Pulmonary Hemorrhage: A Case Study

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PURPOSE

Present the case of a preterm extremely low birth weight (ELBW) infant with pulmonary hemorrhage (PH) and a hemodynamically significant patent ductus arteriosus (hsPDA) and describe management of these interrelated conditions.

BACKGROUND

PH is acute bleeding in the lungs due to pulmonary edema.

- Strongly associated with hsPDA due to pulmonary over-circulation
- Typically occurs in first 2-4 days of life
- Incidence: 50/1,000 live births in NICU population
- Mortality rate: 50% in preterm infants
- Multiple risk factors contribute to PH

Risk Factors

Maternal

- Pregnancy induced HTN
- Toxemia/Preeclampsia
- Infection
- Bleeding Disorders
- Medications: anitconvulsants, antitubercular drugs, vit K antagonists, no antenatal steroids

Infant

- Prematurity
- Intrauterine growth restriction (IUGR)
- VLBW/ELBW
- Respiratory (RDS, meconium)
- Sepsis
- Mechanical ventilation
- hsPDA
- Congestive heart failure (CHF)
- Coagulopathy
- Multiple gestation
- Hypothermia
- Polycythemia
- Erythroblastosis fetalis
- ECMO
- Previous blood products
- Urea cycle defects
- Oxygen toxicity

MANIFESTATIONS

- Frank blood from nose, mouth, or endotracheal tube (ETT)
- May be preceded by pink frothy secretions
- Acute respiratory decompensation: apnea, respiratory distress, cyanosis
- Shock: bradycardia, hypotension, poor perfusion
- Chest x-ray (CXR): increased feathery opacities
- Heme: anemia and coagulopathy

CASE STUDY

History:

Infant is a 785 g female born at 28 6/7 weeks' estimated gestational age (EGA) to a 23-year-old G1P000 mother with preeclampsia with severe features. IUGR. Parents married with no significant family health history or substance use. Mother received two doses of betamethasone prior to delivery. Maternal labs unremarkable.

Delivery:

- C-section for pre-eclampsia with severe features, breech presentation
- Meds: Maternal intrapartum IV antibiotics for c-section prophylaxis
- ROM: 0 hours, clear amniotic fluid
- Delayed cord clamping: 60 seconds
- Apgars 7, 9
- Placed in open warmer on warming mattress, in bowel bag
- BCPAP of 6 cm water, 30% oxgyen, OG tube placed
- Normal physical exam for gestational age

Hospital Course:

DOL 0:

- BCPAP at 6 cm water, 21% oxygen
- D10 bolus x 1 for hypoglycemia
- CXR: mild respiratory distress

DOL 1:

- Cryoprecipitate for oozing from IV starts, abnormal coags (see chart)
- Multiple significant apnea events over about 1 hour
- Apnea, bradycardia, blood in mouth
- Code called: PPV, chest compressions, intubation, IV and ET epinephrine
- CXR: increased feathery opacities
- HFOV: MAP 14 AMP 24 Hz 10
- Normal saline bolus x 1, packed red blood cells, platelets
- Morphine, hydrocortisone, antibiotics, surfactant

DOL 6:

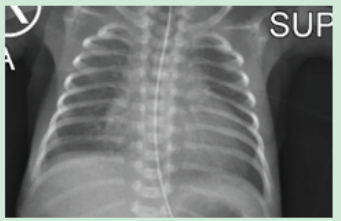
- Persistent intermittent bleeding from ETT
- Additional Vitamin K for coagulopathy
- Heart murmur: hsPDA on echocardiogram

DOL 7:

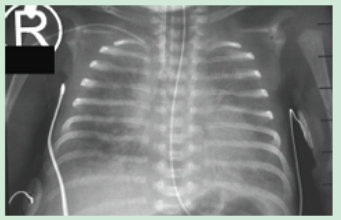
- Acetaminophen course initiated

DOL 12:

- Outcome: PDA closure, resolution of PH and coagulopathy



Initial CXR



After PH

Coagulation Panel	Facility Specific Normal Values	DOL3	DOL2	DOL1
Fibrinogen (mg/dL)	200-430	148 L	174 L	153 L
International Normalized Ratio	0.8-1.1	1.3 H	1.6 H	2.2 H
Partial Thromboplastin Time (sec)	31-48	35		51 H
Prothrombin Time (sec)	13.2-16.7	16.5	19 H	25 H

References

MANAGEMENT

Stop	Bleeding: ETT epinephrine, increase PEEP or MAP to tamponade airways, blood products
Optimize	Oxygenation and gas exchange: consider HFV, surfactant
Treat	Underlying cause: sepis, hsPDA, other.

PDA treatment varies widely between providers.

- Expectant Management: fluid restriction, diruetics, thermoregulation
- Pharmacological: acetaminophen, ibuprofen, indomethacin
- Surgical: PDA occlusion with coil or clip for persistent hsPDA unresponsive to medication.
- Literature supports both expectant management and pharmacologic or surgical closure using an individualized approach.

IMPLICATIONS

PH is life threatening but can be managed successfully.

Severe PH can have long-term sequelae like bronchopulmonary dysplasia (BPD), and doubles the risk of significant neurodevelopmental outcomes.

Clinician understanding of etiology and proper PH management is vital for best patient outcomes.

CONCLUSIONS

PH is significantly associated with hsPDA in preterm ELBW infants.

A multisystem approach is necessary for successful PH management.

Consistent evidence-based guidelines for early identification of hsPDA and individulaized treatment could decrease the incidence of PH in preterm ELBW infants.