Patient

View this article online at: patient.info/doctor/bronchopulmonary-dysplasia

Bronchopulmonary dysplasia

Synonyms: chronic lung disease (CLD) of prematurity, BPD

What is bronchopulmonary dysplasia?

BPD is a chronic lung disease that most commonly occurs in premature infants who have needed mechanical ventilation and oxygen therapy for infant RDS. However, it can also occur in immature infants who have had few signs of initial lung disease.[1] Although the disorder is most often associated with premature birth, it can also occur in infants born at term who need aggressive ventilator therapy for severe, acute lung disease.[2]

Definition[3]

BPD is diagnosed in all preterm infants who needed oxygen at 28 days. However, BPD is considered:

- Mild if, at the time of the final evaluation (at 36 weeks gestational age), the child can tolerate room air.
- Moderate if he or she requires less than 30% oxygen.
- Severe if more than 30% oxygen is required. The need for nasal CPAP or mechanical ventilation further supports the definition of severe BPD.

Bronchopulmonary dysplasia epidemiology[4]

The strongest risk factors for BPD are prematurity and low birth weight.

- Almost 80% of infants who are born at 22–24 weeks of gestational age are diagnosed with BPD, whereas only 20% of infants born at 28 weeks of gestation develop BPD.
- Among infants with BPD, 95% are very low birth weight.

Other perinatal risk factors include intrauterine growth restriction (IUGR), male sex and, inconsistently, chorioamnionitis, race or ethnicity, and smoking. Genetic risk factors may also contribute to the development of BPD.

Bronchopulmonary dysplasia symptoms (Presentation) [2]

Infants affected are usually immature and have very low birth weight.

- The most common clinical scenario is of a 23- to 26-weeks of gestation baby who over a period of 4-10 weeks progresses from needing ventilation to CPAP through to requiring supplemental oxygen.
- Most babies have initial RDS and require respiratory support in the form of ventilation or CPAP.
- They respond well to initial surfactant and ventilation, with improvement in the respiratory distress. However, in some there may be an increase in their oxygen and ventilatory requirements in the first two weeks of life.
- This dependence on respiratory support tends to continue and, although many will come off the ventilator or CPAP, the oxygen dependence continues.
- Many of these babies will continue to have tachypnoea, tachycardia and signs of respiratory distress, such as intercostal recession and nasal flaring.
- Infants with severe BPD have trouble feeding and gain weight poorly because of this and higher energy requirements.
- Bronchial hyperreactivity and wheezing can also occur.
- Some babies can develop pulmonary hypertension.

Differential diagnosis

In an infant with a diagnosis of BPD, worsening of respiratory status can indicate presence of an additional condition such as:

- Pulmonary atelectasis.

- Pneumonia.
- Air leak syndromes (include pulmonary interstitial emphysema, pneumomediastinum, pneumothorax, pneumopericardium, pneumoperitoneum and subcutaneous emphysema).
- Patent ductus arteriosus.
- Subglottic stenosis or tracheomalacia.

Investigations

- CXR:
    - Chest imaging is important in making the diagnosis and assessing for complications
    - As the BPD evolves, the CXR changes with development of diffuse haziness and coarse interstitial pattern which reflects atelectasis, inflammation and/or pulmonary oedema. Areas of gas trapping may alternate with areas of atelectasis.
    - In those with increase in respiratory distress or oxygen requirements, CXR helps to differentiate BRD from other conditions such as pneumonia or air leak syndrome.
    - The diagnostic and prognostic usefulness of CXRs in BPD is highly variable.[5]
- Computerised tomography (CT) scanning has provided insights into the pathophysiology of BPD.[6] CT and MRI scans can provide very detailed imaging of the lungs.
- Arterial blood gases may show acidosis, hypercapnoea and relative hypoxia (for the inspired oxygen concentration).
- Continuous oxygen monitoring by using pulse oximetry is very useful to establish oxygen requirements and ensure appropriate oxygenation.

Bronchopulmonary dysplasia treatment and management[7]

The current therapy for BPD is limited to supportive care including high-oxygen therapy and pharmacotherapy.[8]

- Nasal CPAP is increasingly used at birth rather than ventilation even for the very preterm babies.
- If the baby does need intubation and ventilation it is important to minimise ventilation-associated lung injury. Strict monitoring and maintaining of tidal volumes along with use of synchronised ventilation modes is recommended.
- Nutrition strategies are generally aimed at higher calories with fluid limitation.
- Diuretics, bronchodilators, and corticosteroids (inhaled and systemic) are frequently used in infants with established BPD.

Sequelae and prognosis[9]

Pulmonary outcome
Children with a history of BPD continue to have impaired lung function and increased respiratory morbidity, with decreased pulmonary function during infancy, a considerable impact on pulmonary function later in childhood, and an increased risk of developing asthma.

Infants with BPD are at an increased risk of developing serious pulmonary infection, particularly due to respiratory synctial virus (RSV).

- The Green Book recommends use of palivizumab prophylaxis in preterm infants with BPD during the RSV season.[10]
- Vaccination against influenza should be given for children with BPD unless contraindicated.[11]

Neurodevelopmental outcome

Preterm infants in general are predisposed to poor neurodevelopment outcomes. In addition to other predetermined factors, BPD adversely affects preterm infants' neurological outcomes including a lower head circumference, cerebral palsy, and lower cognitive and language skills. Prolonged positive pressure ventilatory support, grade III–IV intraventricular hemorrhage, and discharge at more than 43 weeks gestational age have been found to be predictors of impaired neurodevelopment.

Cardiac outcome

Infants with BPD are at a higher risk for developing pulmonary hypertension and cardiac dysfunction. Patients with BPD and pulmonary hypertension have substantially higher morbidity and mortality compared to patients with BPD without pulmonary hypertension. BPD with pulmonary hypertension has a mortality of up to 50%. Studies suggest that almost 50% of infants with moderate/severe BPD at 36 weeks PMA have a lower right ventricular function on echocardiography compared to infants with no/mild BPD. Abnormal left ventricular myocardial performance also correlates with the severity of BPD.

Prevention

Giving prophylactic steroids to mothers at risk of premature labour to reduce risk of infant RDS.[12]

A Cochrane review has confirmed that early surfactant replacement therapy with extubation to nasal CPAP compared with later selective surfactant administration with continued ventilation is associated with less need for ventilation and lower incidence of BPD.[13]

Early systemic postnatal corticosteroid treatment (started during the first six days after birth) prevents BPD and the combined outcome of mortality or BPD. However, it increases risks of gastrointestinal perforation, cerebral palsy, and the combined outcome of mortality or cerebral palsy.[14]

A Cochrane review suggests that late systemic postnatal corticosteroid treatment (started at seven days or more after birth) reduces the risks of mortality and BPD, without evidence of increased cerebral palsy. However, it concludes that the current evidence is limited so the use of late corticosteroids should be reserved for babies who cannot be weaned off the ventilator.[15]

Further reading

- Jensen EA, Dysart K, Gantz MG, et al; The Diagnosis of Bronchopulmonary Dysplasia in Very Preterm Infants. An Evidence-based Approach. Am J Respir Crit Care Med. 2019 Sep 15;200(6):751-759. doi: 10.1164/rccm.201812-2348OC.

Last updated by: Dr Colin Tidy, MRCGP 21/07/2023	
Peer reviewed by: Dr Krishna Vakharia, MRCGP 21/07/2023	**Next review date:** 19/07/2028