bleed

Epidural vs Subdural Hematoma

Epidural: lentiform



Acute: Very bright

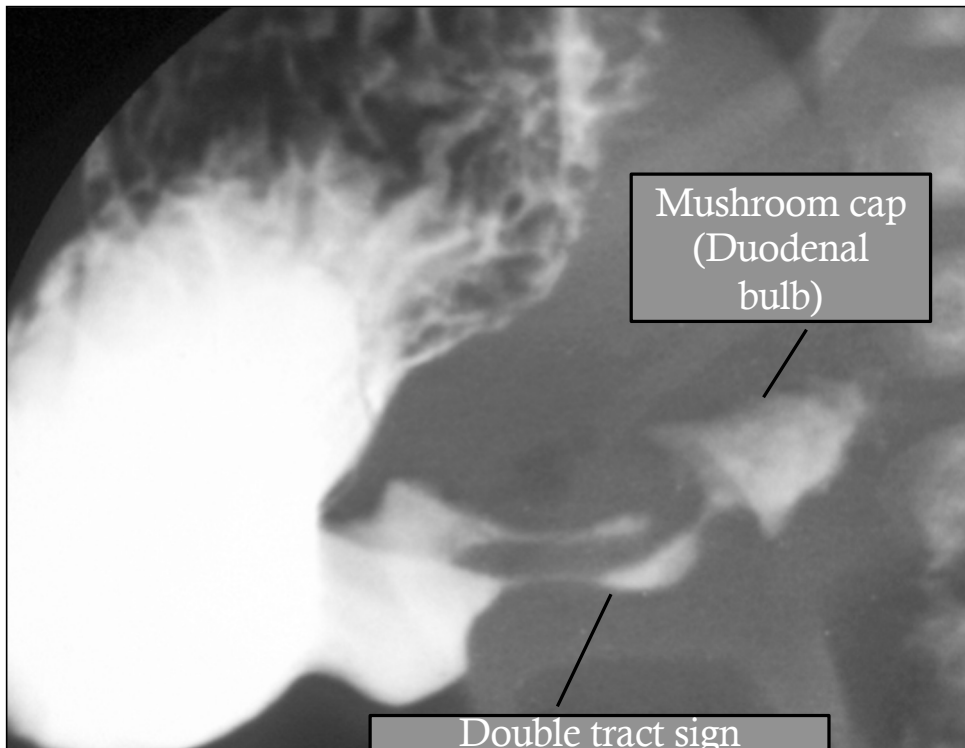
Subdural: crescentic



Subacute: slightly bright

CT for head trauma: NO IV contrast!!
Can obscure small petechial bleed or contusion

Case 2: 4-week M, vomiting and failure to thrive



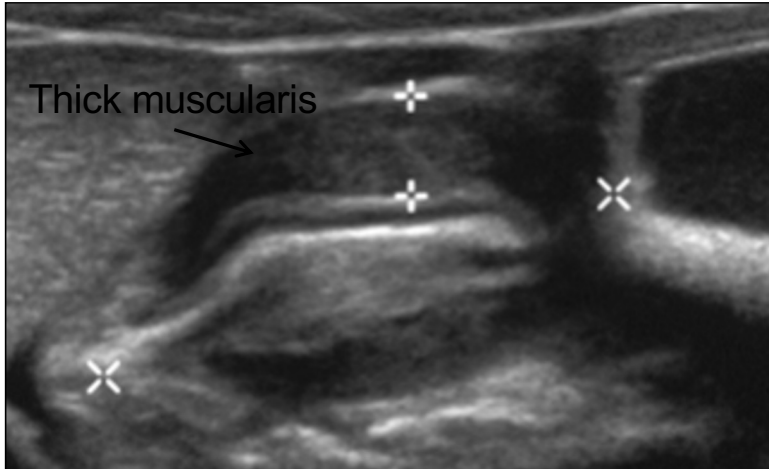
Mushroom cap
(Duodenal
bulb)

Double tract sign
(puckered lumen of
hypertrophic pyloric
channel)

Diagnosis?

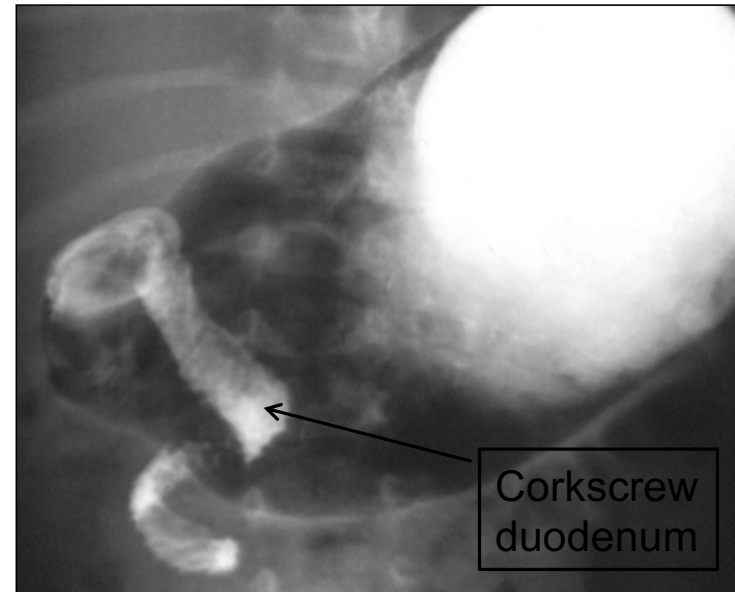
- A. Duodenal atresia
- B. Pyloric stenosis
- C. Midgut volvulus.
- D. Duodenal web
- E. Intussusception

Pyloric stenosis: US



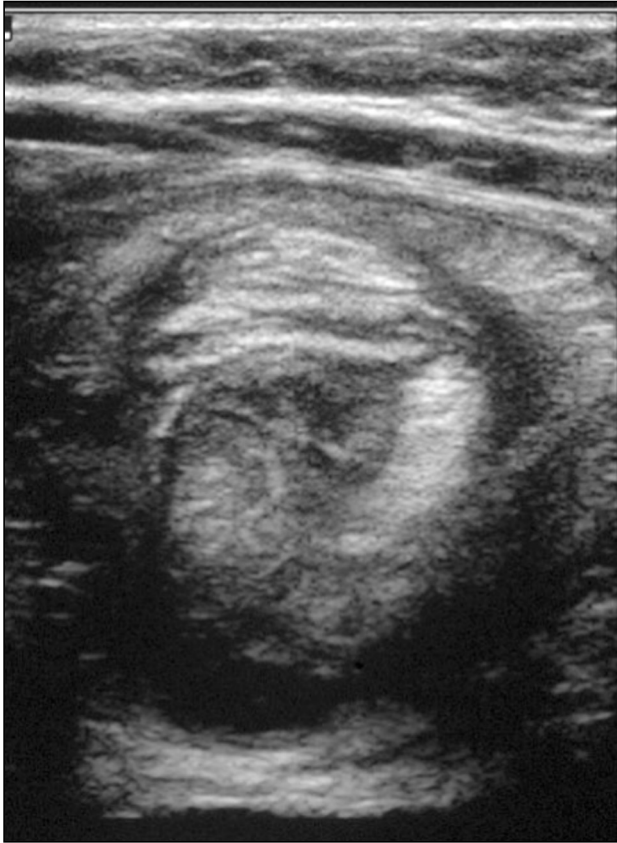
- 2 wks – 3mo. M>F
- Non bilious “projectile” vomiting
- metabolic alkalosis
 - Hypokalemic, hypochloremic
- Dx: Ultrasound (study of choice)
 - Pylorus thickness > 3mm
 - Elongated channel > 15mm
 - Occasionally dx on UGI

Midgut volvulus: UGI



- Variable: usually < 2 years
- Bilious vomiting
- Child is toxic, acidotic
- Dx: UGI series
 - Corkscrew appearance

**Case 3: Irritable Toddler w/bloody stools
RLQ ileo-colic intussusception.**

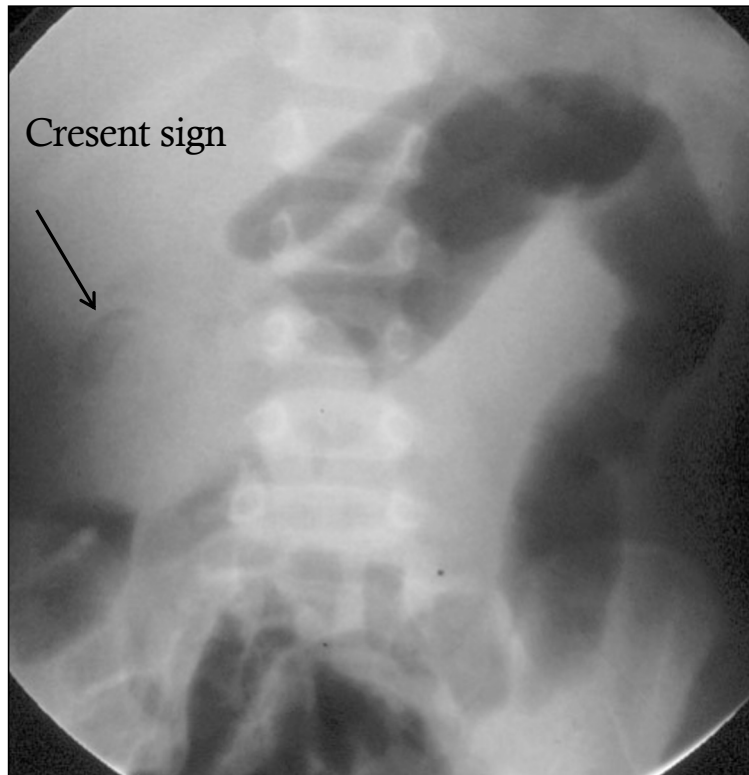


US of RLQ: Donut sign

What is next?

- Ⓐ A. CT scan
- Ⓑ B. Air enema & surgical consult
- Ⓒ C. Barium enema
- Ⓓ D. Send the patient to the OR
- Ⓔ E. Chest radiograph

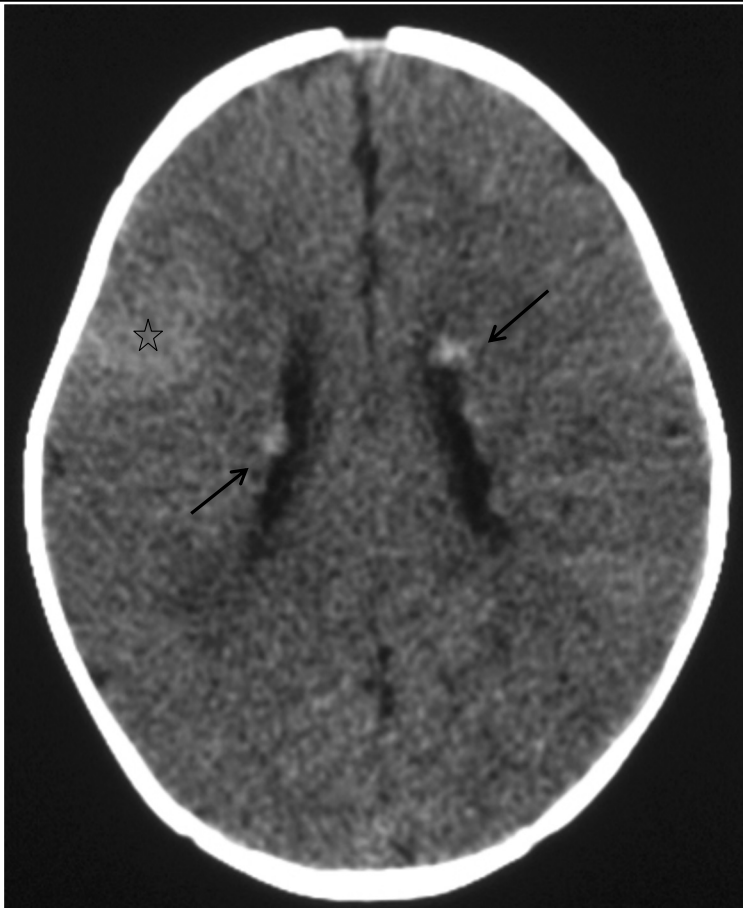
**Case 3: Ileo-colic intussusception.
What is next? Air enema and surgical consult**



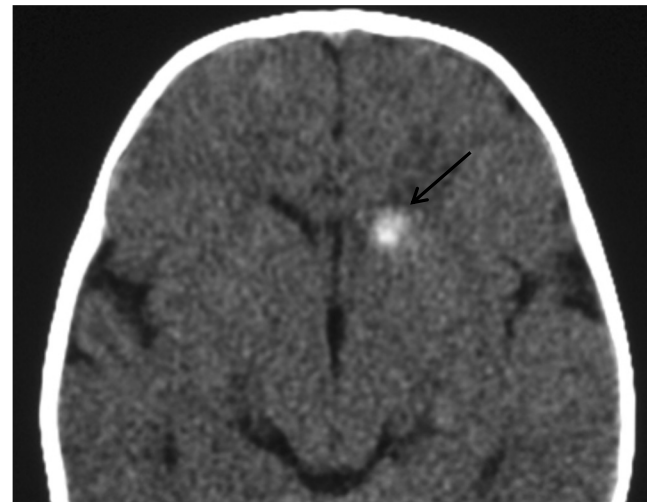
**AIR ENEMA
REDUCTION**

- ⊗ Imaging of choice: ultrasound
- ⊗ Air enema therapy: small risk of perforation
- ⊗ Around 10% recurrence rate
- ⊗ Small % are not reducible
- ⊗ IV and fluid bolus before Tx
- ⊗ Surgery should be on stand by

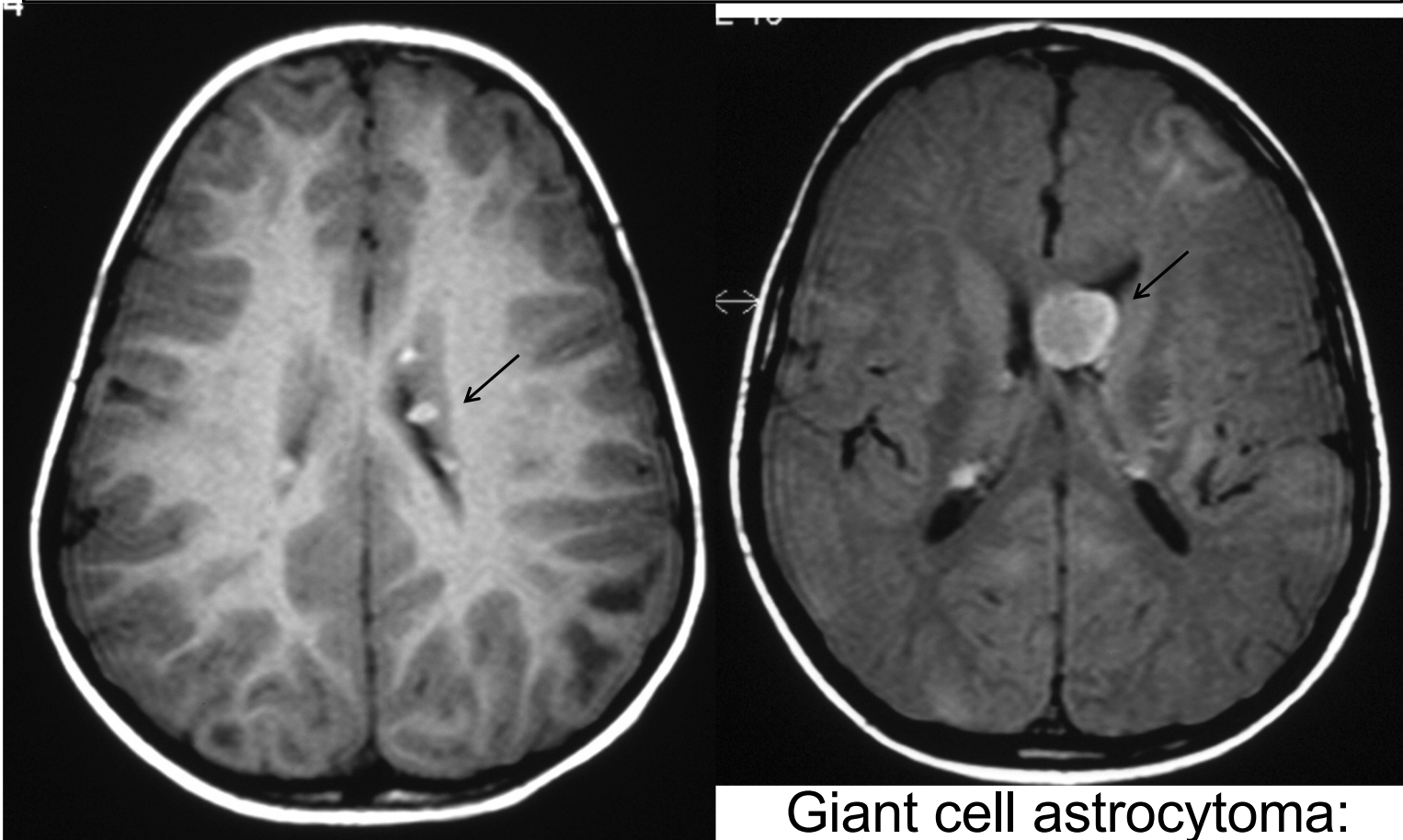
**Case 4: 8-yr w/seizures, mental retardation,
adenoma sebaceum**



- A. CMV
- B. Hyperparathyroidism
- C. Tuberos Sclerosis
- D. Oligodendrogliomas
- E. Von Hippel Lindau



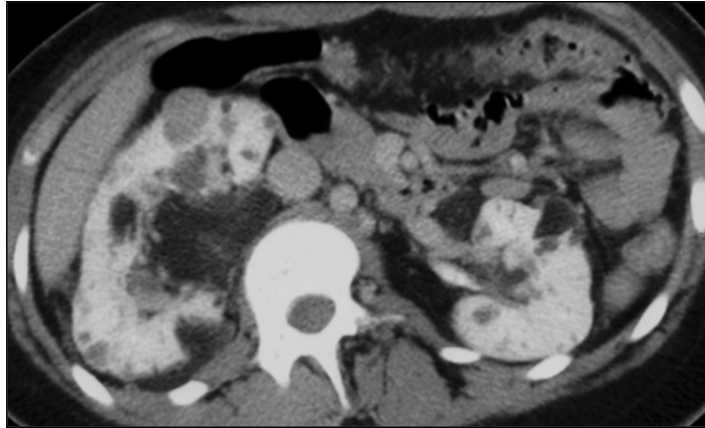
Tuberous Sclerosis



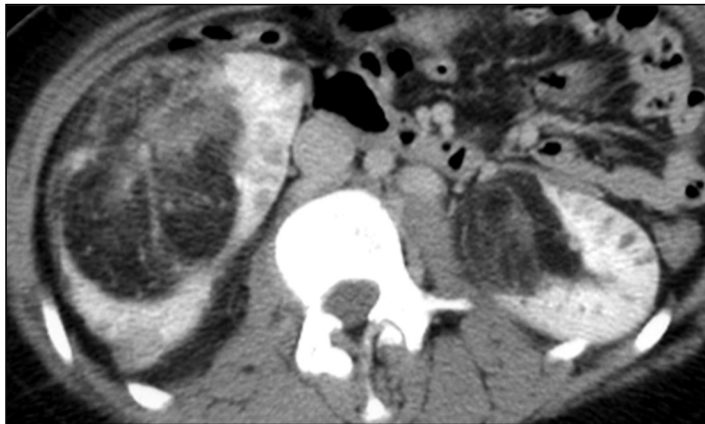
Subependymal tubers

Giant cell astrocytoma:
Foramen of Monroe

Tuberous sclerosis

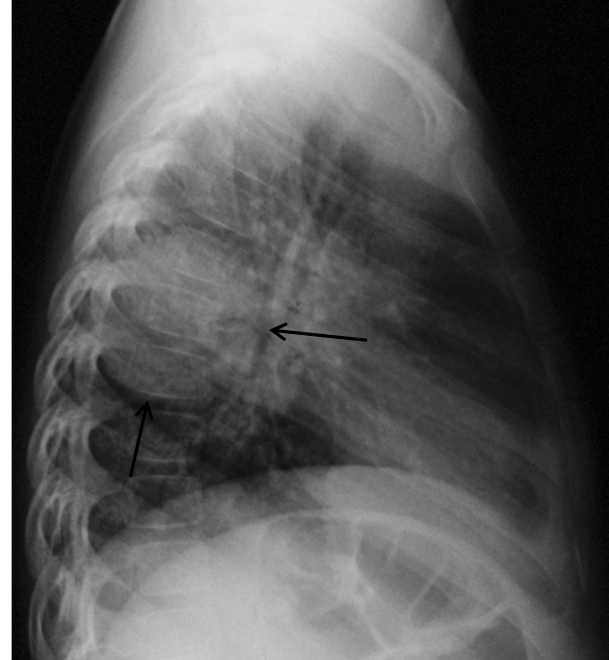
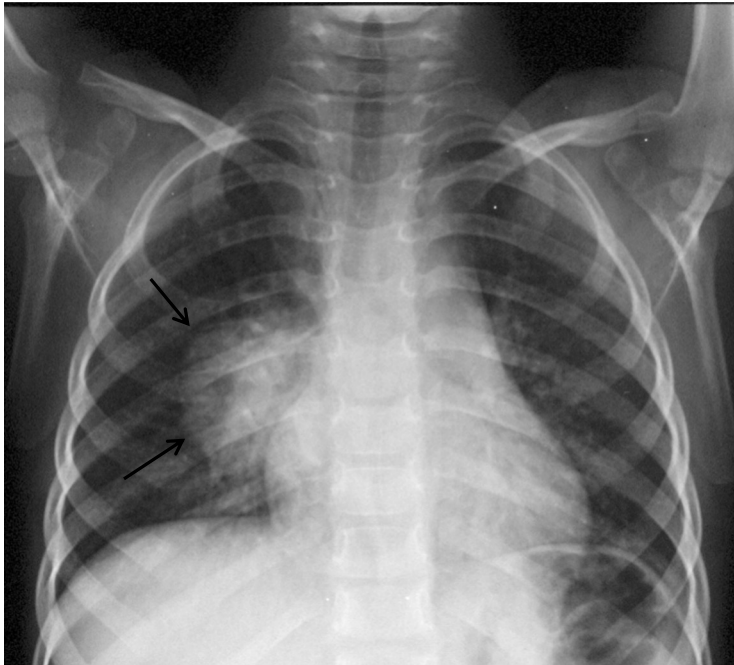


angiomyolipomas > 4 cm at risk bleed



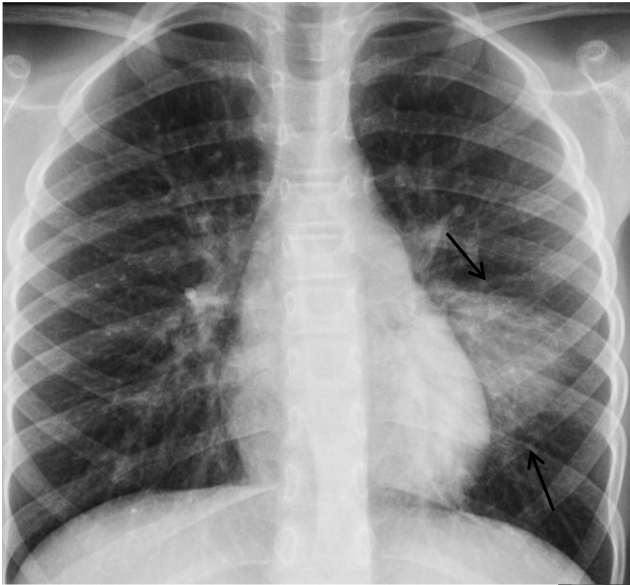
- ⊗ Seizures, mental retardation, adenoma sebaceum
- ⊗ Hamartomas (tubers) are seen in different organs particularly brain and kidneys (angiomyolipomas)
- ⊗ Giant cell astrocytomas, renal cysts, renal cell carcinoma, bone islands

Case 5: 5-yr F w/chest pain and cough for a week

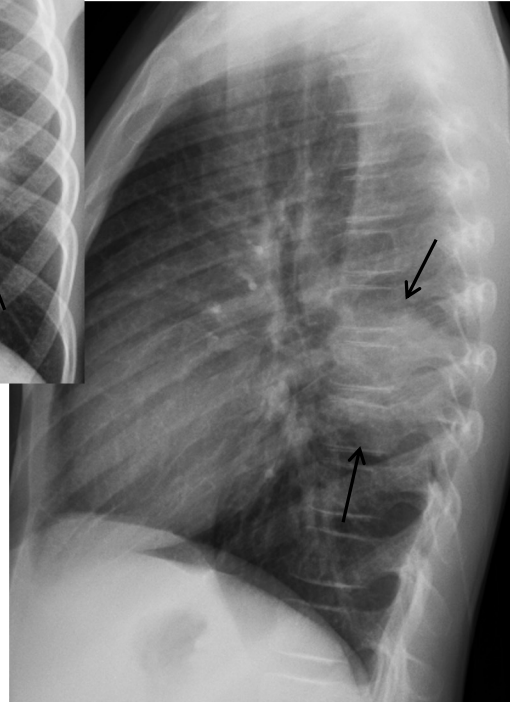


- A. Round pneumonia
- B. Mediastinal teratoma
- C. Congenital lobar emphysema
- D. Croup
- E. Neurogenic tumor

Round Pneumonia



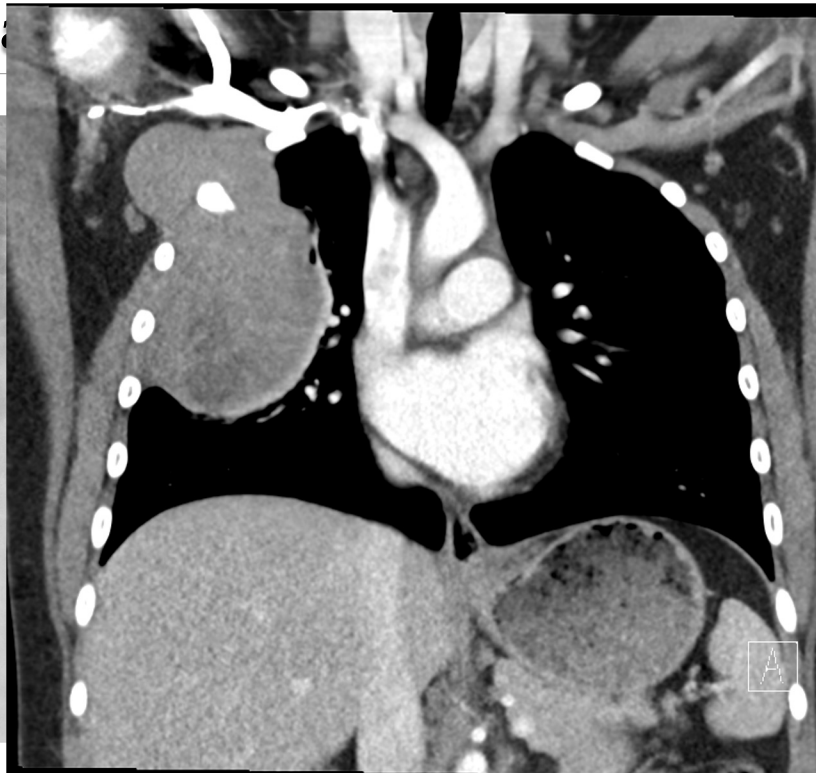
Another example:
7 yr old F w/cough & fever



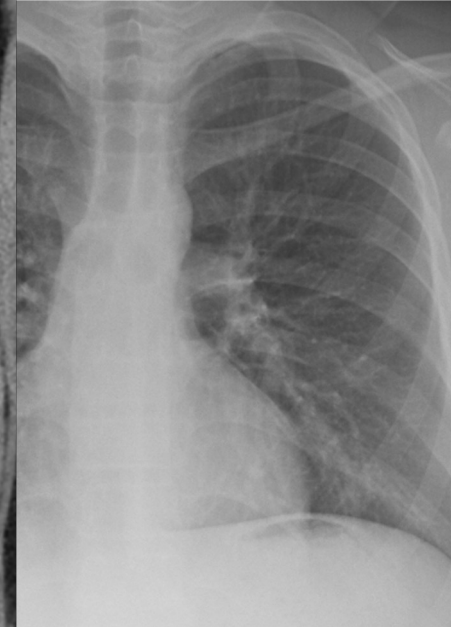
- Pneumococcus
- Usually between 2 – 8 y
- if older suspect immunodeficiency, atypical organism or neoplasm
- Lower lobes
- Touching the pleura
- Clinical history must correlate with findings

Pitfall case 12 yr old with chest pain and shoulder pain

Initial xray read

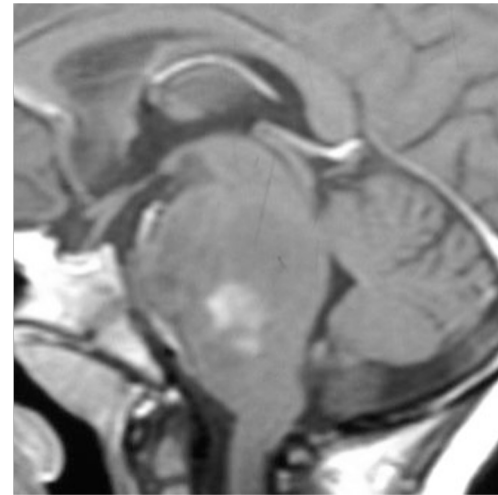
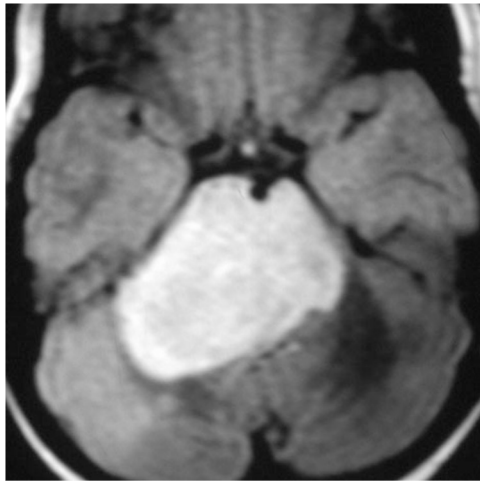
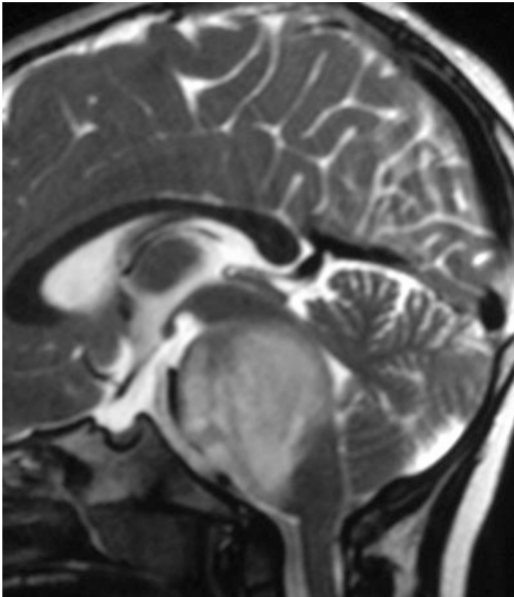


month later



Osteosarcoma of chest wall

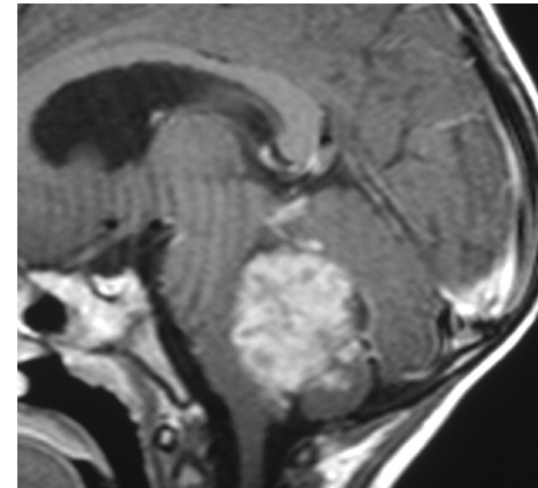
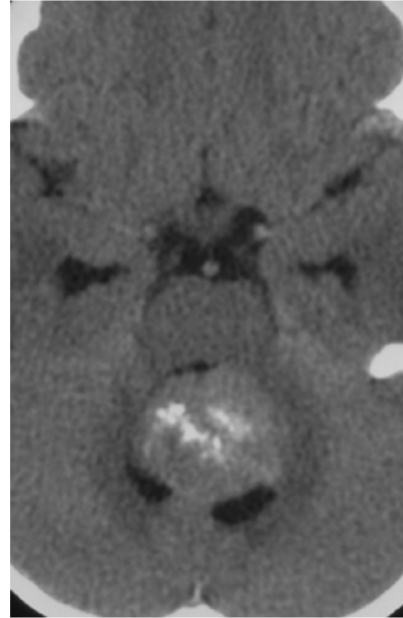
**Case 6: 6yr w/headaches, vomiting, diplopia &
Rt fascial weakness & Lt hemiparesis**



- Ⓐ A. Pontine Glioma
- Ⓑ B. Multiple sclerosis
- Ⓒ C. Brain abscess

Pediatric Brain Tumors

- Most common site for tumors is the posterior fossa
- Most common pediatric brain tumors (in order):
 - pilocytic astrocytoma
 - medulloblastoma
 - ependymoma



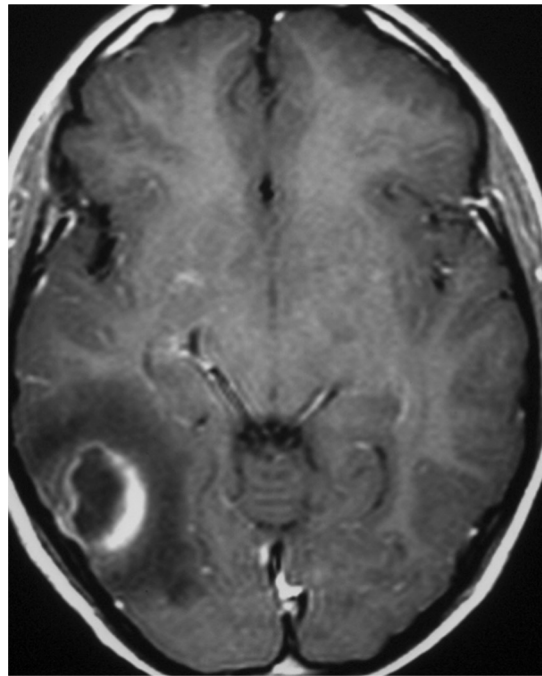
Ependymoma:
•Midline
•partially calcified
posterior fossa mass

Contrast for tumors & infection

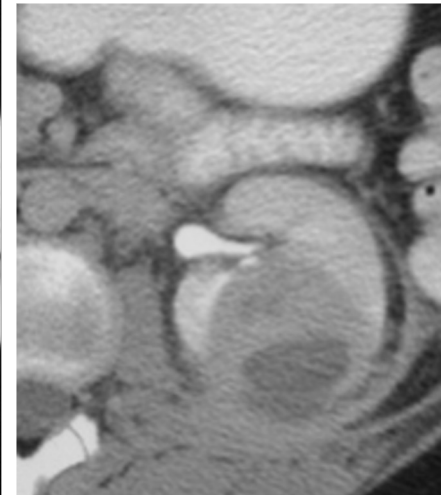
Cerebral abscess:
rim enhancing lesion surrounding edema



CT

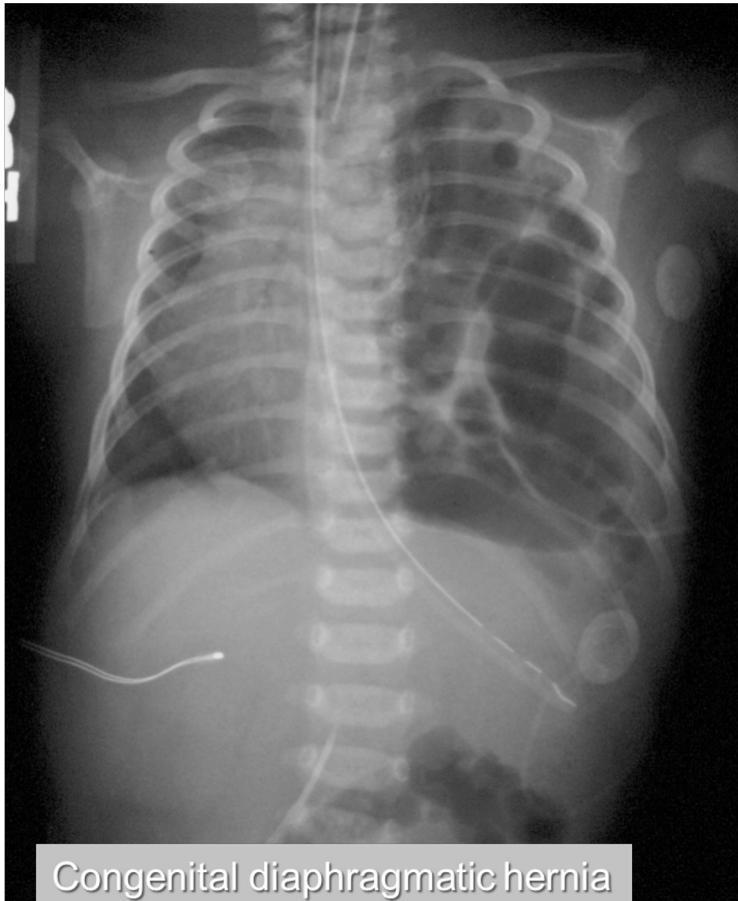


MRI



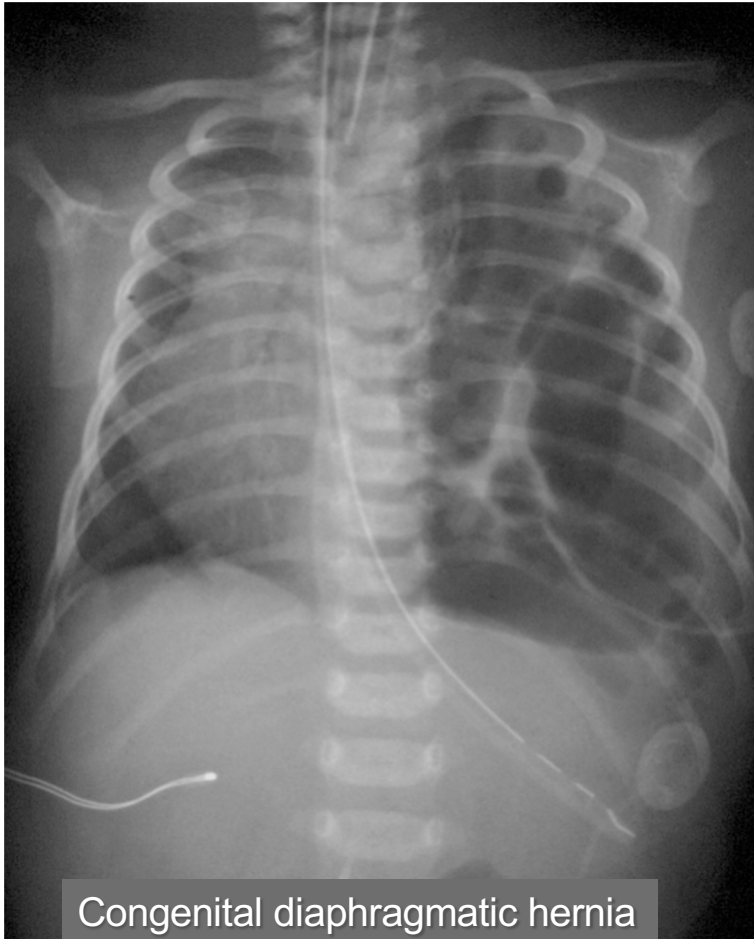
Patient also had
Renal abscess

Case 7: Which one is commonly observed in this term newborn with severe respiratory distress?



- A. Persistent pulmonary hypertension
- B. Pyloric stenosis
- C. Tension pneumothorax
- D. Systolic murmur

Persistent pulmonary hypertension



Associated with:

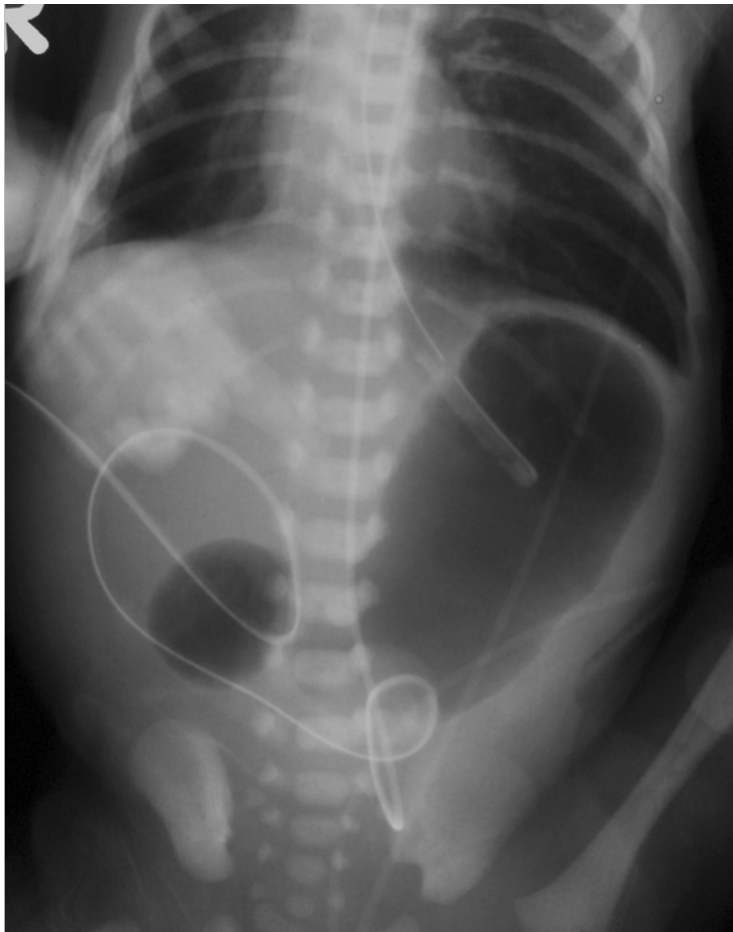
Congenital diaphragmatic hernia

Meconium aspiration

Occasionally with severe RDS

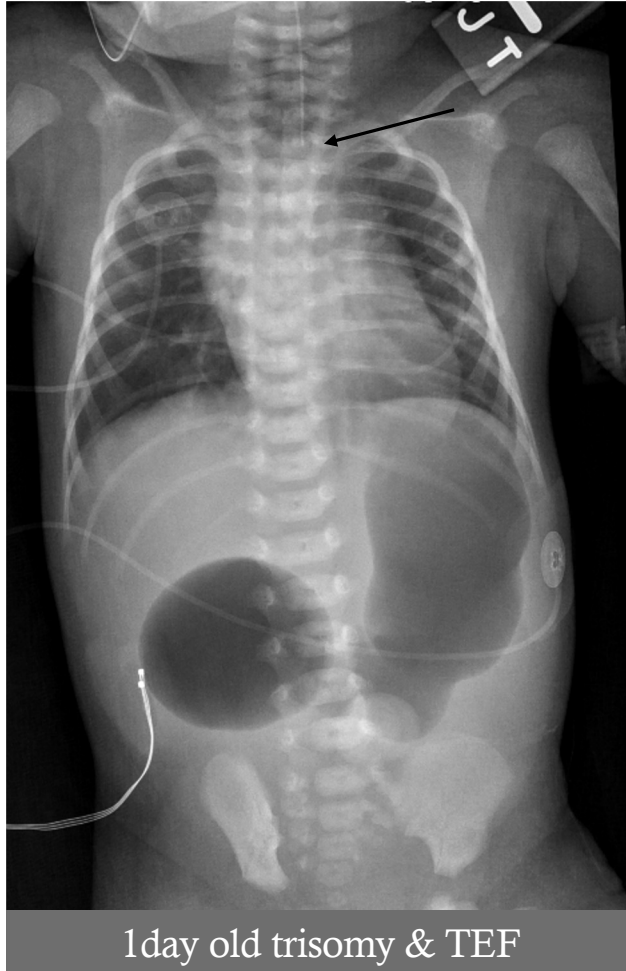
Idiopathic

Case 8: 1-day old baby with vomiting



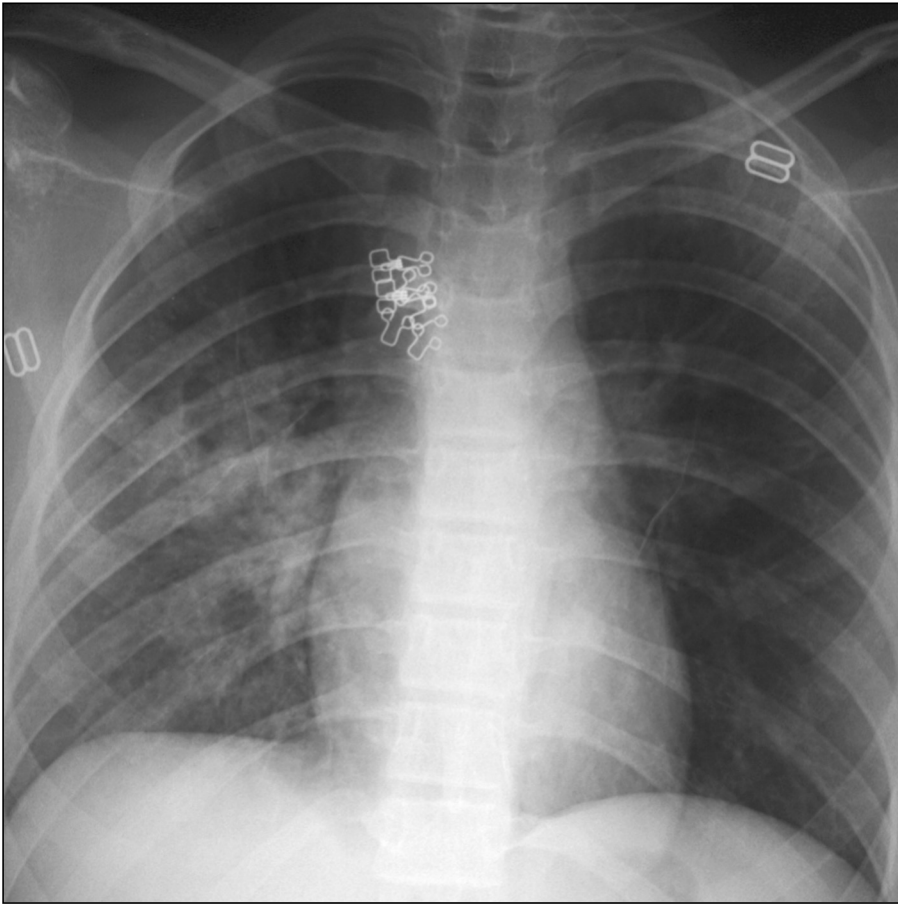
- A. Pyloric stenosis
- B. Duodenal atresia
- C. Ileal atresia
- D. Duodenal hematoma
- E. T-E fistula

Duodenal atresia



- ⊗ Double Bubble Sign
 - ⊗ No air in bowel distally
- ⊗ Bilious vomiting (obstruction distal to ampulla of vater)
- ⊗ No further imaging necessary
- ⊗ Associated with Down Syndrome (30%) and part of VACTERL
- ⊗ Due to failure canalization of duodenum

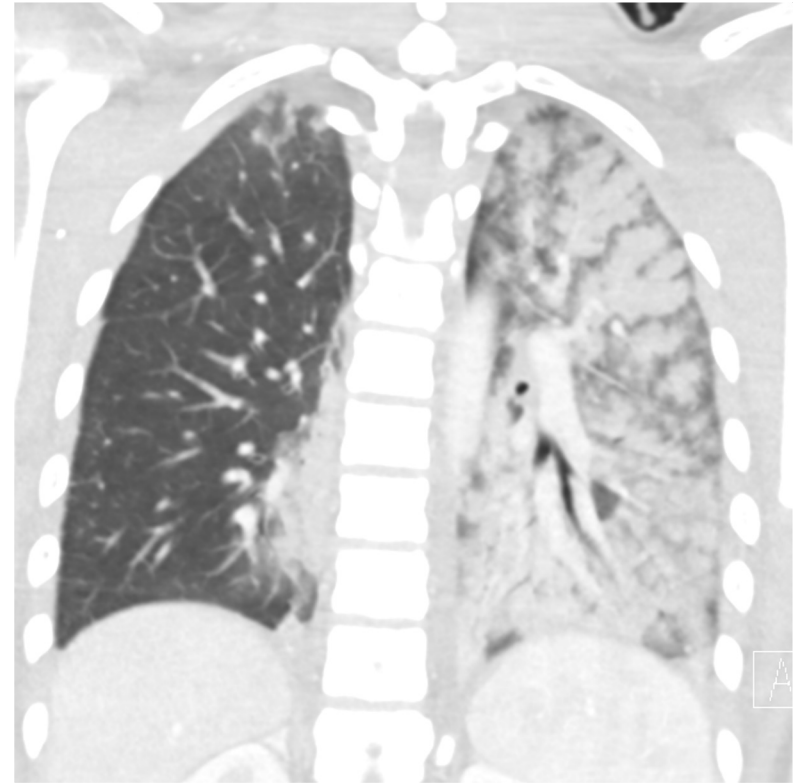
Case 9: Adolescent girl fell from a horse & has difficulty breathing and hemoptysis



- A. Aspiration
- B. Pneumothorax
- C. Traumatic pneumatocele
- D. CPAM
- E. Necrotizing pneumonia

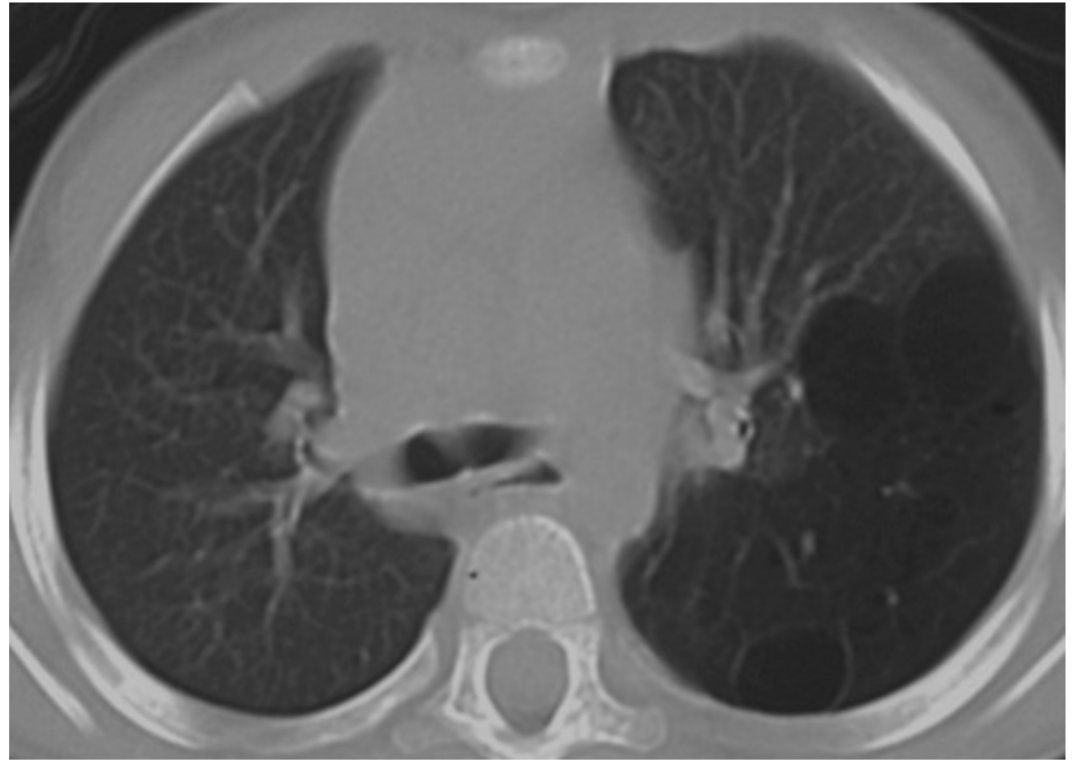
Traumatic pneumatocele/Pulmonary contusion

- Ground glass opacity usually in the lung bases
- Alveolar rent causes intraparenchymal air leak
- Associated with rib/clavicle fracture
- Cavity with an air fluid level classically seen (traumatic pneumatocele)
- Hemoptysis

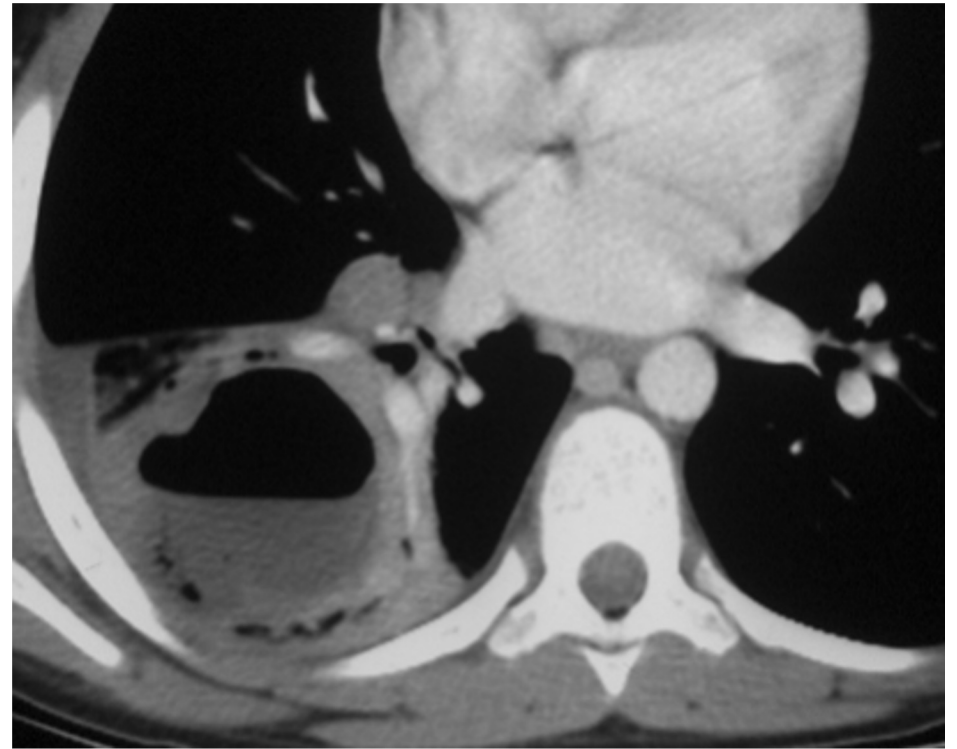
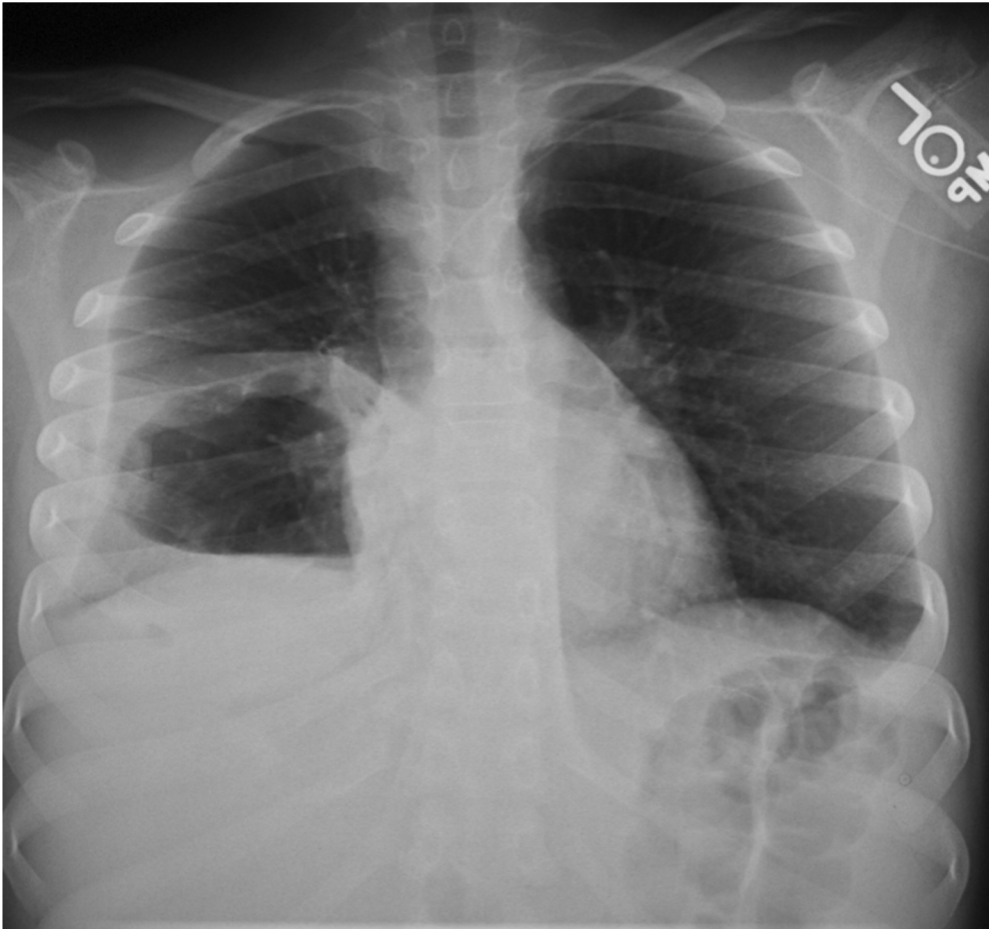


MVA Rollover 17yr f other occupants perished,
Neg CXR, but CT showed extensive contusion & hemorrhage

Cystic pulmonary masses:
Congenital Cystic Pulmonary Adenomatoid Malformation: CPAM



Cystic Pulmonary masses:
Pulmonary abscess



IV Contrast (CT & MRI)

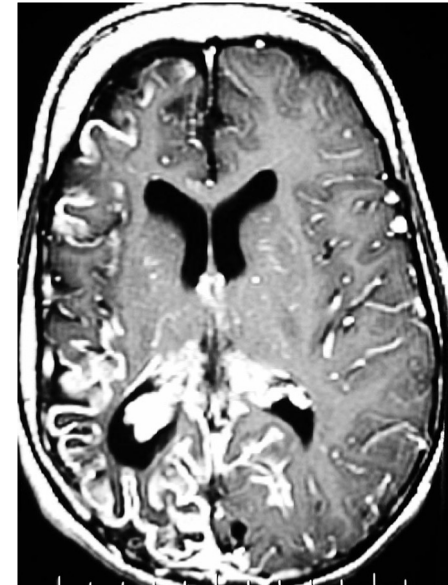
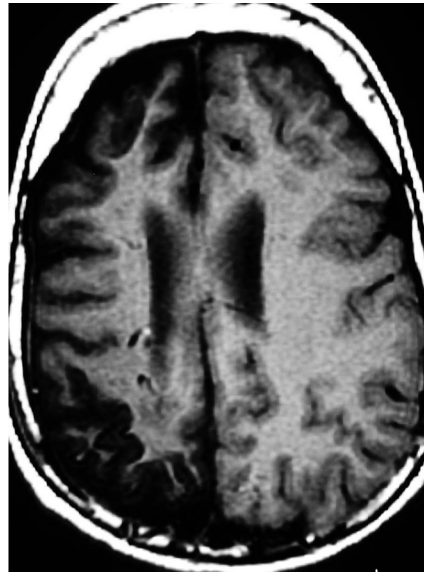
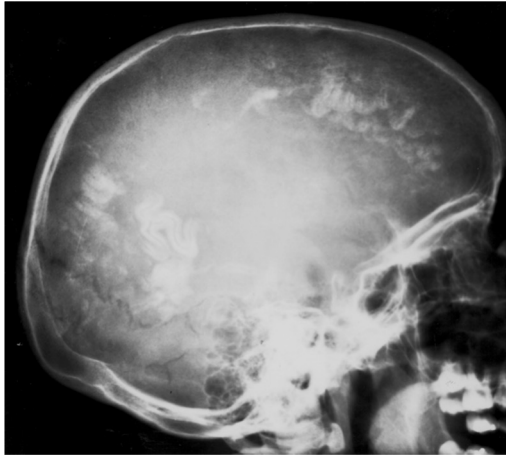
In general for evaluation of

- vascular structures: vascular rings
- infection
- inflammation
- tumor
- Congenital lung malformations: CPAM, sequestration, etc

Exception: Sinusitis

Case 10: Which one of the following associated findings is most likely seen in this patient with glaucoma:

calcifications

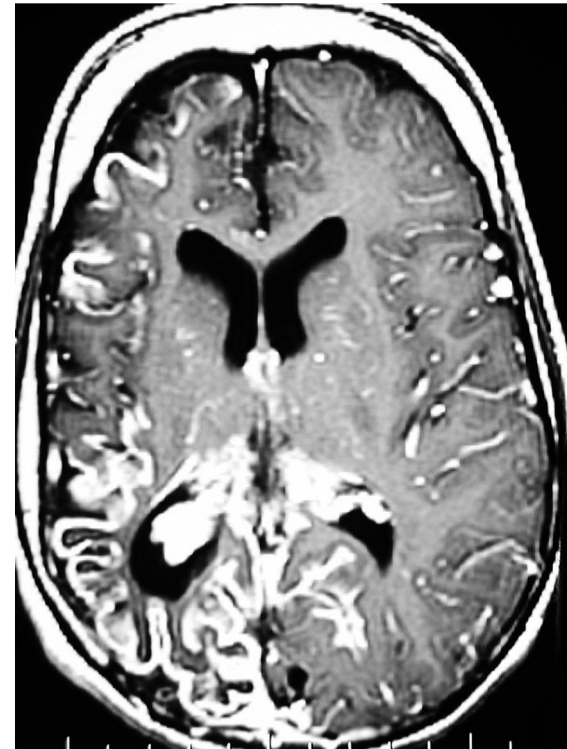


leptomeningeal
angiomas

- A. Hypopigmented skin lesions
- B. Port wine stain
- C. Agenesis of corpus callosum
- D. Periostitis of the long bones

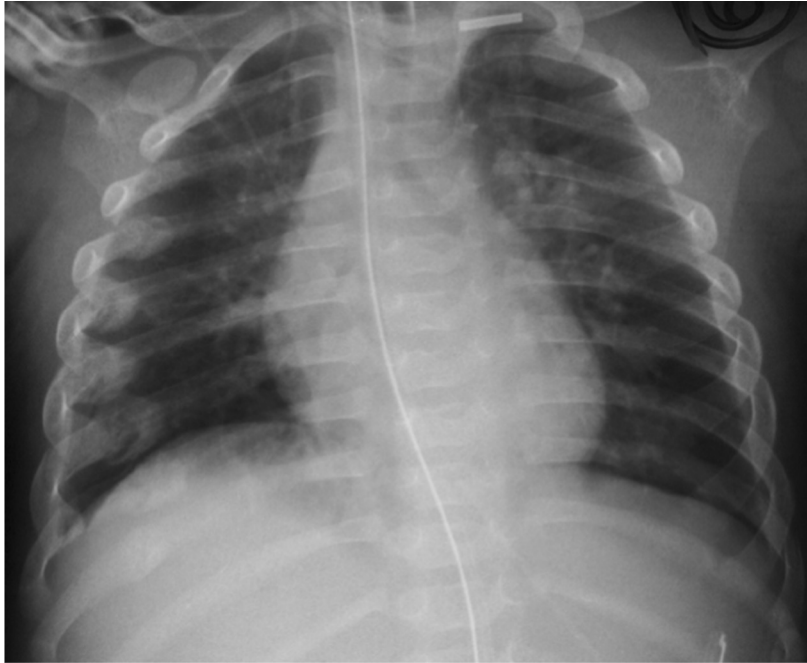
Sturge Weber Syndrome

- Phakomatosis/neurocutaneous disorder
- Seizures
- Nevus(port wine stain) in the distribution of the ophthalmic branch of the trigeminal nerve
- Ipsilateral leptomeningeal angiomas
- High incidence of mental retardation
- Glaucoma/buphthalmos



leptomeningeal
angiomas

Case 11: 2 mo. Infant with hypotonia



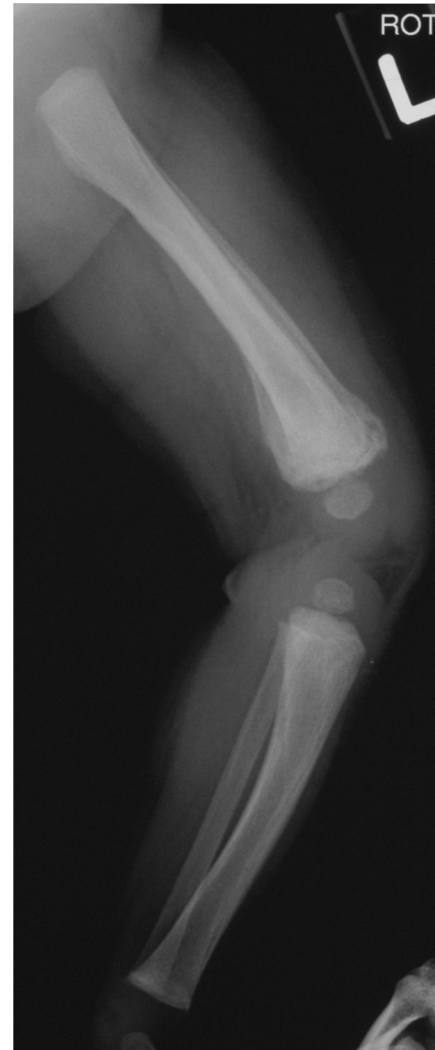
- A. Osteogenesis imperfecta
- B. Thanatophoric dysplasia
- C. Congenital syphilis
- D. Non accidental trauma
- E. Osteopetrosis



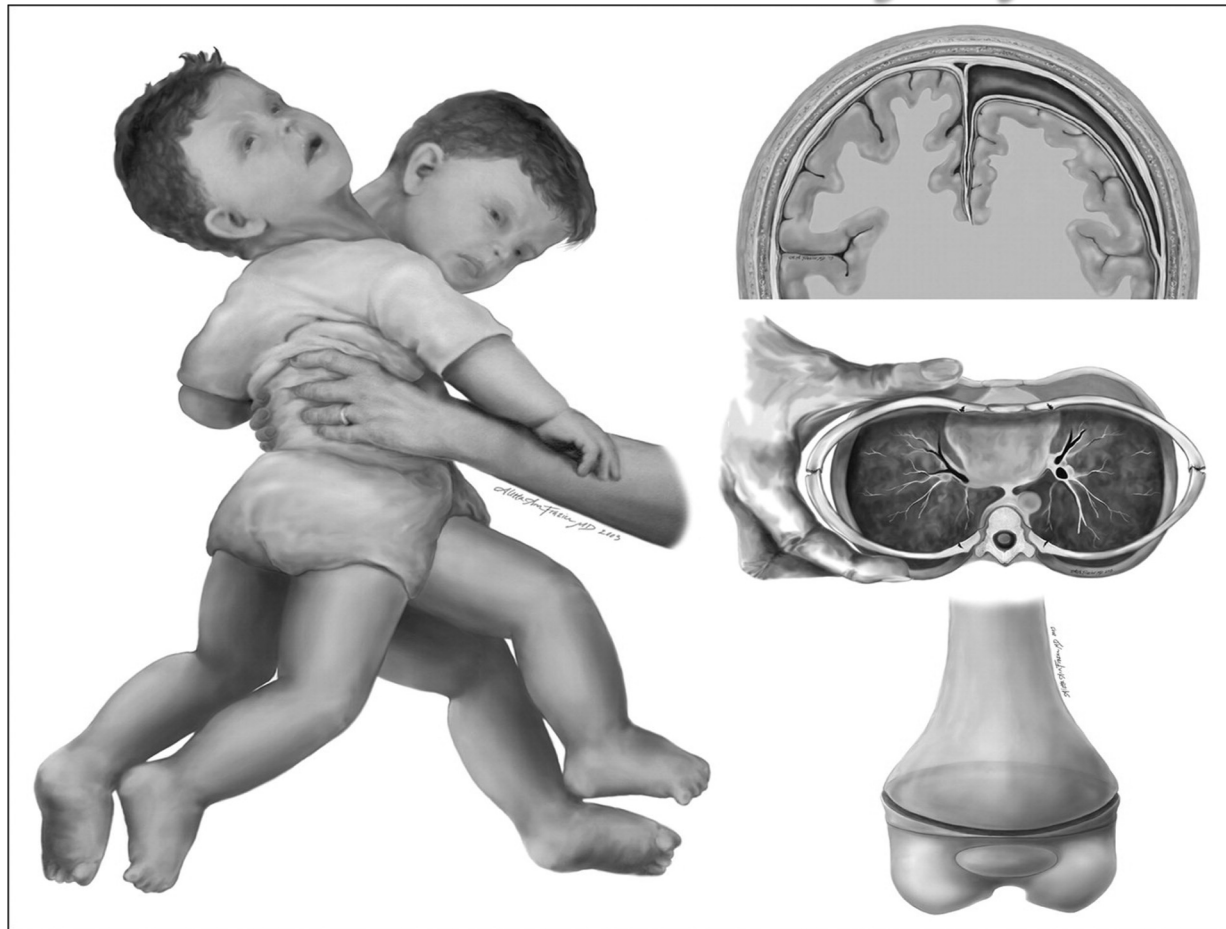
Child Abuse



Multiple fractures in
different stages of
healing

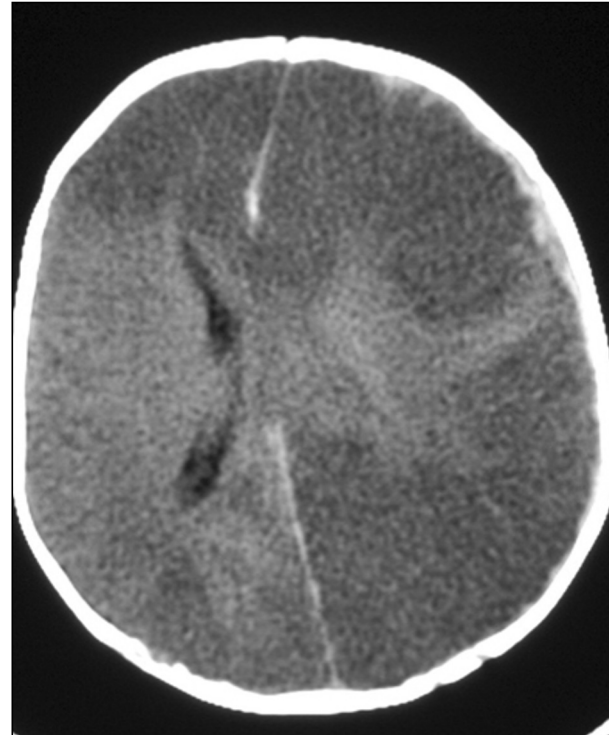
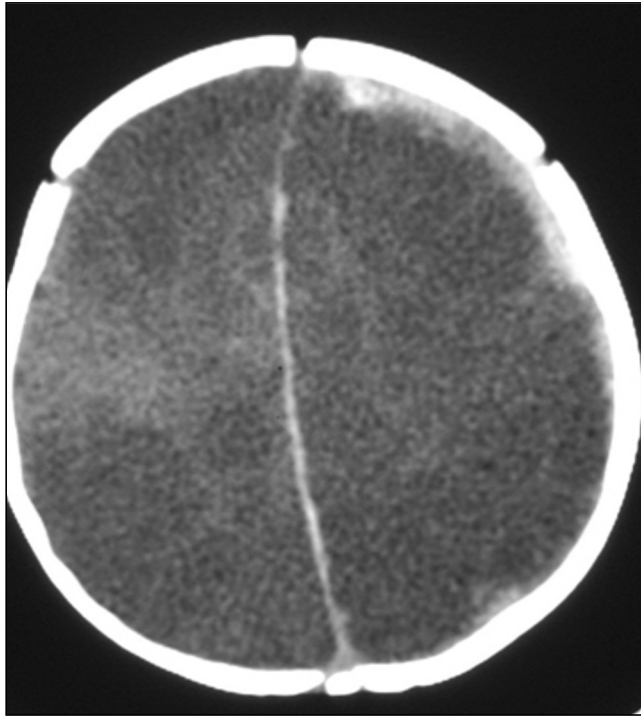


Mechanism of Injury



Published in: Gael J. Lonergan; Andrew M. Baker; Mitchel K. Morey; Steven C. Boos; *RadioGraphics* 2003, 23, 811-845.
DOI: 10.1148/rg.234035030

NAHI: Acute SDH, diffuse edema & ischemia⁷⁻²⁵⁻⁰⁸
supposedly hit by brother with toy truck



Bone Survey: multiple rib fractures

Case 12: One yr old infant with abdominal distention



The best tumor marker to diagnose this tumor is?

- A. Alpha-fetoprotein
- B. Beta HCG
- C. CEA
- D. CA 125

Hepatoblastoma

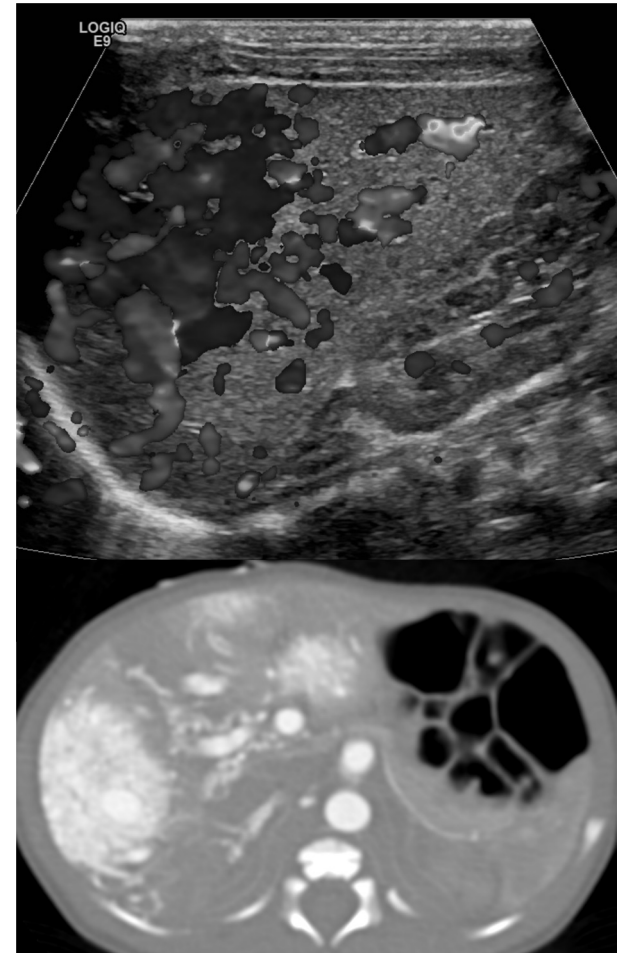
- Most common primary liver tumor of childhood
 - 43% of total liver masses
- Usually seen in infants and children < 3 yrs
- Most common presentation is a painless mass
- Serum AFP levels elevated in > 90% of pts.
- Predisposing conditions:
 - Beckwith-Wiedemann syndrome
 - Trisomy 18
 - familial polyposis coli,
 - Gardner syndrome



2yr m, mass incidentally found on appy US,
Palpable & firm on clinical exam in RLQ

Liver neoplasms

- Liver 3rd most common site primary tumor in peds after kidney & adrenals
- 2/3 of primary liver tumors are malignant, most common:
 - Hepatoblastoma
 - HCC (hepatocellular carcinoma)
 - Undifferentiated Embryonal Sarcoma
- 1/3 of hepatic primary tumors benign, most common:
 - Infantile hemangioma
 - FNH (focal nodular hyperplasia)
 - Mesenchymal hamartoma



New born: multifocal hepatic hemangiomas & high output cardiac failure due to significant arteriovenous shunting.
Tx: High Dose Propranol & steroids

**Case 13: Teenager with rectal bleeding,
diarrhea, and anorexia**



Thickened
colonic walls,
no small bowel
involvement

- A. Crohn's**
- B. Ulcerative Colitis**
- C. Irritable Bowel Syndrome**
- D. Lactose Intolerance**

Case 14: 14yr M with vomiting, fever & RLQ pain



Complex collection appendix not seen
extensive inflammation RLQ

- ⊗ A. Perforated Appendicitis
- ⊗ B. Ulcerative Colitis
- ⊗ C. Crohn's Disease
- ⊗ D. Sprue

Case 14: Perforated Appendicitis

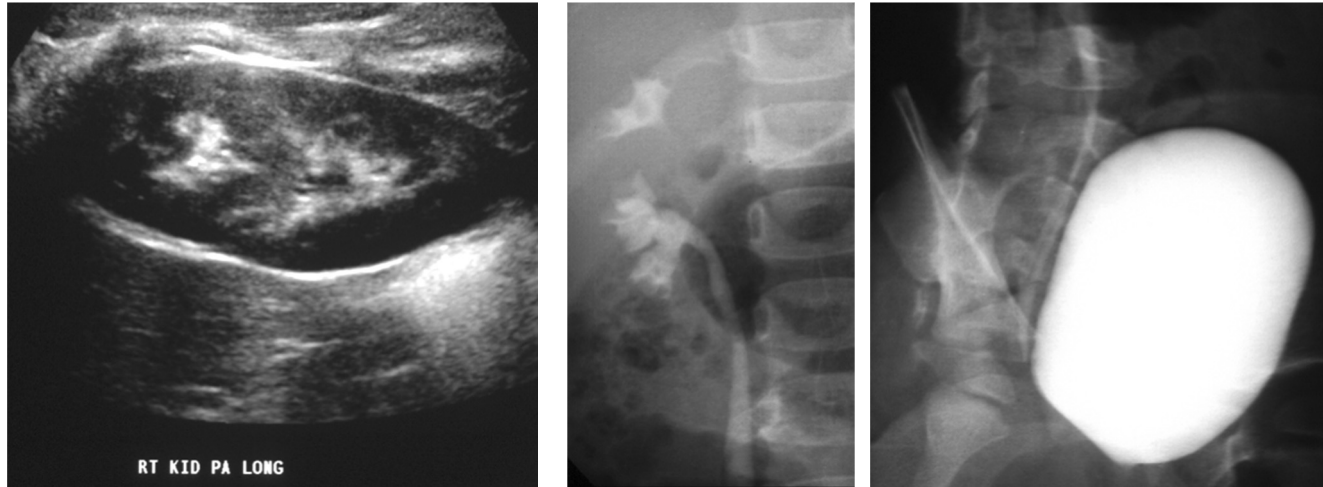


Deep pelvic abscess
US guided transrectal drainage with TPA

Appendicitis

- Dx is not often straight forward
- 1/3rd kids atypical presentation
- Complications: abscess, peritonitis, sepsis, bowel obstruction
- Peds higher incidence perforation

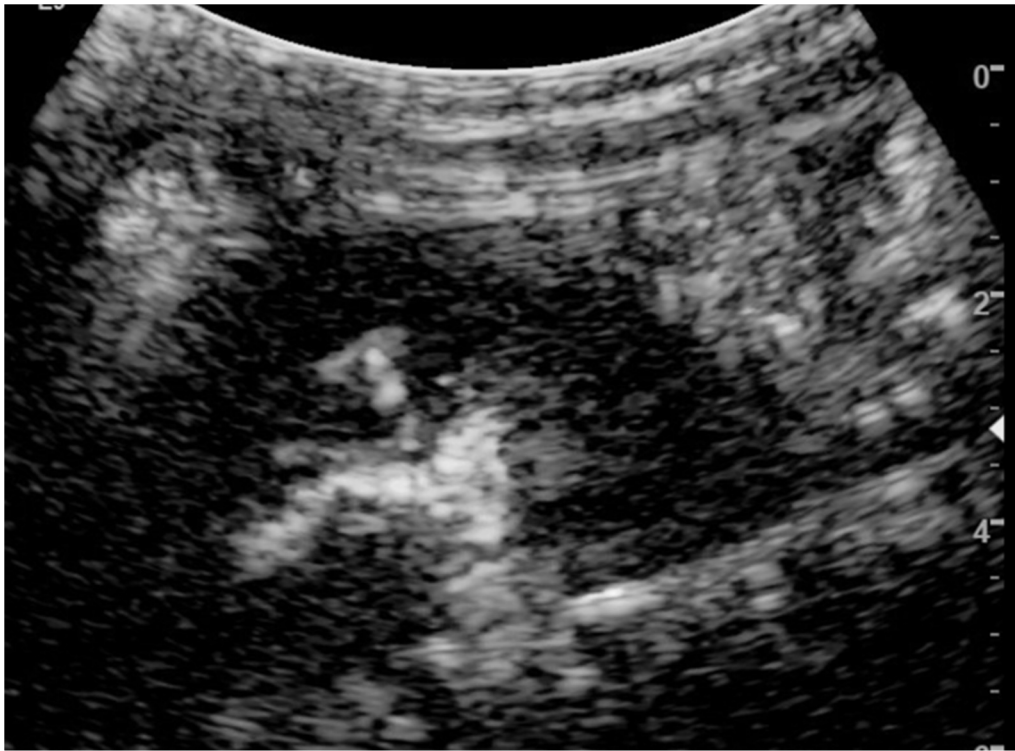
Case 15: 2 mo old infant w/ fever.



- Ⓐ A. Prominent Column of Bertin
- Ⓑ B. Reflux into a duplicated collecting system
- Ⓒ C. Posterior urethral valves
- Ⓓ D. Myelomeningocele

Companion case VUR

Left kidney grade 3 reflux on 4th n& 5th cycle filling

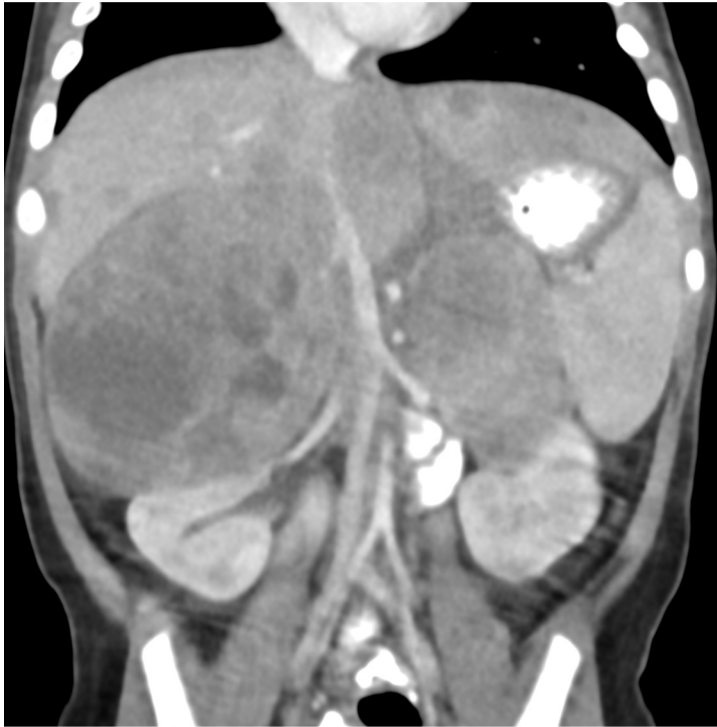


- ⊗ 20mo old Uneplained recurrent UTI
- ⊗ VCUG negative
- ⊗ Contrast enhanced voiding urosonography (ceVUS) was positive

Bonus: 3mo old right eye hematoma & bruising. DX?



Neuroblastoma



Bilateral suprarenal masses, liver mets



MIBG: bone & skin mets

Most common malignancy in infant

Commonly originates in medulla adrenal gland/retroperitoneal mass

Paraneoplastic syndrome: opsoclonus-myoclonus

Elevated urine catecholamines

Surrounds vascular structures w/out invading

50% calcification

Bouns: 6 yr M w/ hemoptysis. Just finished 6 mo course of observed tx for TB. What do you do next?

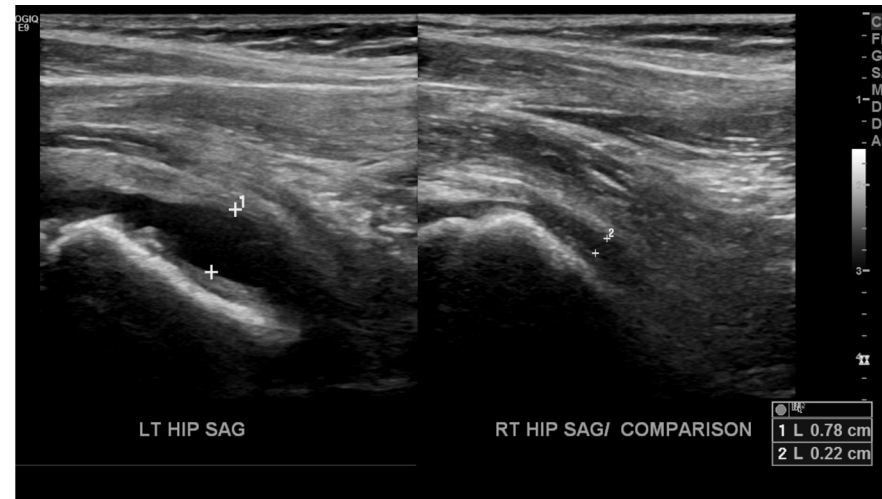


ma with
necrotic
des

Limping child

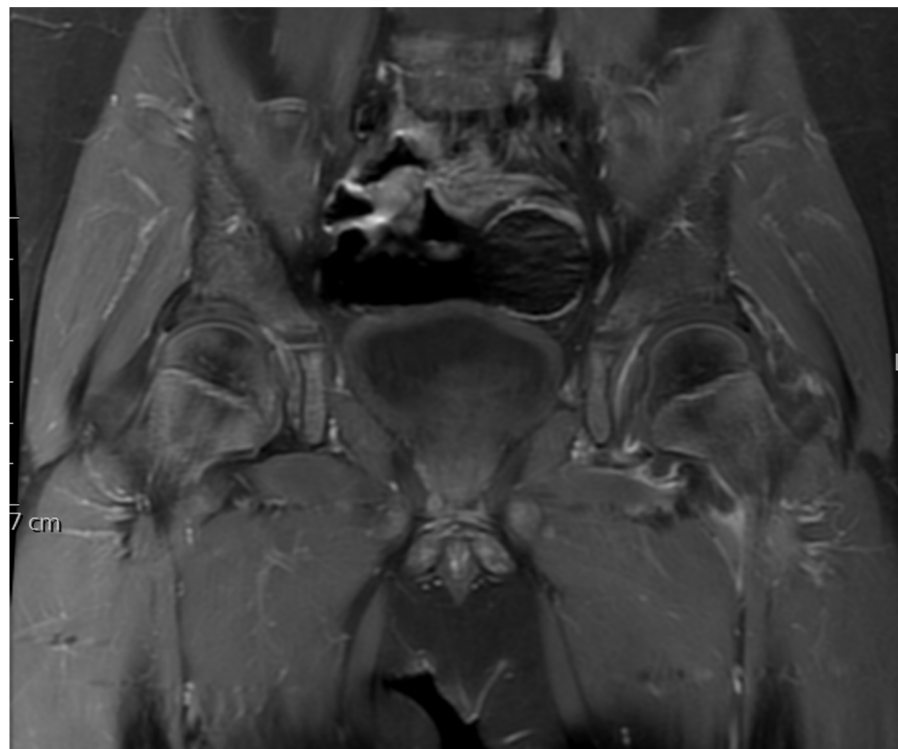
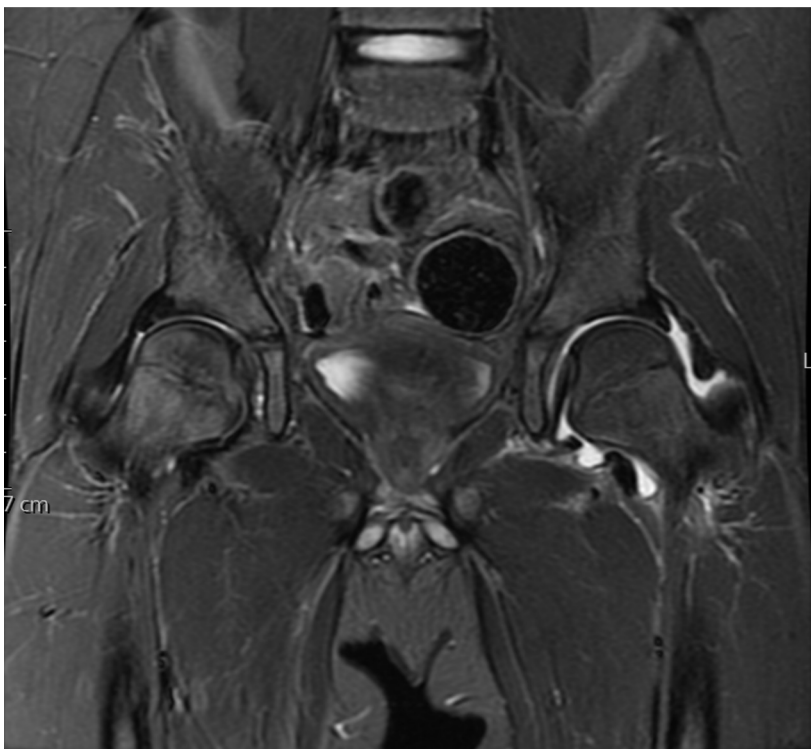
review

7 year old limping and hip pain for 3 days



Ddx?

Mri next morning

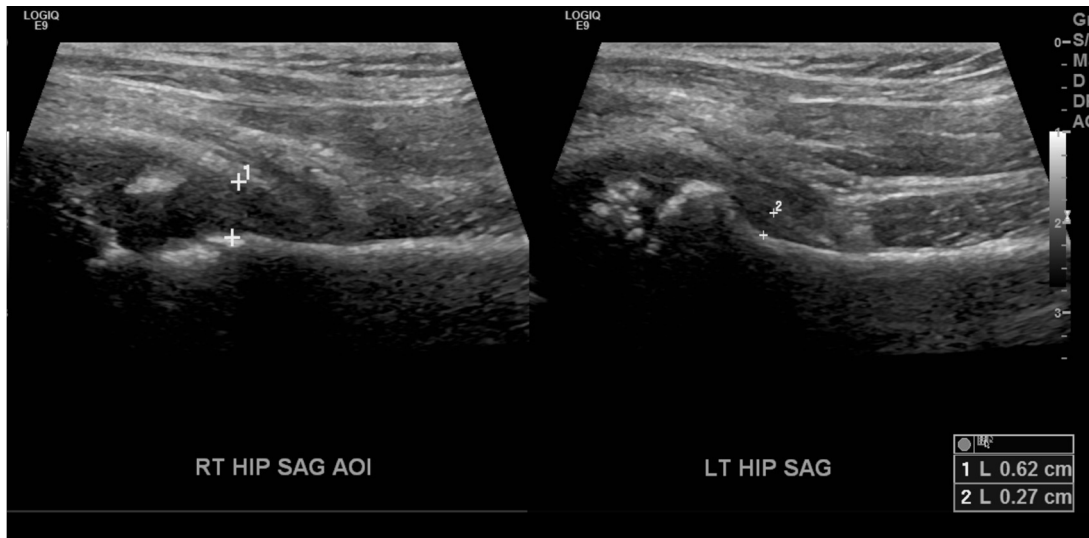


NEXT STEP?

Joint aspiration: Toxic (transient synovitis) synovitis



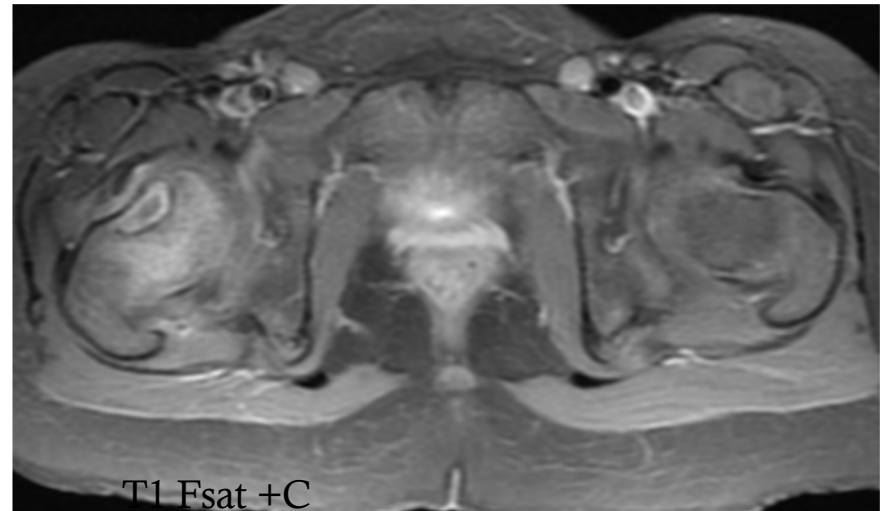
3 yr old rt hip pain for 1 week and fever US.
Arrived in am from NY requested by er



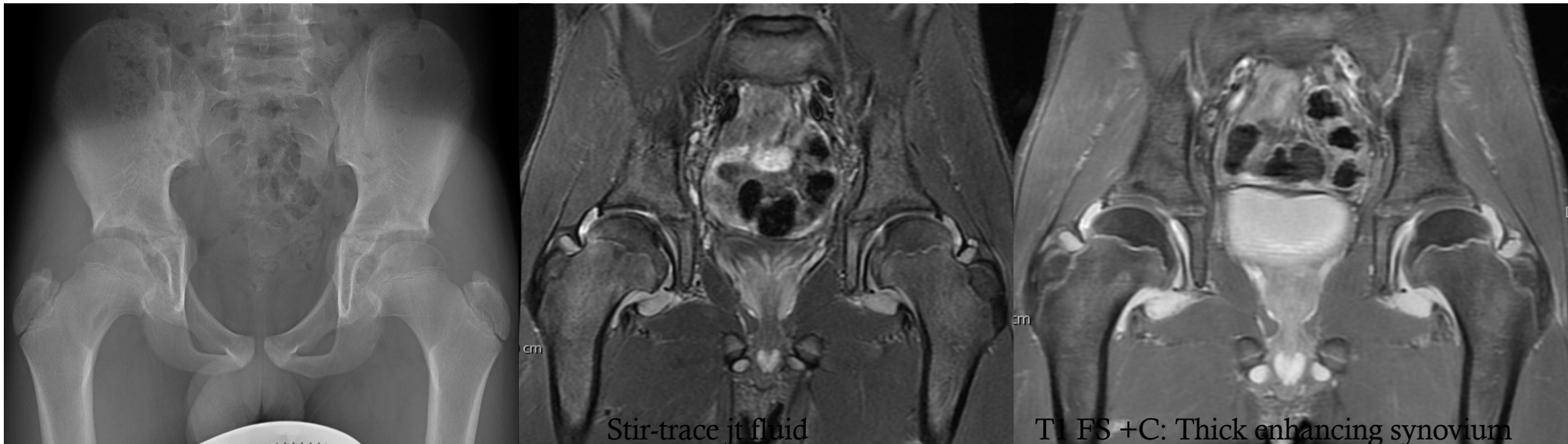
DDX? Brodie's abscess



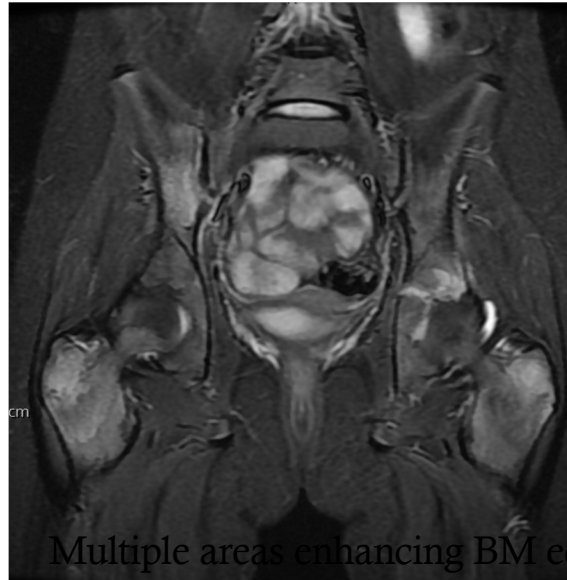
F/U MRI: Septic joint & osteomyelitis



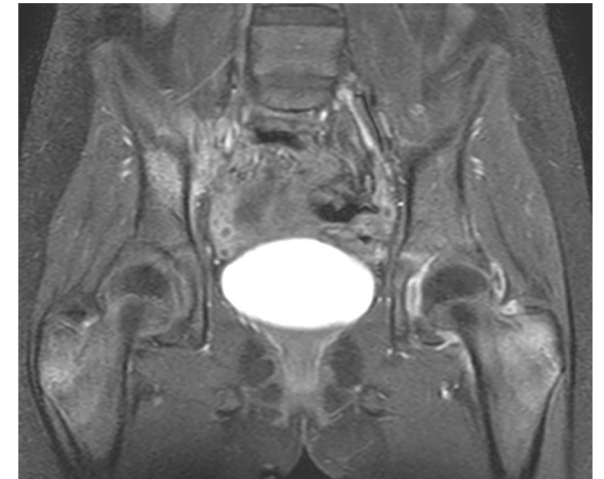
JIA: 12 yr M, lt hip pain & limping 24 hrs
s/p recent fall.



CNO: 12 yr F Gymnast w/nontraumatic right buttock pain x 4 days. HX of ulcerative colitis



Multiple areas enhancing BM edema

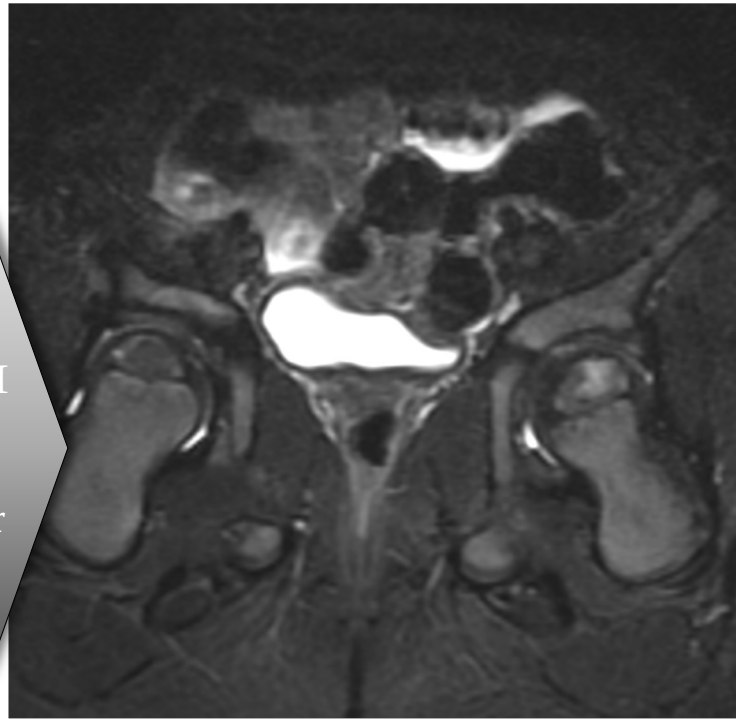


Dramatically improved now on methotrexate

2 yr old limping. DDX?



MRI
3
wks
later



Early Legg-Calve-Perthes Disease

Perthes: early at 6yr, 7yrs fragmentation phase, 12yrs progressive

