Derleme / Review
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Respiratory Distress in Newborn

Yenidoğanda Respiratuvar Distress

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ÖZET

Solunum zorluğu, bir bebeğin yenidoğan yoğun bakım ünitesine kabul edilmesinin en yaygın nedenlerinden biridir. Bütün dönem yenidoğanların % 7'sini etkileyen, prematürelerde daha yaygın ve yüksek oranda görülen bir durumdur. Yenidoğan yoğun bakım ünitesine başvuran bebeklerin% 15'inde ve geç preterm bebeklerin% 29'unda önemli solunum yolu morbiditesi gelişmektedir. Yenidoğanda solunum sıkıntısı, takipne, burun akıntısı, çekilme veya inleme gibi artan solunum eforunda bir veya daha fazlasında artış olarak kabul edilir.

Yenidoğanda solunum sıkıntısı nedenleri çeşitli ve multisistemiktir. Pulmoner nedenler normal akciğer gelişimi veya ekstrauterin hayata geçiş sırasında değişiklikler ile ilişkili olabilir. Yenidoğanda solunum sıkıntısının altta yatan nedeni değişmektedir ve her zaman akciğer kaynaklı değildir. Bu nedenle, ilk resüsitasyon ve stabilizasyondan sonra, daha spesifik bir tanı ve uygun yönetimi belirlemek için ayrıntılı bir öykü, fizik muayene, radyografik ve laboratuvar bulgularının kullanılması önemlidir.

Yenidoğanda solunum sıkıntısını kolayca tanımayı ve çeşitli nedenlerin her biri ile ilişkili fizyolojik anormallikleri anlamayı öğrenmek optimal yönetime rehberlik edecektir..

Anahtar Kelimeler: yenidoğan, prematüre, solunum sıkıntısı,

ABSTRACT

Respiratory distress is one of the most common causes of neonatal intensive care unit admittance. In the whole newborn period the incidence is 7%, but is becoming more common and is even more common in premature babies. Fifteen percent of babies admitted to neonatal intensive care unit and 29% of late preterm infants develop significant airway morbidity. Respiratory distress in newborn is considered as an increase in one or more following factors designating increased respiratory effort; tachypnea, runny nose, nasal flaring, retraction or grunting.

The causes of respiratory distress in the newborn are diverse and multi-systemic. Pulmonary causes may be associated with changes in normal lung development or during extra uterine life. The underlying cause of respiratory distress varies in the newborn and is not always caused by respiratory system. It is therefore important to use a detailed history, physical examination, radiographic and laboratory findings to determine a more specific diagnosis and appropriate management after initial resuscitation and stabilization.

Understanding respiratory distress in newborn is easy and understanding physiological abnormalities associated with each of the various causes will guide the optimal management.

Key Words: newborn, premature, respiratory distress

INTRODUCTION

Respiratory distress is one of the most common causes of neonatal intensive care unit admittance. In the whole newborn period the incidence is 7%, but is becoming more common and is even more common in premature babies (1). Fifteen percent of babies admitted to neonatal intensive care unit and 29% of late preterm infants develop significant airway morbidity. This risk is higher for babies born before 34th gestational week (2). Some risk factors increase the likelihood of neonatal respiratory disease; prematurity, meconium stained amniotic fluid (MAS), cesarean delivery, gestational diabetes, maternal chorioamnionitis and presence of prenatal ultrasonographic findings such as oligohydramnios or structural lung abnormalities (3). However, it is not always possible to predict who will become symptomatic. Respiratory distress can lead to respiratory failure and cardiopulmonary arrest if unnoticed and not managed properly, regardless of the cause. Therefore any healthcare proffesional who cares for newborn babies should easily

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recognize the symptoms and signs of respiratory distress, distinguish between various causes and initiate management strategies to prevent significant complications or death (4).

Failure to diagnose symptoms in newborn and treatment of underlying respiratory distress can lead to short and long-term complications such as chronic lung disease, respiratory failure, and even death. The downe score can be used as a simple assessment tool in healthcare institutions in the periphery, making a decision whether to continue treatment with CPAP (Continuous Positive Airway Pressure) in the same center or to be referred to an advanced neonatal unit early, until a more sophisticated test / prediction model is available.

Table 1. *Downe Scoring System*

	0	1	2
Cyanosis	None	Room air	40% FiO_2
Retraction	None	mild	severe
Grunting	None	Audible with Stethoscope	Audible without stethoscope
Air entry-make baby cry and listen breath sounds while baby cries	Clear	Decreased or Delayed	Barely audible
Respiration rate	< 60	60-80	>80

Assessment; >4: Clinical respiratory distress , Check blood gases , >8: Risk of Respiratory Failure

DEFINITION AND SYMPTOMS

Respiratory distress in newborn is considered as an increase in one or more following factors designating increased respiratory effort; tachypnea, runny nose, retraction or grunting.(6) Normally, the respiratory rate of the newborn is 30 to 60 breaths per minute. Tachypnea is defined as a respiratory rate greater than 60.(6) Tachypnea is actually a stabilizing mechanism for hypercarbia, hypoxemia or acidosis (both metabolic and respiratory), making it a common but non-specific finding in a wide variety of respiratory, cardiovascular, metabolic or systemic diseases.(7) Pulmonary disease can trigger tachypnea especially in newborns. Natural elastic properties of lungs provide expansion. A functional residual capacity (FRC) occurs at the end of expiration to prevent collapse of the alveoli. The newborn chest wall is more flexible due to its cartilage nature and the neonatal lungs are prone to atelectasis and decreased FRC (7). If the lung compliance is reduced in diseases such as Transient Tachypnea of the Newborn (TTN), Respiratory Distress Syndrome (RDS), Pneumonia or Pulmonary Edema, there is a decrease in tidal volume. To achieve adequate minute ventilation, the respiratory rate increases. Hypoxemia increases tachypnea further (7). Therefore, affected newborns have prominent tachypnea. Additional clinical findings help to diagnose the causes of respiratory distress, as tachypnea is a non-specific symptom. Increased respiratory distress arises from increased airway resistance, reduced lung compliance, or pulmonary mechanisms that are independent of both. Airflow resistance increases when there is congestion in the airflow. The critical importance of the airway radius is indicated in the R1⁄4 V (8lh/pr) equation, where R is the resistance, V is flow, L is length, h is viscosity and the r is radius (8). If the airway radius is halved, the resistance increases by 16 times.

Nasal flaring is a compensatory symptom that increases the upper airway diameter and reduces resistance and breathing work. Retractions are caused by use of accessory muscles in neck, rib cage, sternum or abdomen, when lung compliance is poor or airway resistance is high. Wheezing may indicate increased airway resistance. A high-pitched, monophonic breath sound, stridor shows obstruction of larynx, glottis or subglottic area. Wheezing may also be high-pitched, but is typically polyphonic, expiratory, and shows tracheobronchial obstruction. Grunting is an expiratory sound caused by the sudden closure of glottis during expiration to protect FRC and prevent alveolar atelectasis. It is important to maintain and retain physiological FRC in poorly compatible respiratory disorders, such as RDS or TTN due to poor lung compliance in very low or very high FRCs. Meconium aspiration syndrome (MAS) at the other end of the spectrum is an example of lower airway obstruction with air trapping. These neonates often have high lung volumes adversely affecting lung compliance. Regardless of the cause, it is vital to recognize symptoms and act quickly. If the newborn cannot maintain breathing work to meet respiratory needs, he develops respiratory failure. This failure may occur as impaired oxygenation (cyanosis) or ventilation (respiratory acidosis). Without immediate intervention, the respiratory arrest is close (4).

PATHOGENESIS

The causes of respiratory distress in the newborn are diverse and multi-systemic. Pulmonary causes may be associated with changes in normal lung development or during extra uterine life. Normal lung development occurs

in 5 phases (9). Respiratory disease may be caused by developmental abnormalities that occur before or after the birth. Early developmental malformations include tracheoesophageal fistula, bronchopulmonary sequestration (abnormal pulmonary tissue mass not associated with tracheobronchial network), and bronchogenic cysts (abnormal branching of the tracheobronchial tree). Parenchymal lung malformations such as congenital cystic adenomatoid malformation, congenital diaphragmatic hernia or severe oligohydramnios lead to pulmonary hypoplasia that develops later in pregnancy. More common respiratory diseases such as TTN, RDS, neonatal pneumonia, and persistent pulmonary hypertension of the newborn (PPHN) are due to complications in the postnatal transition period. Although mature alveoli are present at 36 weeks of gestation, a large alveolar septation and microvascular maturation occur in the postpartum period. The lungs are not fully developed until 2 to 5 years of age (9). Therefore, postnatal developmental lung disease may also occur. Bronchopulmonary dysplasia (BPD) is an important lung disease that complicates premature alveolarization during alveolar development when exposed to mechanical ventilation, oxygen, and other inflammatory mediators prior to normal development. As defined, BPD affects 32% of premature infants and 50% of low birth weight infants (10).

DIFFERENTIAL DIAGNOSIS

The underlying cause of respiratory distress varies in the newborn and is not always caused by respiratory system (6). It is therefore important to use a detailed history, physical examination, radiographic and laboratory findings to determine a more specific diagnosis and appropriate management after initial resuscitation and stabilization. A detailed physical examination should focus beyond the lungs to identify the non-pulmonary causes such as airway obstruction, chest wall abnormalities, cardiovascular disease, or neuromuscular disease of which may initially occur as respiratory distress in newborn infant. Radiographic findings may identify diaphragmatic paralysis, congenital pulmonary malformations, and intrathoracic lesions, such as pneumothorax, mediastinal mass and congenital diaphragmatic hernia which compromise lung expansion. Significant tachypnea without difficulty in breathing requires additional laboratory research to identify metabolic acidosis or sepsis. Hypoglycemia, hypomagnesemia, and hematological abnormalities may result in suppressed respiration or may prevent oxygen transport to the peripheral tissues, therfore laboratory evaluation should be considered with these clinical findings. Hypermagnesemia may contribute to respiratory distress and may affect the ability of the newborn to respond to resuscitation due to hypotonia and suppressed airway or apnea (4).

It may be difficult to differentiate cardiovascular diseases from pulmonary causes of respiratory distress. Most congenital heart defects are associated with cyanosis, tachypnea, or respiratory distress due to heart failure. Timing can be an important clue to differentiate, because there are very few congenital heart defects which appear immediately after birth, but rather they become evident few hours to days after birth when the ductus arteriosus closes(2). Pulmonary hypertension should be considered in any infant with respiratory distress and cyanosis. This occurs when there is a failure of transition from the uteroplasental circulation to the postnatal pulmonary circulation after birth. Pulmonary vascular resistance remains high; disruption of pulmonary blood flow cause cyanosis and persistence of foramen ovale and ductus arteriosus cause blood flow from right to left. Respiratory distress associated with PPHN can be primary or secondary due to specifically presence of congenital diaphragmatic hernia, MAS or RDS. When PPHN occurs without concurrent pulmonary disease, it is difficult to distinguish it from cyanotic heart disease. Response to ventilation with 100% oxygen (hyperoxia testing) can help to differentiate two. In some newborns with PPHN, PaO2 will increase above 100 mm Hg, but not more than 45 mm Hg in infants with cyanotic heart defects with right to left shunt (11).

CONCLUSION

Understanding respiratory distress in newborn is easy and understanding physiological abnormalities associated with each of the various causes will guide the optimal management. While it is ideal to reduce the incidence with preventive measures, early recognition and treatment of common neonatal respiratory diseases reduces both short and long-term complications and associated mortality of babies at risk.

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