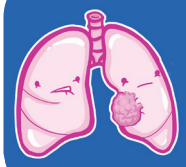

NOTES
PERINATAL ACUTE RESPIRATORY DISEASE

GENERALLY, WHAT IS IT?

PATHOLOGY & CAUSES

- Respiratory problems in newborns/infants; dyspnea to sudden death

SIGNS & SYMPTOMS

- Respiratory distress
  - Cyanosis, bradypnea, tachypnea, etc.

DIAGNOSIS

DIAGNOSTIC IMAGING

Chest X-ray

OTHER DIAGNOSTICS

- Pulse oximetry, arterial blood gases

ECG

- Congenital heart defects

TREATMENT

OTHER INTERVENTIONS

- Supplemental oxygen therapy, assisted ventilation

MECONIUM ASPIRATION SYNDROME (MAS)

osms.it/meconium-aspiration-syndrome

PATHOLOGY & CAUSES

- Respiratory condition caused by aspiration of amniotic fluid contaminated by meconium (fetal stool) before/during birth
- Bile pigments
  - Meconium with black-green color
- MAS in approx. 10% of neonates exposed to meconium
- Meconium in airways
  - *Airway obstruction:* atelectasis
  - Surfactant deactivation, synthesis inhibition
  - *Chemical pneumonitis:* irritates air pathways
  - *Persistent pulmonary hypertension of newborn (PPHN):* hypertrophy of pulmonary vessels due to chronic distress
  - Medium for bacterial growth + reduces antibacterial activity → increases risk of infection

CAUSES

- Initiated by fetal distress due to perinatal complications (e.g. maternal hypertension, preeclampsia, placental insufficiency, oligohydramnios, infection, acidosis, maternal drug abuse)
  - Hypoxia → increased vagal stimulation → gastrointestinal (GI) tract peristalsis + sphincter relaxation → meconium release
  - Hypoxia → fetus gasping, aspiration of meconium-stained amniotic fluid

RISK FACTORS

- Term/post-term gestation (> 40 weeks); perinatal complications → fetal hypoxia, stress

COMPLICATIONS

- Pneumothorax, pulmonary hypertension, neonatal infection, infant respiratory distress syndrome, acidosis

SIGNS & SYMPTOMS

- Meconium spotting during labor
  - Green-yellow colour of amniotic fluid, infant's skin, umbilical cord
- Low APGAR score
  - Appearance, Pulse, Grimace, Activity, Respiration
- Respiratory distress
  - Labored breathing, tachypnea, bradycardia, intercostal/subcostal/substernal retractions, cyanosis, nasal flaring
- Blood gas
  - Hypoxemia, hypercarbia, acidosis

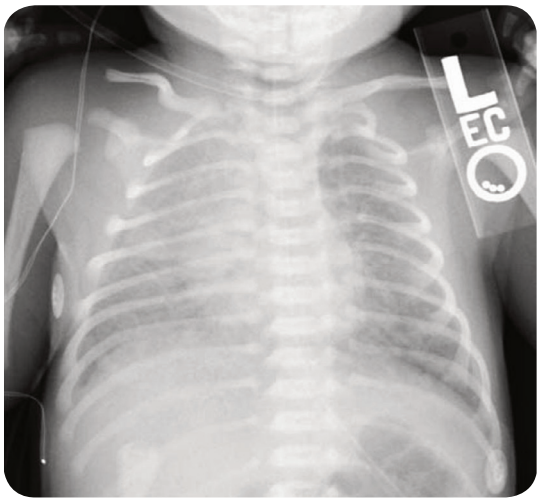

Figure 127.1 A plain chest radiograph of a neonate demonstrating bilateral, diffuse, coarse opacities secondary to meconium aspiration.

DIAGNOSIS

DIAGNOSTIC IMAGING

Chest X-ray

- Patchy atelectasis, consolidation areas
- Hyperexpansion due to airway obstruction
- Pneumomediastinum due to air leak

Ultrasound

- ECG to assess pulmonary hypertension

OTHER DIAGNOSTICS

Meconium

- In amniotic fluid, on infant, in trachea (if intubation required)

Respiratory distress

Pulse oximetry

- Low oxygen saturation

Auscultation

- Crackles, rhonchi sounds

TREATMENT

MEDICATIONS

- Antibiotics
- Maintain circulatory volume; correct existing metabolic imbalances
  - IV fluids; electrolytes, glucose; correct acidosis

OTHER INTERVENTIONS

- Transfer to neonatal intensive care unit (NICU)

Amnioinfusion

- Intrauterine saline infusion
- If meconium-stained amniotic fluid, preventative measures

Maintain oxygenation, ventilation

- Neutral thermal environment
- Decreased oxygen consumption
- Supplemental oxygen
- Mechanical ventilation
- If PPHN
  - Inhalation of nitric oxide (iNO), phosphodiesterase inhibitors
- If severe
  - ECMO

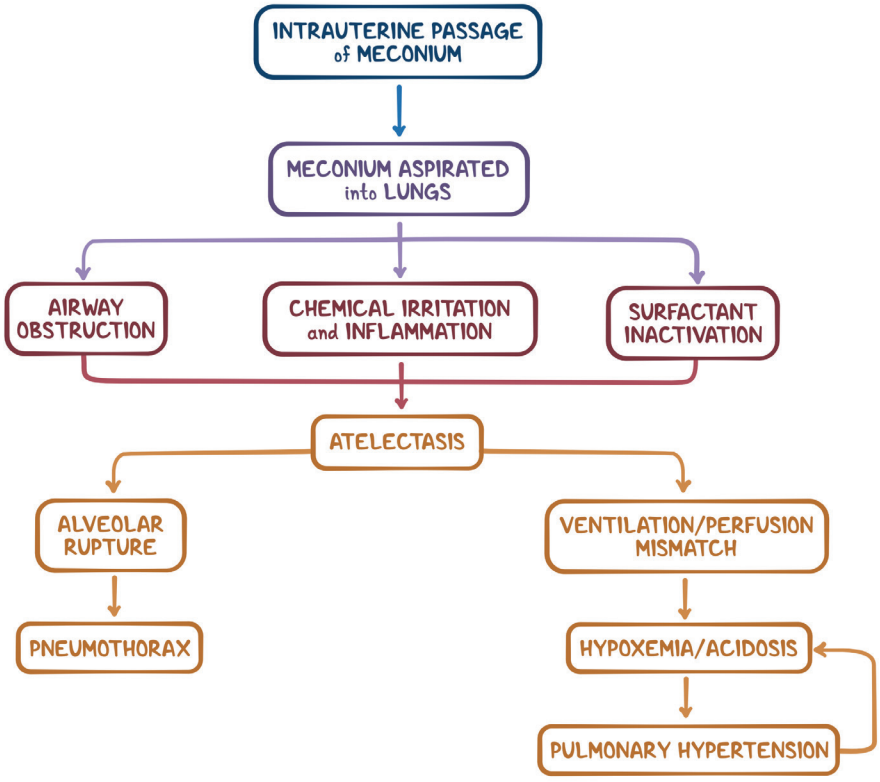

Figure 127.2 Flowchart depicting the pathophysiology of MAS.

Figure 127.3 A histology photomicrograph of the fetal membranes containing meconium laden macrophages.

NEONATAL RESPIRATORY DISTRESS SYNDROME

osms.it/neonatal-resp-distress

PATHOLOGY & CAUSES

Respiratory disease in neonates: loss of lung compliance (distensibility) due to lack of surfactant.

- AKA neonatal respiratory distress syndrome/surfactant deficiency disorder (SDD)
- Surfactant deficiency → ↑ surface tension → ↓ lung compliance → alveoli collapse upon expiration (microatelectasis) → V/Q mismatch → intrapulmonary shunting + extrapulmonary shunting (e.g. through patent ductus arteriosus) → hypoxemia

CAUSES

- Surfactant production inhibition by insulin due to maternal diabetes
- Genetic mutations affect production of surfactant proteins
- Surfactant inactivation by meconium
- Pulmonary inflammation, edema may complicate respiratory distress

RISK FACTORS

- Premature delivery, cesarean delivery, maternal diabetes, intrauterine asphyxia, meconium aspiration syndrome

COMPLICATIONS

Acute

- Acidosis, hypoglycemia, hypotension, infection, diffuse atelectasis, respiratory failure, death

Chronic

- Intracranial hemorrhage, retinopathy of prematurity, bronchopulmonary dysplasia, pulmonary hemorrhage, neurologic impairment

SIGNS & SYMPTOMS

- Respiratory distress
  - Tachypnea, tachycardia, intercostal/subcostal/substernal retractions, cyanosis, nasal flaring, expiratory grunting
- Ventilatory failure (↑ blood CO_2), apnea

DIAGNOSIS

DIAGNOSTIC IMAGING

Chest X-ray

- Low lung volume
- Bilateral, diffuse granular/"ground glass" appearance
- Air bronchograms
  - Pulmonary edema secondary to inflammation, atelectasis

LAB RESULTS

- Oxygen saturation monitor
  - ↓ SaO_2, consider influence of preductal/postductal gradients
- Metabolic acidosis, hypoxia

OTHER DIAGNOSTICS

Physical examination

- Lung auscultation (decreased breath sounds); respiratory distress

Post-mortem histopathology

- Lungs interspersed with hyper-distended alveolar ducts, collapsed alveoli
- Hyaline membranes lining/filling alveoli

TREATMENT

OTHER INTERVENTIONS

- Reduce oxygen consumption
- Radiant warmer, intravenous (IV) fluids with glucose

Assisted ventilation

- If symptoms do not subside
- Endotracheal intubation with synthetic/animal exogenous surfactant therapy

Prevention

- Fetal lung maturity test (if preterm delivery anticipated)
  - Assess surfactant levels by amniocentesis; administer corticosteroids, promote lung maturity

Continuous positive airway pressure (CPAP)

If severe

- Extracorporeal membrane oxygenation (ECMO)

INSURE

- INtubation-SURfactant-Extubation

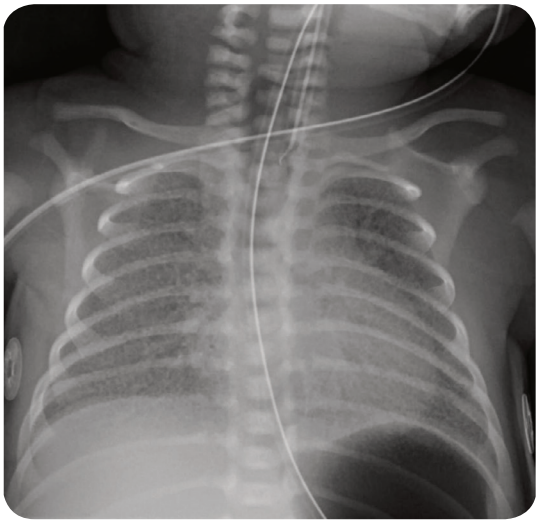

Figure 127.4 A plain chest radiograph of a neonate with infant respiratory distress syndrome. Both lung fields are granular in appearance.

SUDDEN INFANT DEATH SYNDROME (SIDS)

osms.it/sids

PATHOLOGY & CAUSES

- Sudden unexplainable death of infants < one year old despite thorough death scene investigation, analysis of perinatal history, autopsy
- Leading cause of death in infants < one year old; peak incidence, 8–16 weeks

CAUSES

Triple risk model

- Triggering event
  - Sleeping prone, infection
- Underlying vulnerability
  - Genetic polymorphisms involving autonomic nervous system function, cardiac conduction channels, altered cerebral serotonin (5-HT) signaling
- Developmental vulnerability
  - Immature neuroregulation of cardiorespiratory control, delayed immune functionality

RISK FACTORS

- Previous loss of infant from SIDS
- Periconceptional/postnatal smoking, substance abuse
- Teenage (< 20 years) pregnancy
- Inadequate prenatal care
- Premature birth
- Low birth weight
- Intrauterine growth restriction
- Infant of genetically male sex
- Sleep environment
  - Prone position (strongest modifiable risk factor); soft sleeping surface; loose blankets, pillows, stuffed toys; overheating; bed sharing

SIGNS & SYMPTOMS

- Infant fed, put to bed without sign of distress; found unresponsive

DIAGNOSIS

OTHER DIAGNOSTICS

- Diagnosis of exclusion
- Forensic autopsy, clinical history, death scene investigation

TREATMENT

OTHER INTERVENTIONS

- Emergency responders
  - Attempt cardiopulmonary resuscitation; document scene
- Transport to healthcare facility
  - Resuscitation attempt continued
- Physical examination, lab tests documented
- Interview of family members
  - When was infant last seen alive; who found infant, when; history of illnesses; sleeping environment
- Protective factors
  - Prone sleeping position, elimination of environmental risk factors; breastfeeding, room-sharing, not bed-sharing, immunizations

TRANSIENT TACHYPNEA OF THE NEWBORN

osms.it/newborn-transient-tachypnea

PATHOLOGY & CAUSES

- Respiratory condition; presents in first hours of life, periods of non-acute rapid breathing
- AKA "quiet tachypnea"

CAUSES

- Delayed reabsorption of alveolar fluid through epithelial aquaporin channels → increased alveolar fluid → decreased pulmonary compliance, partial collapse of small airways, air trapping → hypoxemia, hypercapnia

RISK FACTORS

- Cesarean delivery without labor; maternal diabetes, asthma, smoking during pregnancy; pulmonary immaturity; surfactant deficiency

SIGNS & SYMPTOMS

- Symptoms present immediately after birth in response to excessive fluid in lungs
- Tachypnea (> 60 breaths/minute), nasal flaring, expiratory grunting, intercostal/subcostal/substernal retractions
- Hypoxemia → hypoxia, cyanosis

DIAGNOSIS

DIAGNOSTIC IMAGING

Lung sonography

Chest X-ray

- Radiopaque levels of fluid in horizontal fissure of lungs; hyperinflated lungs; diaphragm flattening

OTHER DIAGNOSTICS

- Pulse oximetry
- Arterial blood gas assessment
  - Evaluate gas exchange, monitor acid-base balance

TREATMENT

OTHER INTERVENTIONS

- Commonly resolves during first three days of life
- Supplemental oxygen therapy; nasal CPAP if additional support required
- Neutral thermal environment: decrease oxygen consumption
- Orogastric feedings/IV fluids with glucose if PO feedings avoided due to increased respirations
- Antibiotics, if infection suspected