Respiratory Distress Syndrome (RDS)

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Etiology

- Pulmonary system most vulnerable to premature birth
- RDS or hyaline membrane disease (HMD) major cause of respiratory distress in the newborn.
- Underlying etiology is surfactant deficiency
- Decreased or absent surfactant increases alveolar surface tension, making the lungs stiffer, increasing the neonate’s work of breathing.
Risk Factors

- Gestational age < 35 weeks
- Maternal diabetes
- History of RDS in siblings
- Males > females
- Second born twin
- C-section
- Poor Apgar scores - asphyxia
Contributing Etiologic Factors

- Immaturity of gas exchange airways
- Immature respiratory muscles
- Cartilaginous ribs
- Immature CNS – apnea
- Adverse effects of hypothermia, hypoxemia, and acidosis on surfactant production

See Table 10-1
Vicious Cycle of RDS

↓ surfactant & ↑ PVR

↓

Atelectasis & pulmonary hypoperfusion

↓

Hypoxia, hypercapnea, acidosis

↓

↓ surfactant & ↑ PVR

See Figure 10-1
Clinical Manifestations

• Begin at birth or soon after
• Signs include
  – Tachypnea: RR > 60 bpm
  – Expiratory grunting
  – Chest retractions
  – Nasal flaring
  – Cyanosis
  – Other signs include, hypothermia, flaccid muscle tone and hypoactivity.
• Chest X-ray: small (bell-shaped), uniform reticulogranular, with air bronchograms
• ABGs: hypoxemia & respiratory/metabolic acidosis
• Worsen 1st 48 to 72 hours → recovery
Clinical Manifestations

- Sternal Retraction
- Cyanosis
- Jaundice
- A Typical Premature
  - Weight: 1560 gm (3 lb 7 oz)
  - Length: 45.5 cm (17\(\frac{1}{2}\) in.)
- Sudden Abdominal Distention
Chest X-Ray

- Chest x-ray shows underaerated areas with ground glass appearance.
- Air bronchograms appear with worsening atelectasis
Treatment

• Prevention
  – Prenatal care
  – Tocolysis and administration of glucocorticoids to the mother – accelerates fetal lung maturity

• Surfactant replacement (requires intubation)
  – Prophylactic administration: to infant at risk for RDS
  – Therapeutic (rescue) administration: to infant with RDS

• Oxygen and ventilator support
  – Oxyhood
  – Nasal CPAP
  – Intubation & mechanical ventilation
  – High frequency ventilation
  – Adequate alveolar ventilation using low pressures and FiO₂ to maintain PaO₂ between 50 and 80 mmHg.
Treatment

- Dexamethasone
- Albuterol, ipratropium bromide
- Hydration
- Maintain electrolyte balance
- Diuretics (furosemide)
- Thermoregulation
Treatment

- Aggressive treatment
  - Early intubation
  - Prophylactic surfactant
  - Early support of ventilation

- Conservative treatment
  - Watch and wait
  - Lowest level of support
    - Oxyhood
    - Surfactant as rescue
    - Nasal CPAP
    - Mechanical ventilation
Complications

- Secondary to use of mechanical ventilation
  - Intracranial hemorrhage
  - Barotrauma
    - Pneumothorax
    - Pulmonary interstitial emphysema (PIE)
    - Brochopulmonary dysplasia
- Infection, sepsis, disseminated intravascular coagulation (DIC), necrotizing enterocolitis (NEC)
- Patent ductus arteriosus (PDA)
Conclusions

- RDS most common problem in the NICU demanding careful and appropriate respiratory care
  - ~30% of neonatal deaths
  - ~70% of preterm deaths
- Goals of management should be
  - Provide adequate support to allow recovery
  - Minimize complications
  - Be vigilant