

# Jennie Godwin, DO

Dr. Godwin is originally from Arkansas but moved to Kansas City for medical school. After spending some time up north for residency she came back to Kansas City for fellowship in Neonatology and is very happy to be staying on as faculty starting this fall. Dr. Godwin has two young boys who are the loves of her life and 14 house plants.



# Mystery Case

Presented by: Jennie Godwin DO and Karishma Rao MD

Created by: John Daniel MD, MS

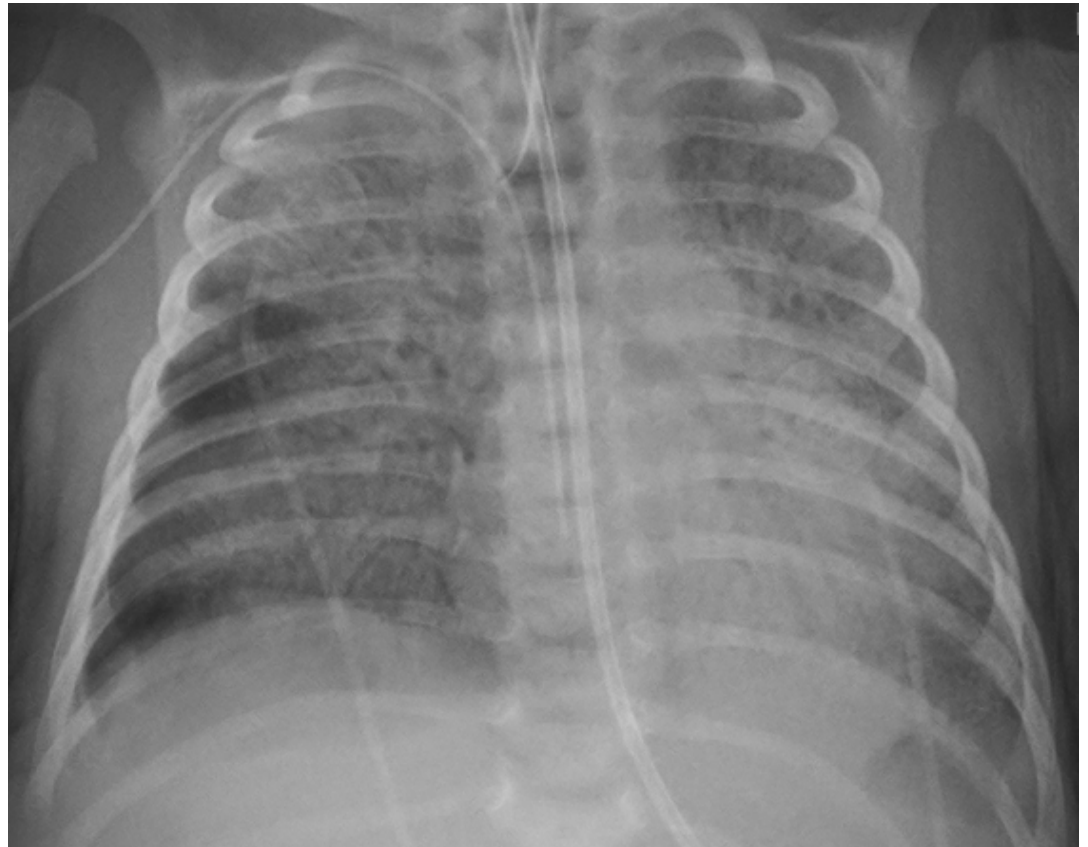


# Mystery Case: Pre-admission

- The patient is a 2-week-old term male infant of a set of twins presented to an outside ED for lethargy and abnormal breathing
  - Lethargic and in respiratory distress
  - Temperature of 31.8 C
- Non-invasive respiratory support did not result in improvement and he ultimately was intubated
  - Patient had cardiac arrest during intubation and received 10 minutes of CPR before ROSC

## Mystery Case: Pre-admission

- Ampicillin and gentamicin were started for presumed late onset sepsis
- Prostaglandins initiated due to concerns for congenital heart disease



# Mystery Case: CMH NICU

## ➤ Echo

- Normal cardiac anatomy and normal biventricular function

## ➤ Labs

- AST 393 (20-77)
- ALT 247 ( $\leq 44$ )
- CBC showed platelet count of 63,000 (150,000-450,000)

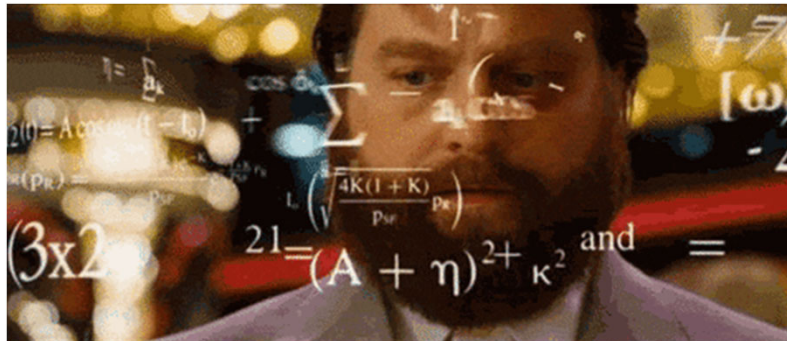
# Mystery Case: CMH NICU

## ➤ Labs

- Lumbar puncture
  - Total nucleated cells 4 (0-30 cells/mcL)
  - Glucose 70 (50-80 mg/dL)
  - Protein 115 (20-~150 at this age)
  - HSV PCR, Enterovirus PCR, Paraechovirus PCR were negative
- Blood culture x2 **negative**
- Urine CMV PCR **negative**
- Respiratory viral panel PCR (sent on HD4 and HD6) **negative**
  - Influenza A (subtypes H1, 2009 H1, H3), Influenza B, RSV, Adenovirus, Human Metapneumovirus, Parainfluenza (1, 2, 3, 4), Rhinovirus/Enterovirus, Bordetella pertussis, Chlamydia pneumoniae, Mycoplasma pneumoniae, and Coronavirus (HKU1, NL63, OC43, and 229E)

# Mystery Case: CMH NICU

- Infant began to improve after arrival, extubated to NIV respiratory support on HD4
- Normal neurologic exam
- *So why was this baby so sick?*



# Mystery Case: The Plot Thickens

- On HD 6 the patient's twin brother is admitted for increased work of breathing, nasal congestion and apnea
- Respiratory viral panel as well as SARS-CoV-2 RT-PCR swab were sent on the twin brother
  - (+) SARS-CoV-2 (COVID-19)



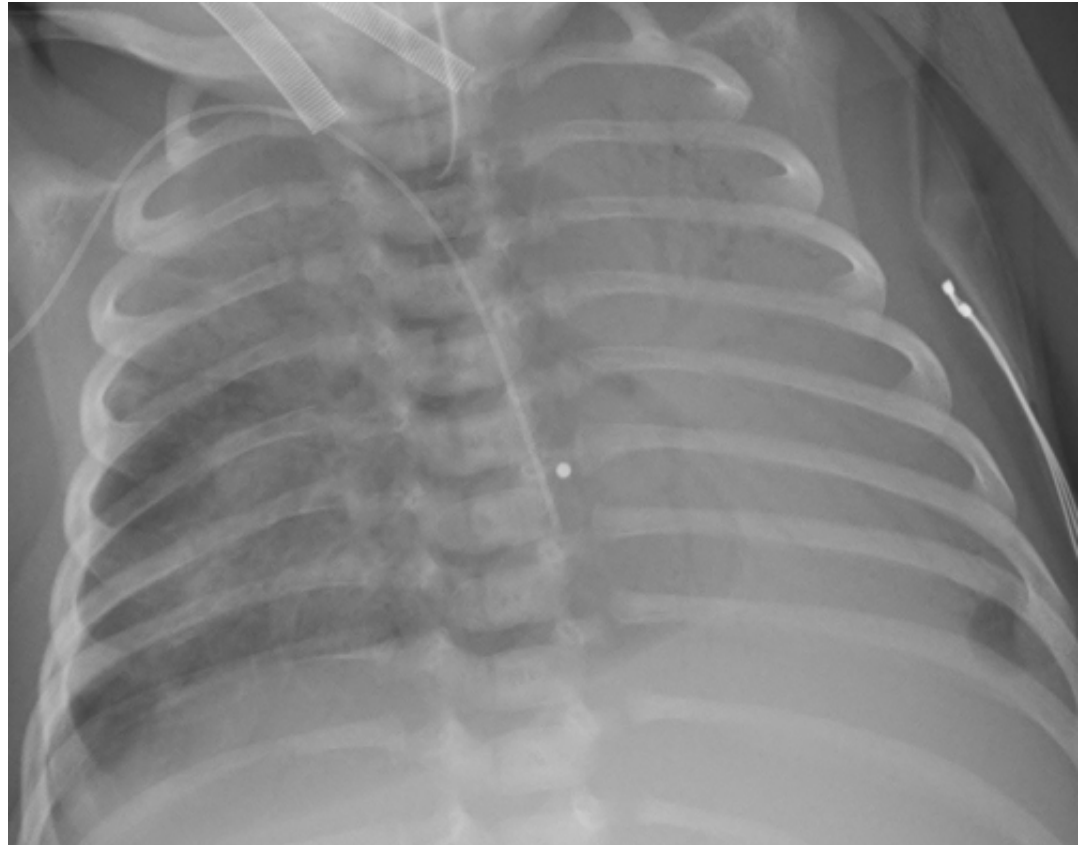
# Mystery Case: The Plot Thickens

- We then sent SARS-CoV-2 RT-PCR on our patient and it was also *positive*
- So we were dealing with Neonatal COVID



## COVID-19: Clinical Course

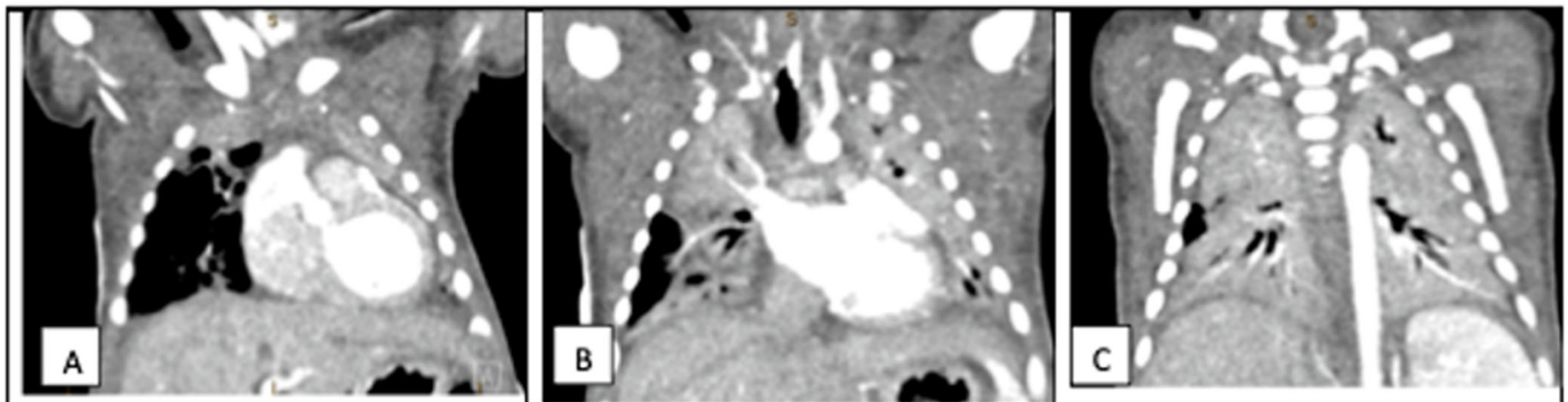
- The patient's twin brother only developed mild symptoms
- Unfortunately our patient continued to clinically worsen
  - Required reintubation, sedation, and eventually paralysis
  - Escalated from conventional mechanical ventilation to HFOV
  - Ultimately, ECMO cannulation



# COVID-19: Clinical Course

- After stabilization onto ECMO, a chest CT was obtained showing extensive confluent consolidation throughout both lungs (left > right) most compatible with pneumonia
- Bronchoscopy was performed and revealed no structural abnormalities
- Infant was then extubated to room air for lung rest

# COVID-19: Clinical Course



**Table 2 Coronal images of thorax from CT-angiogram while on ECMO, moving anterior (A) to posterior (C) while on multiple level of PEEP. Extensive consolidation noted throughout the entire left lung, with focal consolidation in the superior and posterior right lung. Presences of multiple air bronchograms confirms consolidation rather than atelectasis.**

# COVID-19: Clinical Course

- Stable on ECMO for several days, with slow improvement of his pneumonia
- Concerning though were his increasing inflammatory markers (CRP, LDH, ESR)
  - Possible concomitant Multisystem Inflammatory Syndrome in Children (MIS-C)

# MIS-C

- Severe inflammatory syndrome associated with COVID-19 infection
- This exaggerated inflammatory response causes damage to vital systems leading to:
  - Hemodynamic instability
  - Myocardial dysfunction
  - Respiratory failure

# COVID-19: Clinical Course

- We reached out to several other large centers in the US and UK for some guidance on how to approach this case
- No other center had seen an child this young with these findings
- So we took the kitchen sink approach – we started trying therapies and hoped something would work



# COVID-19: Clinical Course

**Table 4. Drugs used to treat suspected MIS-C in an infant with COVID-19 pneumonia**

Drug	Dose	Duration
Dexamethasone	0.15mg/kg/dose BID	12 days
Anakinra	1mg/kg/dose BID	3 days
IVIg	2g/kg/dose once daily	3 days
Methylprednisolone	1mg/kg/dose once daily	7 days

- Anakinra (brand name: Kineret) is a immunomodulator used to treat rheumatoid arthritis in adult patients
- Interleukin-1 (IL-1) receptor antagonist
  - IL-1 triggers down stream inflammatory cascade of inflammatory cytokines (IL-6, IL-8, etc.)
- Case reports indicated some success in treating older children with MIS-C

16 in



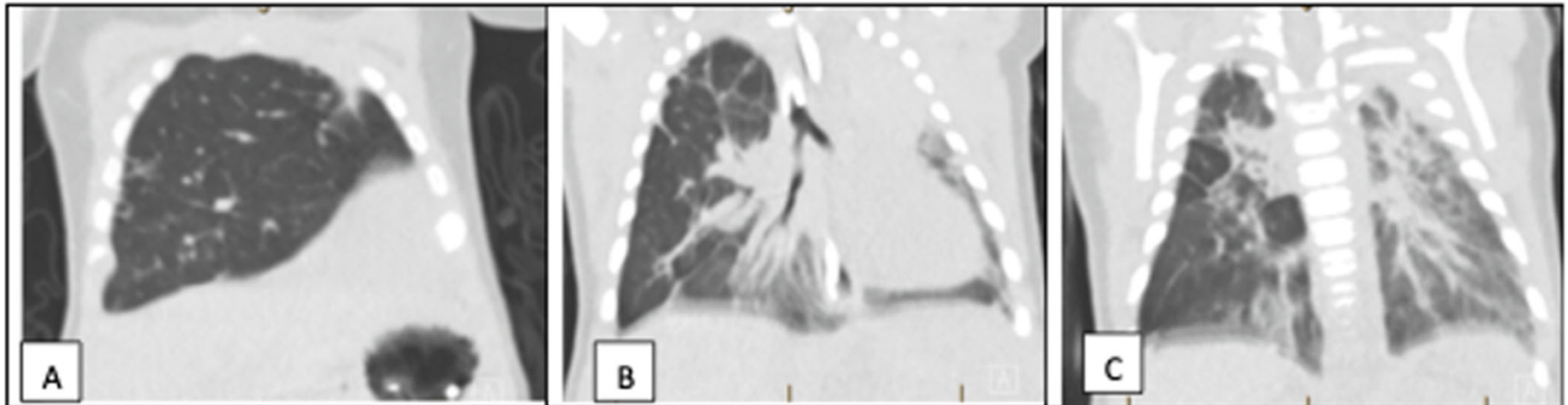
# COVID-19: Clinical Course

- We continued to have *slow* improvement on ECMO
- On day 17 of ECMO the infant developed focal seizures, concerning for ischemic infarct
- He was optimized as best we could do from a respiratory standpoint and decannulated from ECMO on day 22 of his run
  - He required vasopressor and HFOV support

# COVID-19: Clinical Course

- Over the next several weeks he continued to slowly improve
- He has since undergone a tracheostomy and is currently working on transitioning home going ventilator settings

# COVID-19: Clinical Course

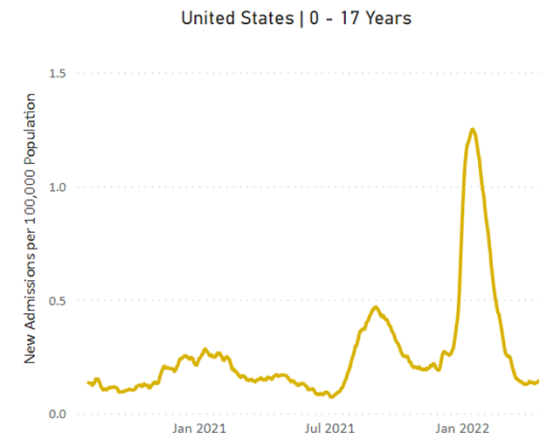


**Table 3 Coronal Images of chest CT two months after ECMO decannulation, scrolling anterior (A) to posterior (C). Severe hyperinflation of the right lung, with expansion across midline of the chest anteriorly. Loss of lung architecture is seen with extensive air trapping.**

Repeat CT scan after decannulation showed progressive lung damage leaving his left lung essentially non-functional

# A Word About COVID

- The novel severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) first appeared in Wuhan, China and started attracting attention worldwide in December, 2019
- Initially, neonates seemed to be relatively spared from severe COVID-19 requiring hospitalization
- B.1.617.2 (Delta) variant of SARS-CoV-2 (June 20 - July 31, 2021) hospitalization rates among children aged 0-4 years increased 10-fold by the middle of August 2021



# Final Thoughts



- Although the majority of neonates who test positive for SARS-CoV-2 are either asymptomatic or have only mild symptoms, COVID-19 should remain on the differential when a neonate presents with cardiorespiratory failure
- Concurrent development of MIS-C presents additional management challenges, but use of immunomodulating agents should be considered in infants with severe COVID pneumonia



# Thank you!



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