How to interpret and evaluate bronchopulmonary dysplasia in neonates

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Outline

• How to interpret BPD
  • “old” vs. “new” BPD patterns
• NIH clinical definition
• Evaluation: What does the clinician want to know?
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How to interpret BPD

• BPD is
  • a structural lung disorder
  • most often associated with premature infants
  • leads to chronic respiratory and radiographic abnormalities
How to interpret BPD

• It is important to remember that:
  
  • BPD has changed since first described
    • Pathophysiology
    • Epidemiology
    • Clinical definition
  
  • Changes reflect
    • improvements in neonatal intensive care
    • Survival of younger patients
How to interpret BPD

• Patterns of injury

  • “Old” BPD, aka “long standing healed” or “classic”
    • Etiology is injury of alveolar structure
    • Damage is heterogeneous

  • “New” BPD
    • Etiology is arrest of alveolar development
    • Damage is homogenous
“Old” BPD pattern

• The BPD pattern first described in 1967
• Pre-surfactant era
• Patients were older and larger than those diagnosed with BPD today
  • Mean CGA 33 weeks
  • Mean weight 1600 g
  • Lungs developmentally more mature than today’s BPD patients
Lung Development

• 5 developmental phases
  • Embryonic (26d to 6 weeks)
  • Pseudoglandular (6 to 16 weeks)
  • Canalicular (about 16-28 weeks)
  • Saccular (about 28-36 weeks)
  • Alveolar (36 weeks through infancy)
“Old” BPD pattern

• Historically, “older” preemie born after 28 weeks
• Limited surfactant leads to **necrotizing bronchiolitis**
  • Variable occlusion of small airways
• Maturing alveoli damaged in a non-uniform fashion
• Primary injury is damaged alveolar structure
• Injury is **heterogeneous**
“Classic” BPD pattern

“Old” BPD pattern
“New” BPD pattern

• Today, epidemiology of BPD has changed
  • mean CGA is closer to 27 weeks
  • Mean weight is <1000g
  • Lung is more immature at the time of injury
Lung Development

• 5 developmental phases
  • Embryonic (26d to 6 weeks)
  • Pseudoglandular (6 to 16 weeks)
  • **Canalicular** *(about 16-28 weeks)*
  • **Saccular** *(about 28-36 weeks)*
  • Alveolar (36 weeks through infancy)
“New” BPD pattern

• Typically “younger” preemie born before 28 weeks
• Treated with surfactant
  • No necrotizing bronchiolitis
• Immature alveoli damaged in a uniform fashion
• Primary injury is an arrest of alveolar development
  • Simplified alveolar spaces
  • Fibrosis is diffuse, often mild
• Injury is homogenous
“New” BPD pattern

“New” BPD
Comparison

“Old” BPD

“New” BPD
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“New” BPD
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2005 NIH clinical BPD definition

• Patient is evaluated **at 36 weeks CGA**

• If the patient has had at least 28d of supplemental oxygen at some point, criteria are met for BPD

• Severity grading:
  • Mild- no persistent oxygen requirement
  • Moderate- <30% supplemental O_2
  • Severe- >30% supplemental O_2
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What does the clinician want to know?

- In the acute setting
  - Evaluation of:
    - Support apparatus
    - Hyperinflation
    - Atelectasis
    - Edema
    - Heart size
    - Comparison with prior exams
    - Complications of treatment
What does the clinician want to know?

• In the chronic setting
  • Imaging studies accurately demonstrate gross lung pathology
  • Over time, imaging findings typically improve

However...

• The main complication of BPD in childhood and adolescence is chronic respiratory morbidity (CRM)
• No test yet devised can accurately predict infant’s long term clinical outcome and risk of CRM
Summary

• Remember...

• The pattern of “new” BPD differs from “old” BPD

• According to NIH criteria, clinicians can’t diagnose BPD until 36 weeks of age
Thank you!