Lungs in Crisis: Pulmonary Hemorrhage in Premature Neonates

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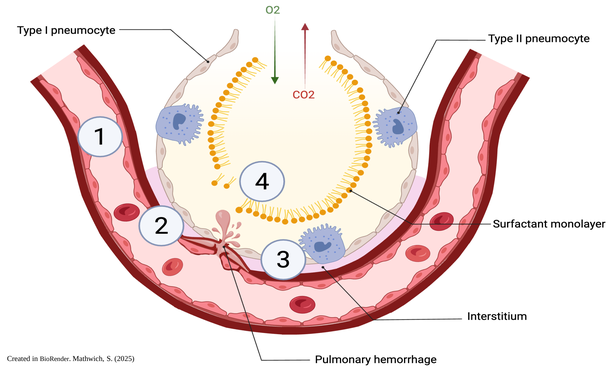
PURPOSE

The purpose of this presentation is to explore the complex pathology of pulmonary hemorrhage (PH) in premature infants. A clinically grounded framework for managing PH is provided.

BACKGROUND

- PH is a critical and often life-threatening condition in neonates
- Defined by extravasation of blood into the alveolar spaces of the lungs during the perinatal period
- Results in impaired gas exchange and acute respiratory compromise
- Most commonly affects very low birth weight (VLBW) infants born before 28 weeks' gestation
- Mortality rate is estimated to be up to 50% in extremely low birth weight infants

PATHOPHYSIOLOGY



1. Increased pulmonary hydrostatic pressure and pulmonary overcirculation develop

2. Endothelial injury leads to loosening of tight junctions and hemorrhagic fluid leaks into the interstitium

3. Pulmonary edema ensues

4. Hemorrhagic fluid ruptures through impaired alveolar wall, inactivating surfactant in the alveoli

RISK FACTORS

PRIME MANDAGEMENT PATHWAY

Initial Presentation
- Blood in airway
- Respiratory decompensation
- Bradycardia & Hypotension

P	R	I	M	E
Prioritize Diagnosis	**Respond with Intervention**	**Investigate Underlying Cause**	**Manage Ongoing Care**	**Escalate Care**
Clinical Assessment Identify sudden respiratory decline with hemorrhagic secretions	**Airway & Respiratory Support:** • Gentle suctioning (one time) • Intubation • Increase PEEP • 100% FiO2	**Infection/Sepsis** Start empiric antibiotics if infection is suspected	**Ventilator Adjustments** Use lung-protective strategies to avoid barotrauma	**Multidisciplinary approach** • Neonatology • Cardiology • Pulmonology • Hematology
Lab Tests • ABG • CBC • PT • aPTT • Fibrinogen • Metabolic Panel • Type & Screen • Coagulation Profile • Newborn Metabolic Screen	**Hemodynamic Stabilization:** • Obtain IV access *(PAL, UVC)* • Volume replacement with crystalloid fluids	**PDA**	**Monitor for Resolution** • Frequent ABG checks • Hemodynamic monitoring	Consider ECMO
Chest X-ray • Alveolar infiltrates • Worsening pulmonary edema	**Medications:** • Surfactant therapy • ET Epinephrine • Consider inotropes if necessary • Analgesics/sedatives	**Coagulopathy**		
Echocardiography Rule out structural heart defects or hemodynamic instability	**Blood Products:** • PRBC • Platelets • FFP • Cryoprecipitate	**Surfactant Administration**		
		Mechanical Ventilation		

Outcome Goals
- Stabilize oxygenation and ventilation
- Prevent further hemorrhagic events
- Address and correct underlying causes
- Minimize long-term lung injury and complications

CLINICAL PEARLS

Likely Timing	• First 72 hours of life
Hallmark signs	• Pink-red frothy secretions from the airway • Sudden respiratory collapse • Cyanosis • Pallor • Hypotension • Fine wet rales

Classification	Clinical Consequences
Mild	• Subclinical
Moderate	• Surfactant inactivation • Ventilation/perfusion mismatch • Rapidly escalating ventilatory needs
Severe	• Moderate PH consequences • Triggers disseminated intravascular coagulation • Requires urgent volume and blood product replacement

CONCLUSIONS

- PH in premature neonates presents a complex clinical challenge influenced by multifactorial pathophysiology. Treatment response may vary.
- Early recognition of risk factors, individualized ventilatory support, and hemodynamic management are critical in optimizing outcomes.
- Up to 50% of infants affected by PH succumb to the pathology, with mortality risk inversely related to gestational age.
- Current literature highlights the necessity for prompt recognition, a deeper understanding of its etiology, and management strategies to provide better long-term pulmonary and neurodevelopmental outcomes for survivors.