

## NEONATES - APNOEA

Neonates often have periodic breathing, with spells of rapid breathing for about 20 seconds alternating with cessation of breathing for about 10 seconds. Apnoea is said to occur if the baby stops breathing for more than 20 seconds (though symptoms may occur before this). The baby may develop bradycardia, cyanosis and hypotonia. Apnoea usually occurs in very small babies, and in those with a PDA or respiratory distress. Attacks may occur frequently for 2 weeks or more before gradually becoming less frequent. An untreated attack may cause death.

### CAUSES

Causes of apnoea in neonates:

1. Airways obstruction due to excessive flexion or extension of the neck.
2. Sepsis - meningitis, septicaemia.
3. Hypoxia - asphyxia, RDS, pneumonia, anaemia, reflux/inhalation, cardiac failure, PDA.
4. Cerebral - meningitis, convulsions (may be sub-clinical), intraventricular haemorrhage.
5. Metabolic - hypoglycaemia, hypocalcaemia, hyponatraemia.
6. Physical factors - hyperthermia, hypothermia, excess handling or suction.
7. Drugs - maternal sedation.

In some small premature babies, apnoea occurs without any apparent precipitating factor. However, babies with apnoea must always be treated for sepsis, and meningitis excluded by lumbar puncture.

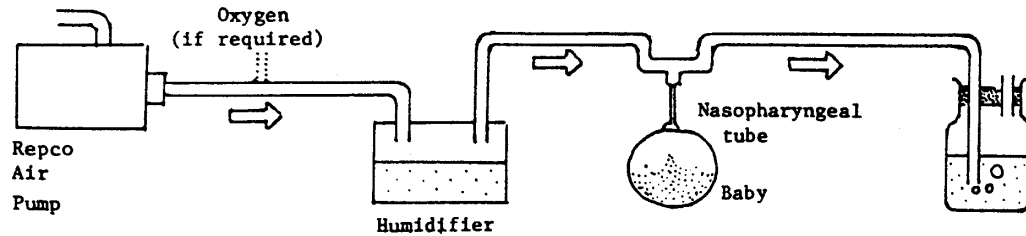
### TREATMENT

1. Ensure correct positioning of the head (the neutral position - neck not flexed and not extended).
2. Treat any of the above precipitating factors.
3. Do a lumbar puncture
  - a. clear: give ampicillin and gentamicin (see p.244, 245)
  - b. cloudy: treat as per neonatal meningitis (see p. 262).
4. Do a Hb (transfuse if Hb less than 10 g/dl) and a dextrostix (give IV dextrose if the blood glucose is less than 2.5 mmol/l, but still look for the other causes of apnoea).
5. Treat cardiac failure with frusemide, digoxin and fluid restriction. If there is a patent ductus arteriosus, consider attempting to close it with indomethacin suspension (see p.267).
6. See that the baby is not too hot or too cold.
7. Handle the baby as little as possible.
8. Monitor respiration with an apnoea alarm (eg MR-10 Graseby) if you have one.
9. Give oxygen to correct hypoxia, if it is present. If there is no clinical hypoxia, but apnoea is frequent and severe, it is reasonable to try giving intranasal oxygen at 0.25 litre/min. Do NOT give more than this, as hyperoxia makes apnoea worse and may cause blindness due to retrolental fibroplasia. Stop the oxygen if it has no effect.
10. As soon as attacks occur, stimulate the baby by flicking the sole of the baby's foot with your finger. If this does not work, BRIEFLY BUT GENTLY suck out the baby's nose and pharynx. These stimuli will usually make the baby cry and breathe.
11. If the baby still does not breathe, ventilate him with a face mask and bag, or by frog breathing (but this may make the baby blind if you have to do it many times with 100% oxygen). If you ventilate the baby by these means, insert a nasogastric tube and make sure that the stomach does not become

distended with air or oxygen. The best way to ventilate is by passing an endotracheal tube, but this should only be attempted by an experienced person.

If apnoea is frequent and severe despite the above measures:

12. Aminophylline often reduces apnoeic attacks, however overdose of this drug is very dangerous and it should be used very cautiously. Toxicity causes tachycardia, arrhythmias, vomiting and convulsions. The pulse rate should be taken before each dose is due, and no aminophylline given if the pulse is over 180. Subsequent doses should be reduced. Aminophylline elixir has 25 mg/5 ml. Give a loading dose of 1.25 ml/kg, and then maintenance doses of 0.5 ml/kg every 12 hours by NG tube. Alternatively, the aminophylline can be give intravenously: dilute 2 ml of intravenous aminophylline (250 mg/10 ml amp) with 8 ml of sterile water. Give 1.25 ml/kg of the dilute solution IV SLOWLY over 60 minutes as a loading dose, then 0.5 ml/kg slowly IV every 12 hours.
13. If aminophylline is not effective, nasal continuous positive airways pressure (CPAP) is an option. However, it is time consuming and if it is to be done at all it must be done well. A suitable circuit using an air pump (producing about 6 litre/min) and a size 3.0 endotracheal tube passed through the nose so that the tip is in the pharynx is shown below. Good connections and a leak-free humidifier is essential. The tube needs regular suction to keep it patent. The mouth and other nostril are not closed.



## REFERENCES

- Apnoea: J Pediatr 90:342-347,1977  
Lancet 1:987-988,1977
- Nasal CPAP: Pediatrics 56:218-223,1976  
Lancet 2:853,1976
- Aminophylline: Arch Dis Child 54:190-193,1979  
Pediatrics 96:99-103,1980

## NEONATES - ASPHYXIA

### DEFINITION

An Apgar score of <7 at 5 minutes.

|             | Apgar score  |                             |                  |
|-------------|--------------|-----------------------------|------------------|
|             | 0            | 1                           | 2                |
| Appearance  | Blue or pale | Baby pink, blue extremities | Completely pink  |
| Pulse       | Absent       | Below 100                   | Over 100         |
| Grimace*    | No response  | Grimace                     | Cry              |
| Activity    | Limp         | Some flexion limbs          | Active           |
| Respiration | Nil          | Hypoventilation, poor cry   | Good, strong cry |

\*Give a light slap to the soles of the feet

| Apgar score | Infant's condition | Physiological group |
|-------------|--------------------|---------------------|
| 7 - 10      | Vigorous           | Normal              |
| 3 - 6       | Some depression    | Primary apnoea      |
| 0 - 2       | Severe depression  | Terminal apnoea     |

The Apgar score at one minute gives an indication of the need for resuscitative measures. The change in Apgar between 1 and 5 minutes and within the first 15 minutes after delivery have been shown to be reasonable predictors of outcome.

Although a considerable amount is now known about the pathophysiology of perinatal asphyxia, the outcome for babies with severe perinatal asphyxia remains poor even in the centres of excellence.

### MANAGEMENT

In Papua New Guinea, the management of babies with asphyxia is based on high quality supportive care:

1. Oxygen. In the absence of continuous oxygen saturation monitoring, it is reasonable to give nasopharyngeal oxygen (0.5 litre/min) until the baby recovers. If monitoring is available, oxygen is given as appropriate.
2. Thermal control. Baby's body temperature should be kept in the normal range of 36.5-37.2 °C (sometimes the babies become hyperpyrexia).
3. Correction of shock. If peripheral perfusion is poor, it is reasonable to give 20 ml/kg of normal saline initially. If perfusion remains poor, the use of dopamine should be considered.
4. Fluid balance. Give IV fluids at 2/3 maintenance. Use 10% dextrose.
5. Monitor blood glucose with dextrostix and do not let it fall below 2.2 mmol. Avoid hyperglycaemia (keep blood glucose below 8 mmol).
6. Prevent/control convulsions. In severely asphyxiated babies, it is reasonable to give "prophylactic" phenobarbitone. In less severely affected babies, phenobarbitone should be given when there is any suspicion of actual or impending convulsions (phenobarbitone loading dose 20 mg/kg IMI or 10 mg/kg slowly IVI, then 5 mg/kg daily orally).
7. Treat hypocalcaemia if it occurs (or more practically, if the baby has uncontrollable fitting with a normal dextrostix).

## Notes

1. Corticosteroids should not be used, and although many paediatricians use mannitol, there is no evidence for its effectiveness.
2. Babies with severe asphyxia may appear to settle relatively quickly after the resuscitation - but there is likely to be a deterioration after 6-12 hours or so as cerebral oedema develops.

## REFERENCES

- Oswyn G, Vince J, Friesen H. PNG Med J 43(1-2):110-120,2000. Perinatal asphyxia in Port Moresby General Hospital: a study of incidence, risk factors and outcome.
- Saugstad OD, Rootwelt T, Aalen O. Pediatrics 102(1):e1,1998. Resuscitation of asphyxiated newborn infants with room air or oxygen: an international controlled trial, The Resair 2 study.
- Saugstad OD. Resuscitation of newborn infants with room air or oxygen. Semin Neonatol 6(3):233-239,2001. Review.
- Tarnow-Mordi WO. Lancet 352:341-342,1998. Room air or oxygen for asphyxiated babies? Editorial.

## **NEONATES - BORN BEFORE ARRIVAL (BBA)**

If these babies are sick or weigh under 2.2 kg they should be admitted to the neonatal nursery, if one is available.

1. Give vitamin K (phytomenadione) 1 mg. 1 mg/0.5 ml or 1 mg/ml (NOT 10 mg/ml) IM once.
2. Apply crystal violet (gentian violet) to the cord.
3. Apply (oxy)tetracycline (terramycin) eye ointment to both eyes once.
4. If the mother has not been immunised against tetanus during the pregnancy give tetanus immunoglobulin 60 units IM.
5. Give the baby Sabin, hepatitis B and BCG vaccines.

If the baby:

- a. is not sucking well
- b. is not gaining weight
- c. has vomiting or abdominal distension
- d. is febrile or hypothermic
- e. is jaundiced
- or
- f. has any other signs of possible infection



**TREAT THE BABY WITH ANTIBIOTICS FOR NEONATAL SEPSIS**

## NEONATES - CONVULSIONS

Seizures occur in approximately 0.5% of newborn infants. They are often subtle and may manifest themselves in a great variety of different ways. Convulsions may primarily affect muscular tone and give rise to brief periods of clonic extension of the body, tonic or clonic movement of any part of the body, cyclical movement, doggy paddling or simply episodes of apnoea, jitteriness, tremors, facial twitching, repetitive eye opening, nystagmus, abnormal cries or even sudden chewing, swallowing or yawning movements. Vasomotor skin changes have also been attributed to convulsions in the neonate. Therefore, it is essential to have a high index of suspicion in order to diagnose fits in this age group.

### AETIOLOGY

1. Primary cerebral
  - a. Asphyxia
  - b. Meningitis
  - c. Intraventricular haemorrhage
  - d. Congenital infection
  - e. Structural brain abnormality
2. Electrolyte disturbances
  - a. Hyponatraemia
  - b. Hypocalcaemia
  - c. Hypomagnasaemia
3. Metabolic
  - a. Hypoglycaemia
  - b. Kernicterus
  - c. Pyridoxine deficiency
  - d. Inborn error of metabolism.
4. Drug withdrawal
  - a. Narcotics
  - b. Anticonvulsants

#### Document

1. Maternal drug history.
2. Maternal illness during pregnancy.
3. Foetal wellbeing, eg growth, liquor, foetal movements.
4. Complication of labour, eg. foetal distress.
5. Condition of infant at birth/resuscitation.

### INVESTIGATIONS

Depending on availability:

1. Urgent
  - a. dextrostix
  - b. serum sodium, calcium, glucose, bilirubin (if jaundiced)
  - c. magnesium only if calcium low
  - d. full infection screen including lumbar puncture
2. Non-urgent
  - a. ultrasound scan of head

## TREATMENT

1. Ensure clear airway (beware - overzealous suction can precipitate a vasovagal attack. Posture is more important than suction).
2. Prevent ongoing metabolic damage:
  - a. Give oxygen
  - b. Treat hypoglycaemia if present. If dextrostix  $<3$  mmol/l or if you have no dextrostix, give 5 ml/kg of 10% dextrose IV (and continue with 10% dextrose infusion).
3. Stop the fit:
  - a. Paraldehyde. Stat dose 0.1 ml/kg IM. Dissolves plastic: only draw up into syringe when ready to inject and give immediately
  - b. Diazepam. Initial dose 0.25 mg/kg. Diazepam has a long half-life which is variable, but especially long in preterm infant (40-400 hours). Frequent repeated doses will give rise to very high levels. The infant may become apnoeic as a result.

Sometimes neonatal fits are refractory to treatment and in these cases repeated or larger doses may be required to terminate the fits.

Respiratory suppression is more likely to occur if phenobarbitone has also been given - so be prepared.

4. Treat any identified cause of the fit without delay.
5. If no cause is identified and the fit is difficult to control, it is worth giving:
  - a. 10% calcium gluconate 1 ml/kg over 10-15 minutes
  - b. 50% magnesium sulphate 0.2 ml/kg IM stat
  - c. pyridoxine 20-25 mg IV or oral stat.
6. Prevent further fits. Give "prophylactic" anticonvulsant:
  - a. Loading dose
    - i. First line: Phenobarbitone 10 mg/kg slowly IV. Repeat dose if fits not controlled. Alternatively, 15-20 mg/kg IM
    - ii. Second line: Phenytoin 20 mg/kg IV. NB: Give over 1 hour.
  - b. Maintenance treatment
    - i. Start 12 hours after loading doses
      - Phenobarbitone 3-6 mg/kg/day, daily
      - Phenytoin 5 mg/kg/day in 12 hourly doses. The dose may have to be increased after the first few weeks because of an increasing rate of elimination.
    - ii. Maintenance treatment can be stopped after a few days in babies whose fits have been of short duration, or in whom a treated metabolic cause was found. It should be continued long term for babies with:
      - severe birth asphyxia
      - meningitis
      - fits very difficult to control
      - evidence of neurological damage.

## FOLLOW-UP

Babies with abnormal neurological movements and fits need follow-up, including developmental assessment, hearing testing, measurement of head circumference and adjustment of anticonvulsant therapy as required. Pertussis and measles immunisations may be given as normal.