Neonatal Respiratory Distress Syndrome

Neonatal respiratory distress syndrome (NRDS) is a condition related to fetal lung immaturity in premature infants (<37 weeks gestational age) and a lack of surfactant. Infants with NRDS will exhibit signs of respiratory distress including tachypnea, nasal flaring, intercostal/substernal retractions, and audible grunting upon expiration. Interventions used to treat NRDS include administration of exogenous surfactant, oxygen therapy, and mechanical ventilation. It is important to note that infants with NRDS should not receive bottle or gavage feedings, as these may increase their respiratory rate and risk of aspiration. Instead, total parenteral nutrition (TPN) is used to provide the infant with adequate nutrients.

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Cause/Mechanism

Fetal Lung Immaturity

Fetus Lungs Missing

The respiratory system is one of the last organs to fully develop structurally and functionally. Infants with immature pulmonary systems are unable to fully oxygenate their bodies. Fetal lung immaturity may lead to the development of neonatal respiratory distress syndrome (NRDS). Premature infants born less than 37 weeks gestational age are at an increased risk of developing NRDS. Other causes of NRDS not related to prematurity or of pulmonary origin include sepsis, heart defects, exposure to cold, obstruction of the airway, intraventricular hemorrhage, hypoglycemia, metabolic acidosis, blood loss, and drugs.

Lack of Surfactant

Lacking Surf-surfactant at alveoli

Neonatal respiratory distress syndrome is most commonly caused by a lack of surfactant in the infant's lungs. Surfactant is a substance that reduces surface tension in the alveoli of the lungs and helps to prevent alveolar collapse. The more premature the newborn, the less surfactant available, thus increasing the likelihood of NRDS.

Assessment

Respiratory Distress

Lungs Shooting Flare-gun

Most infants with this condition will be tachypneic, initially, with a respiratory rate greater than or equal to 80-120 breaths/min. Because these infants are in respiratory distress, they may appear pale or cyanotic due to inadequate oxygenation.

Nasal Flaring

Nasal Flare

Nasal flaring is a sign of respiratory distress in infants, indicating that there is increased work of breathing.

Retractions

Retractions at ribcage

Retractions occur in infants experiencing respiratory distress and indicate that additional muscles in the chest are being used to breathe. Intercostal retractions can be noted between the infant's ribs during inspiration, while substernal retractions are seen below the infant's breastbone.

Grunting

Grunting-boar

Grunting upon expiration can be heard without the use of a stethoscope in infants with respiratory distress syndrome. Keep in mind that once the neonate begins grunting, constant positive airway pressure (CPAP) is the only way to improve respiratory status.

Interventions

Surfactant

Surf-surfactant at alveoli

Surfactant is a substance that reduces surface tension in the alveoli of the lungs and helps to prevent alveolar collapse. Administration of exogenous surfactant can be used as a rescue treatment for infants in respiratory distress. This allows for improved breathing and gas exchange. Surfactant is given via endotracheal tube into the trachea.

Oxygen

O2-tank

Oxygen therapy may be initiated to maintain adequate oxygenation, while also preventing lactic acidosis related to hypoxia. Oxygen must be warmed and humidified, when administered to infants. Oxygen therapy is commonly delivered via nasal cannula or nasal prongs with CPAP.

Mechanical Ventilation

Mechanical Vent-ventilator

Mechanical ventilation may be indicated if the infant's $PaCO_2$ level begins to rise, and the neonate is unable to maintain an adequate oxygen saturation by means of oxygen therapy via nasal cannula or CPAP. Suction only as needed.

Considerations

Total Parenteral Nutrition (TPN)

Nutritional-plate IV

Bottle and/or gavage feeding with a nasogastric tube is contraindicated in infants with NRDS, as it may increase their respiratory rate and risk of aspiration. Instead, total parenteral nutrition (TPN) is used to provide the infant with adequate nutrients. Oral hygiene is especially important for infants who are NPO. Oral care using sterile water or breastmilk is recommended.