No disclosures
Learning objectives

1. Recognize common and uncommon diseases which manifest as dots and bubbles on neonatal chest radiography

2. Understand the stages of embryologic lung development and implications on patterns of lung disease seen in neonatal patients

3. Recognize distinguishing features between “old” and “new” definitions for bronchopulmonary dysplasia

4. Distinguish between various types of air leaks seen in neonates
Parad. Update on the diagnosis and management of bronchopulmonary dysplasia/chronic lung disease of infancy: what the radiologist should know. Pediatr Radiol 2010 (suppl 1); S92-S100.

Intrinsic lung disease

- Surfactant deficiency
- Bronchopulmonary dysplasia (BPD)
  - Old
  - New
Surfactant Deficiency
Surfactant Deficiency

- Prematurity
- New meds – exogenous surfactant, corticosteroids
- Genetic disorders of surfactant dysfunction
  - Mutations in genes encoding surfactant proteins B and C (SP-B) and (SP-C) and phospholipid transporter (ABCA3)
    - Unexplained fetal respiratory distress syndrome in term newborns
    - Can be diagnosed with DNA analysis, but lung biopsy may ultimately be required

Parad. Update on the diagnosis and management of bronchopulmonary dysplasia/chronic lung disease of infancy: what the radiologist should know. Pediatr Radiol 2010 (suppl 1); S92-S100.

Bronchopulmonary Dysplasia

- Evolving disease with definition in flux over last 50 years

- Changing medical/respiratory management with survival of extremely low birthweight infants (< 1000 g) as young as 22 weeks gestational age (WGA)

- “Old”: exposure to O2 > 28 days with abnormalities on chest radiograph

- “New”: 2001 consensus conference of the United States National Institute of Child Health and Human Development (NICHD)
35 WGA preterm infant with persistent pulmonary hypertension and respiratory failure
“Old BPD”
**Bronchopulmonary Dysplasia**

<table>
<thead>
<tr>
<th>TABLE 1. DEFINITION OF BRONCHOPULMONARY DYSPLASIA: DIAGNOSTIC CRITERIA</th>
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</thead>
<tbody>
<tr>
<td><strong>Gestational Age</strong></td>
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<tr>
<td>Time point of assessment</td>
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<tr>
<td>Mild BPD</td>
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<tr>
<td>Breathing room air at 36 wk PMA or discharge, whichever comes first</td>
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<tr>
<td>Moderate BPD</td>
</tr>
<tr>
<td>Need* for &lt; 30% oxygen at 56 d postnatal age or discharge, whichever comes first</td>
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<tr>
<td>Severe BPD</td>
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<tr>
<td>Need* for ≥ 30% oxygen and/or positive pressure (PPV or NCPAP) at 56 d postnatal age or discharge, whichever comes first</td>
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</tbody>
</table>

*Definition of abbreviations: BPD = bronchopulmonary dysplasia; NCPAP = nasal continuous positive airway pressure; PMA = postmenstrual age; PPV = positive-pressure ventilation.*

“New BPD”


Lung Disease in Premature Neonates: Radiologic-Pathologic Correlation Radiographics 2005
Premature infant born at 24 WGA
“New BPD”

Premature infant born at 28 WGA
Congenital Pulmonary Airway Malformation (CPAM) / Congenital Cystic Adenomatoid Malformation (CCAM)

• Congenital Diaphragmatic Hernia (CDH)
CCAM/CPAM
Congenital Pulmonary Airway Malformation/
Congenital Cystic Adenomatoid Malformation

DOL 1

4 months

9 months
Congenital Pulmonary Airway Malformation/
Congenital Cystic Adenomatoid Malformation
CPAM/CCAM

27 weeks GA

35 weeks GA

DOL 1

10 months
Congenital Diaphragmatic Hernia

- Most known prenatally
- Enteric tube, catheter, and mediastinal deviation
Spontaneous/Iatrogenic

- Pulmonary Interstitial Emphysema (PIE)
- Pneumatocele
- Pneumomediastinum
- Pneumothorax
- Pneumopericardium
Pulmonary Interstitial Emphysema

- Parenchymal disease, most commonly surfactant deficiency
- Barotrauma
- Rupture of overdistended pulmonary alveoli leading to entry of air into the pulmonary interstitium
DOL 1

DOL 2

DOL 2 decubitus

DOL 7

DOL 45

26 WGA Preterm Infant
Diffuse
24 WGA, DOL 2

Unilat
24 WGA on jet, DOL 2

Focal
26 WGA on jet, DOL 7
Persistent pulmonary interstitial emphysema in a 25-day-old premature girl. Multiple radiolucent cystic structures throughout the right lung with linear and punctate structures within these cystic lucencies (line-and-dot pattern).

Donnelly, et al. CT findings and temporal course of persistent pulmonary interstitial emphysema in neonates: A multiinstitutional study. AJR 2008;4, 1129-1133
Pneumatocele

Premature infant born at 24 WGA

DOL 1

DOL 6
Pneumomediastinum

- Outlines and lifts thymus
  - Spinnaker sail sign

- Anterior
  - Usually resolves with conservative treatment

- Posterior
  - Can decrease venous return
Premature IUGR infant born at 27 WGA – developed pneumomediastinum on DOL 1 after uncomplicated intubation and administration of surfactant
• Posterior pneumomediastinum
  – Can impair venous return

• Echo: compression of left atrium with decreased and turbulent flow in the pulmonary veins

• Expired
Pneumopericardium

• Known complication of respiratory distress syndrome

• Can be iatrogenic

• Gas contained within the pericardial reflection
  • Outlines heart, aorta, pulmonary artery

• Tamponade determined clinically
  • Increasing respiratory distress
  • Cyanosis
  • Muffled heart sounds
Pneumopericardium
Summary

5 days later
S/p bronchoscopy for RUL
persistent atelectasis

5 days later
26 weeks, 2 days GA

7 years

*Presented with permission