IS IT THE LUNG OR HEART ?

DR SAJITH KESAVAN

FELLOW PEDIATRIC RESPIROLOGY

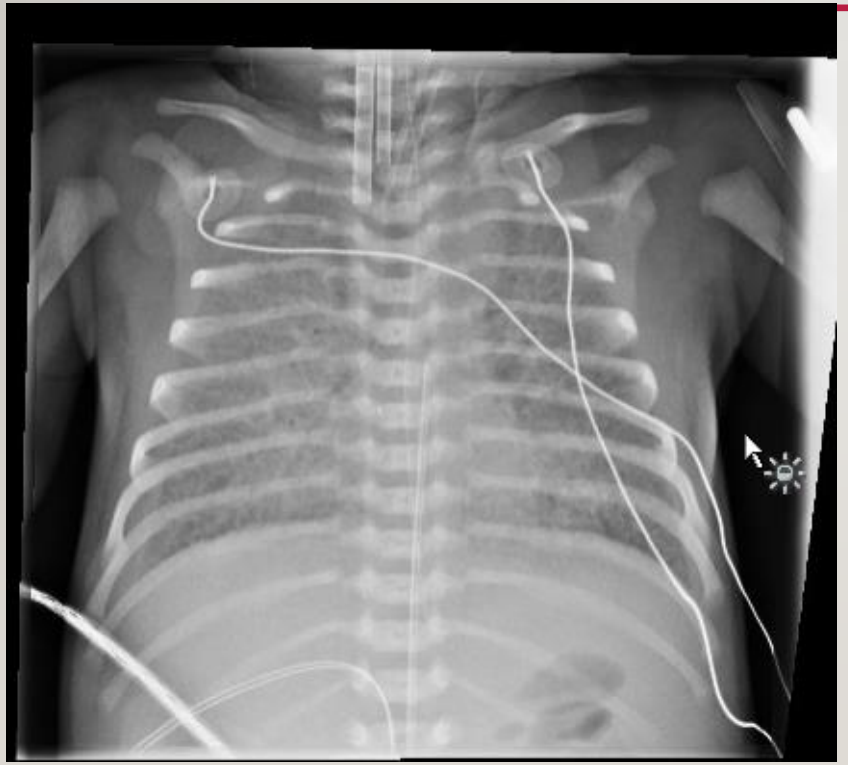
STOLLERY CHILDRENS HOSPITAL

EDMONTON

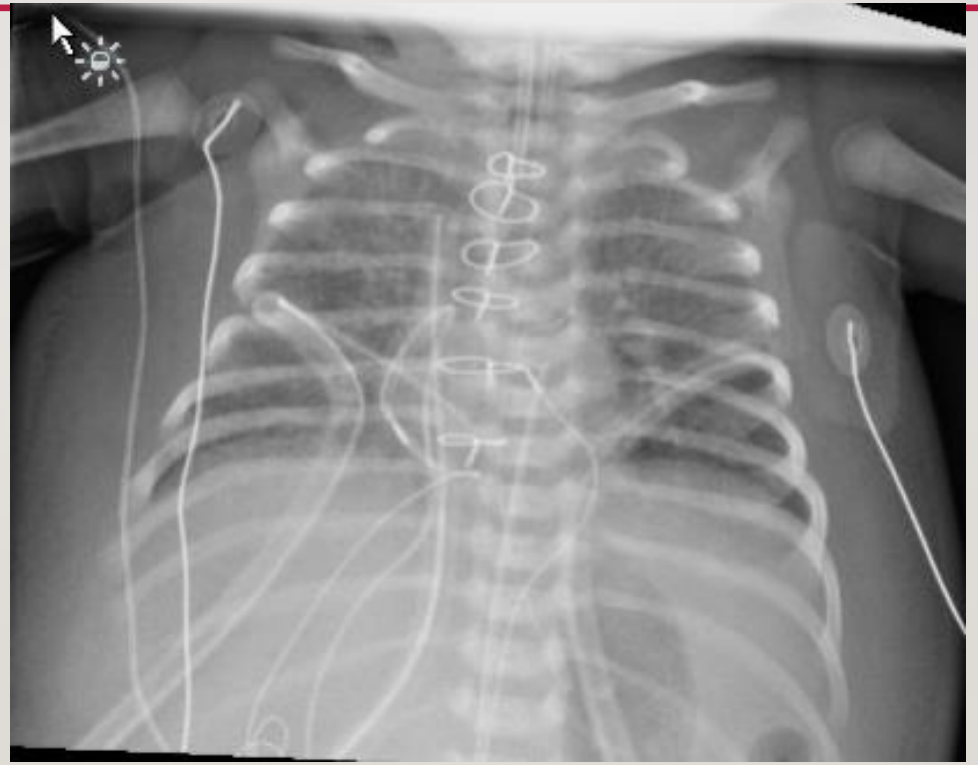
CASE SUMMARY

- Term baby antenatal diagnosis supracardiac TAPVC
- Hypoxic at birth – cannulated to VA ECMO within few hours of birth as failed mechanical ventilation
- OR on day 1 of life – obstructed supracardiac TAPVD repair and decannulation from ECMO
- Delayed sternal closure on day 3 of life
- Extubated on day 32
- Failure to wean from CPAP at 6 weeks of life
- Pediatric respirology consulted – Is it heart or lung or pulmonary veins ?

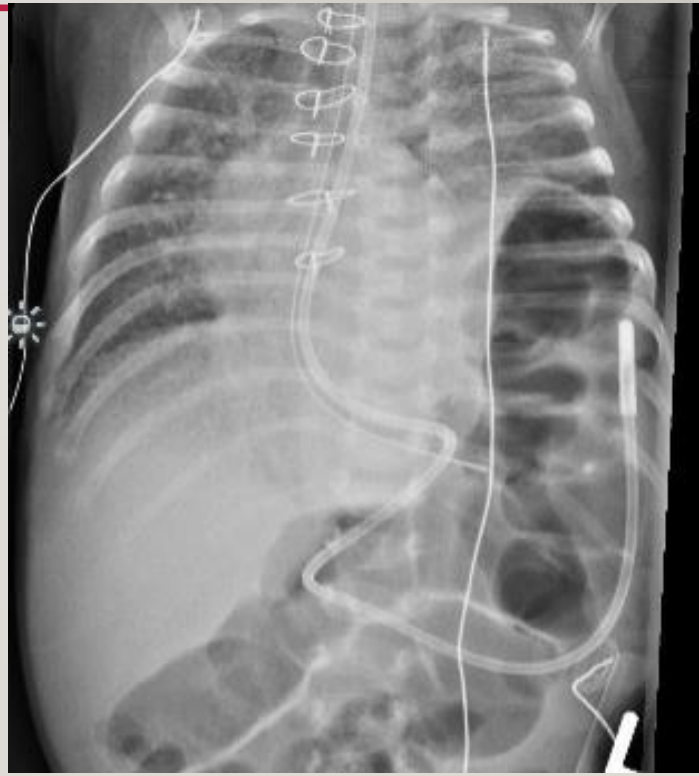
SERIAL CHEST XRAYS



PRE OP

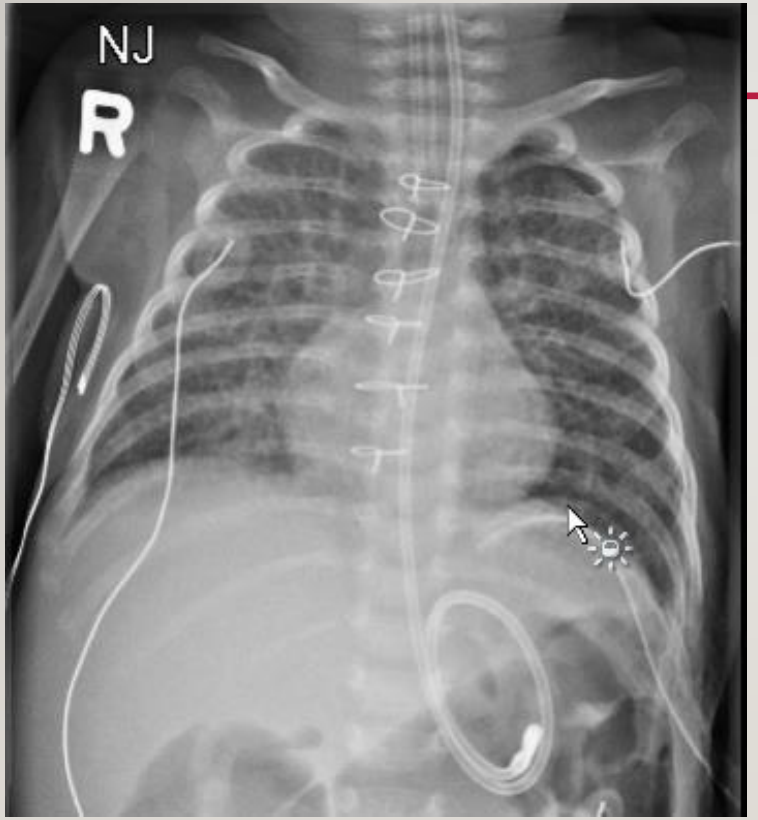


DAY 6 POST OP

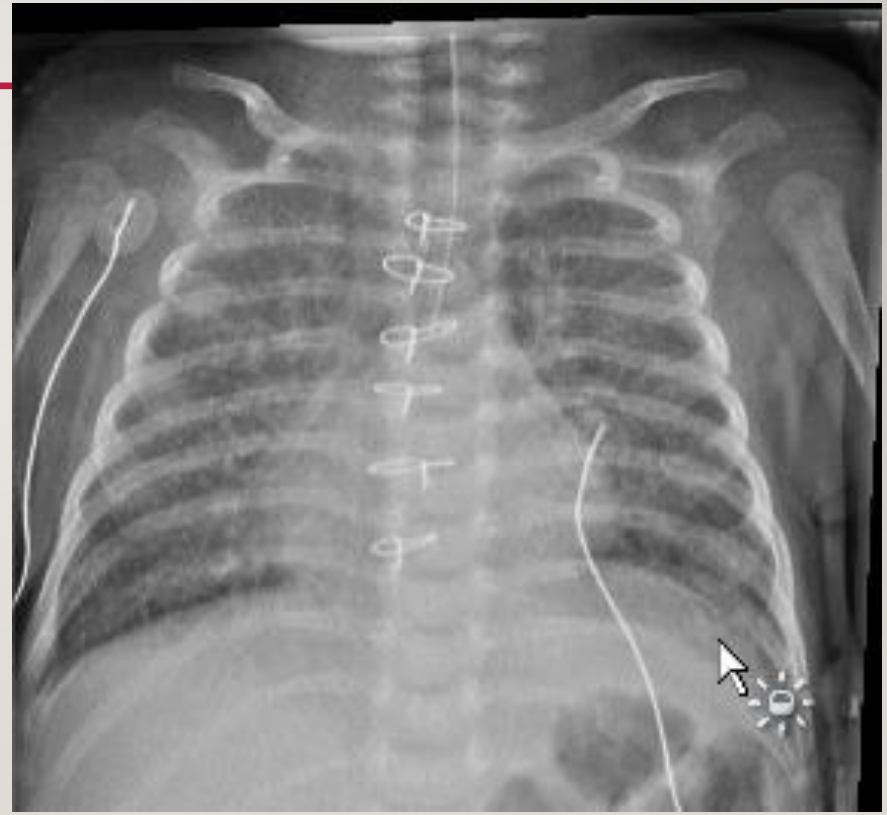


DAY 30 POST OP

LEFT DIAPHRAGM LIGATION



Day 30



6 weeks

LATEST ECHO (AT 6 WEEKS)

- Systemic RVSP
- Dilated and hypertrophied RV with normal function
- Mild obstruction at Pulmonary venous confluence connection ;gradient 3- 4
- Individual pulmonary veins appear normal

MORE DATA

- CPAP 8 at 0.3 fio2 – tachypnoeic and has moderate work of breathing
- ABG 7.37/50 PaCO2 / 93 PaO2 / HCO3 28
- Respiratory viral panel negative
- On diuretics and sedation wean
- Results of one more important test available

SUMMARY SO FAR

- 6 week old baby S/P Neonatal Obstructed supracardiac TAPVD repair
- S/P Left diaphragm plication
- Failure to wean from CPAP at 6 weeks post op but improving trend
- Systemic pulmonary hypertension
- **What are the differential diagnosis ?**
- **What is the next approach ?**

FAILURE TO WEAN FROM PPV AFTER CARDIAC SURGERY

- Brain - Injury, sedation , withdrawal
- Heart – residual defects ,heart failure
- Airway- vocal cords, trachea, bronchi
- Lung parenchyma- pulm edema , pneumonia, collapse , interstitial lung process
- Pleural process- effusion, airleak
- Respiratory Muscles - diaphragm
- Pulmonary Vascular –pulmonary hypertension
- Pulmonary infection

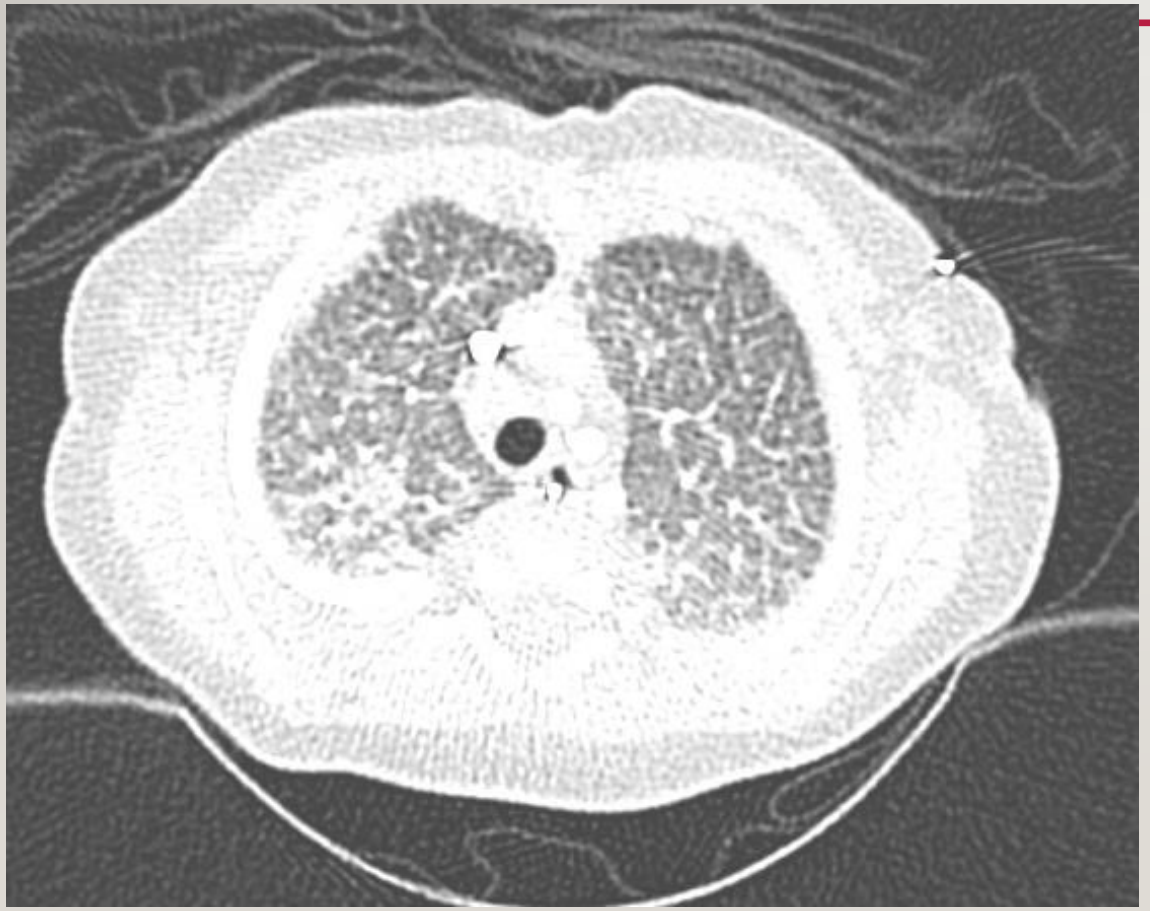
DIFFERENTIAL DIAGNOSIS

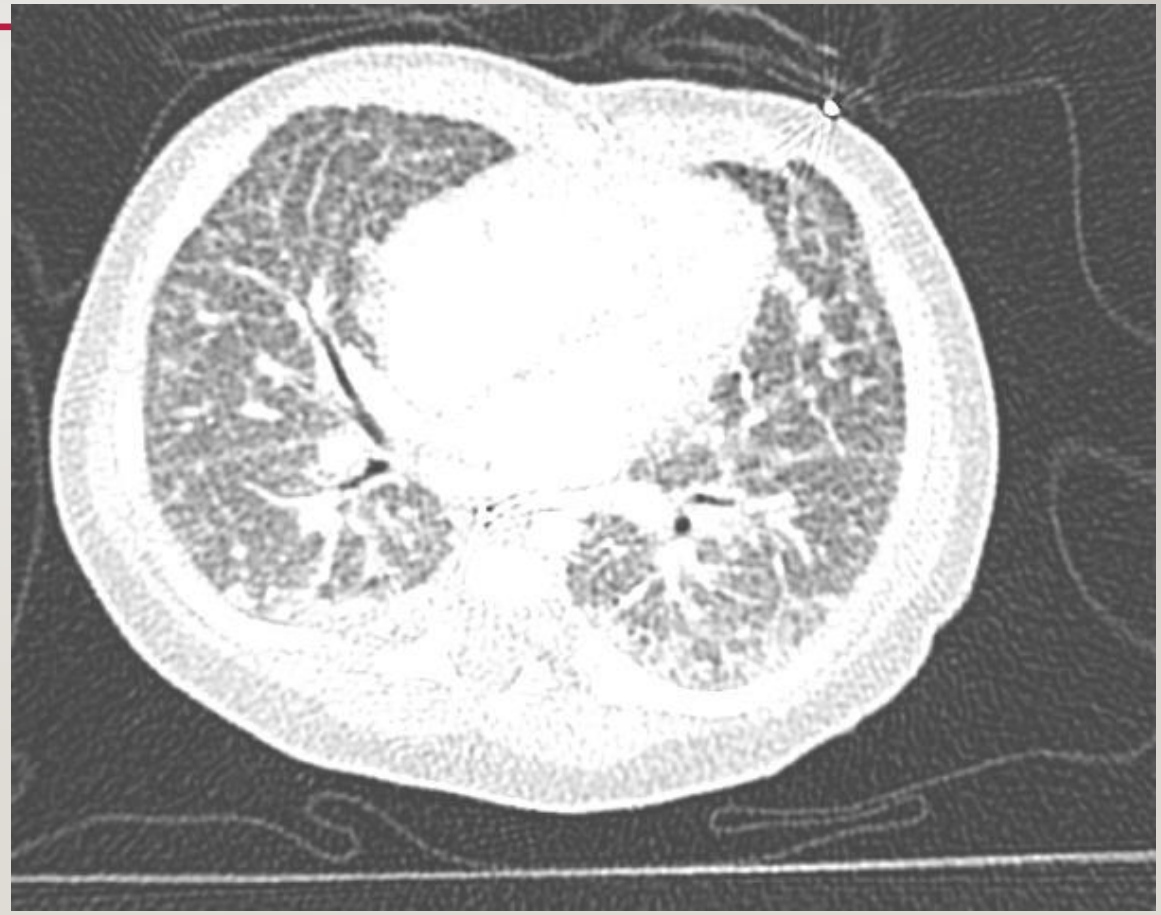
- Residual cardiac defects causing pulmonary edema
  - PVH secondary to chronically under filled and small left-sided chambers
  - Pulmonary venous chamber to left atrial anastomosis site stenosis
  - Individual pulmonary vein stenosis
  - PAH as a result of large left to right shunt across the patent vertical vein
- Fluid overload
- Additional Interstitial lung disease
- Diaphragmatic paralysis
- Airway – vocal cord , tracheobronchomalacia

WHAT DO YOU RECOMMEND ?

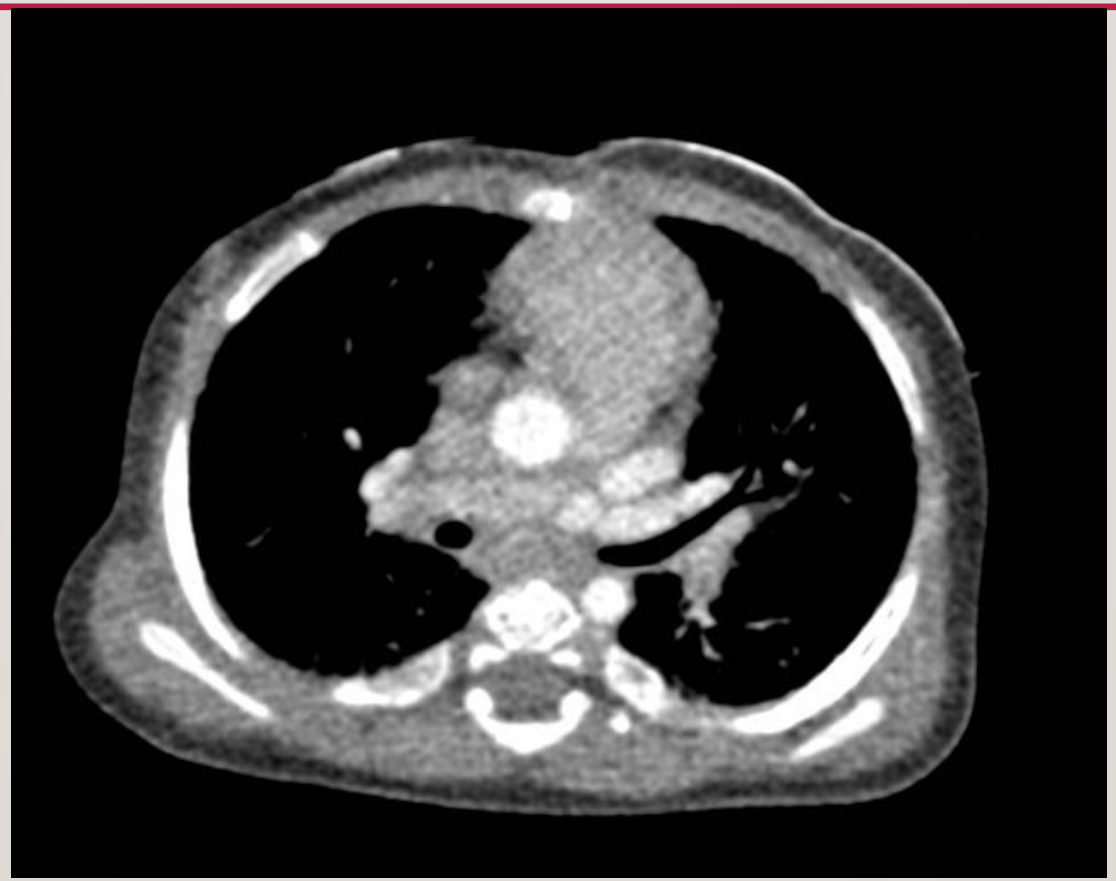
- CT CHEST WITH ANGIO
- CARDIAC CATH

HRCT CHEST WITH ANGIO





CT ANGIO

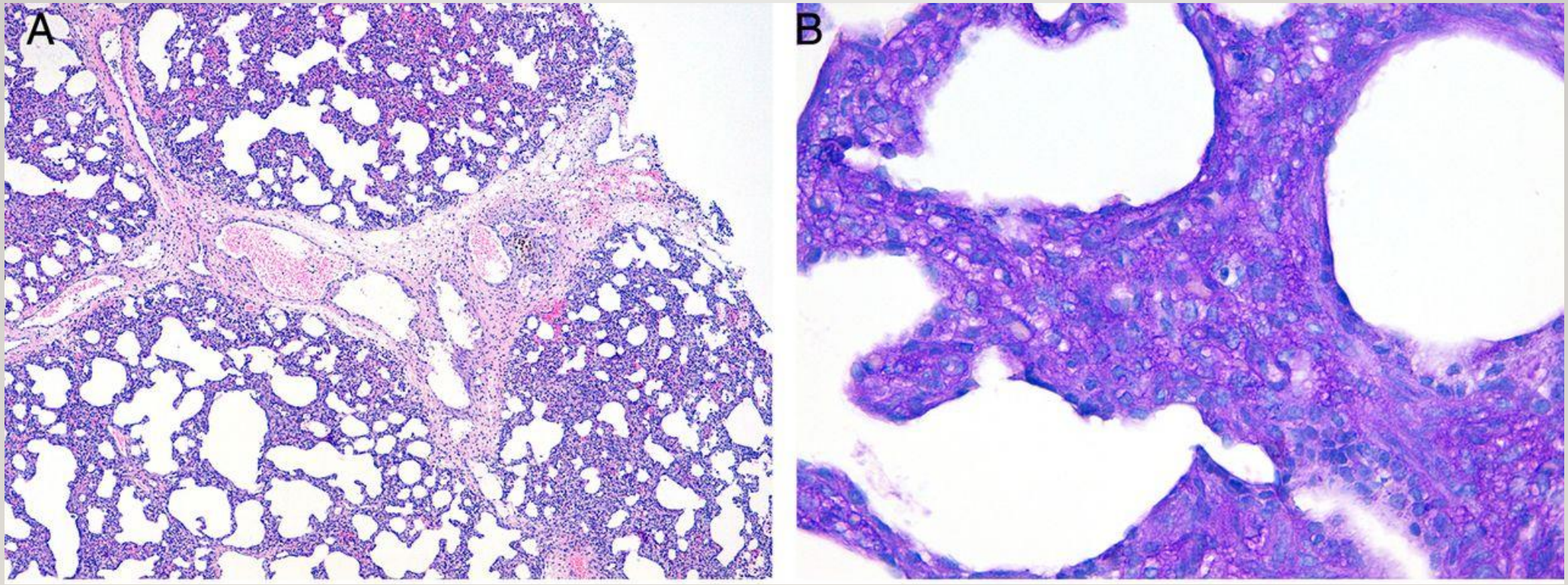


CARDIAC CATH

- Minor narrowing of the left upper pulmonary vein as it enters into the left atrium

LUNG BIOPSY

- Pulmonary interstitial glycogenosis
- Mild pulmonary hypertensive changes
- Alveolar simplification, moderate
- Lymphatic dilation, focal



P I G

- First described in 1992 and named as "infantile cellular interstitial pneumonitis"
- Pulmonary Interstitial Glycogenosis (P.I.G.) was coined by Canakis et al in 2002
- Abnormal developmental process
- HRCT typically characterized by GGO with cystic changes
- Biopsy gold standard
- Clinical phenotype -neonatal respiratory failure / distress in late preterm out of proportion to gestation with comorbid CLD or term infants with pulmonary hypertension, and/or structural heart disease

Pulmonary interstitial glycogenosis: Diagnostic evaluation and clinical course

Deborah R. Liptzin[1] | Christopher D. Baker[1] | Jeffrey R. Darst[1] | Jason P. Weinman[2] | Megan K. Dishop[3] | Csaba Galambos[4] | John T. Brinton[5] | Robin R. Deterding[1]

PULMONARY INTERSTITIAL GLYCOGENOSIS- HISTOPATHOLOGY

- Non-inflammatory, cellular interstitial infiltrate.
- Very young infants, usually <2 months of age and rarely in infants >6 months of age.
- Diffuse expansion of the interstitium due to vimentin-positive, mesenchymal, oval to spindle cells with cytoplasmic clearing .
- Glycogen is not demonstrated following PAS on light microscopy in the majority of cases.
- . Glycogen droplets are more readily identified by electron microscopy.

Armes JE, Mifsud W, Ashworth M. Diffuse lung disease of infancy: a pattern-based, algorithmic approach to histological diagnosis. *Journal of Clinical Pathology* 2015;**68:**100-110.

PIG-ASSOCIATIONS

- PIG is commonly seen on a background of alveolar simplification(79%)
- Co-associations with structural heart disease have been described (68%)
- PIG has also been documented in conjunction with alveolar dysplasia, ACD, persistent pulmonary hypertension and congenital lobar emphysema.
- The prognosis is generally good, depending on the severity of any associated lung conditions.

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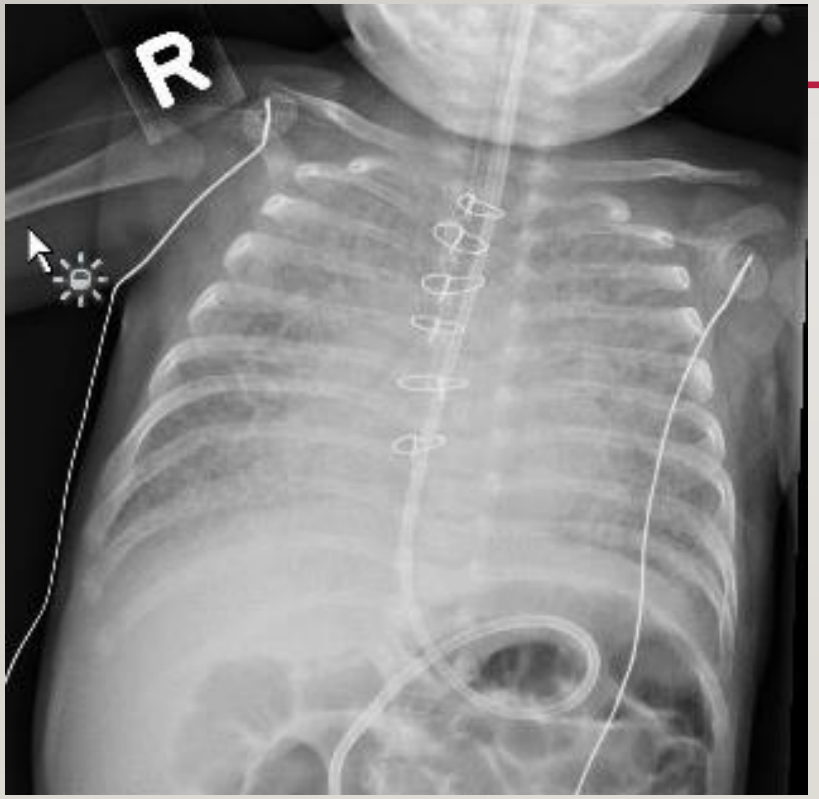
TREATMENT AND PROGNOSIS

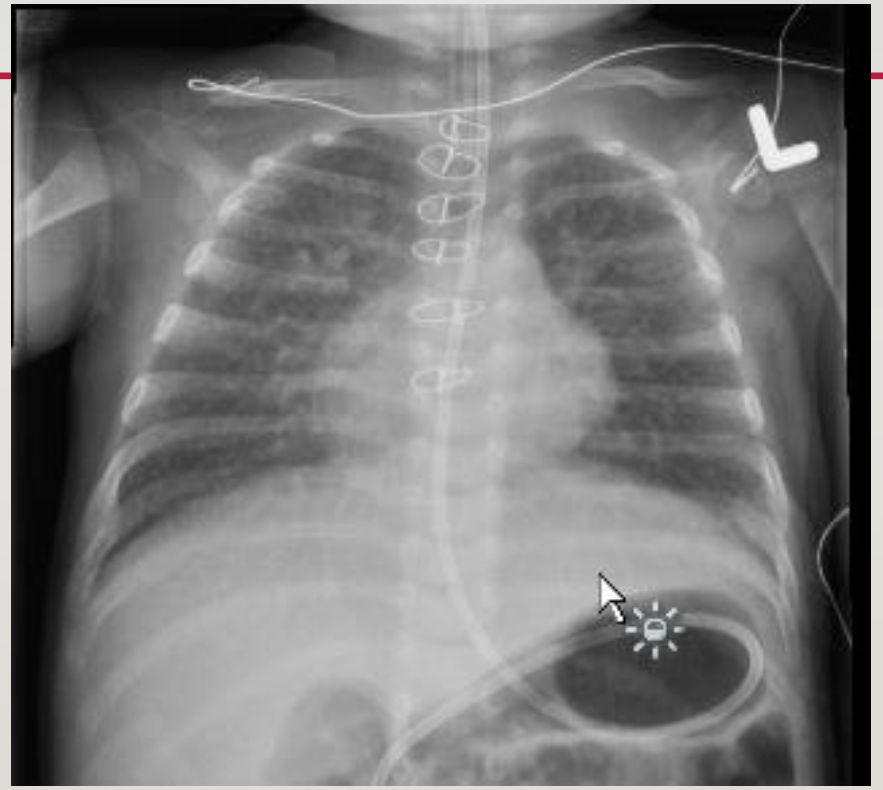
- It is proposed that corticosteroids induce alveolar maturation and lipofibroblasts apoptosis
- The decision to use corticosteroid therapy in patients with P.I.G. should be personalized to each patient and his/her underlying disease process and level of respiratory support
- 10 mg/kg/day x 3 up to 6 months or 2 mg/kg/day prednisone
- In general a good response to steroids in case series but not universal
- Hydroxychloroquine - not encouraging results

FURTHER CLINICAL COURSE

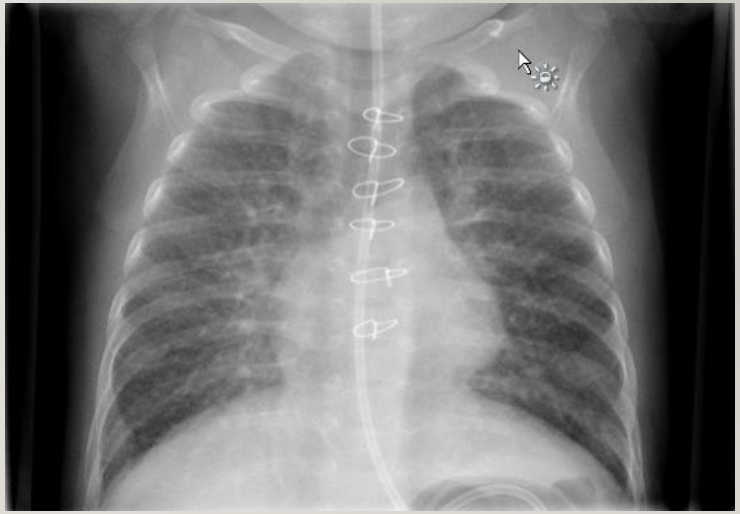
- A trial of inhaled nitric oxide started noninvasively bcos of systemic RVSP and increased work of breathing
- Developed worsening pulmonary edema and hemodynamic compromise and reintubated
- Nitric oxide stopped
- Pulse methyl prednisolone 10 mg/kg x 3 days-repeat after 4 weeks



Pre pulse with nitric



Post pulse steroids off nitric



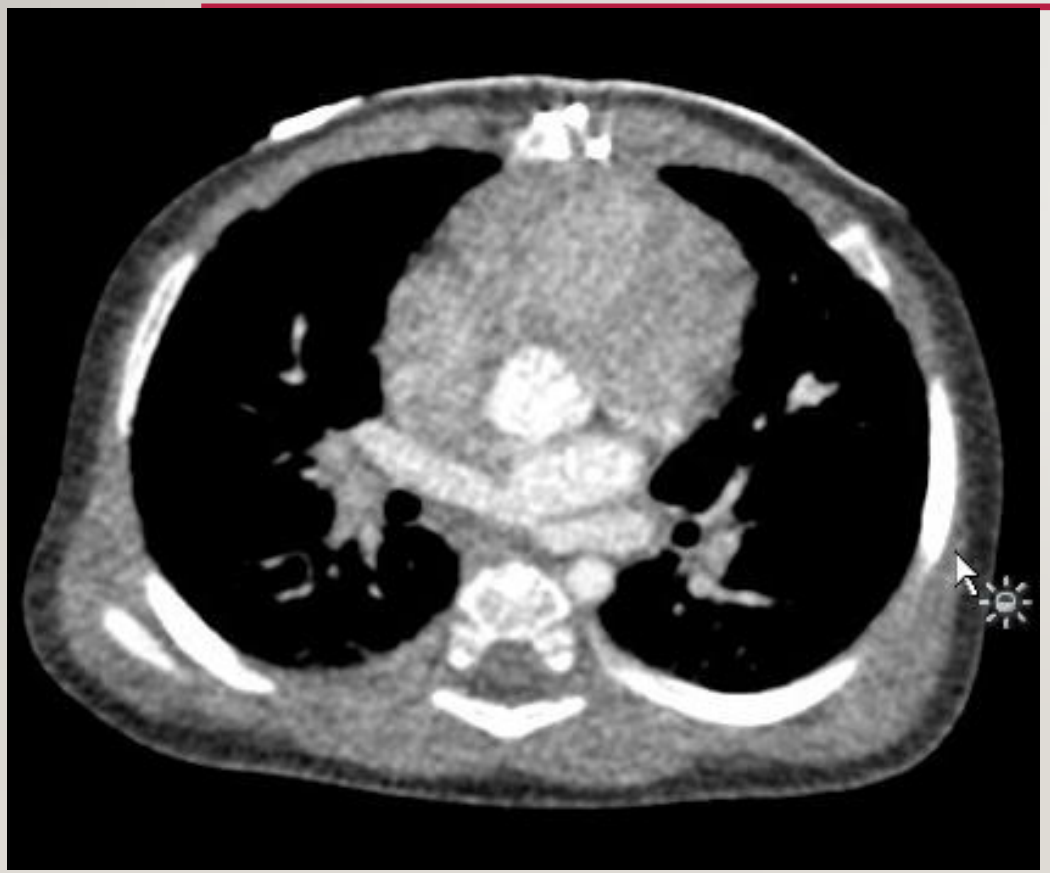
At discharge- after the second pulse on tadafil

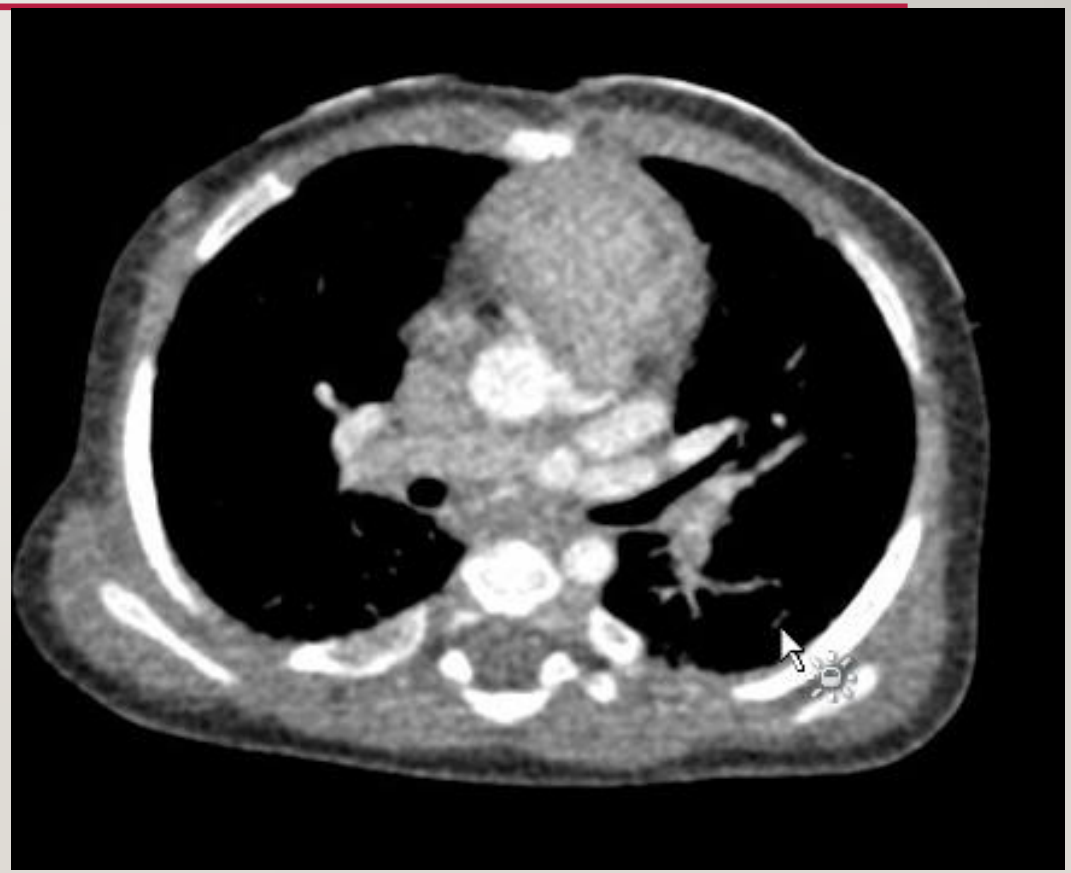
FURTHER COURSE

- Extubated after steroids to NIV and weaned off CPAP in another 1 week
- Started on sildenafil after cath
- Subsequently weaned off and in room air by 3 weeks post pulse steroids
- Discharged home on diuretics and tadalafil – off O2
- Predischarge echo on tadalafil – RVSP 2/3rd systemic

FOLLOW UP AT AGE OF 6 MONTHS

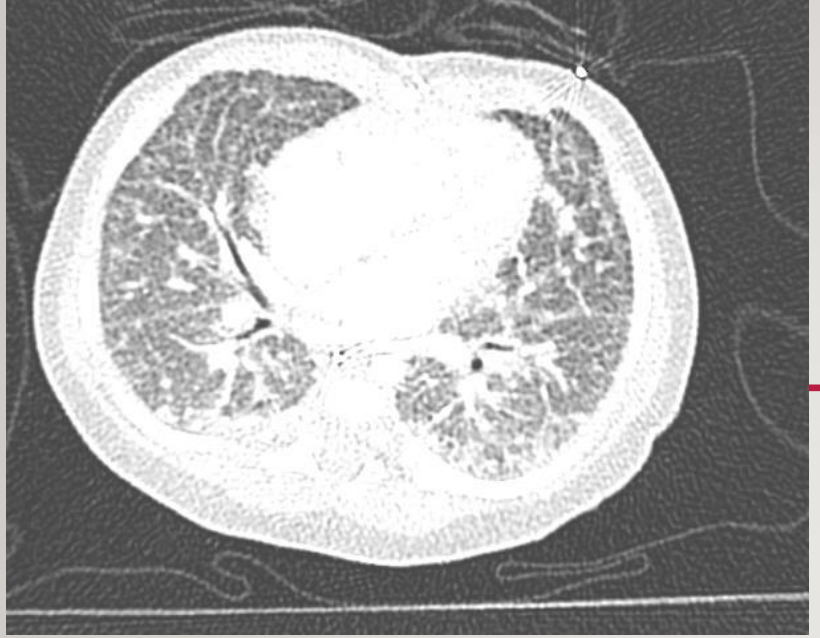
- Thriving and developing well.
- Baseline tachypnoea , no O2 requirement
- Tolerated metapneumoviral infection well at age of 5 months
- Received a total of 4 monthly pulse steroids
- On tadalafil , aldactizide and bosentan
- Follow up CT chest with Angio -
- Follow up ECHO -

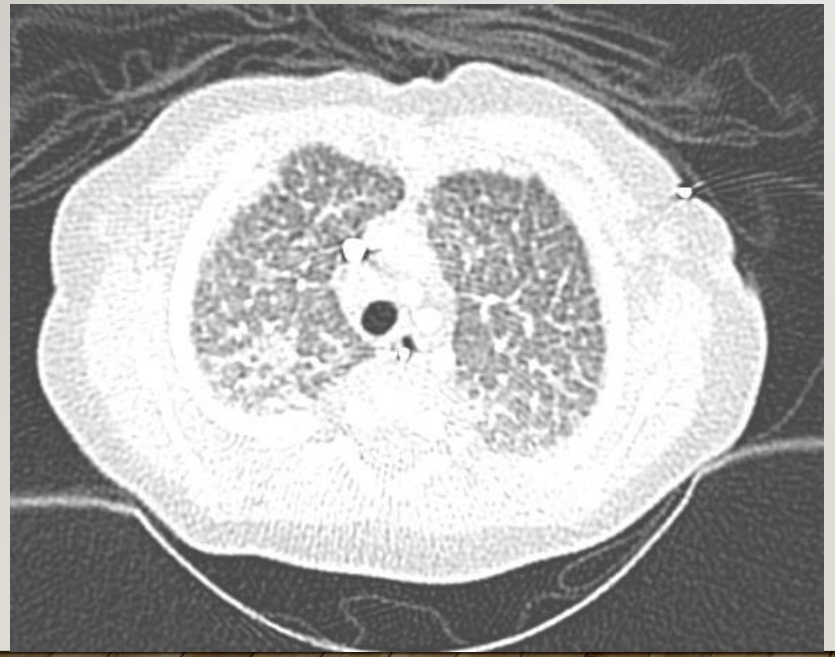




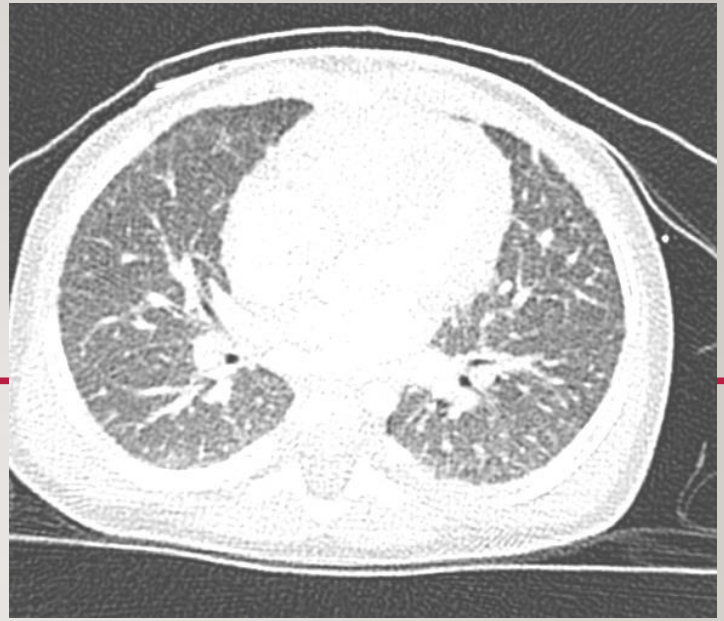
ECHO AND CT ANGIO AND FOLLOW UP

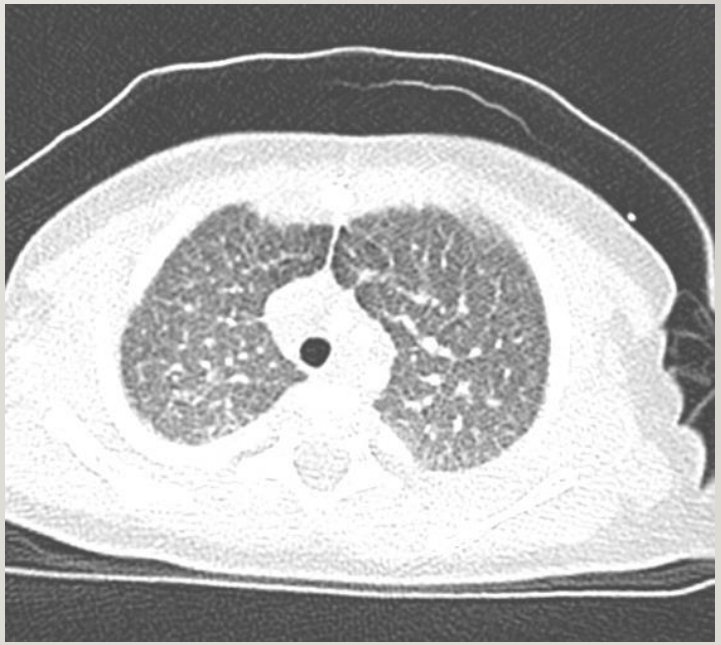
- RVSP 2 /3rd systemic ,septal flattening
- Narrowing of left lower pulmonary vein and left upper pulmonary vein with mean gradient of 11 and 5 mm Hg
- Narrowing confirmed by CT angio
- Planning suture less repair of pulmonary vein stenosis in the next one month
- We are planning to continue monthly pulse methyl prednisolone upto 6 doses .





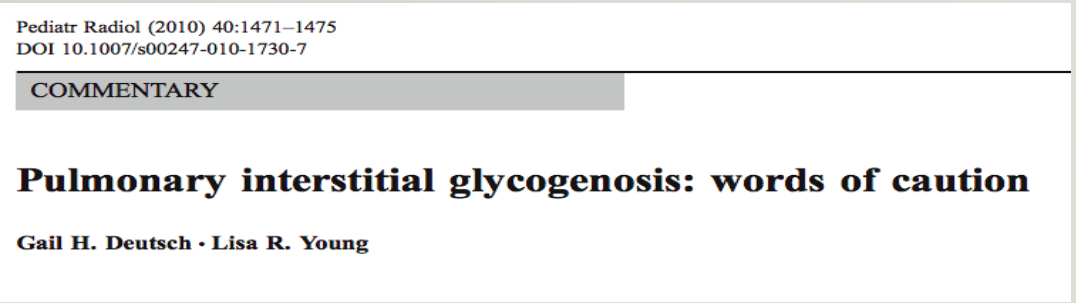
After
6 months





ONGOING DEBATES

- Is it a specific developmental abnormality with aberrant differentiation or reflects a non-specific reactive process secondary to different underlying diseases ?
- What is the optimal treatment – indications , dose and duration of steroids not clear-positive outcomes in case series could have reporting bias.
- Usually described as good prognosis - but it is more important prognostically to recognize the lung growth abnormality and clinical context than it is to diagnose PIG by histology


Pediatr Radiol (2010) 40:1471–1475
DOI 10.1007/s00247-010-1730-7

COMMENTARY

Pulmonary interstitial glycogenosis: words of caution

Gail H. Deutsch · Lisa R. Young

Seidl E, Carlens J et al.Pulmonary interstitial glycogenosis - A systematic analysis of new cases, Respiratory Medicine (2018)

IS IT THE HEART OR THE LUNG ?

Or is it both ?