AShir Minnes

RESPIRATORY DISTRESS IN THE NEWBORN

Index

1. General Presentation

Respiratory distress is a clinical condition characterized by the presence of one or more signs of increased work of breathing including: tachypnea, nasal flaring, grunting, and chest wall retractions. It is vital to recognize these signs early and alleviate respiratory distress in the newborn because the patient can rapidly deteriorate to respiratory failure. Some of the underlying causes of respiratory distress include upper and lower airway diseases, lung diseases, and poor respiratory effort secondary to central nervous system dysfunction. Risk factors for developing respiratory distress vary depending on the underlying cause.

2. Questions to ask

Initial assessment of newborns in respiratory distress should begin by evaluating the ABC's (airway, breathing, circulation). Only then should you move onto the history and physical exam. Even though respiratory distress is a clinical sign, details from the patient's history are critical in formulating the differential diagnosis. When faced with a newborn, asking about the pregnancy, labor and delivery are especially important since these questions can elicit risk factors for the various causes of respiratory distress in the newborn.

a) History of Presenting Illness
- Onset (acute vs. insidious)
- Timing
- Severity (improving, deteriorating)
- Associated symptoms (cough, relation to feeds, emesis etc.)

b) Past Medical History
- **Maternal/Obstetric History**: prenatal fetal assessments (ultrasound, amniocentesis, triple screen), Group B Streptococcus (GBS) status, maternal diabetes, infections, toxic exposures, medications

- **Labour and Delivery**: fetal monitoring (HR, beat to beat variability, decelerations), prolonged rupture of membranes, maternal fever, vaginal delivery vs. Caesarian section, gestational age, use of forceps/vacuum, complications (trauma, meconium, asphyxia)
- **Neonatal period**: APGAR scores, need for resuscitation

b) Family History
- Lung disorders
- Congenital heart disease
- Early childhood deaths
- Consanguinity

3. Differential Diagnosis

- Pulmonary
  Respiratory distress syndrome/hyaline membrane disease; transient tachypnea of the newborn/wet lung; meconium aspiration syndrome; pleural effusion; pneumothorax: congenital lung malformations
- Infectious
  Sepsis; pneumonia (GBS, other infectious organisms)
- Cardiac
  Congenital heart disease; persistent pulmonary hypertension of the newborn
- Hematologic
  Blood loss/anemia
  Polycythemia
- Anatomic
  Tracheoesophageal fistula
  Congenital diaphragmatic hernia
  Upper airway obstruction
- Metabolic
  Hypoglycemia
  Inborn errors of metabolism
  Acidosis
  Neurologic
- CNS
  Trauma or intracranial bleed
  Drug withdrawal syndromes
  Seizures
- MSK
  Chest wall deformities

4. Physical Examination

In the assessment of a newborn in respiratory distress, you should perform a focused respiratory exam, as well as exams of the other systems that are part of the differential diagnosis:

Vital signs:

Tachypnea (RR >60/minute), tachycardia (HR >160/minute), decreased oxygen saturation, temperature instability

Inspection (the most important aspect of the physical exam):

Increased work of breathing, cyanosis, pallor, scaphoid abdomen, meconium staining, (clubbing may be difficult to detect in newborns), asymmetric chest wall movement (suggestive of tension pneumothorax)

Palpation:

Tracheal deviation, displaced apical beat, thrill may be palpable in the precodium

Percussion:

Usually not very informative in the newborn (may have dullness to percussion with consolidation, or hyper-resonance with a pneumothorax)

Auscultation:

Make sure you auscultate over all the lung zones (don't forget about the right middle lobe). Listen for air entry (symmetry and adequacy of air exchange), bronchial/vesicular air sounds, adventitious sounds (crackles, wheeze), as well as possible bowel sounds.
It is important to also take the time to listen to the heart sounds for the presence of any pathological murmurs.

Special Tests:

Transillumination of the chest wall is used to quickly detect a pneumothorax

5. Investigations

a) Blood work:

Arterial blood gas (ABG) or capillary blood gas
CBC with differential, blood cultures
Blood glucose
Other blood work will depend on the differential diagnosis

b) Imaging:

Chest x-ray (CXR)
Echocardiogram/ECG (if indicated)

6. Supplementary information

	Patho-physiology	**Risk Factors**	**Presentation**	**Investigations**	**Prognosis/ Treatment**
TTN (Transient Tachypnea of the Newborn) "Wet Lung"	Delayed absorption/ clearance of fetal lung fluid	-Term or preterm -Short labor -C-section -Infant of diabetic	-Tachypnea, -Occasionally grunting and nasal flaring -Onset immediately	ABG: mild to moderate hypoxemia, respiratory acidosis CXR: ↑	Full recovery in 2-5 days Responds well to O2

	Patho-physiology	Risk Factors	Presentation	Investigations	Prognosis/ Treatment
		mother	after birth -Resolves over 24-72 hrs	interstitial markings, fluid in fissures, pleural effusion	
RDS (Respiratory Distress Syndrome) **/ HMD** (Hyaline Membrane Disease)	Lack of pulmonary surfactant	-Preterm -IDM -Short labour -C-section -Asphyxia -Acidosis -Sepsis, MAS	-Resp distress begins at or within few hrs of birth -Worsen over next 24-72hrs	*ABG*: hypoxemia, resp acidosis *CXR*: "ground glass", diffuse atelectasis, air bronchograms, ↓ lung volumes	May require continuous positive pressure ventilation Need surfactant replacement
MAS (Meconium Aspiration Syndrome)	-10-15% of infants are meconium stained, of these, 5% develop MAS -Aspiration can occur before, during, or after delivery -Meconium causes airway obstruction and chemical pneumonitis	-Term or post term -Fetal distress in utero (passage of meconium in amniotic fluid may represent fetal hypoxemia)	-Meconium present -Varying degrees of respiratory distress within hrs of birth -Barrel shaped chest -Audible rales or rhonchi	*CXR*: patchy areas of atelectasis and overinflation 10-20% have pneumothorax	In utero: monitor for fetal distress During labour: intrauterine amnioinflusion Delivery of head: suction oropharynx At birth: intubation, suctioning below the vocal cords
Pneumo-nia/ Sepsis	Inflammation of pulmonary tissues Associated with consolidation of alveolar spaces In neonates: must consider sepsis	-Prolonged rupture of membranes -Maternal fever -Mother is a GBS carrier	-Respiratory distress -Temp instability -Lethargy -Poor feeding -Jaundice -Apnea	*CXR*: Depends on cause (GBS: bilat. conso-lidations, air bronchograms) *Blood Culture*: may be positive Elevated WBC's or neutropenia	Treat with broad spectrum antibiotics until cause of pneumonia is identified and sepsis is ruled out
Congenital Diaphrag-matic hernia	Loops of bowel in chest area via defect in diaphragm Hypoplastic lungs	Often associated with other anomalies (CVS, CNS, GI)	-Respiratory distress -Cyanosis -Scaphoid abdomen -Barrel chest -Dullness to percussion -Absent breath	*CXR*: portion of GI tract in thorax (usually left), displaced mediastinum	Treatment and prognosis depends on the degree of lung hypoplasia as well as the presence of associated

	Patho-physiology	Risk Factors	Presentation	Investigations	Prognosis/ Treatment
			sounds -Asymmetric chest wall mvmt		anomalies
PPHN (Persistent Pulmonary Hyper-tension of the Newborn)	-Persistence of fetal circulation -Right to left shunt via PDA, PFO, intrapulmonary channels -↓ pulmonary blood flow and hypox-emia cause pulmonary vasoconstriction	-Asphyxia -MAS -RDS -Structural abnormalities (Diaphrag-matic hernia, congenital heart disease)	-Respiratory distress -Cyanosis -May have CHF (active precordium, gallop rhythm, single S2, poor capillary refill, weak pulses, hepatomegaly)	*CXR*: abnormal pulmonary vascularity Cardiomegaly *Echo*: increased pulmonary artery pressure, right to left shunt	O2 given early May require surgical correction of heart defect

7. Appendix

Increased work of breathing:

Tachypnea: respiratory rate >60/minute (increased respiratory rate to maintain ventilation in the face of decreased tidal volume)
Grunt: partial closure of glottis during expiration (attempt to maintain lung volume and allow for adequate gas exchange)
Nasal flaring: attempt to decrease airway resistance
Suprasternal retractions/ tracheal tug: suggests upper airway obstruction
Subcostal retractions: less specific sign, associated with either pulmonary or cardiac disease

Respiratory failure:
inadequate oxygenation or ventilation of tissues

Oxygenation: supply of adequate oxygen to tissues
Ventilation: removal of carbon dioxide from tissues
Signs of respiratory failure include cyanosis, gasping, choking, apnea and stridor

Pulmonary Surfactant:

Mixture of lipids and proteins produced by type II pneumocytes in the lung. Surfactant creates a thin layer within the alveoli that decreases surface tension, preventing collapse of alveoli. This increases the amount of available surface area for gas exchange.

8. References

1. Aly H. Respiratory Disorders in the Newborn: Identification and Diagnosis. Pediatrics in Review. Vol 25(6), June 2004: 201-208.

2. Behrman, RE, and RM Kliegman. Nelson Essentials of Pediatrics. W.B. Saunders Company Philadelphia. 2002.
3. Bickley, LS. Bates' Gude to Physical Examination and History Taking. Lippincott Williams & Wilkins. Philadelphia. 2003.
4. Goldbloom, RB. Pediatric Clinical Skills. Saunders. Philadelphia. 2003
5. Molckovsky, A and Pirzada (eds). The Toronto Notes Review for the MCCQE. Toronto Notes Medical Publishing 2004.

Acknowledgements
Writer: Shir Minnes