RESPIRATORY THERAPY IN A LOT OF NEWBORN WITH EXTREMELY LOW BIRTH WEIGHT

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Abstract

Introduction: Newborns with extreme prematurity are considered those who have a birth weight under 1000 grams. Morpho-functional plurivisceral immaturity leads to particular diseases, through frequency and gravity. The most common lung problem in a premature baby is respiratory distress syndrome. Another common respiratory problem of premature is apnea of prematurity.

Objectives: The authors aim to study the pathology and the treatment of respiratory pathology at a lot of premature newborns with extremely low birth weight.

Material and method: The study was carried out in the Premature and Neonatology Department during two years, on a group of 34 premature newborns with birth weight under 1000 grams (800 grams- 1000 grams).

Results: In the studied lot respiratory distress syndrome was present in 22 cases (64,7%), and 29 (85,2%) presented apnea episodes. In 17 cases these two were associated. From newborns with mild respiratory distress syndrome and apnea, 7 required only supplemental oxygen. In 11 cases with severe respiratory distress syndrome and repeated apnea crisis was necessary treatment with continuous positive airway pressure through nasal prongs for different periods of time. In 16 cases with severe respiratory distress syndrome and due to persistence of apnea and modification of blood gas parameters, was needed oro-tracheal intubations and mechanical ventilation.

Conclusions: Extreme prematurity is an important risk factor in increasing neonatal morbidity and mortality, premature with extremely low birth weight being the most exposed to all major complications of prematurity. Nasal continuous positive airway pressure is a useful method of respiratory support that reduces the incidence apnea, and in the treatment of respiratory distress syndrome and in reducing the necessity of the initiation of mechanical ventilation.

Key words: Extreme prematurity, respiratory support

Introduction

An extremely low birth weight (ELBW) infant is defined as one with a birth weight of less than 1000g.

Plurivisceral morpho-functional immaturity causes some particular diseases through frequency and severity: respiratory distress syndrome, peri- and intraventricular hemorrhage, apnea crisis, patent ductus arteriosus, enterocolitic ulceronecrotis and infections). The complications of prematurity can be classified as follows:

- Early pathology: idiopathic respiratory distress syndrome, recurrent apnea, intra and periventricular hemorrhage, lung hemorrhage, jaundice, infections
- Late sechele: at eyes (retinopathy of prematurity-retrolental fibroplasia, myopia, strabismus), auditive (hypoacusis, deafness), neurological (cerebral paralysis, diplegie, choreoathetosis, epilepsy), intellectual (IQ lower than 70), psychic (behavior disturbances).

The most common lung problem in a premature baby is respiratory distress syndrome.

Respiratory distress syndrome an early complication of extreme prematurity is respiratory distress syndrome (RDS) caused by surfactant deficiency.

By the old statistics respiratory distress syndrome affects 5% of the 1st degree premature, 20% of the 2nd degree premature, 50% of the 3rd degree premature, 70% of the 4th degree premature, and only 0,5% of the term newborn. Related to the gestational age the incidence of the disease is: 20% when gestational age is 34-32 weeks and 40% when gestational age is 32-30 weeks.

The frequency of respiratory distress syndrome related to gestational age and antenatal steroids therapy:

Gestational age	Antenatal steroid therapy	
	without	Yes
<30 weeks	60%	35%
30-34 weeks	25%	10%
>34 weeks	5%	-

Physiologically the volume of surfactant is insufficient to prevent collapse of the alveoli. Normal functional residual capacity is not established because of the collapse alveoli; therefore, oxygenation and ventilation are not sufficient, and each breath requires increased energy output.

The lungs in RDS have low compliance. Little change in volume is achieved with a relatively great amount of pressure, which contributes to increased work of breathing.

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However, the chest wall is very compliant. A slight amount of pressure results in a large change in volume. The neonate may not be able to create enough inspiratory pressure to open the alveoli as the chest wall retracts and collapses in about the relatively stiff lungs.

The diaphragm contracts, creating an inspiratory pressure that moves less volume into the lung than expected and simultaneously causes large sternal and intercostal retractions of the chest wall. The increased effort of these opposing forces usually results in hypoxemia and academia that cause constriction of the pulmonary vascular (arterial) musculature, severely limiting pulmonary capillary blood flow. (1, 2, 3)

The chest radiography helps establish the diagnosis of RDS. The distinctive radiographical pattern includes reduced lung volumes, reticulogranular pattern, air bronchograms, and lung opacification. Surfactant deficiency results in diffuse atelectasis, a reduction in lung volume, and decreased lung expansion. Atelectasis increases lung density resulting in visible air bronchograms. Ground glass appearance appears as areas of atelectatic respiratory alveoli adjacent to expanded respiratory units. (2,3)

The disease being characteristic to premature newborn, the treatment will consist of prevention the premature birth. The antenatal therapy with corticosteroids is indicated for women with risk of premature birth. The treatment will be individualized according to the severity of disease. The therapy aims to maintain, in reasonable limits, the PaO2 (45-70 mmHg) and the PaCO2 (34-45 mmHg).

Treatment for infants of RDS consists of oxygen supplementation and assisted ventilation with continuous distending pressure, conventional mechanical ventilation, high frequency ventilation, and CPAP. Mechanical ventilation is usually weaned as soon as possible because of ventilator associated lung injury and the toxic effects of oxygen. Therefore, use of CPAP after postextubation phase has been effective to prevent atelectasis and to reduce apnea episodes and the need of reintubation. (1, 2, 3 ,4)

Surfactant replacement therapy was implemented immediately. Administration of surfactant leads to a dramatic and rapid improvement in gas exchange decreases the need for high levels of supplemental oxygen and ventilatory support, leads to less barotraumas, and improves lung compliance and lung volumes. A vital importance in the treatment of RDS is the maintenance of thermoregulation because hypothermia increases oxygen consumption; thereby, further compromising neonates with RDS.

Apnea of Prematurity (AOP) is found in 50 to 80% of preterm infants at less than 30 weeks of gestation, and its incidence is even higher in extremely preterm infants .It is almost universal in infants who weigh <1000 g at birth (5). The literature defines clinically significant apnoea in infants as breathing pauses that last for >20 s or <20 s, but with bradycardia or oxygen desaturation (6). The methylxanthines amynophylline, theophylline and caffeine are commonly used for treatment and prophylaxis of apnoea in preterm infants, as they decrease the frequency of apnea and the need for mechanical ventilation during the first seven days of therapy (7). Prolonged apnea may lead to hypoxaemia and reflex bradycardia, and may increase the risk of ventricular hemorrhage, hydrocephalus and abnormal neurological development during the first year of life (6).

Different patterns of apnea can be observed on a neonate: obstructive, central, and mixed sleep apnea. Obstructive sleep apnea is a pause in alveolar ventilation due to obstruction of airflow within the upper airway. Extremely low birth weight infants are particularly prone to obstructive sleep apnea, especially in the supine position, because the pharynx collapses from negative pressure generated during inspiration due to the muscle weakness of the oropharynx. Central sleep apnea is a pause in alveolar ventilation due to a lack of diaphragmatic activity. There is no signal to breathe being transmitted from the CNS to the respiratory muscles due to the immaturity of brainstem control of central respiratory drive. Neonates also manifest an immature response to peripheral vagal stimulation. Recurrent episodes of apnea may affect neurodevelopmental outcome. As the neonate gets older, and the lungs and brain tissues mature, the breathing usually becomes more regular.(6,7)

Objectives

The authors aim to study the pathology and the treatment of respiratory pathology at a lot of premature newborns with extremely low birth weight.

Material and method

The study was carried out in the Premature and Neonatology Department during two years, on a group of 34 premature newborns with birth weight under 1000 grams (800 grams- 1000 grams) and gestational age< 28 week. All the premature newborn received surfactant after birth.

Results

The most common lung problem in a premature baby is respiratory distress syndrome. In the studied lot respiratory distress syndrome was present in 22 cases (64,7%), and 29 (85,2%) presented apnea episodes. In 17 cases these two were associated. (Fig.1)

From newborns with mild respiratory distress syndrome and apnea, 7 required only supplemental oxygen. (Picture. No. 1). In 11 cases with severe distress syndrome and repeated apnea crisis was necessary treatment with continuous positive airway pressure through nasal prongs for different periods of time. (Picture. No. 2). In 16 cases with severe respiratory distress syndrome and due to persistence of apnea and modification of blood gas parameters, was needed oro-tracheal intubations and mechanical ventilation also for different periods of time. (Picture. No. 3)(Fig. 2). There is to be mentioned that at those who needed only supplemental oxygen and treatment with continuous positive airway it was applied INSURE therapy for surfactant administration. At those with mechanical ventilation immediate extubation was not possible.

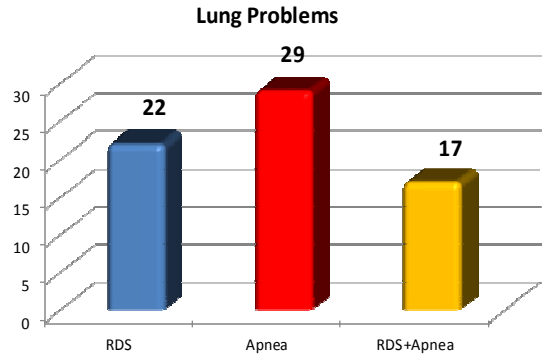

Fig. 1 Lung problems.

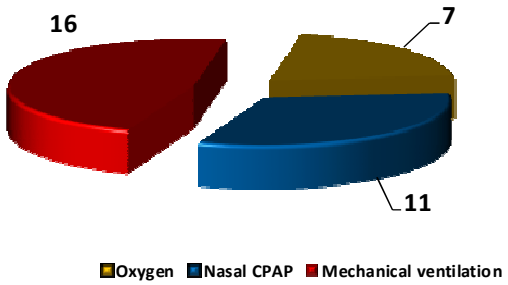

Fig. 2 Respiratory treatment.

Picture1. Oxygen administration to a premature newborn.

Picture 2. Treatment with continuous positive airway pressure through nasal prongs.

Picture 3 Premature newborn with intubation and mechanical ventilation.

Conclusions

Extreme prematurity is an important risk factor in increasing neonatal morbidity and mortality, premature with extremely low birth weight being the most exposed to all major complications of prematurity.

Nasal continuous positive airway pressure is a useful method of respiratory support that reduces the incidence apnea, and in the treatment of respiratory distress syndrome and in reducing the necessity of the initiation of mechanical ventilation.

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