

RESPIRATORY DISEASES

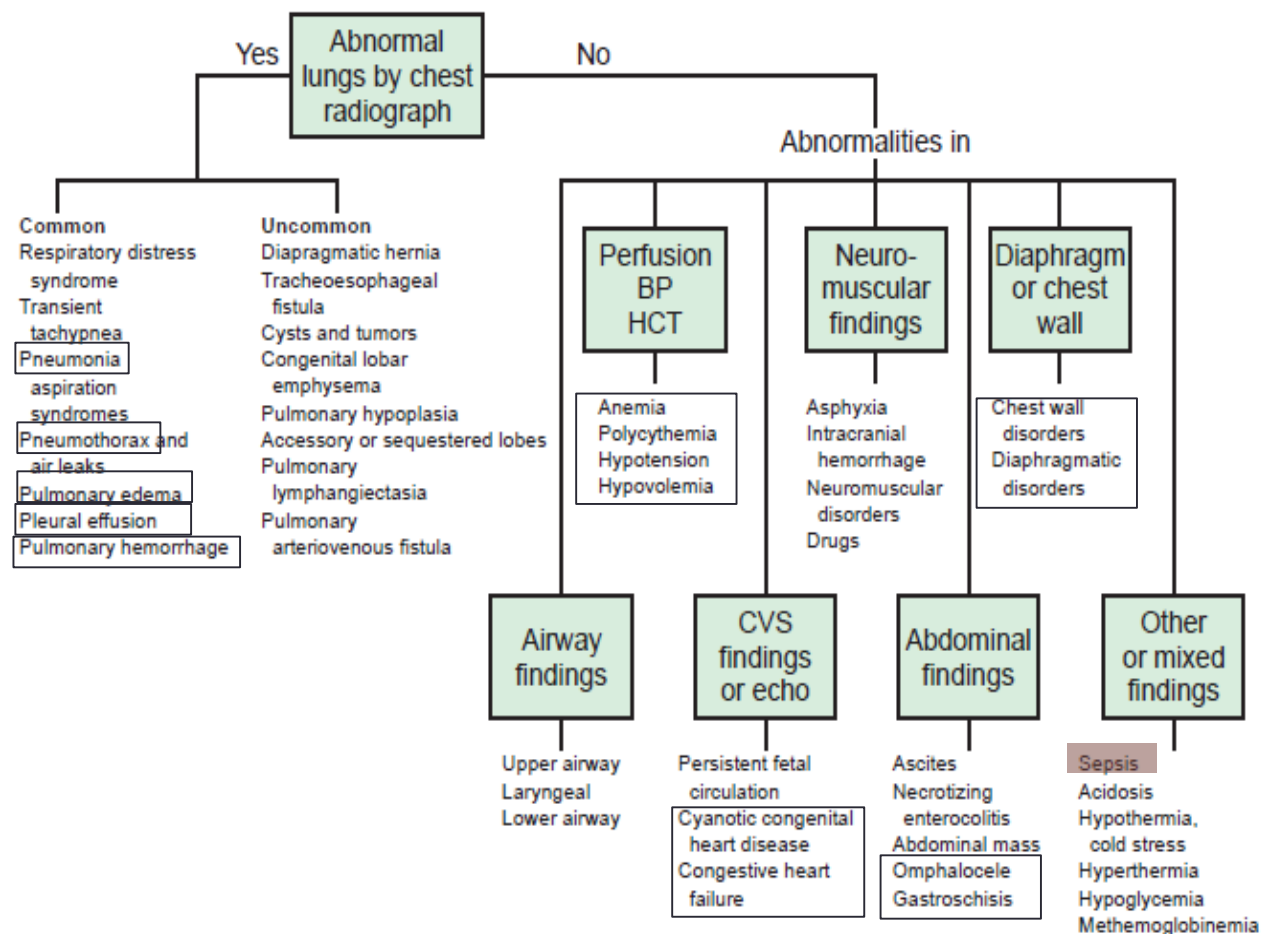
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Introduction

- **Apnea**: No respiratory effort for **> 20 seconds** or if cessation of breathing lasts for **> 10 seconds** and is accompanied by **bradycardia** and or **desaturation**.
- **Periodic breathing** pattern, which shifts from a regular rhythmicity to cyclic episodes of apnea, is **more common in preterm infants**, who may have apneic pauses of **5-10 sec** followed by a burst of rapid respirations at a rate of **50-60 breaths/min** for **10-15 sec**.
 - **a normal characteristic** of neonatal respiration

Neonate with acute respiratory distress



Respiratory Distress Syndrome (Hyaline Membrane Disease)

- **incidence is inversely related to gestational age and birth weight.**
- **Surfactant deficiency (decreased production and secretion; increased consumption) is the primary cause of RDS.**
 - The major constituents of surfactant are **dipalmitoyl phosphatidylcholine (lecithin)**,
 - Composition: 90% lipids, 10% proteins
- **increased surface tension → atelectasis may develop.**
Results in perfused but not ventilated alveoli V/Q mis match, causing **hypoxia.**
- Decreased lung compliance, small tidal volumes, increased physiologic dead space, → ↑ CO₂, ↓ O₂, and ↓ PH → pulmonary arterial vasoconstriction with **increased right-to-left shunting**
- ischemic injury, and oxygen toxicity → **Bronchopulmonary dysplasia / Respiratory failure / Multiorgan failure (Intraventricular H, Pulmonary H, Pneumothorax...)**
- With advancing gestational age, increasing amounts of phospholipids are synthesized in **type II alveolar cells**.
- Surfactant is present in high concentrations in fetal lung homogenates by 20 wk of gestation, but it does not reach the surface of the lungs until later.
- **It appears in amniotic fluid between 28 and 32 wk of gestation.**
- **Mature levels = 35 wk of gestation.**
- Normal **Lecithin : Sphingomyeline ratio is >=2** which indicates mature lungs.
- **Function of lung surfactant**
 1. **Decreases surface tension** during expiration
 2. **Allows the alveolus to keep partly expanded**
 3. **Maintains functional residual capacity**

INCIDENCE

The risk for development of RDS **increases** with

1. Maternal diabetes,
2. Multiple births,
3. Cesarean delivery,
4. Preterm delivery,
5. Asphyxia or hypoxemia
6. Hypothermia
7. Hypovolemia
8. Hypotension
9. Maternal history of previously affected infants.

The risk of RDS is **reduced in**

1. Pregnancies with chronic or pregnancy-associated hypertension,
2. Maternal heroin use,
3. Prolonged rupture of membranes,
4. Antenatal corticosteroid prophylaxis

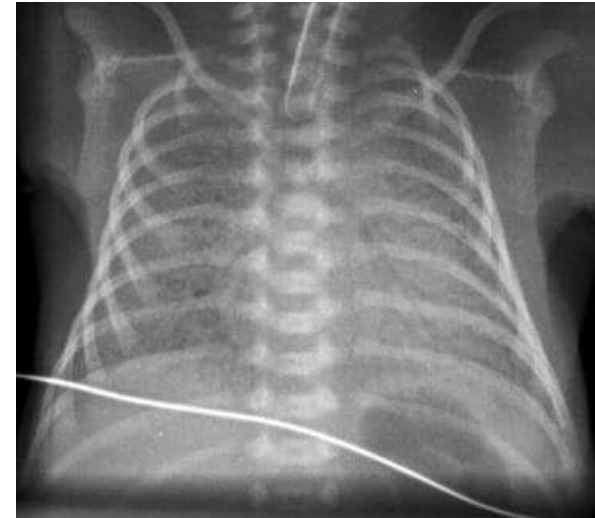
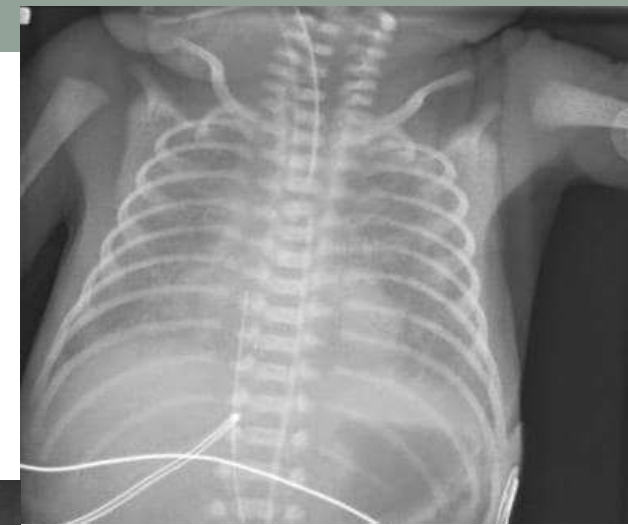
CLINICAL MANIFESTATIONS

1. Signs of RDS usually appear within **minutes to hours of birth**. (Characteristically, tachypnea, grunting, intercostal and subcostal retractions, nasal flaring, and cyanosis)
 2. **History of resuscitation** at birth because of asphyxia
 3. Breath sounds may be normal or diminished with a **harsh tubular quality**
- Improvement is often heralded by spontaneous diuresis and improved blood gas at lower inspired oxygen levels and/or lower ventilator support. (the peak within 3 days, improvement is gradual)**

DIAGNOSIS

- clinical course, chest x-ray findings, and blood gas and acid–base values and Echocardiography (to evaluate complication of RDS → PDA)
- **On chest x-ray**, the lungs may have a characteristic but not pathognomonic appearance that includes a
 1. **fine reticular (Ground glass appearance)**
 2. **air bronchograms**
 3. **Small lung volume** (normal ribs at PA image 8)
- Blood gas and acid–base values
 1. initially by **hypoxemia that may progress**,
 2. **hypercapnia with respiratory acidosis**
 3. **then variable metabolic acidosis.**

Mild RDS
fine reticular (Ground glass appearance)



Moderate RDS
air bronchograms

Severe RDS
Complete white lung
(can't determine the heart)

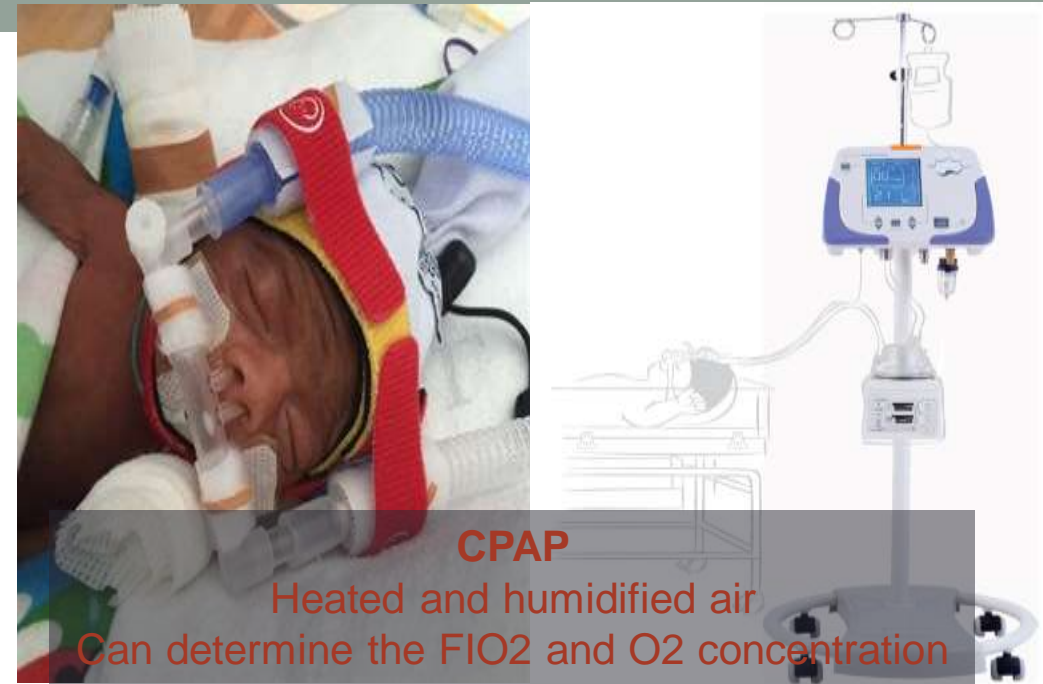


PREVENTION

1. Avoidance of unnecessary or early cesarean section (<39 wk)
2. Administration of **antenatal corticosteroids** to women before 34 wk of gestation
3. **CPAP**

TREATMENT

- A. Therapy requires careful and frequent **monitoring of**
1. Vital = Heart and respiratory rates Blood pressure, Oxygen saturation, Temperature
 2. Pao₂, Paco₂, pH and serum bicarbonate
 3. Electrolytes and KFT
 4. Glucose
 5. Hematocrit
- B. **Oxygen therapy: saturation 88-94%**
- C. **Endotracheal** surfactant replacement therapy
- D. **Empirical antibiotic therapy** is indicated until the results of blood cultures are available.
- E. **Avoid hypothermia** (incubator) 36.5 and 37°C
- F. **Calories and fluids** Excessive fluids (>140 mL/kg/ day) = (PDA) and BPD



- **Reasonable measures of respiratory failure** are:
 1. arterial blood pH <7.20,
 2. arterial blood Pco₂ of 60 mm Hg or higher,
 3. oxygen saturation <90% at oxygen concentrations of 40-70% and CPAP of 5-10 cm H₂O.

TREATMENT

❖ **Surfactant: endotracheal** surfactant replacement therapy include

1. improve oxygenation,
2. improve pulmonary compliance,
3. improved chest radiograph appearance.
4. reduced ventilatory support

• **Complications of surfactant therapy** include

1. transient hypoxia,
2. hypercapnia,
3. bradycardia and hypotension,
4. blockage of the endotracheal tube,
5. pulmonary hemorrhage.



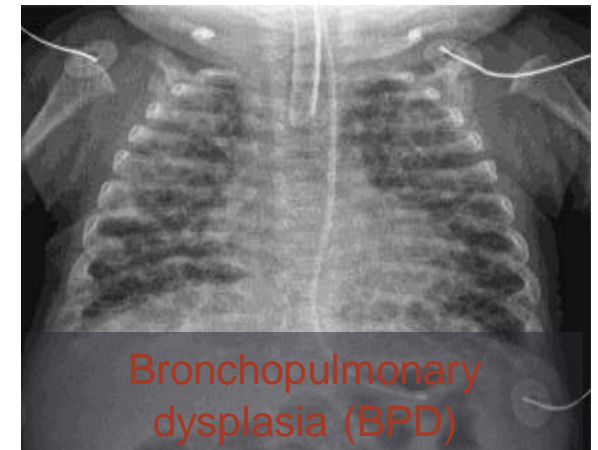
COMPLICATIONS OF RESPIRATORY DISTRESS SYNDROME AND INTENSIVE CARE

- A. Complications of **tracheal intubation**.
- B. Risks associated with **umbilical arterial and venous catheterization**. (renovascular HTN)
- C. **Air leaks** (Pneumothorax, Pneumomediastinum)
- D. **PDA**
- E. **Bronchopulmonary dysplasia (BPD)** : persistent oxygen dependency up to 28 days of life
 - **chest radiograph** = pulmonary interstitial emphysema, atelectasis with hyperinflation, and cyst formation

Treatment of BPD

1. Nutritional and Vitamin A supplementation
2. Early use of nasal CPAP and rapid extubation
3. Diuretic therapy(Furosemide).
4. Inhaled bronchodilators (beta-2 agonist) and Ipratropium bromide
5. Postnatal steroid

Prognosis of BPD = pulmonary HTN, cor pulmonal, RVH, growth failure



Transient Tachypnea of the Newborn TTN

- **early onset of tachypnea** secondary to **slow absorption of fetal lung fluid** = decreased tidal volume and increased dead space = resulting in **persistent pulmonary HYN**
- **diagnosis of exclusion**
- features :
 1. Normal radiographic findings (no RDS and other lung disorders)
 2. Occur in term and late term infants delivered by CS
 3. rapid recovery within 3 days
- Risk Factors:
 1. Maternal = diabetes or asthma
 2. Baby = Male / Macrocosmic
 3. Delivery = CS / low gestational age



- Chest radiograph shows
 1. prominent pulmonary vascular markings
 2. fluid in the intralobar fissures,
 3. rarely, small pleural effusions.

Treatment = Supportive (O₂ and antibiotic)

Meconium Aspiration

- Meconium-stained amniotic fluid usually occurs in **late-term, term or post-term infants**. = **fetal distress and hypoxia** occur before the **passage of meconium** into amniotic fluid.
- Require resuscitation at birth (low Apgar score) due to asphyxia

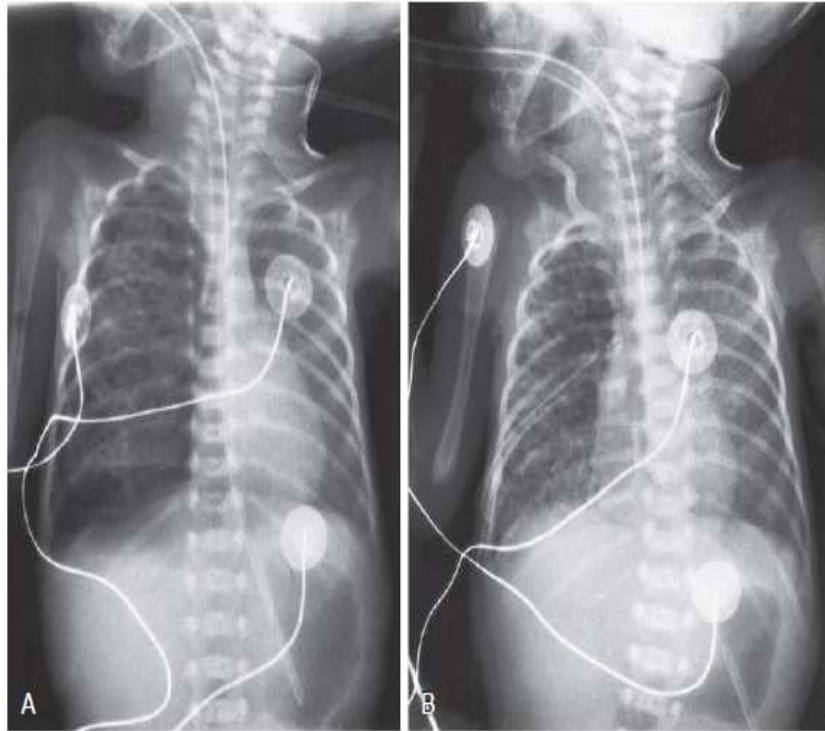


CLINICAL MANIFESTATIONS

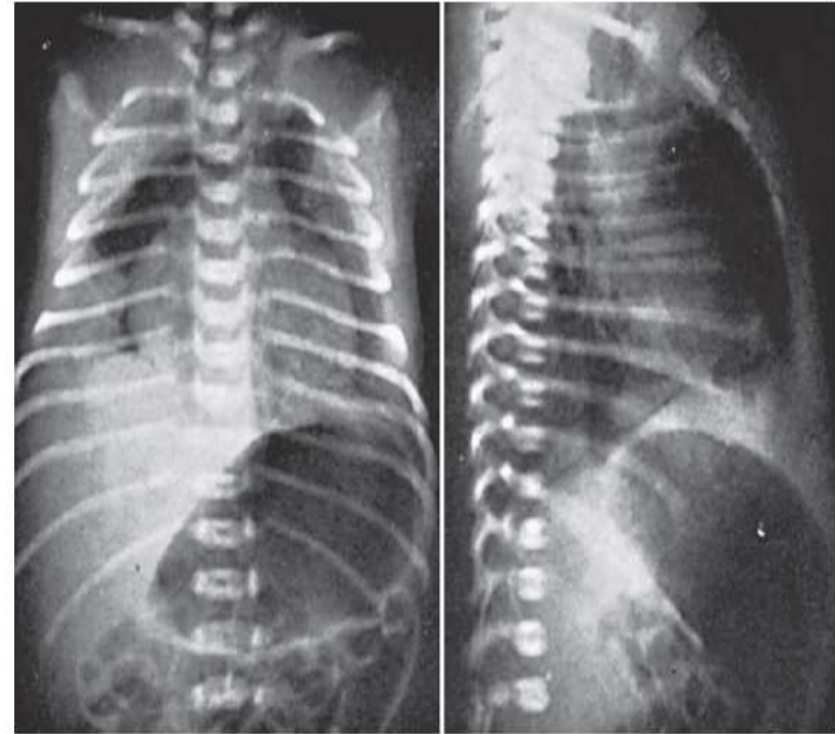
- Signs of Respiratory distress **within the first hours**
- Partial obstruction of some airways may lead to pneumomediastinum, pneumothorax, or both. **Overdistention of the chest** may be prominent.

- The typical chest radiograph is characterized by
 1. patchy infiltrates,
 2. coarse streaking of both lung fields,
 3. increased anteroposterior diameter,
 4. flattening of the diaphragm.
- **Treatment** = similar to RDS + Administration of **surfactant**

Extrapulmonary Air Leaks (Pneumothorax, Pneumomediastinum, Pulmonary Interstitial Emphysema, Pneumopericardium)



Pneumothorax
Due to = RDS, Meconium
aspiration, or spontaneous



Pneumomediastinum

PREMATURITY

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Risk factors for preterm labour

1. Maternal age (<18 yrs or >35 yrs)
2. Maternal ethnicity
3. Multiple pregnancy
4. Infection
5. Hypertension
6. Cervical weakening
7. Uterine malformation
8. Antepartum haemorrhage
9. Amniotic fluid volume (Polyhydramnics and oligohydramnics)
10. Maternal substance abuse (Alcohol, cocaine and cigarette smoking)
11. Fetal abnormality

Clinical management of preterm labour

1. **Magnesium sulphate** reduce the risk of cerebral palsy below 30 weeks gestation.
2. **Betamethasone**
 - ❑ **Corticosteroids given for 48 h before delivery significantly reduce**
 1. incidence of respiratory distress syndrome (RDS),
 2. incidence of intraventricular haemorrhage (IVH),
 3. Risk of NEC
 4. Neonatal mortality
 5. Possibly improve neurodevelopmental outcome.

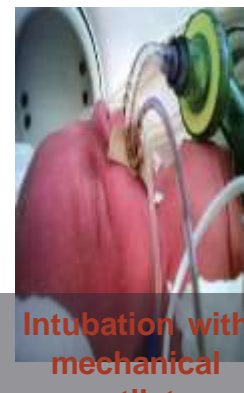
Survival and outcome for the preterm infant

Long-term outcomes

- neurodisability occurring in the most preterm babies (<26 weeks). This can occur **even in the absence of central nervous system (CNS) damage or haemorrhage**,
- There is a higher than expected incidence of
 1. Attention deficit hyperactivity disorder (ADHD),
 2. Autistic features
 3. learning difficulties
 4. Lower Final stature
 5. Lower IQ,
 6. Hearing and visual function.

Stabilization at birth and management in the 'golden hour'

1. transferred to NICU.
2. calm transition and avoidance of trauma or hyperoxygenation.
3. **Monitoring**
 - Vital = Heart rate, respiratory rate, blood pressure and temperature
4. **Thermoregulation** = maintained body temperature in a closed, humidified incubator.
5. **Oxygen therapy**



Complications and Supportive care on the NICU

1. Birth Asphyxia or HIE.

- is the **most common cause** of neonatal seizures in both **full-term and preterm infants**
- **Neonatal signs**
 1. Apgar score <5 at 5 minutes and 10 minutes.
 2. Fetal umbilical artery acidemia
 3. Neuroimaging evidence of acute brain injury
 4. Presence of multisystem organ failure

Therapeutic Hypothermia as management for HIE



2. RDS

3. BPD

4. PDA

5. **IVH** = brain contains a **germinal matrix**, just outside the lateral ventricles , **highly vascular** and vulnerable to hemorrhage

6. **Periventricular leukomalacia (PVL)** = high risk for cerebral palsy

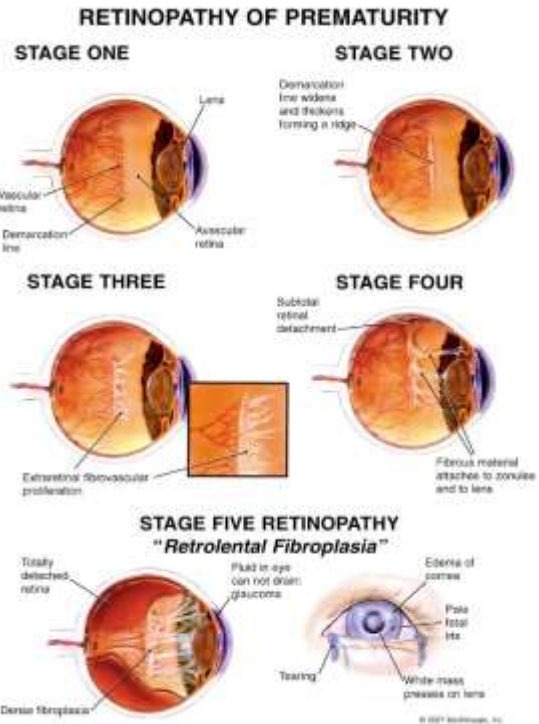
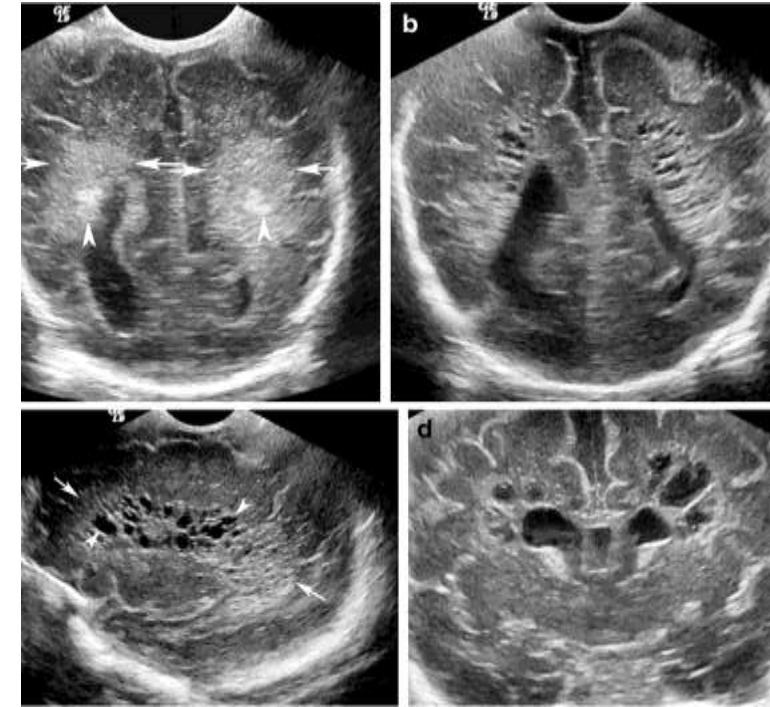
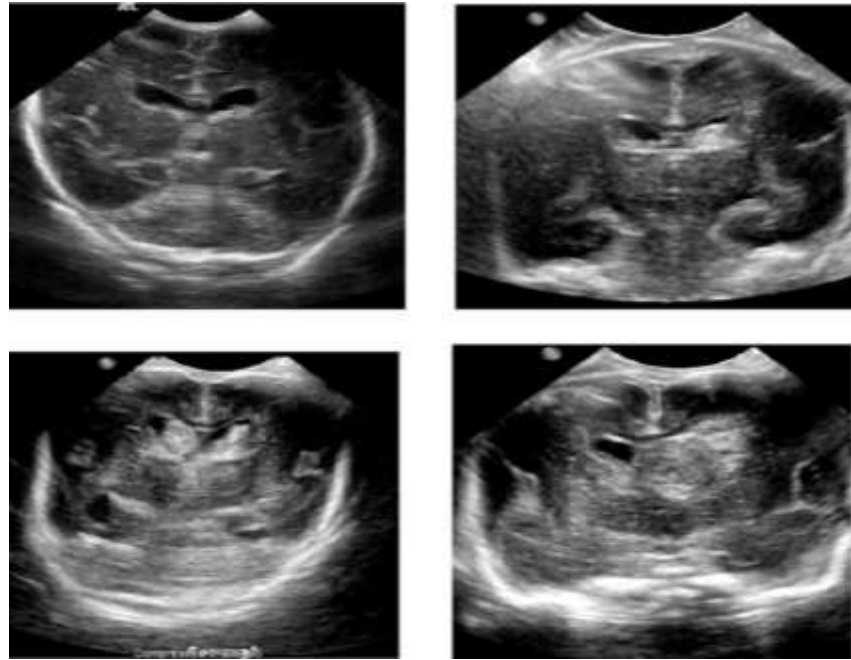
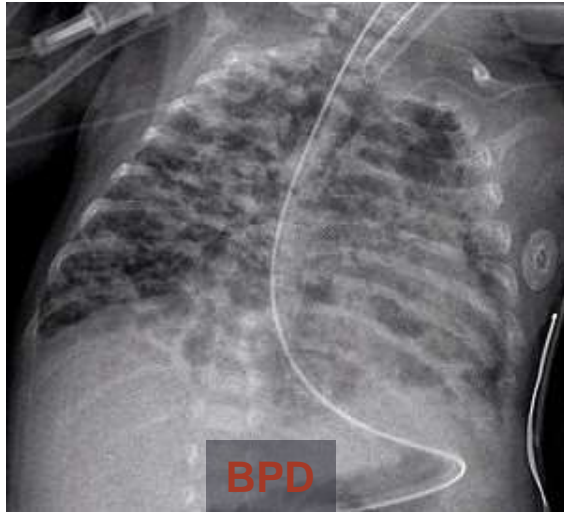
7. **Retinopathy Of Prematurity (ROP)**

8. **Necrotizing enterocolitis (NEC)**

Treatment = ampicillin + aminoglycoside (eg, gentamicin) or third-generation cephalosporin (cefotaxime) + clindamycin or metronidazole

9. **Jaundice**

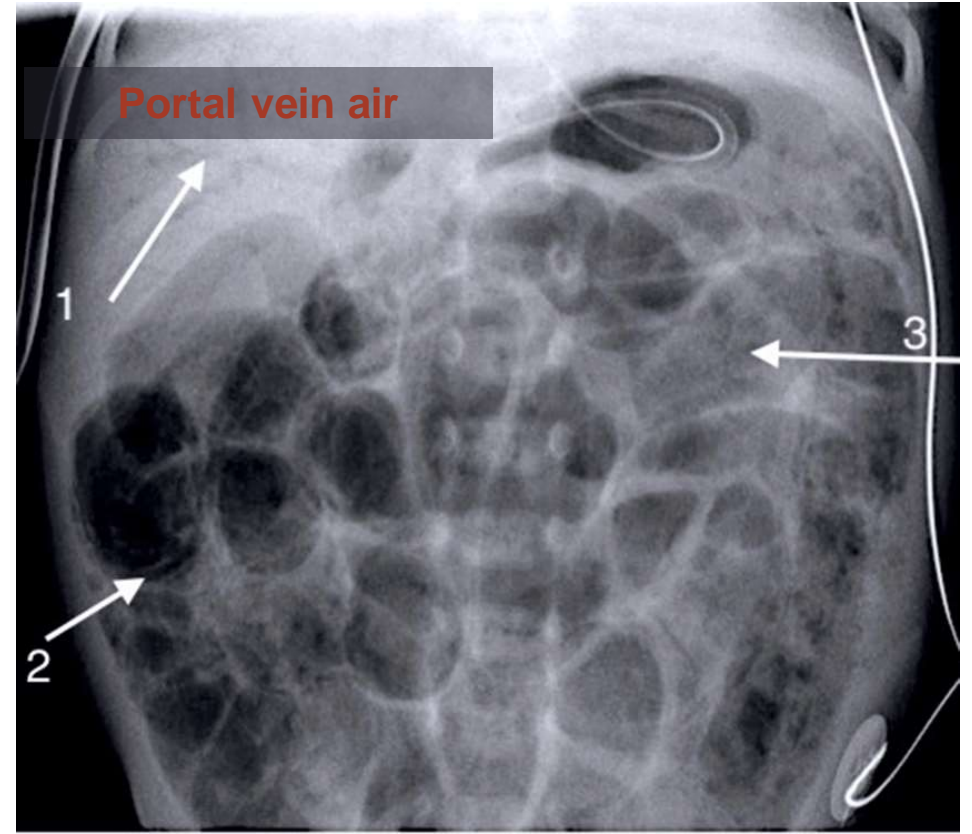
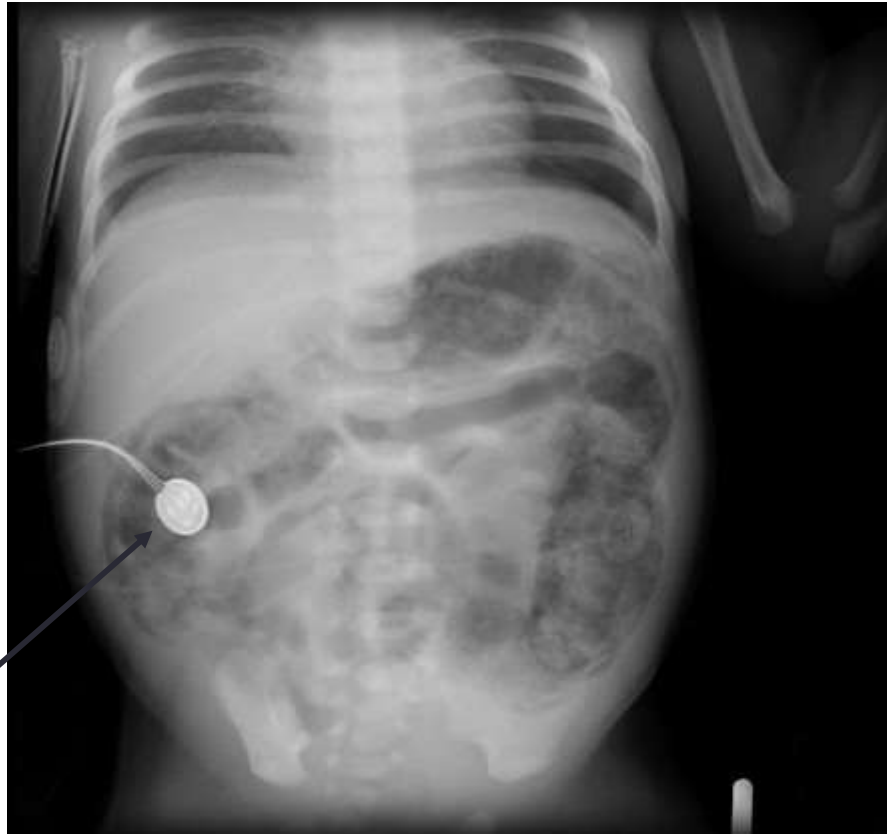
10. **Anaemia**



IVH
Conservative management

Periventricular leukomalacia (PVL)

NEC
Dilated bowel loops
+ pneumatosis
intestinalis (air in
intestinal mucosa)



air of the abdomen in orthostasis; subdiaphragmatic air (arrow) and intestinal pneumatosis (arrow head