Apnoea In Prematurity
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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 PREMATURITY**

- Definition of apnoea and its incidence
- Apnoea of prematurity
  - Types
  - Principle of Management
  - Outcome

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 3

**INCIDENCE**

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
**TYPES**

- Central Apnoea
  - Failure of inspiratory muscle following exhalation
- Obstructive Apnoea
  - Presence of inspiratory muscle activity without airflow
- Mixed Apnoea
  - Central and Obstructive during same episode

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**PRINCIPLES OF THERAPY**

(A) PRIMARY CENTRAL RESPIRATORY CENTER DEPRESSION

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

- Correct infection and metabolic problems
- CNS stimulants

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**DIAGNOSIS OF APNOEA OF PREMATURENESS**

- Monitoring
- Proper history
- Detailed physical examination
- Investigation

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**INVESTIGATIONS**


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

(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

- 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

<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 (up to more over 12 hrs period of 12 or more over 24 hrs)</td>
</tr>
<tr>
<td>Moderate attack (requiring repsonse =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
  - [O2 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
**Figure 23**

**DOXAPRAM**

- Second line add-on drug.
- Useful in apnoea of prematurity unresponsive to methylxanthine
- SIDE EFFECTS
  - Infrequent with low dose
  - Hyperactivity, jitteriness, Seizure, Hypoglycaemia

**Figure 26**

**OTHER TREATMENT OPTIONS**

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

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**Figure 24**

**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**

**Figure 27**

**EVIDENCE BASED APPROACH**

- Treatment with methylxanthine reduced the frequency of apnoic attacks and the use of mechanical ventilation between D2-D7

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

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**Figure 25**

**CPAP**

*Side effects*

- Barotrauma
- Nasal irritation
- Abdominal distension

**Figure 28**

**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
Figure 29

EVIDENCE BASED APPROACH

E) Peter CS et al., Paediatrics, Jan;109(1):8-11, 2002
- No temporal relationship found between GOR & AOP.

- Antireflux treatment did not reduce the frequency of apnoea of prematurity.

Figure 30

DISCHARGE PLANNING & FOLLOW UP

- When to stop medicine?
  Varies between units

  May be stopped at
  More aggressive approach

  32-37 wk, once apnoea is to stop once 7
  day free of
  has resolved apnoea.

- May need restarting and even discharge on
  medicine.
- Home apnoea monitoring -- ??

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References
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