Practical Radiology: Neonatal Imaging

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Objectives

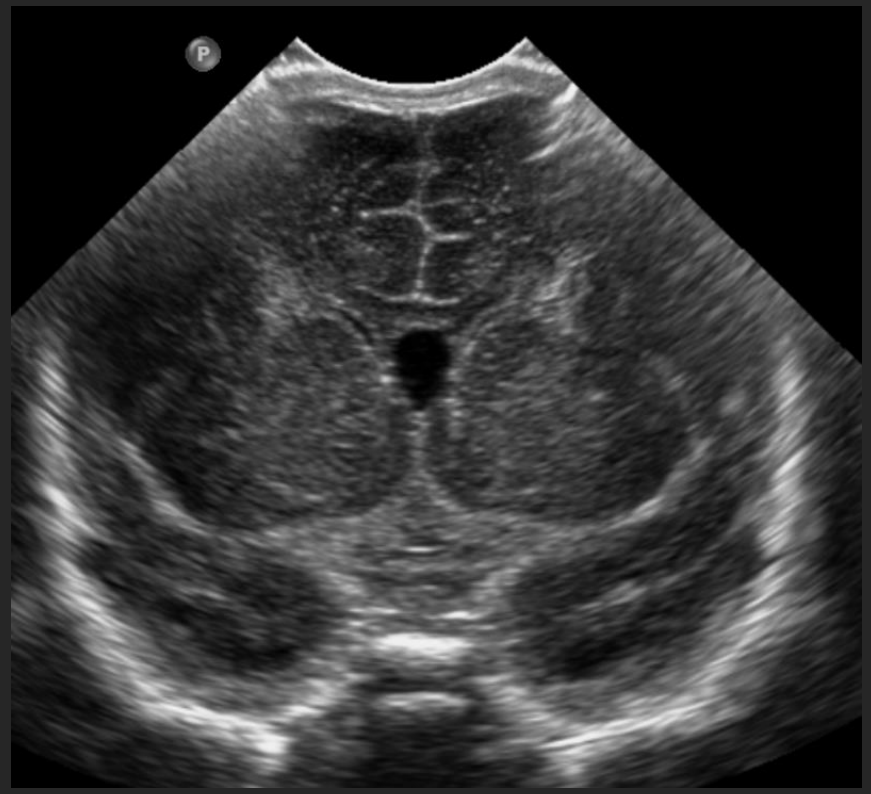
After this presentation, the participant will be able to:

1. Recognize intracranial hemorrhage and infarcts in neonates
2. Identify common neonatal chest pathologies on x-ray
3. List features of abnormal neonatal bowel gas patterns

Appearance by Age

- Premature Infants ≤ 36 weeks gestation

24 weeks



32 weeks

39 weeks

Appearance by Age

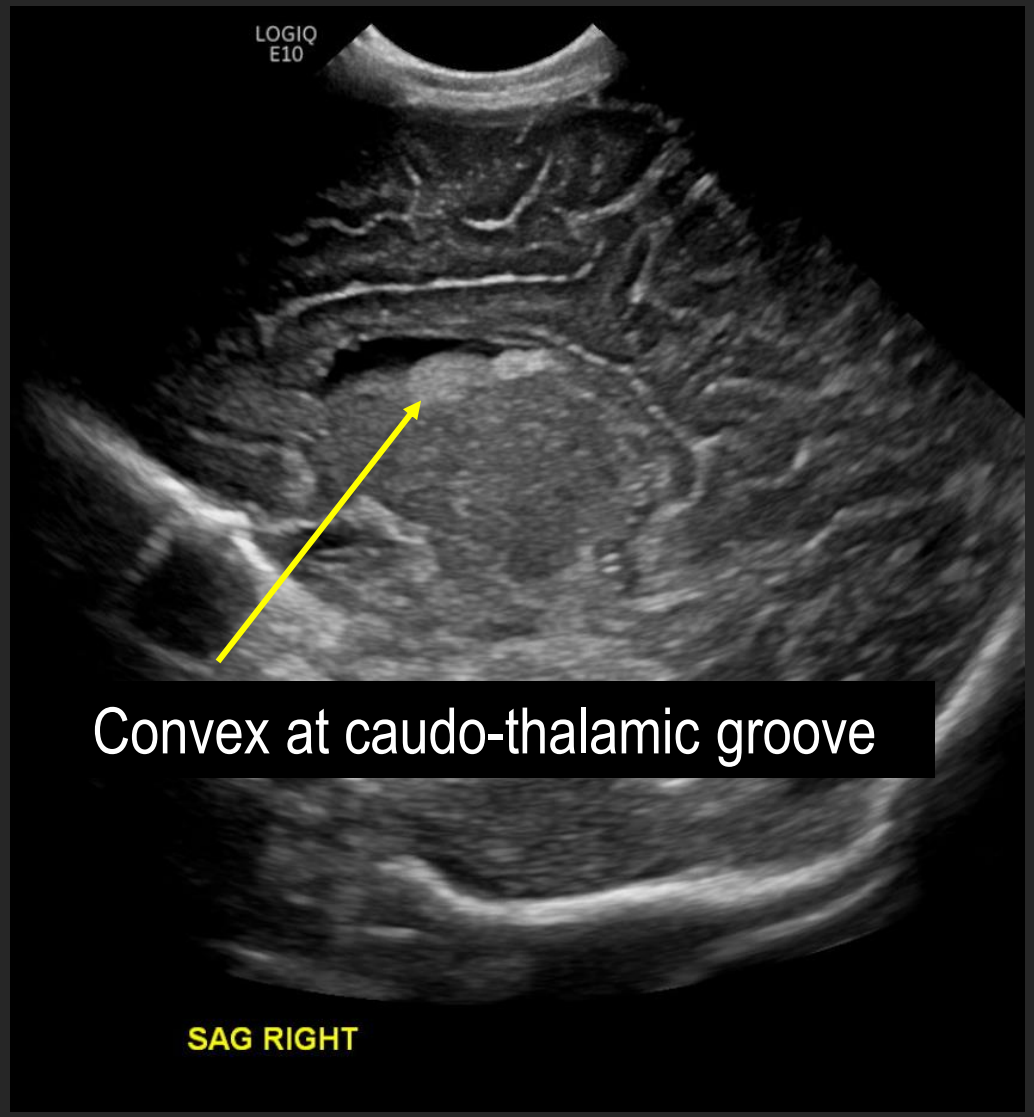
- Term Infants

0 months

3 months

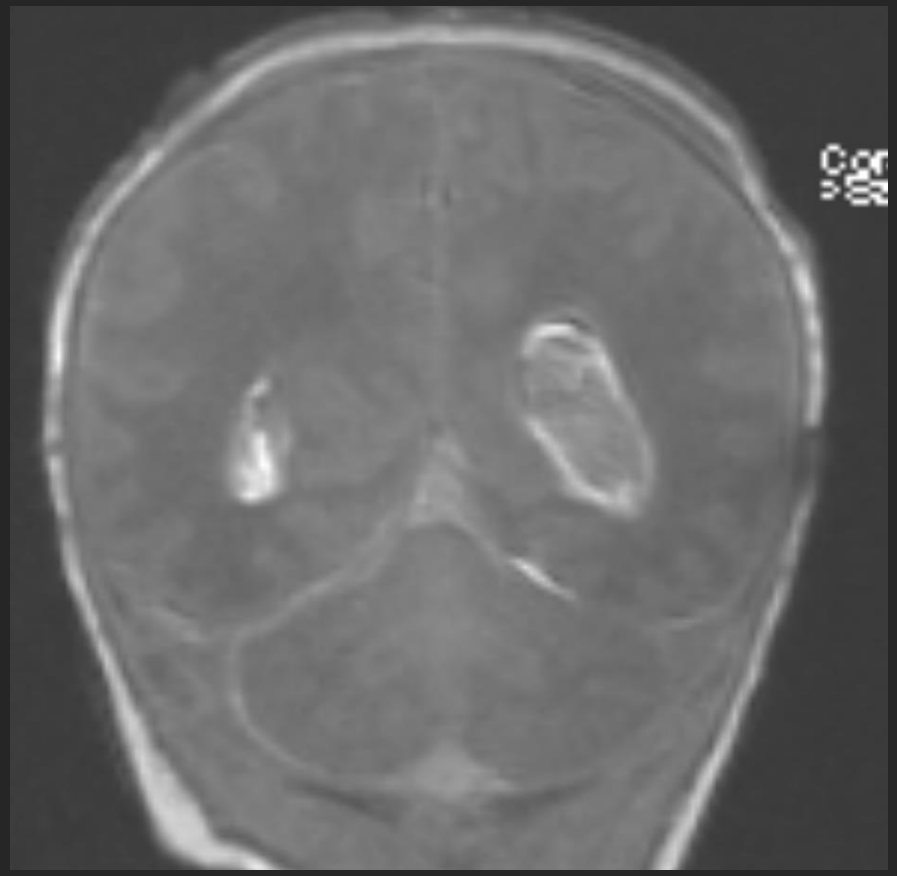
6 months

Intracranial Hemorrhage – Gr 1

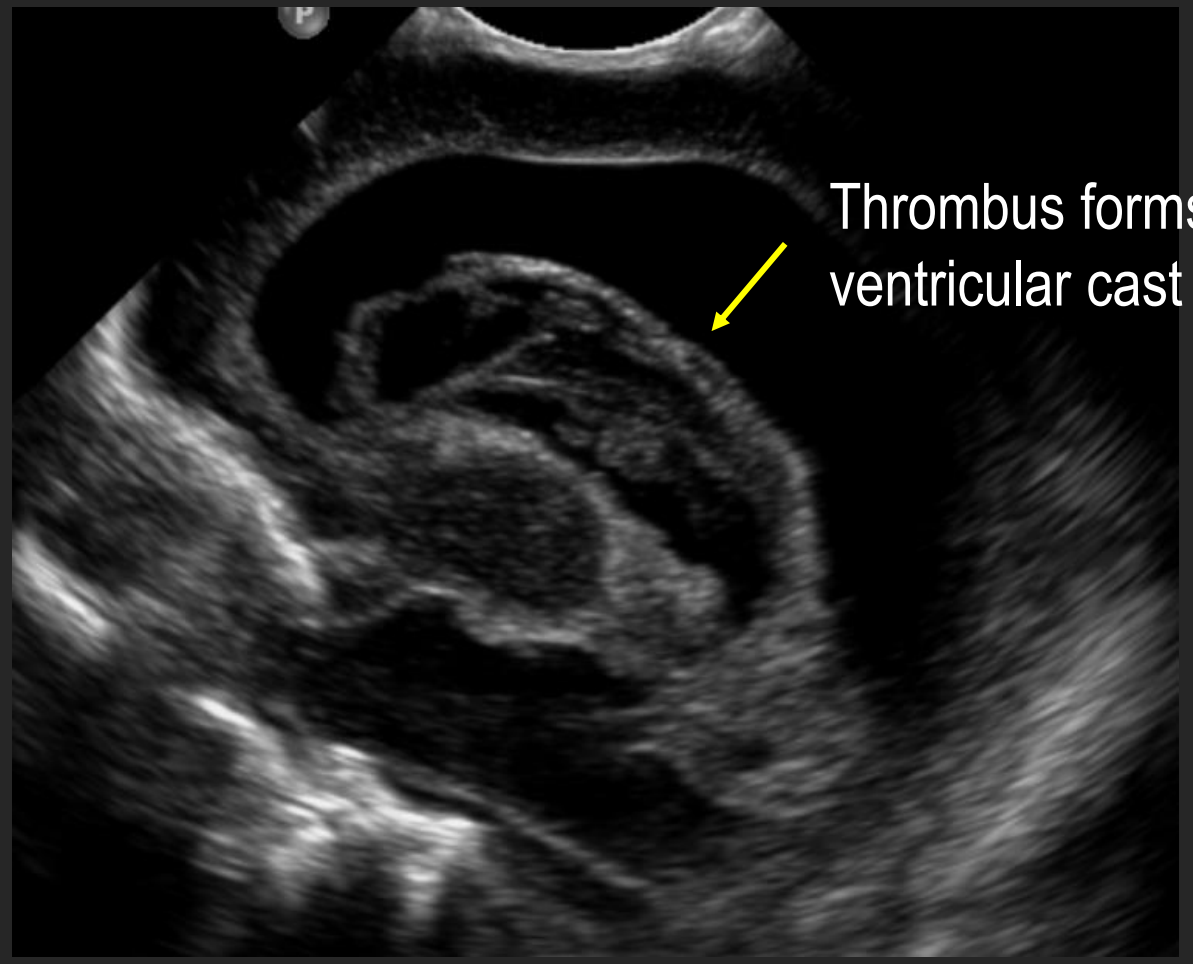


Intracranial Hemorrhage – Gr 2

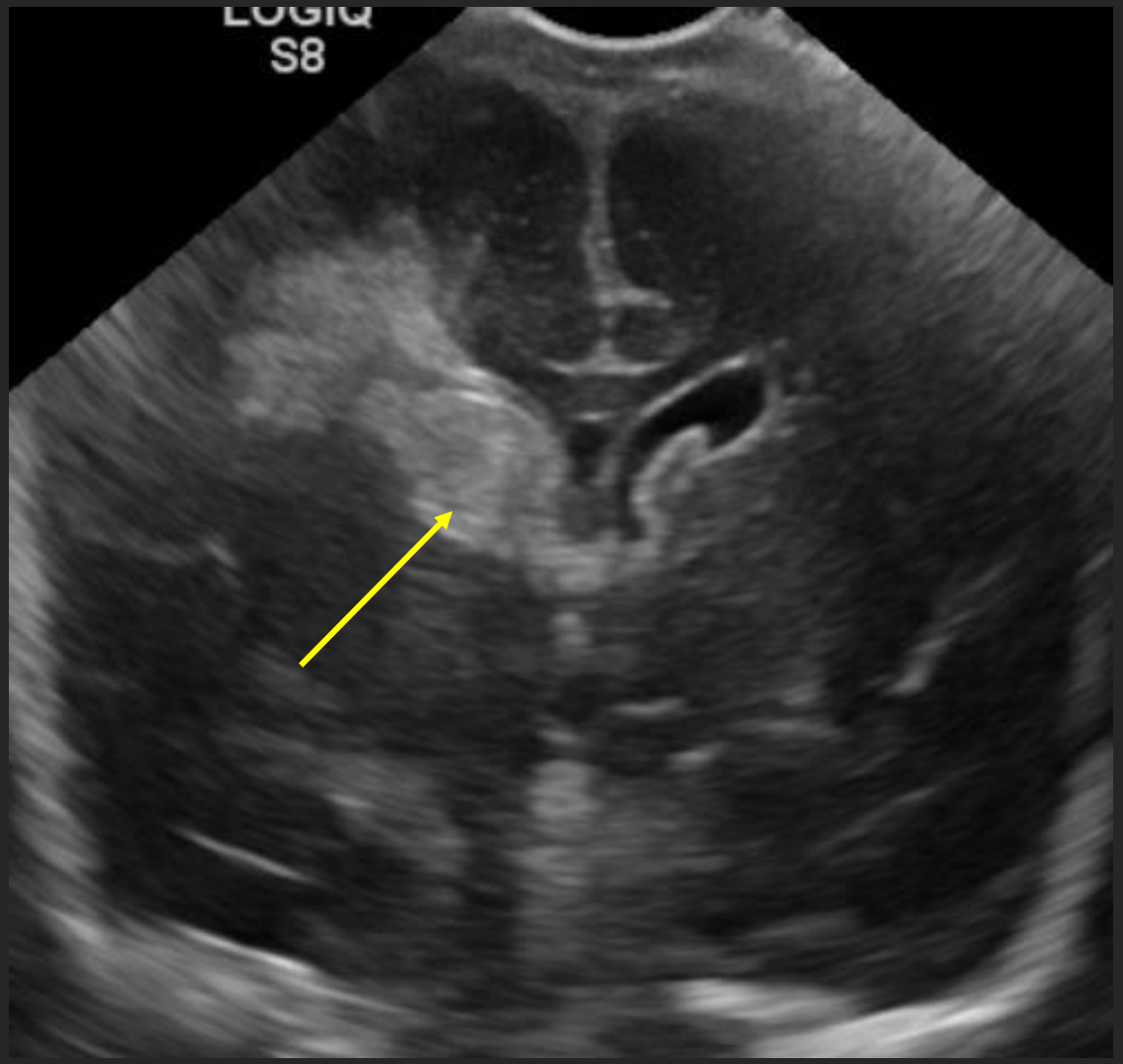
Choroid Plexus

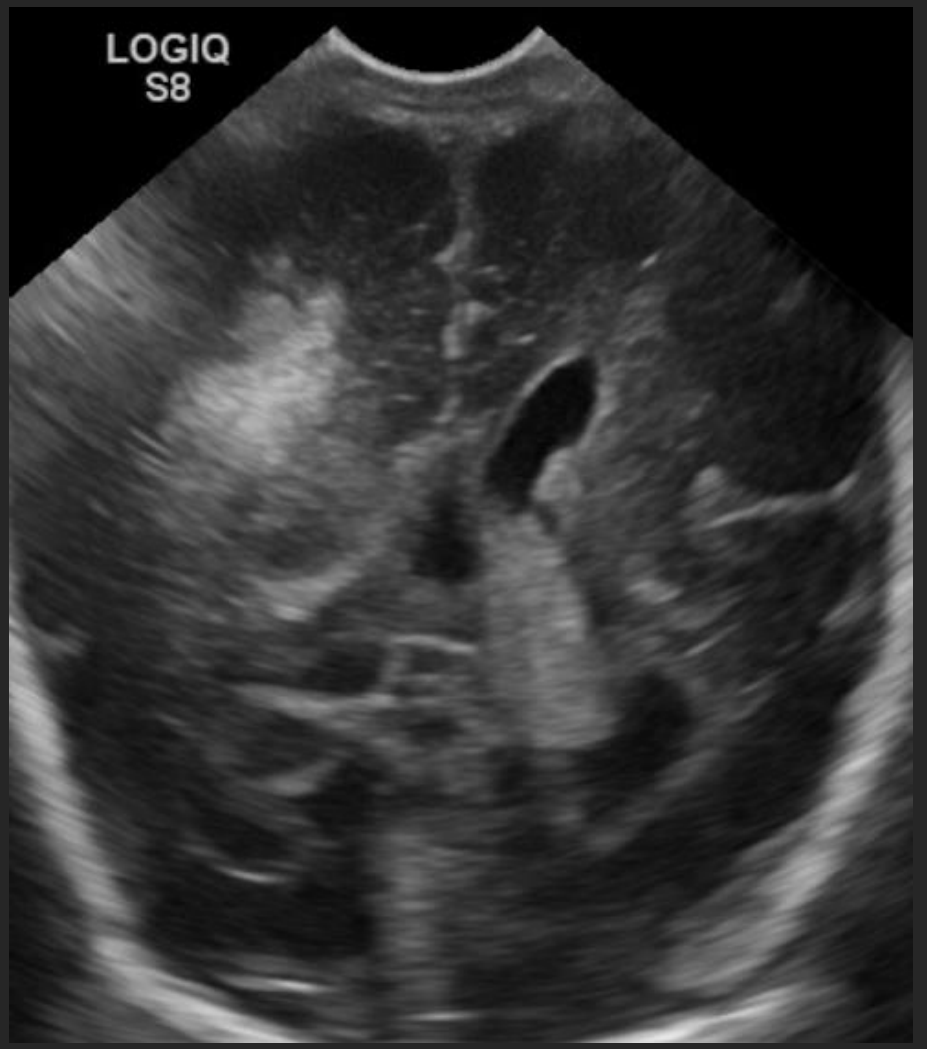


Intracranial Hemorrhage – Gr 3



Intracranial Hemorrhage – Gr 4



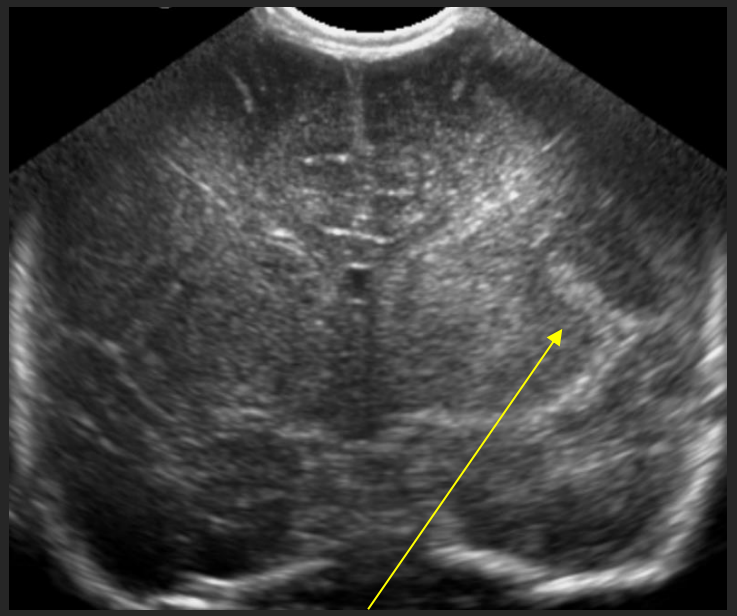


Posterior Germinal Matrix Bleed

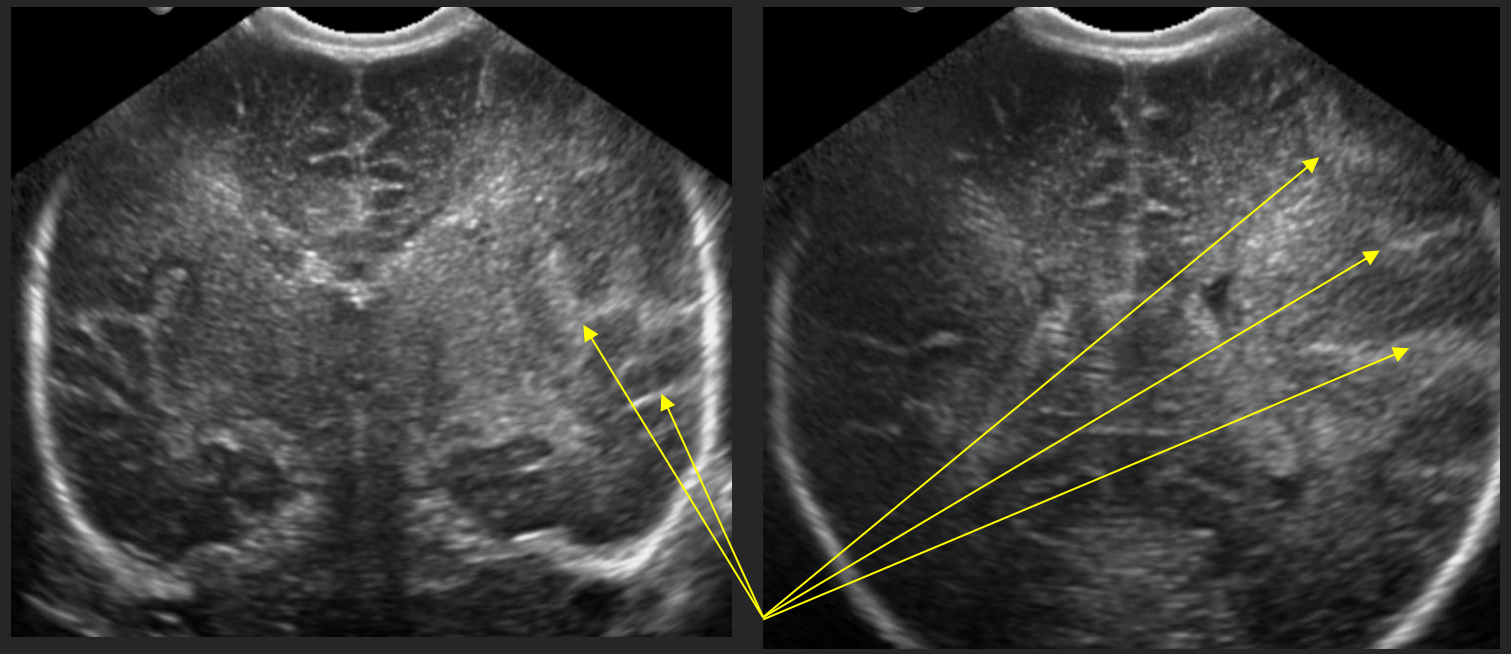
5-week old, follow hydrocephalus

- Posterior germinal matrix
  - Lateral body of lateral ventricles
  - Involutes by 26 weeks

Ischemia – Territorial Infarct

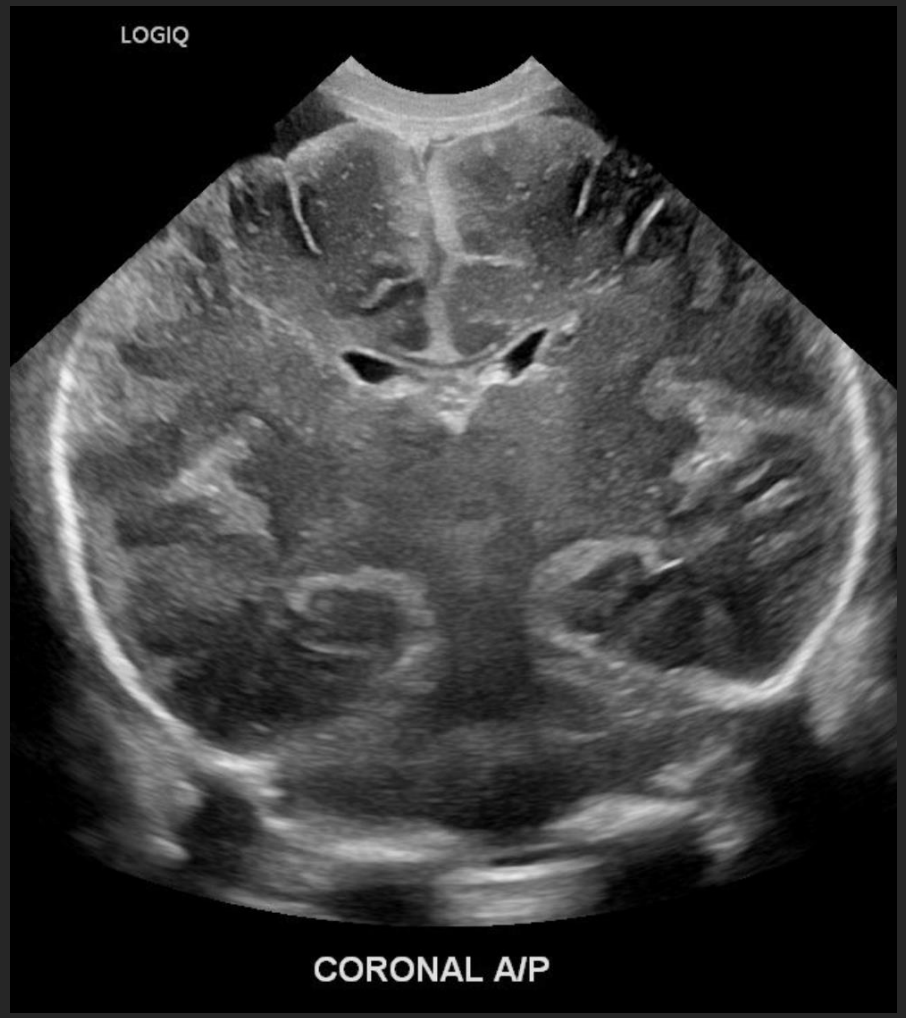


Left sylvian fissure bright, ill-defined

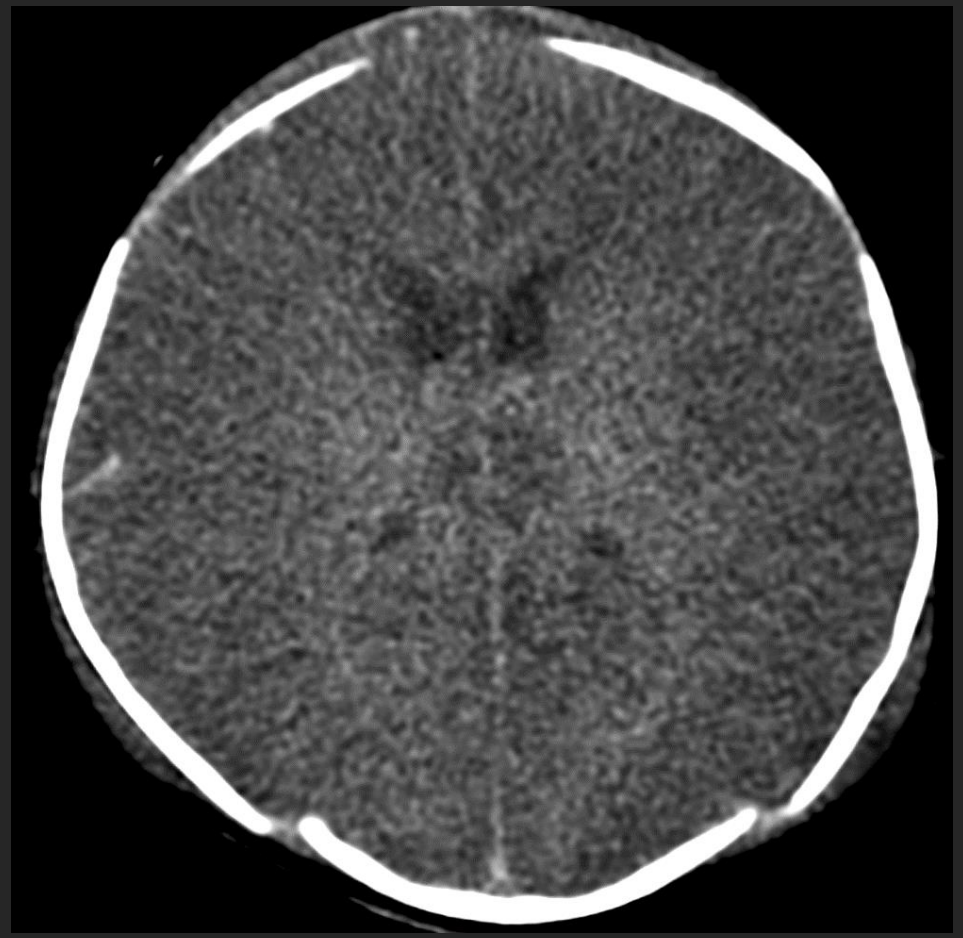


Abnormality extends throughout all sulci in MCA territory

Hypoxic Ischemic Encephalopathy

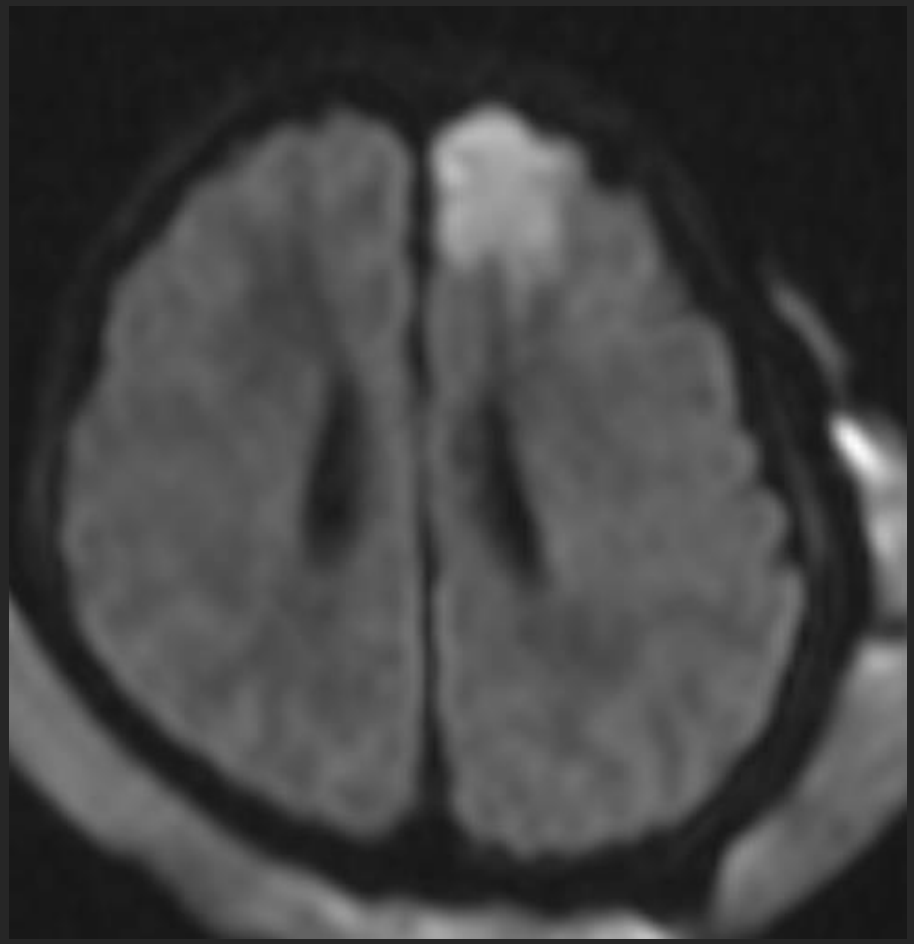


4-wo, meningitis, septic shock

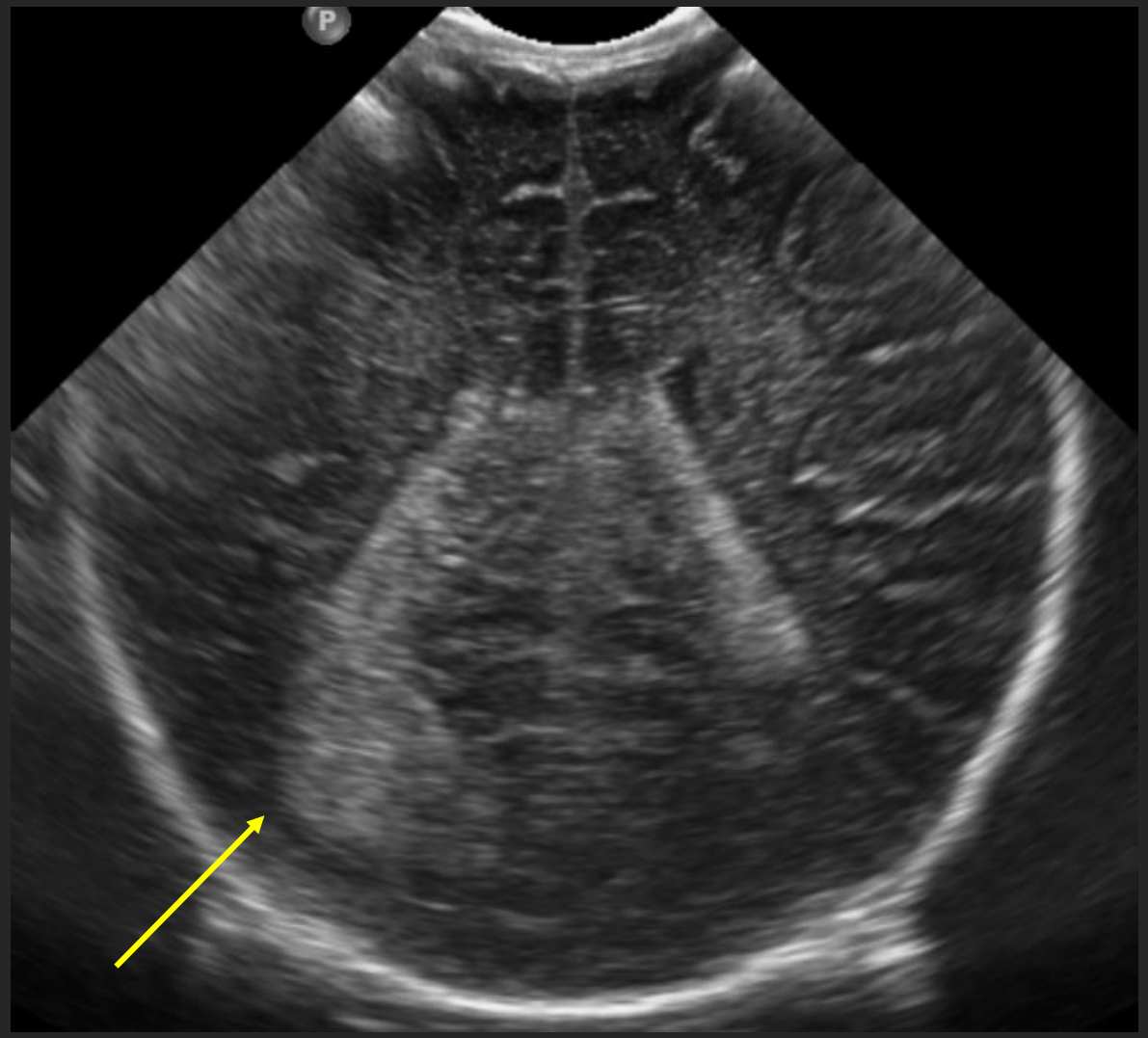


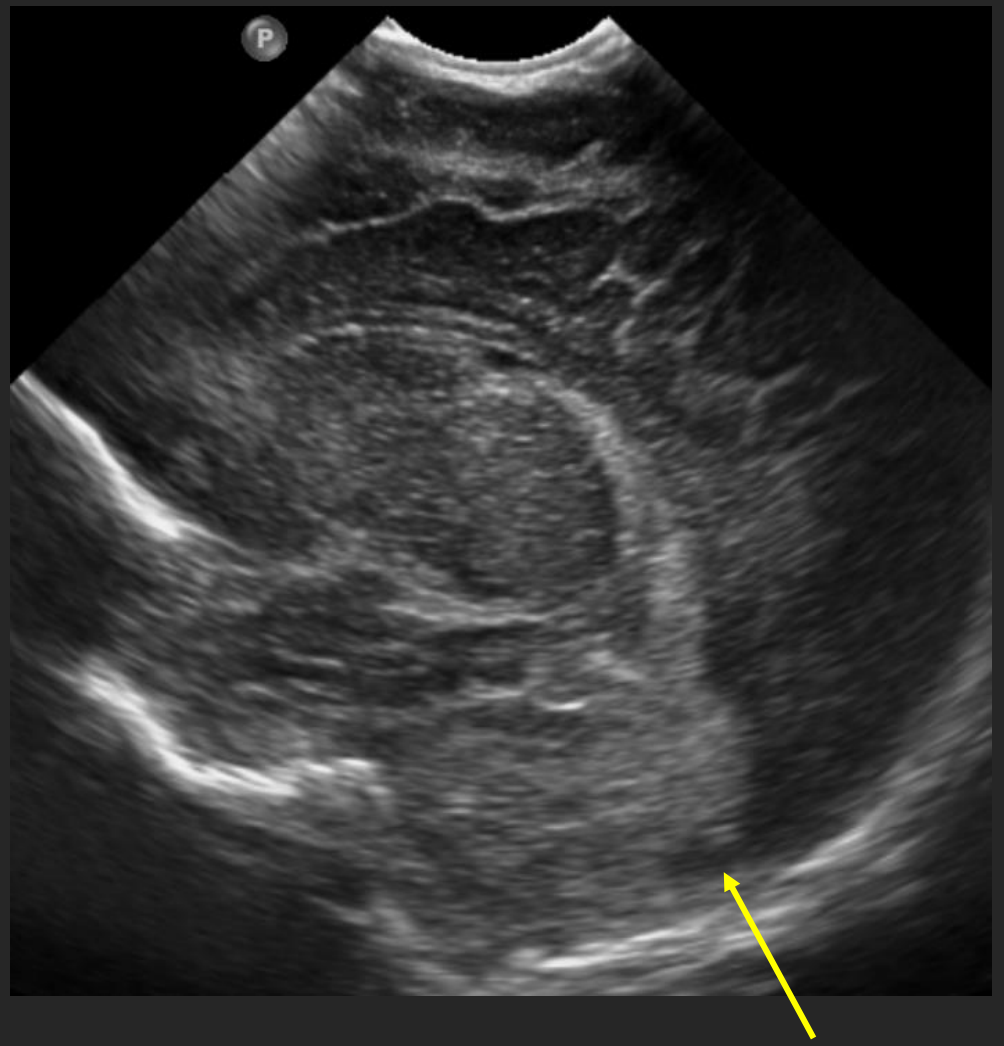
Same day CT

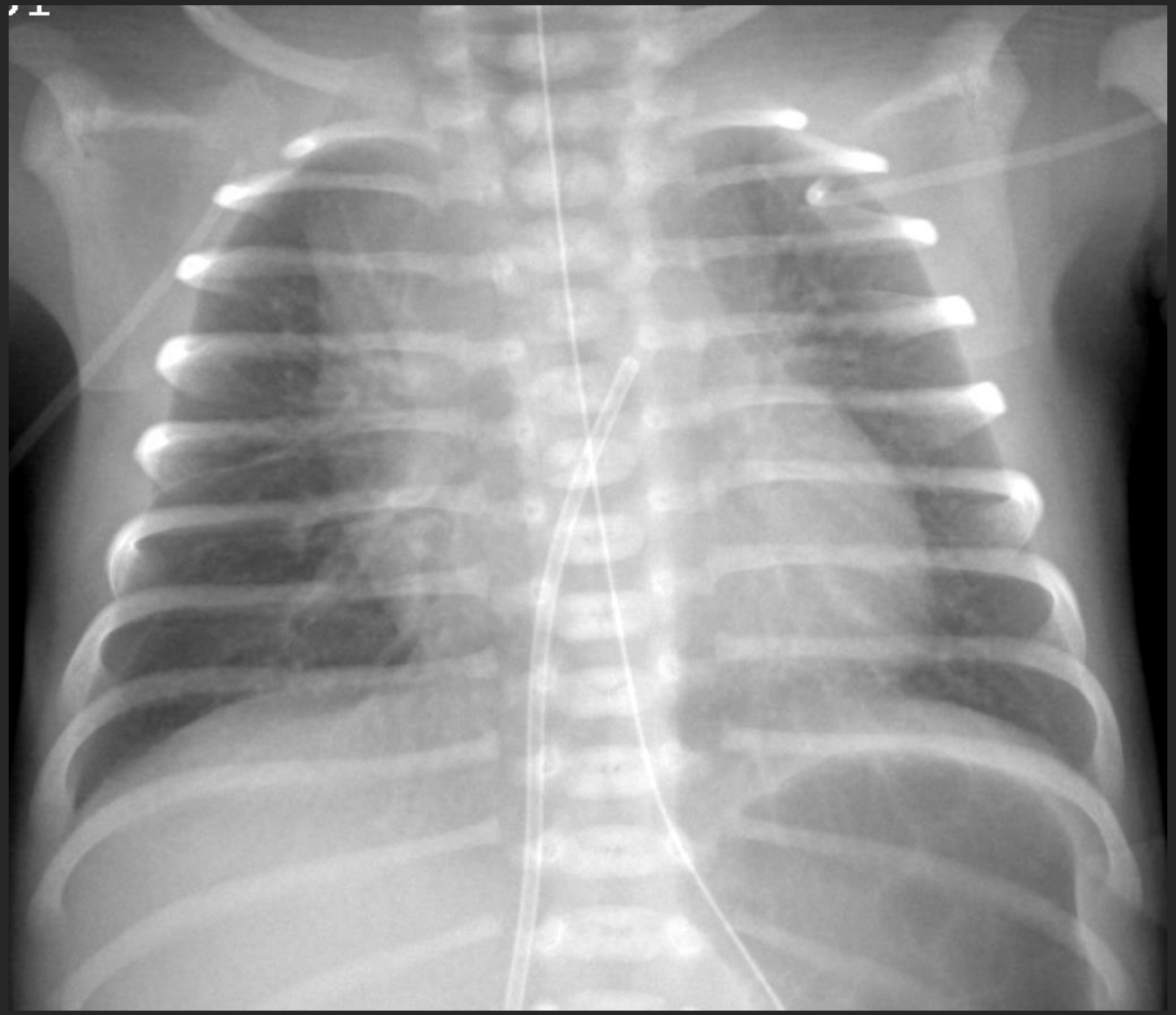
Ischemia – Focal Infarct



Hemorrhagic Venous Infarct

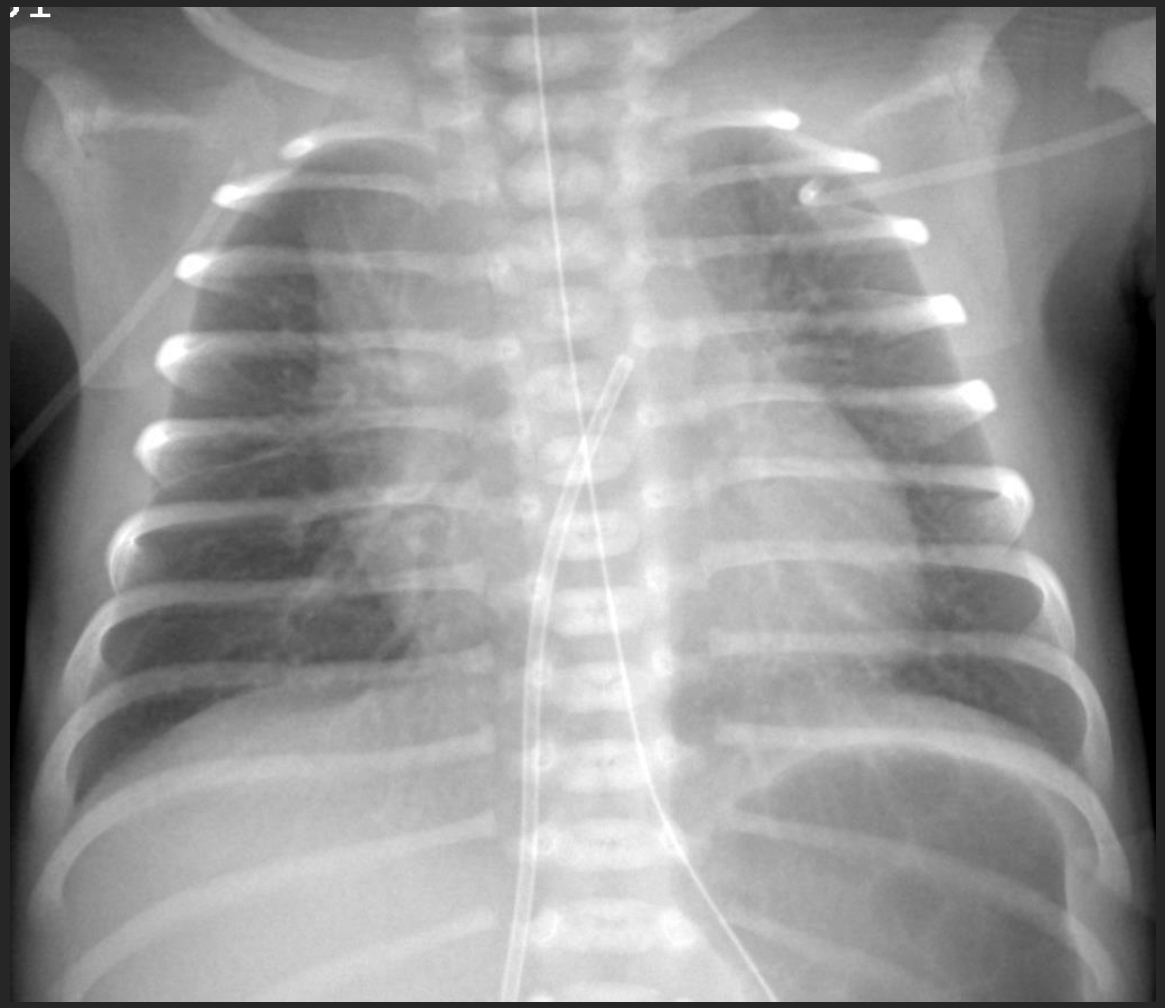






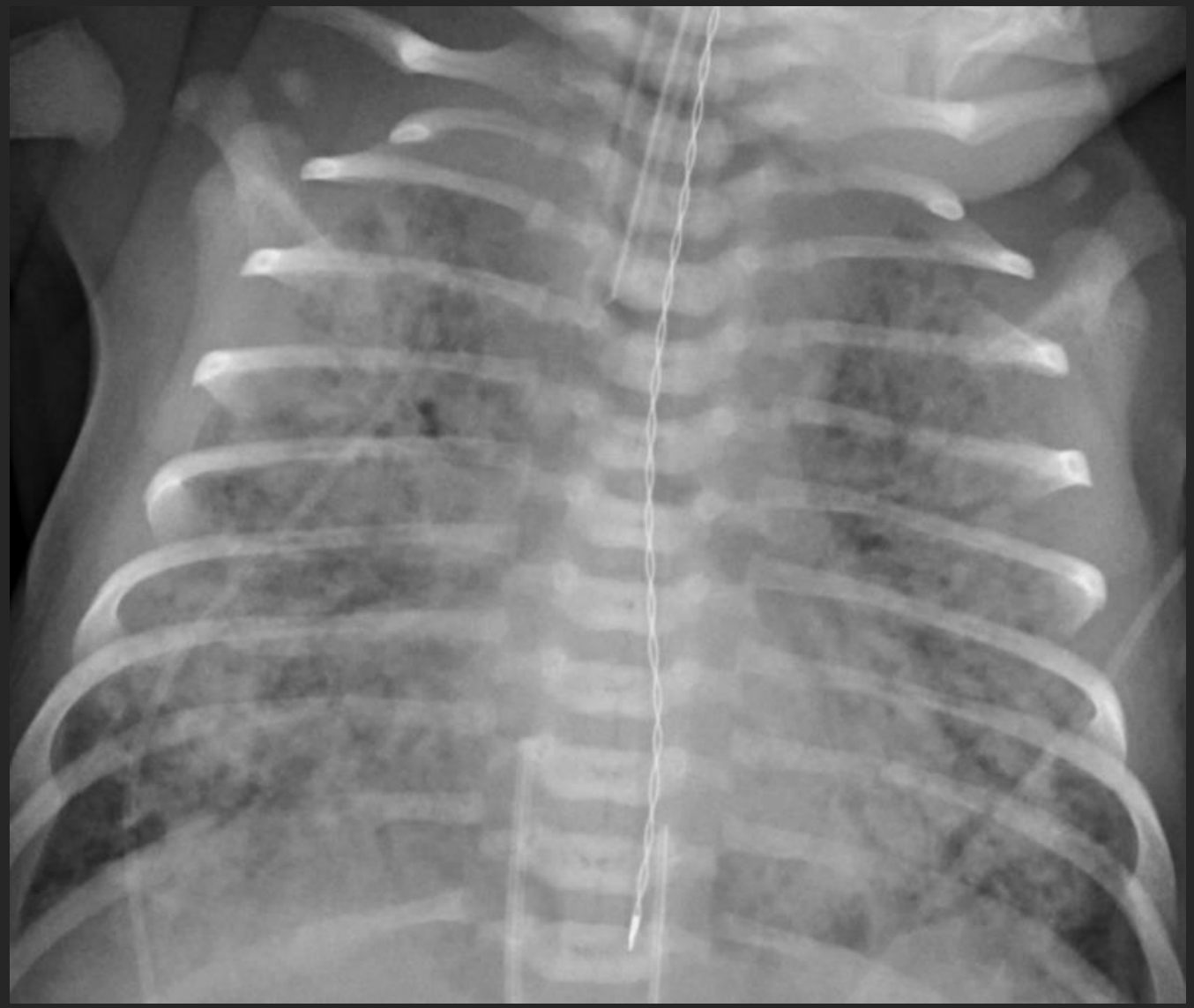
1-day old, tachypnea

Transient Tachypnea



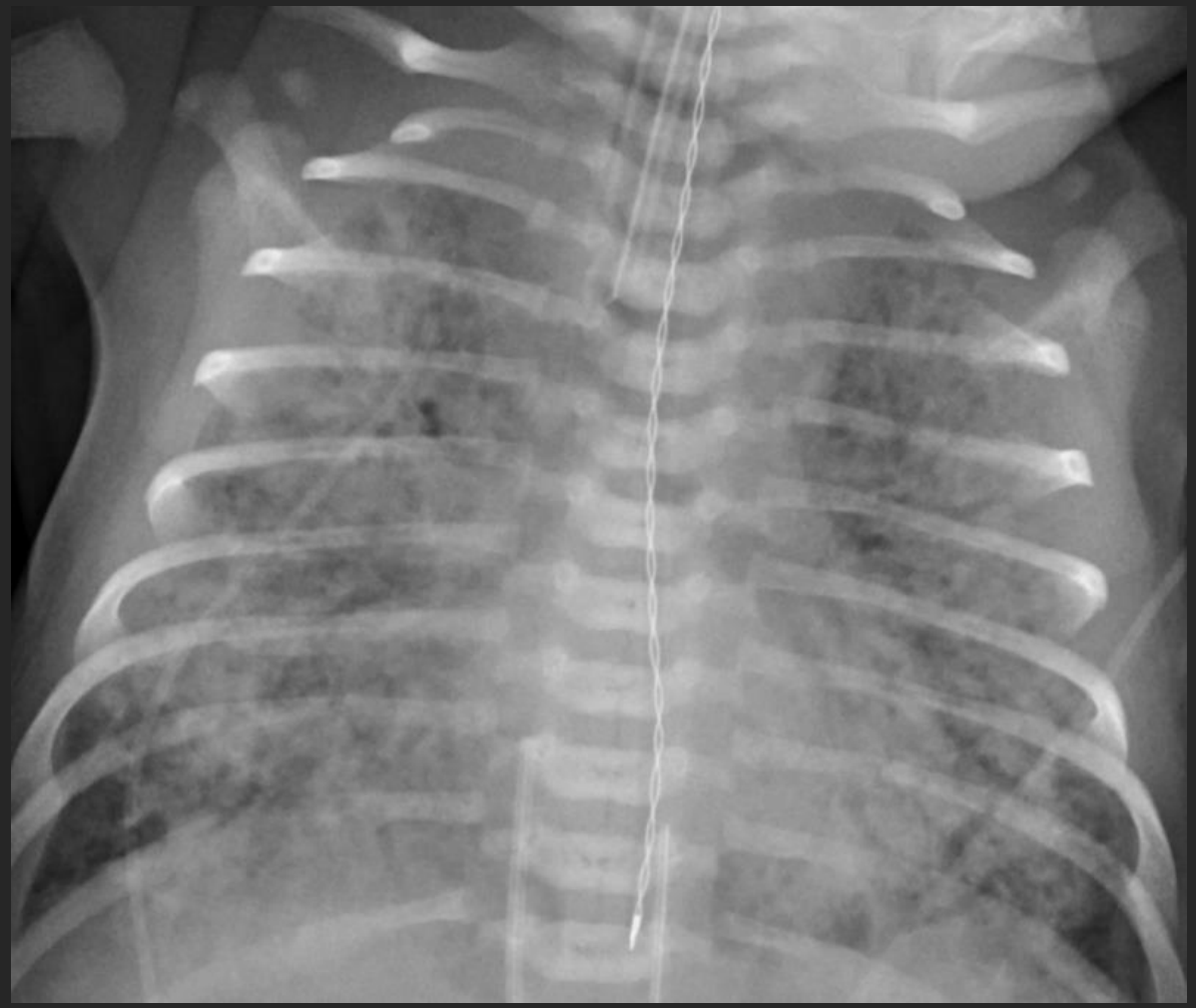
1-day old, tachypnea

- Term infants
- Cesarian delivery
- Opacities:
  - Bilateral
  - Perihilar
  - Linear
- Resolves in 2-3 days



0-day old, tachypnea

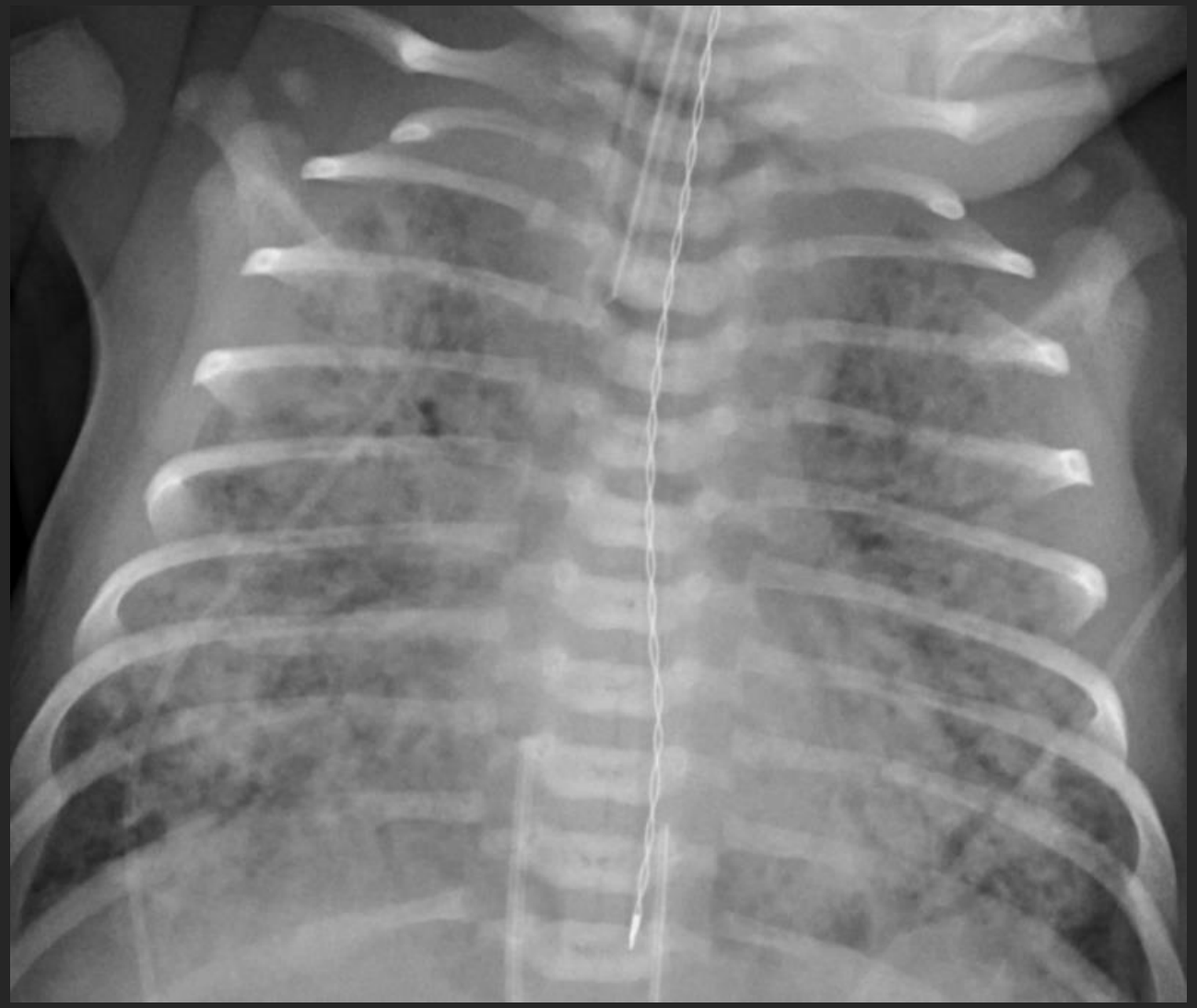
Meconium Aspiration

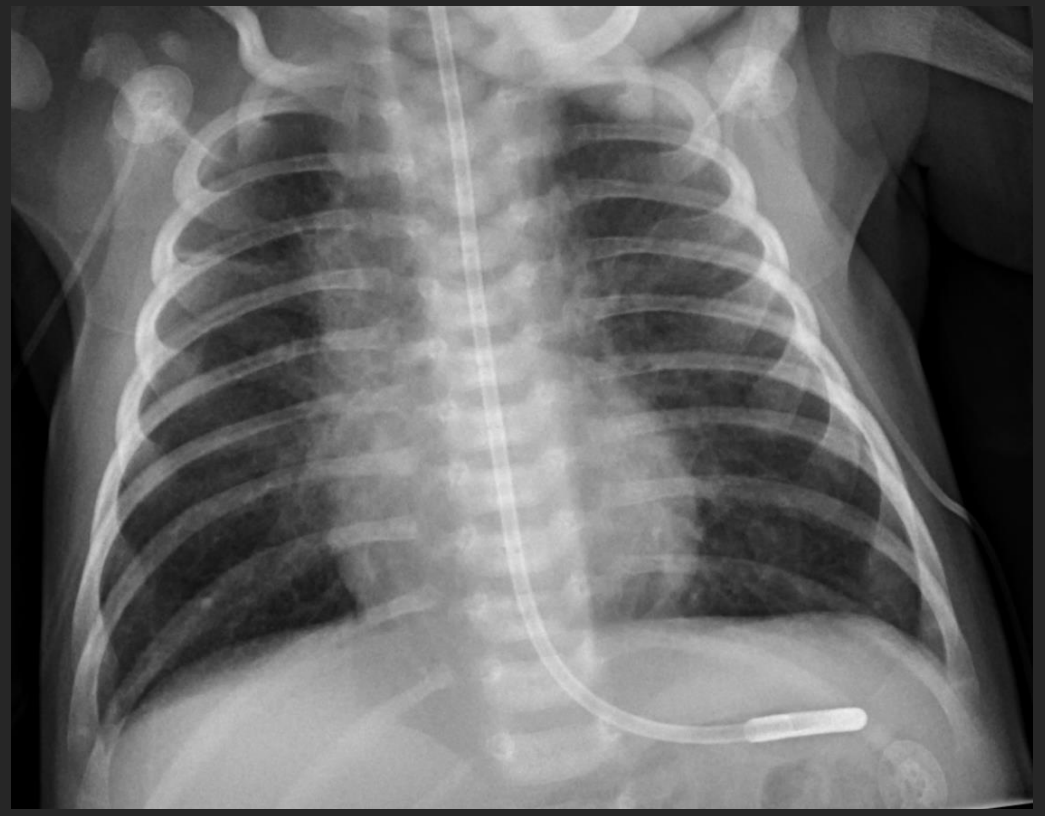


0-day old, tachypnea

- Term infants
- Often intubated
- Opacities:
  - Bilateral
  - Diffuse
  - Patchy reticular
- Hyperinflation (may be due to intubation)
- Changes with time

Meconium Aspiration





Appearance depends on when you see it: 19 days later

0-day old, respiratory distress

Neonatal Pneumonia

0-day old, respiratory distress

- Term infants
- Opacity pattern is variable:
  - Bilateral, scattered
  - Patchy, reticular
- Common organisms
  - Group B *streptococcus*
  - *E. coli*
  - *Staphylococcus aureus*
  - Sexually transmitted

0-day old, respiratory distress

Premature Lung Disease

0-day old, respiratory distress

- "Neonatal respiratory distress syndrome"
- < 36 weeks gestation
  - Earlier gestation is more severe
- Immaturity of Type II pneumocytes
  - Surfactant deficiency
  - Genetic deficiency in term infants
- Treated with surfactant, high-flow oscillatory ventilation

6-week old 26-week gestation

Chronic Lung Disease of Prematurity

6-week old 26-week gestation

- “Bronchopulmonary Dysplasia”
- Barotrauma and oxygen-related injury
  - Develops in weeks to months
  - Susceptible lung
- Prevention
  - Nutrition
  - Fluid restriction
  - Vent settings
  - SpO2 84 – 94%
  - Steroids, bronchodilators, diuretics

Pulmonary Interstitial Emphysema

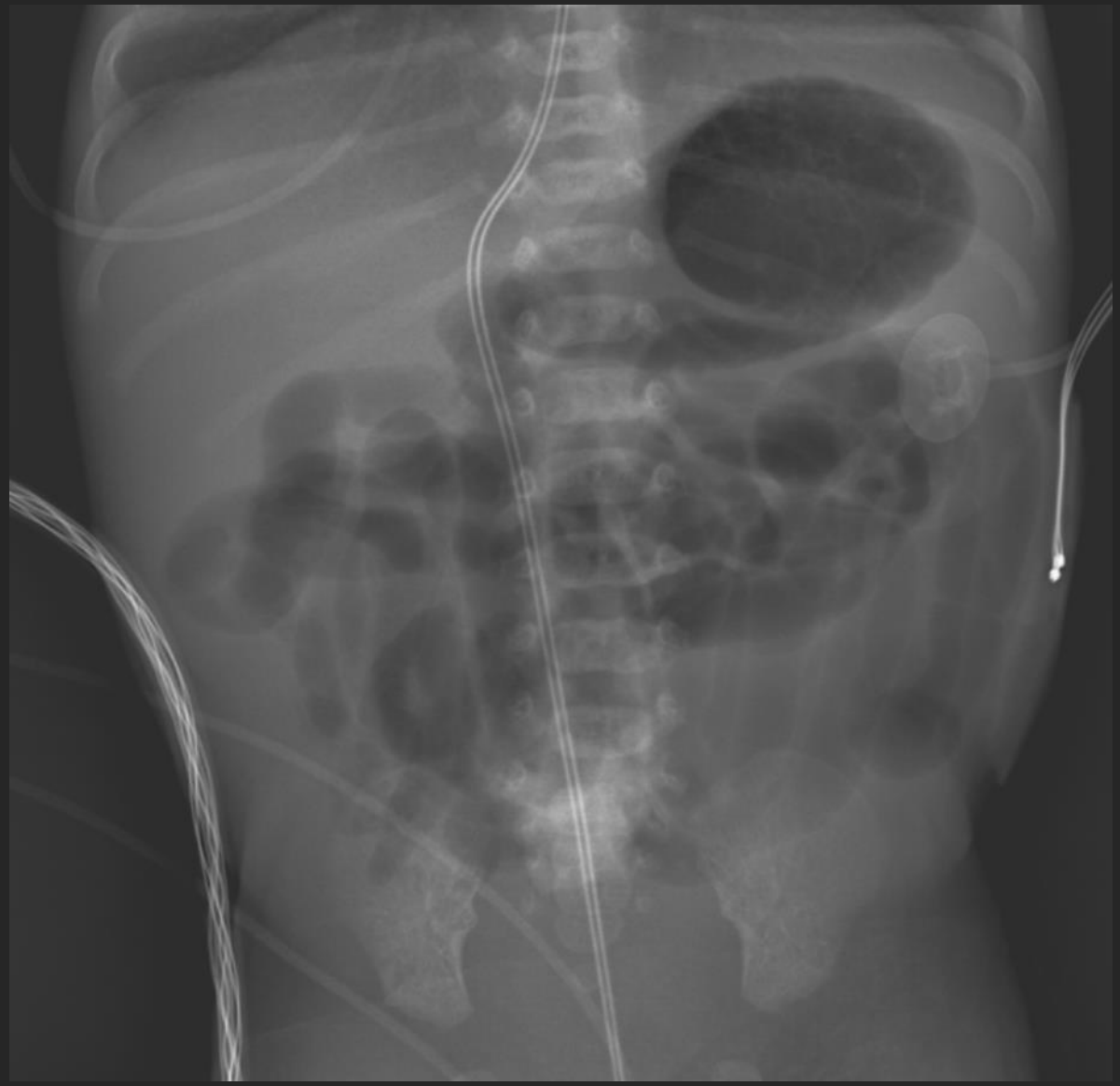
- Intubated patients
- Pressure trauma to stiff lungs
- Lucency
  - Distribution variable
  - Small cysts
- Changes by the day
- Can be confused with chronic lung disease of prematurity
  - Occurs suddenly

Pulmonary Interstitial Emphysema

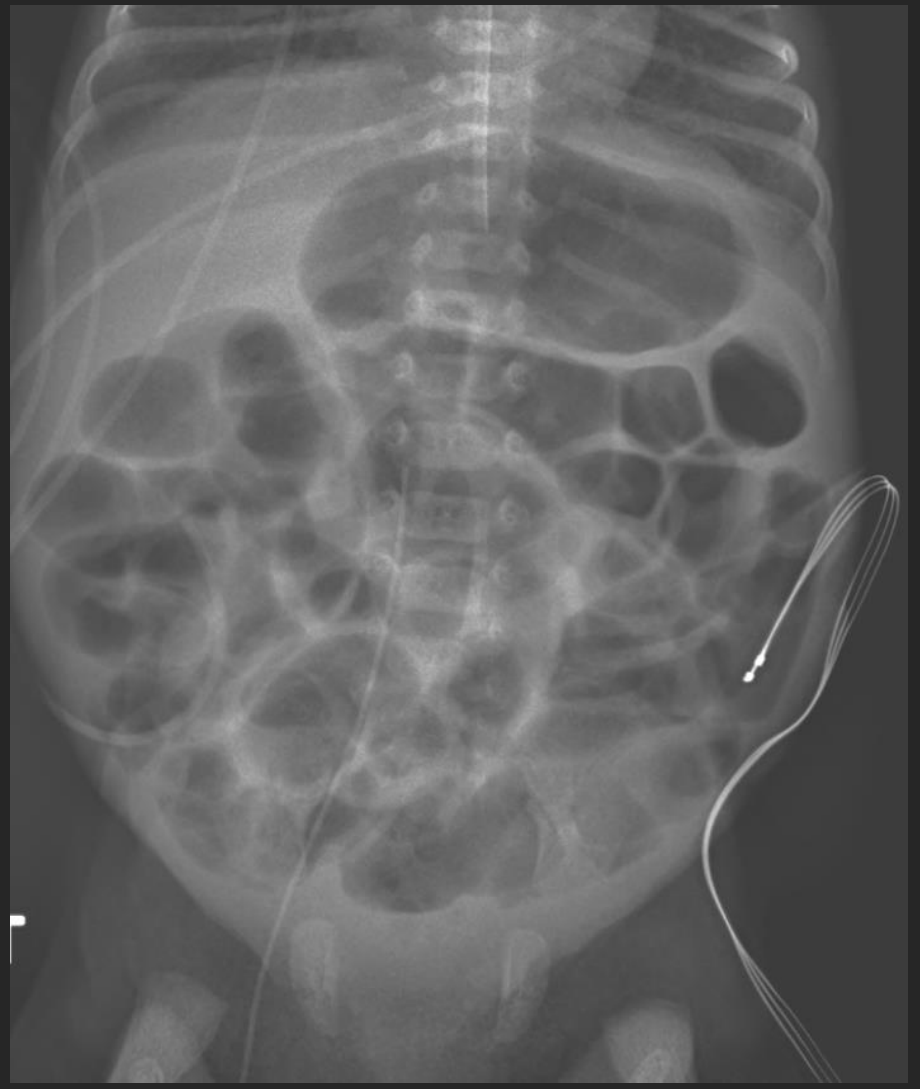
10 days later, mostly gone

Normal Infant Bowel Gas

1-day old

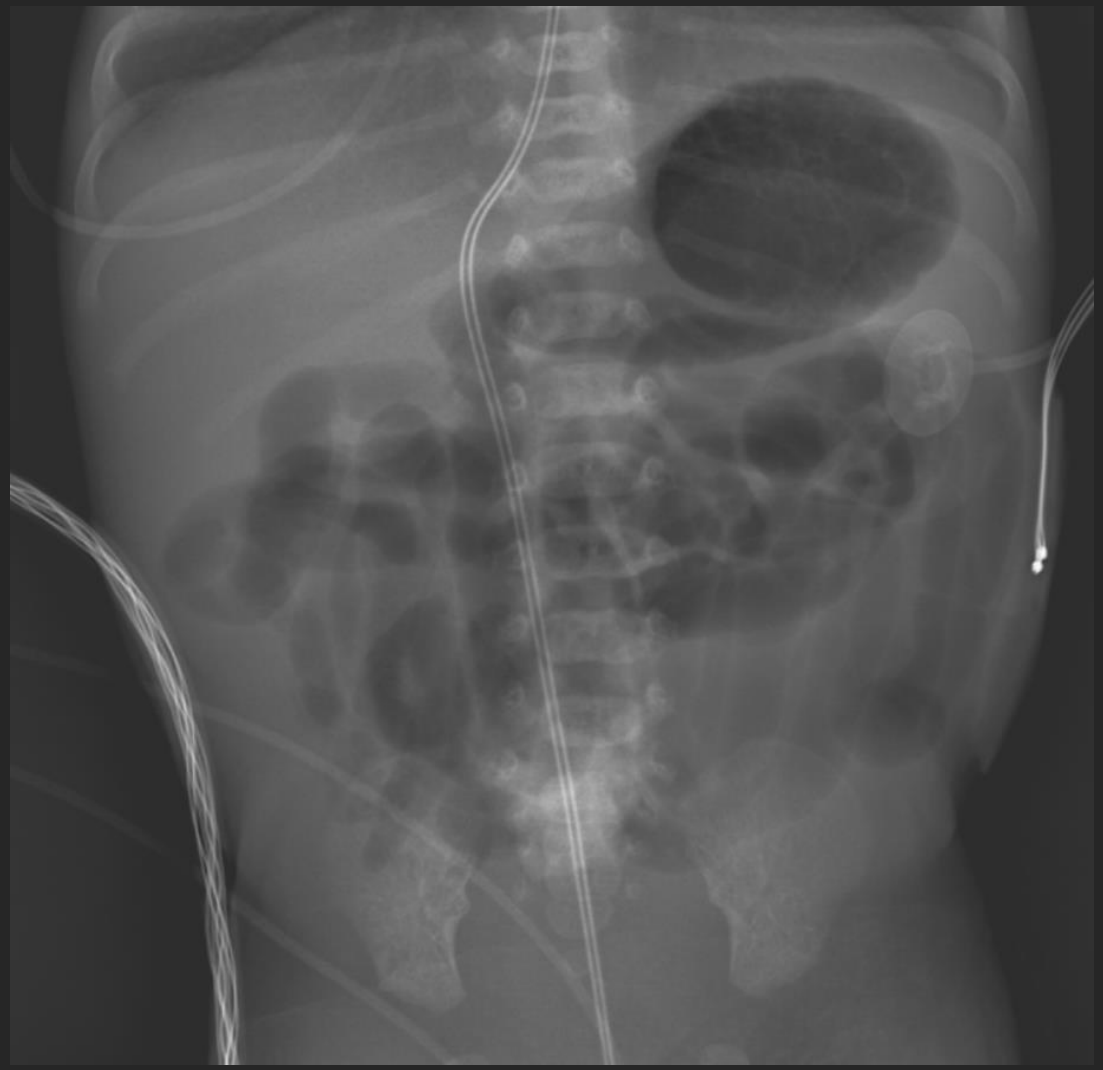


1-day old w/ no meconium



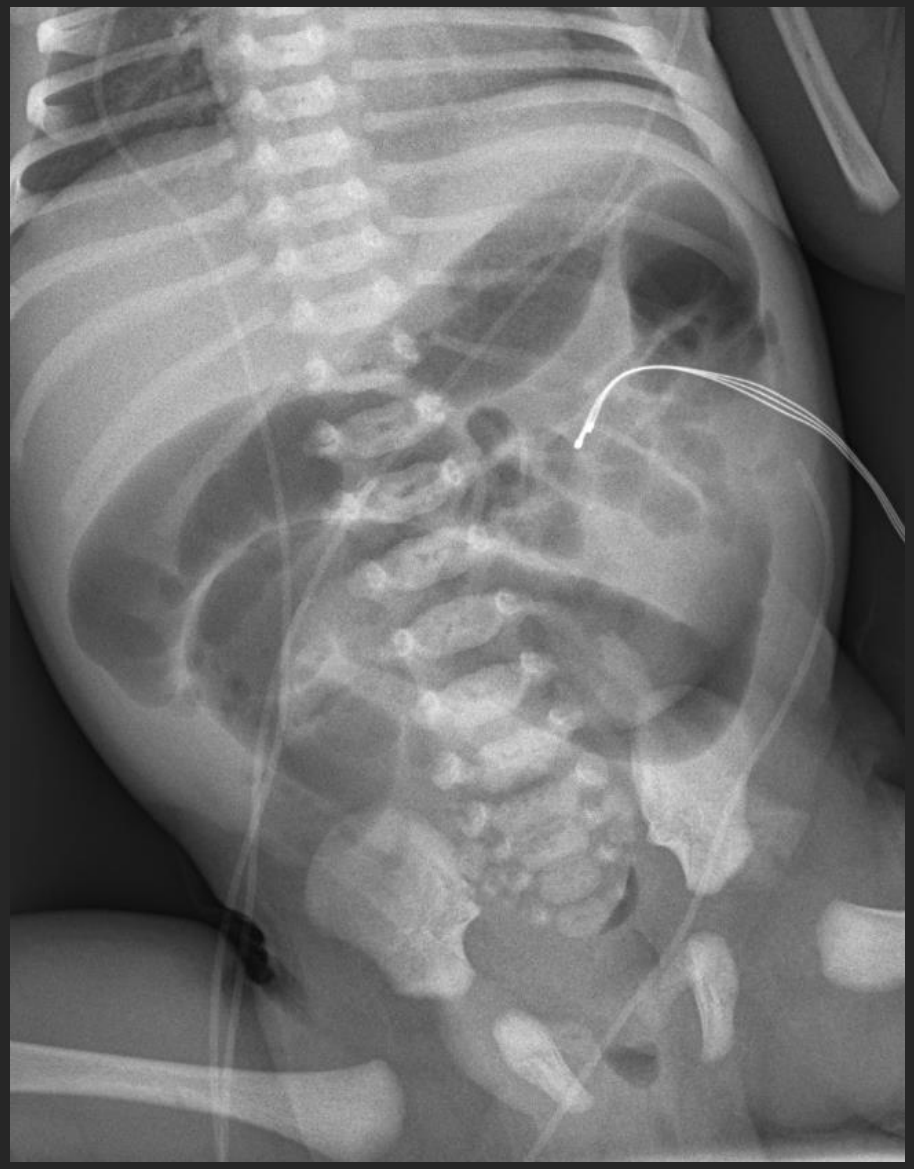
Day of life 3, passed meconium

Meconium Plug Syndrome



1-day old w/ no meconium

- 1:500 births
  - 24-48 hours life
- Risk factors:
  - Low-birth weight infants
  - Maternal diabetes
    - Glucagon secretion limits peristalsis in left colon
  - Maternal Mg++, pre-eclampsia
- May need water-soluble enema
- No long-term sequelae

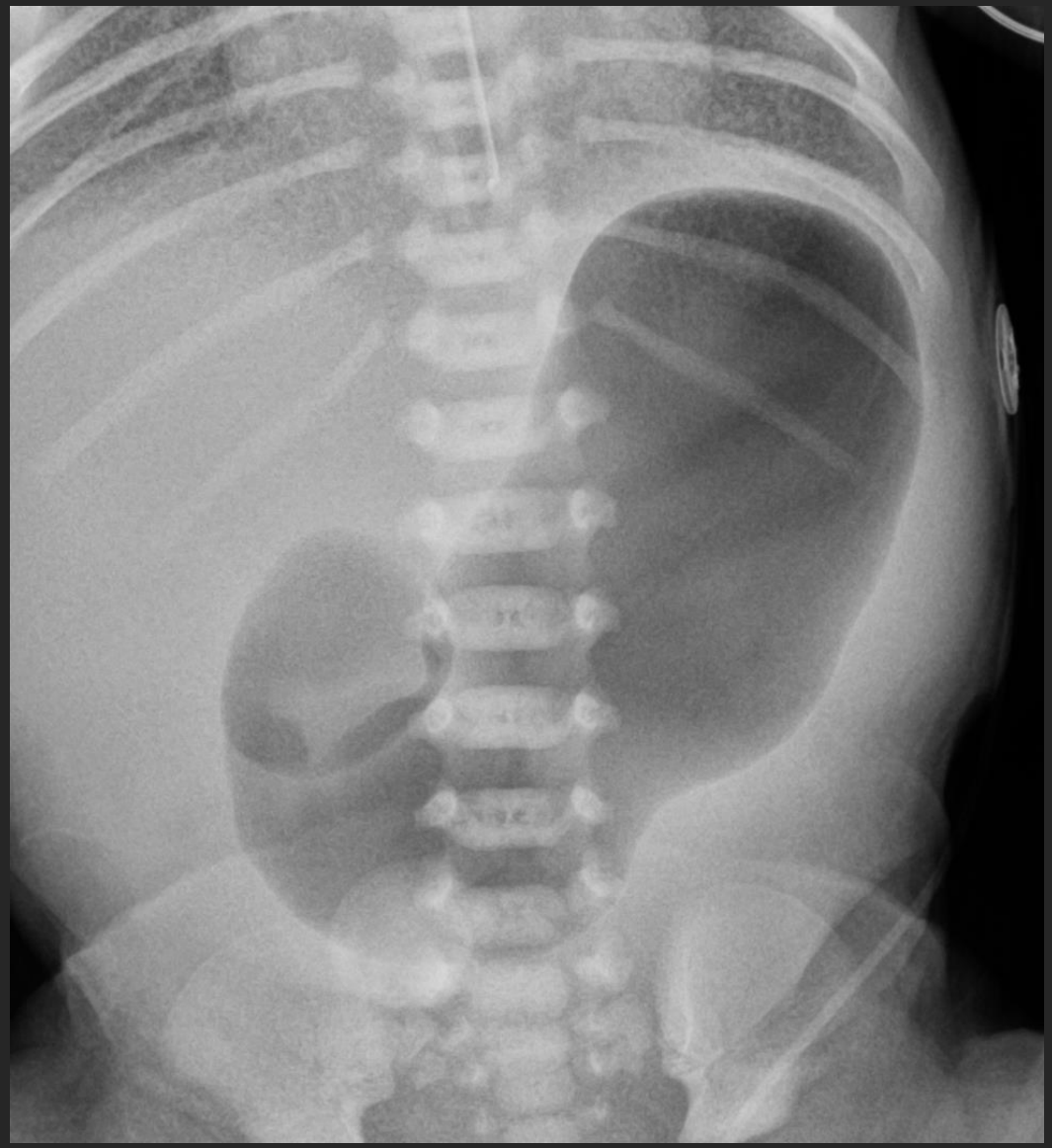


2-day old w/ no meconium

Hirschsprung Disease

2-day old w/ no meconium

- 1:5000 births
  - 95% diagnosed < 1-year old
  - Sporadic or familial
- Absent ganglion cells colon
  - Short segment 80%
    - Rectum + distal sigmoid
  - Long segment 15 – 20%
    - Rectum + entire sigmoid
  - Total colonic aganglionosis 5%
- Surgical treatment, pull-through procedure



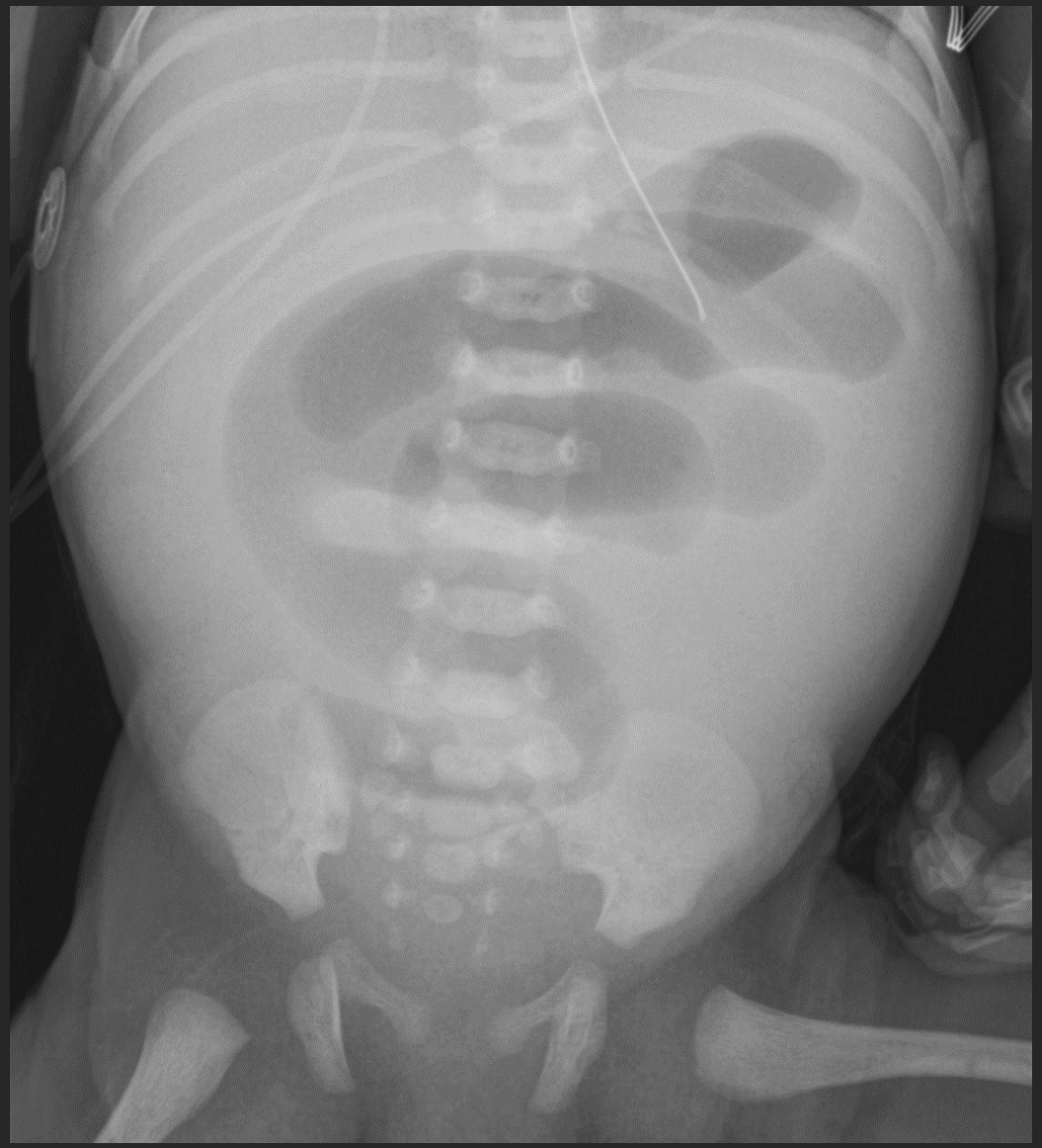
0-day old w/ prenatal abnormality

Duodenal Atresia

0-day old w/ prenatal abnormality

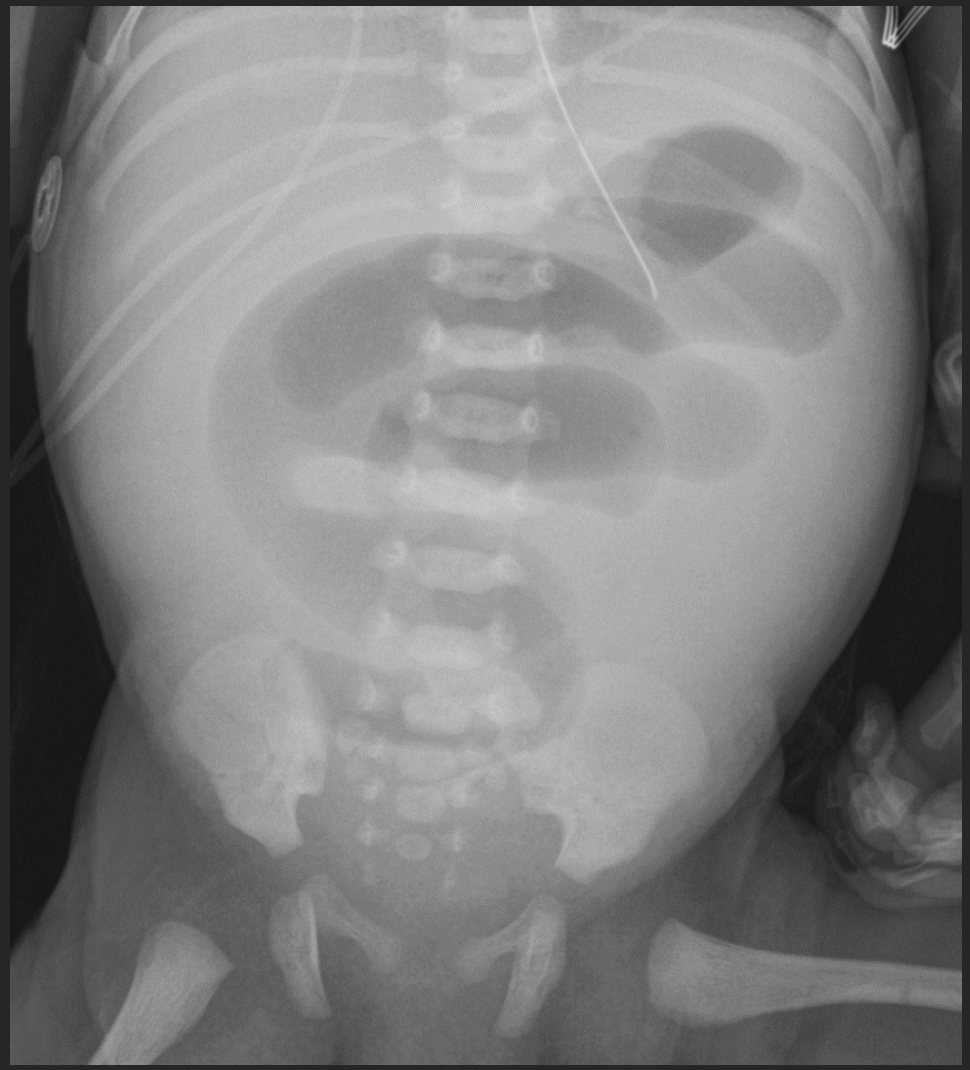
- Failure of duodenal recanalization
  - 2nd portion duodenum
  - Vomiting bilious or non-bilious
- Associated with
  - Trisomy 21
  - Cardiac malformations
  - VACTERL
  - Other bowel atresias
- US may exclude other etiologies
- Surgical duodeno-duodenostomy

3-day old 32-week gestation w/ bilious vomiting, no meconium



3-day old 32-week gestation w/ bilious vomiting, no meconium

Jejuno-Ileal Atresia



3-day old 32-week gestation w/ bilious vomiting, no meconium

- In utero intestinal ischemia
  - Jejunal > ileal
  - Sporadic
- Types
  - I: Internal membrane, no discontinuity
  - II: Blind pouches connected by fibrous cord
  - IIIa: no connection + mesenteric defect
  - IIIb: ileal segment coiled around jejunal segment
  - IV: multiple atresias
- US, Water-soluble enema

Necrotizing Enterocolitis

4-wo, 30-week gestation w/ abdominal distention, discoloration

- Pneumatosis
  - “Bubbly lucencies”
  - Intestinalis
  - Coli
- Ileus
  - Tubular loops
  - Mild dilation
- Portal venous gas
  - US more sensitive
- Pneumoperitoneum

Obstruction, Inguinal Hernia

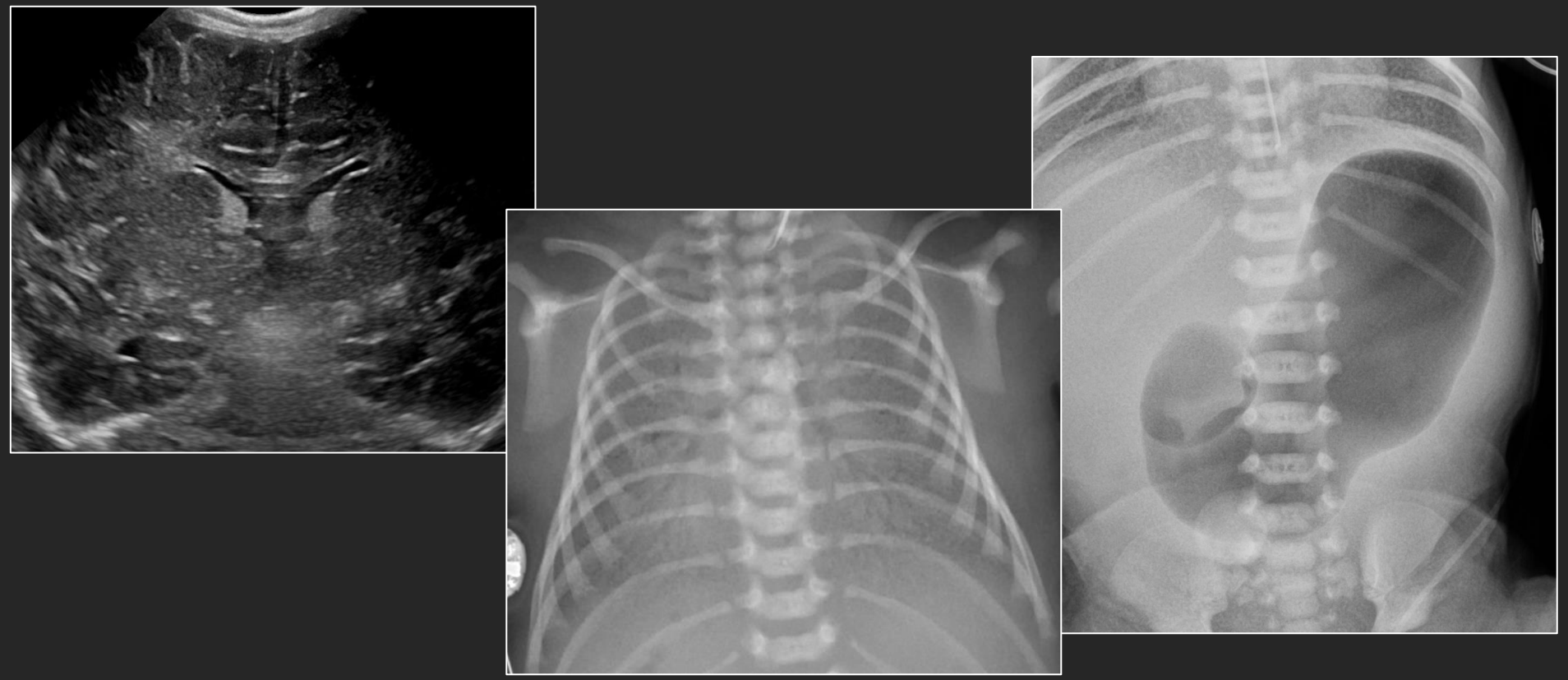
3-week old w/ vomiting

- Tubular, stacked bowel loops
- Obstruction and ileus may look similar
  - Degree of distention
  - Degree of stacked loops
  - *Rectal gas not reliable in infants – fluid filled rectum*
- Assess support devices

Key Points

- Grading “intracranial hemorrhage”
  - Grade 1 convex at caudothalamic groove
- Hemorrhage and infarct differentiated by location
  - Periventricular hemorrhagic venous infarct
- Lung patterns will evolve over time
  - Affected by vent settings, surfactant treatment
- Bowel gas patterns will be affected by mechanical decompression
  - US often a better choice that fluoro to follow an abnormal neonatal gas pattern

Neonatal Imaging



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