Echocardiographic Findings in Ventilated Neonates With Severe Respiratory Distress.

Thesis submitted for the partial fulfillment of M.D Degree in Pediatrics

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القيمة التشخيصية للموجات الصوتية على القلب في الأطفال حديثي الولادة على جهاز تنفس صناعي واللذين يعانون من صعوبة مضاعفة في التنفس

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Abstract

Background: Acute respiratory disease beside prematurity is the leading cause for hospitalization in neonatal intensive care units. Echocardiographic studies may provide important anatomic diagnosis, as well as functional information **Aim of the work**: To detect the diagnostic and prognostic value of early echocardiography in the management of ventilated neonates with respiratory distress and compare outcomes of patients in relation to the echocardographic findings and clinical diagnosis. **Patients and methods**: Prospective descriptive study. Cases: 54 neonates with severe RD (without congenital heart disease) were admitted to the NICU in Children hospitals, Cairo University from January 2007 to December 2008.In addition to 66 control neonates with a gestational age ≥33 weeks who were admitted for neonatal jaundice. The study cases included 24 females and 30 males; mean gestational age was 34.3 ± 3.5 weeks and the mean weight was 2200 ± 800 grams. **Results:** It was found that the 55% of study infants presented with respiratory distress syndrome (RDS) followed by neonatal pneumonia in 30%, MAS in 9.5% and TTN in 5.5% of infants. 25 out of 54 (45%) infants had poor peripheral perfusion, among these infants, 20(80%) had significant echocardiographic findings. Significant echo findings were found in 39 out of the 54(72%) infants, 15 FT and 24 PT. Among studied infants, 15 cases showed normal PAP (27.8%), 16 cases showed mild elevation of PAP (29.6%) while 23 cases showed severe elevation of PAP (42.6%) Follow up echocardiographic study was only done in 26 % of infants included in the study. A significant decrease in the PAP and the right ventricle dimensions was detected on the follow up examination (P. value, 0.04*- 0.007* respectively). Among the studied infants 35 survived (65%) while 19 infants (35%) died. The most common diagnosis associated with mortality in this study was RDS (74%) **Conclusion:** Respiratory distress is one of the most common clinical indications for admission in neonatal ICU. It can be a manifestation of both respiratory and cardiac impairment. Echocardiographic Doppler study is a non invasive technique that helps in the diagnosis of the cause, affects management and prediction of outcome in newborns with sever respiratory distress on mechanical ventilator.

Key Words: Respiratory distress in neonate, PPHN, neonatal echocardiogram.

Introduction

Respiratory distress is a common presentation in the newborn infant. The term is used to describe easily observable physical signs, including rapid breathing, retractions, flaring of the nostrils, a grunting sound on expiration and cyanosis ***(Jain L et al; 2006).***

The most frequent underlying diagnosis of respiratory distress during the first 48 hours are transient tachypnea of the newborn, infections, meconium aspiration syndrome, hyaline membrane disease (HMD) and perinatal asphyxia***.(Greenough and Roberton,1999)***

There is a complex interrelation between the pulmonary and the cardiac systems. Diseases starting primarily in the heart may affect the lung causing lung congestion that may present by respiratory distress ***(Christian et al., 2007).*** On the other hand, respiratory distress caused by pneumonia for example can produce an effect on cardiac function through hypoxia, metabolic acidosis and / or direct effect of causative organism. ***(Moon et al., 2000)***

Echocardiograph Doppler is a non- invasive technique which helps in the diagnosis and prediction of outcome in newborns with respiratory distress. ***(Reynolds et al., 2004)***

PPHN should be suspected in all term infants who have cyanosis. Some cases of neonatal respiratory distress have persistent hypoxia, despite medical intervention and O_2 therapy though they do not present with clinical evidence of congenital heart disease. These may represent case of pulmonary hypertension. ***(Nair and Bataclon, 2004)***

Aim of the study

1. Value of echo-Doppler as a diagnostic non-invasive technique in detection of significant echocardiographic findings other than congenital heart disease with sever respiratory distress on mechanical ventilation with special emphasis on detection of cases with PPHN.

2. Detection of the outcome of patients in relation to the echocardographic findings and clinical diagnosis.

2.1. *Respiratory Distress*

Definition:

Respiratory distress is a common presentation in the newborn infant. The term is used to describe a constellation of easily observable physical signs, including rapid breathing (more than 60 breath per minute), retractions, flaring of the nostrils, as will as a grunting sound on expiration and cyanosis ***(Jain; 2006).*** Respiratory distress due to either medical or surgical causes occurs commonly in neonates ***(Kumar and Bhatnagar, 2005)***.

It is occasionally difficult to distinguish respiratory from cardiovascular causes or sepsis on the basis of clinical signs alone. Any sign of postnatal respiratory distress is an indication for immediate examination and diagnostic evaluation, including a blood gas or pulse oximetry determination and x-ray of the chest. Timely and appropriate therapy is essential to prevent ongoing injury and improve outcome ***(Dudell and Stoll, 2008).***

Table (1): *Disorders of respiration in newborn infants*

I. Central nervous system failure:

Representing depression or failure of the respiratory center e.g :

- Maternal sedation drugs.
- Asphyxia.
- Intra cranial hemorrhage.
- Neuro – muscular disorders.

II. Peripheral respiratory difficulty:

- Transient tachypnea of the newborn.
- Respiratory distress syndrome.
- Meconium aspiration syndrome.
- Pneumonia, sepsis.
- Atelectasis.
- Pneumomediastinum and pneumothorax .
- Idiopathic lobar emphysema..
- Wilson-Mikity syndrome.

III) Cardio vascular cause:

- Cyanotic congenital heart disease.
- Heart failure.
- Persistent fetal circulation.

IV) Haemotologic cause:

- Acute blood loss.
- Chronic blood loss.
- Polycythemia.
- Methemoglobinemia.

V) Metabolic causes:

- Hypoglycemia.
- Hypocalcaemia.
- Hypothermia.
- Acidosis.

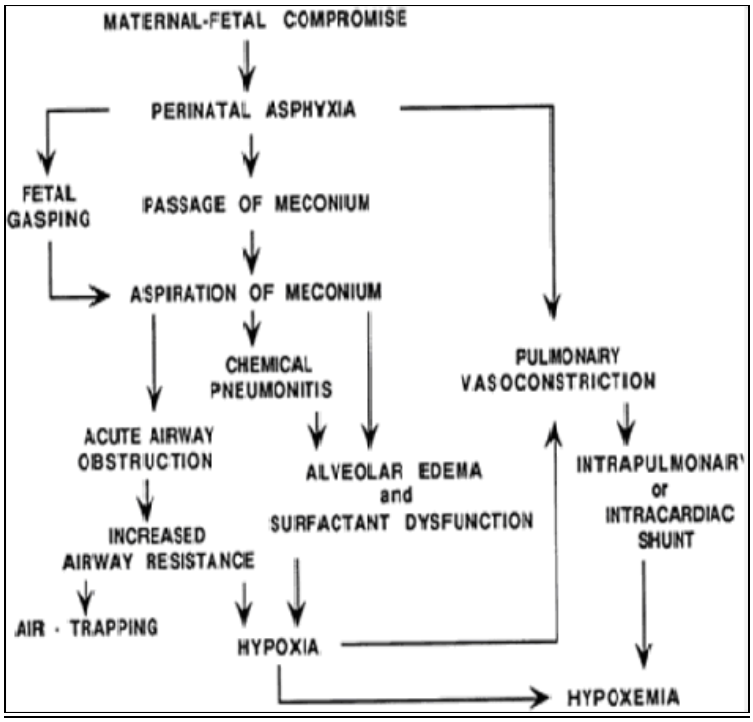

Figure (5): *Pathogenesis of meconium aspiration syndrome* ***(Whitsett et al; 2005)***

4- Pneumothorax

Defined as air in the pleural space can be a cause of neonatal respiratory distress where pressure in the pulmonary space exceeds extra pleural pressure. It can occur spontaneously or as a result of infection, meconium aspiration, lung deformity, or ventilation barotraumas. The incidence of spontaneous pneumothorax is 1 to 2 percent in term newborns and increases to 6 percent in premature births ***(Christian et al., 2007)***.