

Current Practice

Respiratory distress in the newborn

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Introduction

Respiratory problems are the commonest cause of admission of newborns to neonatal units in the early neonatal period. Disorders of respiration in the newborn period are intimately related to the major cardio-pulmonary changes that take place to prepare the baby for extra-uterine existence. Therefore, a thorough understanding of this normal process of transition is necessary for the proper assessment and management of newborns with respiratory distress.

At the time of birth, the fluid in the fetal lung is rapidly replaced by air. Associated with lung inflation and increased oxygenation there is a marked reduction in the pulmonary vascular resistance, with consequent increased pulmonary blood flow and closure of the ductus arteriosus, foramen ovale and ductus venosus. As a result, the lungs take over the respiratory function previously carried out by the placenta. Many pathological processes can interfere with this normal sequence of events and give rise to respiratory distress in the newborn period.

Respiratory distress

Respiratory distress is a general term and is characterized by the following signs:

1. Tachypnoea; a respiratory rate greater than 60/minute.
2. Expiratory grunt; a physiological mechanism of preventing alveolar collapse by expiring against a partially closed glottis.
3. Chest recessions which may be intercostal, subcostal, sternal, substernal or suprasternal.

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4. Central cyanosis.
5. Working of accessory muscles of respiration, especially flaring of alae nasi.

Presence of two or more signs persisting for 4 hours or more suggests respiratory distress.

Aetiology of respiratory distress

A. Primarily respiratory

- Transient tachypnoea of the newborn
- Idiopathic Respiratory Distress Syndrome (IRDS)
- Congenital pneumonia
- Aspiration pneumonia – meconium, milk, blood
- Air-leaks - pneumothorax, pneumomediastinum and pulmonary interstitial pneumonia
- Pulmonary hypoplasia – may be associated with Potter sequence
- Pulmonary haemorrhage
- Surgical conditions – choanal atresia, Pierre-Robin sequence, diaphragmatic hernia, oesophageal atresia with tracheo-oesophageal fistula, congenital lobar emphysema

B. Secondary to extrapulmonary pathology

- Congenital heart disease with heart failure e.g. hypoplastic left heart syndrome, obstructed total anomalous pulmonary venous drainage, critical coarctation of aorta
- Anaemia
- Polycythaemia
- Birth asphyxia
- Persistent pulmonary hypertension
- Sepsis
- Neuromuscular disorders
- Musculoskeletal disorders
- Metabolic disorders

Diagnosis

Since many conditions, both pulmonary and extrapulmonary, can give rise to respiratory distress in the newborn, each baby with respiratory distress should undergo a full evaluation to establish the underlying cause. This evaluation includes a comprehensive history, physical examination and appropriate investigations.

Clinical history

The history should contain details of the pregnancy (any ultrasonically detected anomalies, poly or oligohydramnios, presence of frank diabetes mellitus or impaired glucose tolerance in the mother), gestational age at birth, risk factors for sepsis, duration of membrane rupture, the presence of meconium in liquor, the mode of delivery, presence of birth asphyxia, the time of onset of respiratory distress, frothing at mouth, and the relationship of respiratory distress to feeding.

Physical examination

On examination, establish the severity of respiratory distress by documenting the respiratory rate, presence of recessions, expiratory grunting and central cyanosis. Pulse oximetry is a useful adjunct for assessing the degree of hypoxaemia. Document the vital signs and look for evidence of mediastinal shift, symmetry and intensity of breath sounds, the presence of added sounds, shape of the chest and abdomen, presence frothing at mouth.

Investigation

1. Chest x-ray, taken preferably with a radio-opaque nasogastric tube in-situ, is the most important investigation in a newborn with respiratory distress. It would help to rule out diaphragmatic hernia, pneumothorax, effusions, pulmonary oedema and an abnormal cardiac silhouette. The classical ground glass appearance seen with IRDS may be mimicked in congenital pneumonia or aspiration pneumonias. A bell-shaped chest suggests a neuromuscular disorder or a thoracodystrophy.
2. Full blood count.
3. C-reactive protein is a helpful investigation. An elevated CRP would strengthen the suspicion of sepsis.

4. Septic screen – blood culture is mandatory. The decision to carry out urine and CSF cultures should be taken in the presence of a high suspicion of sepsis. If facilities are available latex-agglutination test for GBS and viral cultures may be helpful.
5. ECG and echocardiogram – These should be performed urgently when congenital heart disease is suspected.
6. Other helpful bed-side tests
 - Chest illumination with a cold light is helpful if pneumothorax is suspected.
 - Nitrogen washout test may help to differentiate respiratory from cardiac causes of cyanosis.
 - Passage of a nasogastric tube in suspected choanal or oesophageal atresias.

Management

Although the definitive management of a newborn with respiratory distress is determined by the underlying diagnosis, good supportive care is the cornerstone of a successful outcome. The supportive care of the infant with respiratory distress is similar regardless of the aetiology.

Newborns with respiratory distress should have frequent and accurate monitoring of the respiratory rate, heart rate, colour, blood pressure, oxygen saturation (SaO₂) and signs of respiratory distress. Arterial blood gas measurement is essential to determine the degree of respiratory failure and decisions on the next most appropriate interventions to be made. Capillary or venous blood gases may be misleading in an infant with poor peripheral perfusion. Unless the supplemental oxygen requirements are modest an arterial line should be sited for blood gas monitoring in oxygen-dependent infants.

Attention to accurate fluid balance, correction of acid-base balance and maintenance of temperature and blood sugar are essential components of supportive care. Breast feeding may not be possible in a baby with respiratory distress, although gavage feeds may be tolerated. Intravenous fluids will be required for severe distress until the condition settles.

Assisted ventilation may be required for infants with severe distress. Surfactant has made a significant contribution towards reducing the mortality and morbidity as well as improving the long term outcome from IRDS. If surfactant is available, preterm infants with significant hypoxaemia should be intubated for surfactant administration. While those with significant distress will need mechanical ventilation from the outset, those with mild RDS may be extubated after surfactant administration and maintained on continuous positive airway pressure (CPAP). More mature infants (>34 weeks) with mild RDS may be managed on CPAP or head box oxygen but may need mechanical ventilation if the need for oxygen increases, if the blood gases are unsatisfactory, or if there are recurrent apnoeas.

Transient tachypnoea of the newborn usually resolves with supplemental oxygen and minimal support. Suspected sepsis should be promptly treated with an appropriate combination of broad-spectrum antibiotics until cultures are available. Pneumothoraces and symptomatic effusions should be drained appropriately and repeat radiographs performed to determine the adequacy of the procedure.

Infants with suspected CHD or malformations requiring corrective surgery are best managed in specialist centres and may require ventilation for safe transportation. All precautions must be taken during the transport process to prevent hypothermia, hypoglycaemia and aspiration.

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