Pediatric Imaging Studies: Congenital and Acquired Diagnoses

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Case #1: Breech Presentation
Newborn
Case #1: Findings on AP Pelvis
Case #1: Diagnosis Developmental Dysplasia of the Hip (DDH)

- Affects 1-2 per 1,000 babies
- Acetabulum is shallow so femur head is:
  - Dislocated, dislocatable or subluxed
- Risk Factors include:
  - Females, first born, breech position, family history of DDH, oligohydramnios or tight swaddling after birth with legs extended
  - AAP recommends ultrasound of female breech births
Case #1: Diagnosis Developmental Dysplasia of the Hip

- **Symptoms:**
  - Leg length discrepancy, uneven thigh or buttock skin folds, less mobility on one side, limp

- **Exam**
  - Barlow: Adduction of both hips and forward pressure with both thumbs causing femoral head to slip over the posterior rim of the acetabulum
  - Ortolani: Abduction of both hips with hands over the knees and thumbs on the medial thigh and clunk of reduction
History: Neonatal Hip Click
Findings: Axial Hip Ultrasound
Neonatal Hip Click: Axial Hip Ultrasound
Case #2: Vomiting Newborn
Case#2: Findings on Supine chest and abdomen
Differential Diagnosis of the Double Bubble

- Congenital obstruction
  - Duodenal atresia
  - Duodenal stenosis
  - Annular pancreas

- Midgut volvulus

- External Compression of the Duodenum
  - Choledochal cyst
  - Mesenteric duplication cyst
  - Duodenal hematoma intramural
  - Superior mesenteric artery syndrome
Case #2: Diagnosis Esophageal & Duodenal Atresia with TE Fistula

- Esophageal Atresia
  - 1 in 4,000 live births
  - Commonly associated with TE fistula and 50% affected will have additional congenital anomaly as well

- Symptoms include:
  - Frothy white bubbles in the mouth and drooling
  - Poor feeding
  - Coughing gagging and choking
  - Vomiting
  - Cyanosis when feeding
  - Respiratory distress
Case #2: Diagnosis Esophageal & Duodenal Atresia with TE Fistula

- Duodenal atresia
  - 1 in 2500-5000 live births, 25-40% of cases in Trisomy 21
  - Vomiting within hours of birth: 85% bilious and 15% nonbilious because defect occurs proximal to the ampulla of Vater
  - Abdominal exam demonstrates scaphoid abdomen with epigastric prominence.
  - Duodenal stenosis may have significantly delayed diagnosis in childhood or adulthood
Ultrasound of infants abdomen
Diagnosis: Duodenal Atresia
Case #3: 2 mo old infant vomiting
Case #3: Findings UGI frontal view
Case #3: Diagnosis Duodenal Web

- Complete or partial obstruction of the duodenum with predilection for second section secondary to a membranous web or intraluminal diverticulum

- Rarely can be acquired in adulthood instead of congenital

- Windsock sign on fluoroscopy with ballooning of the duodenal diaphragm or halo sign with the web projecting into the duodenal lumen

- Case series of 18: age range diagnosis 1d-1year, most common symptom bilious vomiting, 35% with associated anomalies J Neonatal Surg YK Sarin
Case #4: 3 mo old with recurrent apnea
Case #4: Findings UGI
Case #4: Diagnosis Pulmonary Sequestration Extralobar

- Piece of lung tissue that is not attached to pulmonary arterial blood supply so not connected to bronchial tree

- Extralobar 25% and presents in infancy with respiratory compromise

- Develops as an accessory lung contained within its own pleura so rarely gets infected and presents as soft tissue mass instead

- 80% male 90% left hemidiaphragm

- Maybe subdiaphragmatic or retroperitoneal

- Arterial supply aberrant vessel from descending aorta/drains via systemic venous to right atrium
Case #4: Intralobar Sequestration

- 75% Intralobar and presents in adolescence or adulthood as recurrent pneumonia
- Lung tissue is in the same visceral pleura as the lobe in which it occurs
- Equal male:female
- Arterial supply from aorta and venous drainage into left atrium causing right to left shunt
- 66% occur in the posterior segment of the left lower lobe
Case #5: Asymptomatic Child with Abnormal CXR
Case#5: Asymptomatic Child with Abnormal CXR
Case #5: CT of Asymptomatic child with abnormal CXR
Case #5: Findings of CT at level of aortic arch
Case#5: Diagnosis: Bronchogenic cyst

- Most common foregut duplication cyst accounting for 5-10% of mediastinal masses in children
- May cause compressive symptoms on the bronchus causing air trapping and respiratory distress or may become infected
- They do not communicate with the bronchial tree and are filled with water, proteinaceous material, calcium oxalate crystals and blood products
Case #6: Neonate with respiratory distress
Case #6: CXR findings
Case #6: Diagnosis Esophageal Duplication Cyst

- Congenital malformation of the primitive foregut lined by gastric epithelium (infection, perforation and hemorrhage)

- Predominately in the thoracic esophagus

- Asymptomatic incidentally found on CXR or can cause dysphagia secondary to esophageal compression
UGI in child with dysphagia
UGI: Findings Spherical Esophageal Duplication Cyst
Case #7: Hypertensive school age child
Case #7: CXR Findings
Case #7: Diagnosis Coarctation of the Aorta

- Coarctation accounts for 5-8% of congenital heart anomalies
- Common associated lesions are a bicuspid aortic valve and a VSD
- Presentation is CHF (infants) and hypertension (child)
- Location contrary to previous belief is juxtaductal at the site of the ductus arteriosus in most cases
- Less severe disease allows collateral vessels to develop that connect arteries from the upper body to the vessels below the coarctation cause the inferior notching of ribs
Oblique Sagittal Black Blood MRI
MRI Findings
Case #8: 9 mo old with 4 mo history of congestion/wheezing
Case #8: Findings on lateral chest
Case #8: Diagnosis Esophageal FB

- Most common age 6 months- 3 years
- Most common presentation is parents witnessed or it was reported to them
- Case series of 325 patients and only 50% of the patients had symptoms at the time of ingestion such as retrosternal pain, cyanosis or dysphagia and usually transient
Esophageal FB: Double density appearance of button battery

- Esophageal vs tracheal because it is flat in the coronal plane not sagittal like tracheal foreign bodies
- Thoracic inlet at cricopharyngeus muscle 70%
- Mid esophagus at the aortic knob 15%
- Lower esophageal sphincter 15%
Esophageal FB: Lateral view reveals second coin
Case #9: H/o VATER with esophageal atresia repair and dysphagia
Case #9: Findings on CXR
Case #9: Diagnosis Esophageal FB
Food Bolus- Hot Dog

- Most common cause of food impaction is eosinophilic esophagitis

- Glucagon can be given to try and facilitate spontaneous passage of the food bolus by relaxing the esophageal smooth muscle and lower esophageal sphincter (0.02mg/kg max 0.5mg in <20kg)

- No proteolytic enzymes papain or chymotrypsin secondary to esophageal erosion, necrosis and perforation or hemorrhagic pulmonary edema if aspirated
Case #10: 3 yo with abdominal pain
Case #10: Findings on frontal supine image
Case #10: Diagnosis
Intussusception

- Most common cause of intestinal obstruction for children age 6-36 months
- 60% <1 year old, 80-90% <2 years old
- 90% do not have a lead point and 90% ileocecal
- 10% do have a lead point: found more commonly in children >2 years
  - Meckels, polyp, appendicitis, neoplasm, HSP (intramural hematoma and usually ileoileo) and cystic fibrosis (hypertrophied mucosal glands)
Frontal supine radiograph in 2 yo with colicky abdominal pain
Frontal supine view with evidence of intussusception
Ultrasound transverse image of target lesion in RUQ
Fluoroscopic image of air enema with soft tissue mass reducing
Axial CT findings: Right lower quadrant target lesion
Case #11: 6 mo female who presents with perineal laceration.
Case #11: Findings

- Laceration from the vaginal opening to the rectum
- Lumbar compression fracture
- No explanation offered by female babysitter to account for pattern of injury
- Babysitter reports feeding and bathing the patient that morning without incident
- Consistent with impact onto hard surface such as tub causing burst injury of perineum and compression fracture of lumbar spine
5 mo old male infant with abusive head trauma
Diagnosis: Bucket handle fracture of the distal tibia physical abuse
Frontal view of right distal femur of 2 yo female with limp
Diagnosis: Step off configurations
normal variant
CXR 6 mo old infant
Diagnosis: Right posterior rib fractures of 4, 5 and 6
Skeletal surveys in child abuse

- Indicated in abusive head trauma and children <1 yo with another fracture
- Age range 0-3 yo
- >3yo films should be obtained based on history or focal exam findings
- Nuclear med scans have diffuse uptake in small children and repeat films in two weeks of ribs or suspicious extremity findings is a better modality