Apnoea In Prematurity

R Sinha

Citation

Abstract
Apnoea of prematurity remains one of the most challenging problems faced by any neonatologist. Despite better understanding of neonatal physiology there is still not much consensus regarding its management. This PowerPoint tries to give a basic idea of its pathophysiology as well as discuss various management options available. It concludes with a brief review of various evidences available & a hope that a widespread consensus based on best evidences will be available soon.

Figure 1

**APNOEA OF PREMATUREITY**
- Definition of apnoea and its incidence
- Apnoea of prematurity
  - Types
  - Principle of Management
  - Outcome

Figure 3

**INCIDENCE**

Figure 2

**DEFINITION**
- Cessation of breathing for at least 20s or for a shorter period of time if accompanied by bradycardia, desaturation cyanosis or pallor

Figure 4

**Apnoea of Prematurity**
- *It is a diagnosis of exclusion*
- Commonest cause of apnoea in NICU
- Usually occurs between D2 - D7
- Resolves by 37 weeks Post Conceptional Age though recent reports have shown its persistence beyond term
Apnoea In Prematurity

Figure 5

TYPES

- Central Apnoea
  - Failure of inspiratory muscle following exhalation
- Obstructive Apnoea
  - Presence of inspiratory muscle activity without air flow
- Mixed Apnoea
  - Central +Obstructive during same episode

Figure 8

PRINCIPLES OF THERAPY

- Fewer neuronal synapses
- Decreased neurotransmitter level
- Decreased CO₂ sensitivity

Correct infection and metabolic problems
CNS stimulants

Figure 6

DIAGNOSIS OF APNOEA OF PREMATURENESS

- Monitoring
- Proper history
- Detailed physical examination
- Investigation

Figure 9

(A) PRIMARY CENTRAL RESPIRATORY CENTER DEPRESSION

Figure 7

INVESTIGATIONS


- Lab studies
  - FBC, ABG, Sepsis screen
  - Biochemistry (glucose, electrolytes)
- Radiographic studies- CXR, AXR, CrUSS
- Other Studies - EEG
  4 Channel Pneumogram
  Polysomnography

Figure 10

(B) ALTERED AFFERENT INPUT

- Decreased cortical traffic
- Increase afferent input
  (Cutaneous & Vestibular stimulation)
- Sleep state (REM)
**Figure 11**  
(C) ABNORMAL OR HYPERACTIVE REFLEXES  
- Heads paradoxical reflex  
- Posterior pharyngeal reflex  
- Abnormal Hering Breuer reflex  
- Hyperactive laryngeal receptors  
  
Avoid triggering reflexes  
  
Vigorous suction  
Hyperinflation  
Hyperventilation  
Lung collapse  
GOR

**Figure 14**  
SUGGESTED TREATMENT PROTOCOL  
(Dennis E. Maycock NICU Web 2000(4))  
- Exclude other causes of apnoea  
- Treat any precipitating factor  
- Stimulation (vestibular, cutaneous)  
- Trial of nasal prong air/oxygen  
- Stimulant drugs  
- Trial of nasal CPAP  
- Mechanical ventilation  
  
Intervention should occur in order of invasiveness and risk.

**Figure 12**  
(D) HYPOXEMIA  
- Immature hypoxic response  
- Lung disease  
- Hypotension  
- Anaemia  
- CCF  
  
Treat underlying pathology  
Oxygen  
CPAP  
Transfusion

**Figure 15**  
WHEN TO INITIATE TREATMENT  
(Dennis E. Maycock NICU Web 2000)  

<table>
<thead>
<tr>
<th>TYPES OF APNOEA</th>
<th>TREATMENT INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self resolving attack</td>
<td>Frequent episodes (at least 1/hr over a period of 12-24 hrs) with desaturation and or bradycardia</td>
</tr>
<tr>
<td>Mild attack (requiring light touch)</td>
<td>Multiple episodes (at least one over 12 hrs or more over 12 hrs period or 12 or more over 24 hrs)</td>
</tr>
<tr>
<td>Moderate attack (requiring repetition + oxygen)</td>
<td>Two or more episodes over 24 hrs.</td>
</tr>
<tr>
<td>Severe (requiring vigorous stimulation, PPV + oxygen)</td>
<td>One or more episode over 24 hrs</td>
</tr>
</tbody>
</table>

**Figure 13**  
RESPIRATORY CONTROL

**Figure 16**  
EXCLUSION OF PRECIPITATING FACTORS  
- Infection  
- Temperature regulation  
- GI  
  - NEC, GOR  
- CNS  
  - IVH, Seizure, Asphyxia  
- Drugs  
  - Prenatal, Postnatal
EXCLUSION OF PRECIPITATING FACTORS

- Metabolic
  - Ca, Na, Acidosis, Glucose
- CVS
  - CCF, Pulmonary oedema (PDA, Coarctation)
- Haematological
  - Anaemia
- Pulmonary
  - Oxygenation, Ventilation

METHYLE XANTHINE THERAPY

Mechanism of action

- Inhibits adenosine action
  - CO2 sensitivity
  - 1 Minute ventilation
- Direct stimulation of diaphragm

SUPPLEMENTAL LOW FLOW O2

Has been shown to be beneficial.

- Increases the overall duration & percentage of total sleep time (TST) spent in quiet sleep
- Increase respiratory stability & less apnoeas & bradycardias

METHYLE XANTHINE THERAPY

Adverse effects

1. Excessive diuresis
2. Cerebral, intestinal & retinal blood flow
3. Cardiac output, Heart rate & cerebral metabolic rate
4. Altered biochemistry
   - Blood sugar, glycerol
5. GI dysfunction

CNS STIMULANTS

- METHYLXANTHINES: Aminophylline
  Caffeine
- DOXAPRAM

CHOICE OF METHYL XANTHINE

- Caffeine is the drug of choice.
- Longer half life → Easier dosing schedule
- Stable plasma level → Wide therapeutic index
- Less side effects → less rigorous monitoring
- More stable brain haemodynamic
- Better CSF penetration
DOXAPRAM
- Second line add-on drug.
- Useful in apnoea of prematurity unresponsive to methylxanthine
- SIDE EFFECTS
  Uncommon with low dose
  - Hyperactivity, irritability, Seizure, Hyperglycaemia

OTHER TREATMENT OPTIONS
1. Inhalation of low (<1%) CO₂
   - ↓ Frequency of apnoea
   - Improved oxygenation & ventilation
2. Intermittent mandatory ventilation
   Should be reserved for recurrent resistant & significant apnoea.

CPAP

Mechanism of action
- Splints up airway & prevents pharyngeal collapse
- Alteration of Hering Breuer reflex
- Stabilisation of chest wall
CPAP is helpful in obstructive and mixed apnoea

EVIDENCE BASED APPROACH
A) Henderson-Smart DJ et al., Cochrane Database Syst Rev., 2001;(3):CD0001402 (11)
  Treatment with methylxanthine reduced the frequency of apnoea attacks and the use of mechanical ventilation between D2-D7

  - No supportive evidence for prophylactic methylxanthine. Further studies in high risk premature recommended.

CPAP

Side effects
- Barotrauma
- Nasal irritation
- Abdominal distension

EVIDENCE BASED APPROACH
  - Low dose doxapram does have positive benefit as an add-on in resistant cases

  - Though blood transfusion significantly reduces tachycardia & tachypnoea, but it had a little effect on apnoea of prematurity even in mild to severe anaemia.

  - Kinaesthetic stimulation is not recommended
CORRESPONDENCE TO
Dr Rajiv Sinha Flat 2 Block 2 St Peter's Hospital Chertsey
KT16 0RN UK e-mail: rajivsinha_in@yahoo.com

References
Author Information

Rajiv Sinha, MD (Paed Med), MRCPCH, UK
SpR, St Peter's Hospital