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Neonatal Resuscitation

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Neonatal Resuscitation

Introduction

Newborns are amongst the most frequently resuscitated patients in hospital. The Anaesthetist is often the first person to initiate or observe a neonate with cardio-respiratory arrest.

The same basic principles of resuscitation apply, with a number of considerations and modifications, given the unique anatomy and physiology of the neonate.

The Anaesthetist must identify the factors most associated with foetal compromise and neonatal arrest.

Proper planning, adequate equipment and trained personnel are paramount. Neonatal resuscitation protocols are in a state of evolution. There have been numerous changes to existing guidelines.

A team approach is needed to decrease the morbidity and mortality of Neonatal resuscitation. Every effort must be made to prevent substandard level of care.

Mortality and morbidity

Perinatal asphyxia accounts for one third of neonatal deaths in South Africa. One million neonates die worldwide annually. The major avoidable factor contributing to the deaths in South Africa are Health worker related- under trained staff, equipment and delays.

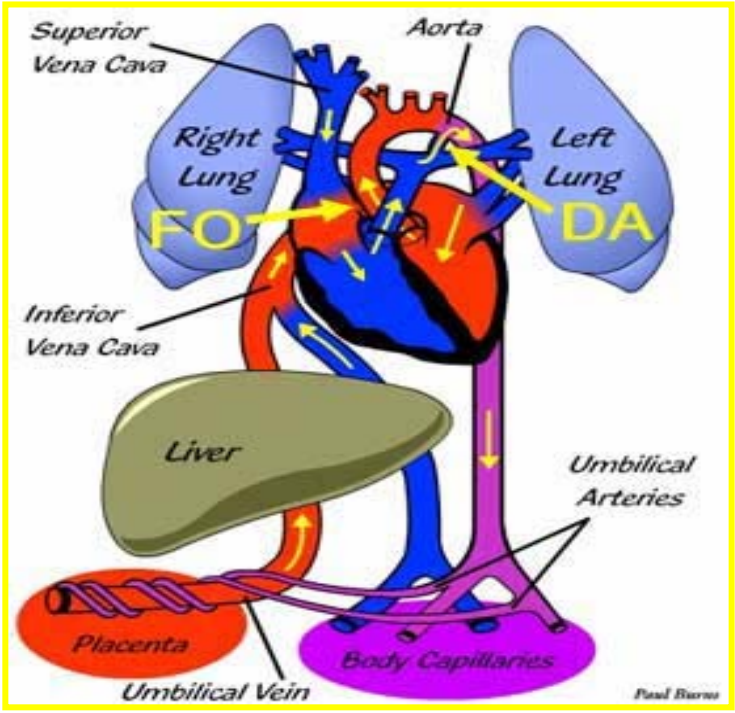
Standard of care is inconsistent throughout the country and there is no assessment or analysis of the level of care provided.

The impact of neonatal mortality/morbidity has both financial and severe social impact. Long term problems include seizures, cerebral palsy and behavioural/learning difficulties.

A recent study has suggested that the HPCSA require that all doctors attain a certificate of competency in neonatal resuscitation before registering as health care professionals.

Whilst only 10% of newborns need any intervention, only 1% needs full resuscitation.

Foetal circulation and transition



Oxygenated blood from the placenta flows via the umbilical vein to the right atrium. Thereafter through the foramen ovale to the left atrium. Reaches head, coronaries and upper body.

Deoxygenated blood from the head and inferior vena cava reaches the right atrium.threreafter to the right ventricle and shunted pass the ductus arteriosus to the descending aorta to the umbilical arteries.

Foetal and transitional circulation

Changes occur at birth converting the parallel circulatory circuit to a series circulatory circuit. Lung fluid is squeezed after passage through the birth canal and also absorbed by lymphatics.

Aeration increases the alveolar oxygen tension and increases pulmonary blood flow. This together with high systemic pressures result in shunt reversal and closure of the ductus arteriosus and foramen ovale.

Prostaglandins keeping the ductus opened diminish as the placenta is removed after cord clamping. Also increased blood flow to the lungs result in increased pulmonary breakdown.

Risk factors associated with Neonatal Resuscitation

1. Maternal

PreEclampsia
Diabetes
Substance abuse
Infection

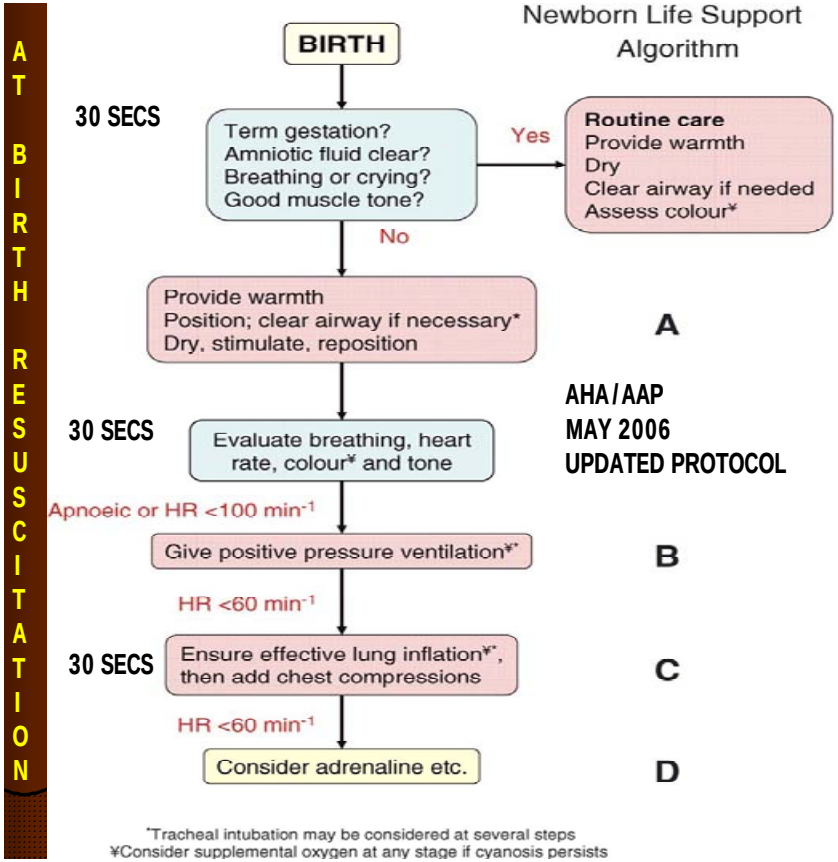
2. Foetal

Anomalies
Preterm
Post term
Oligohydramnios
Polyhydramnios

3. Intrapartum

Abruption placentae
Meconium stained liquor
Chorioamnionitis

American Heart Association
Protocol for Neonatal Resuscitation



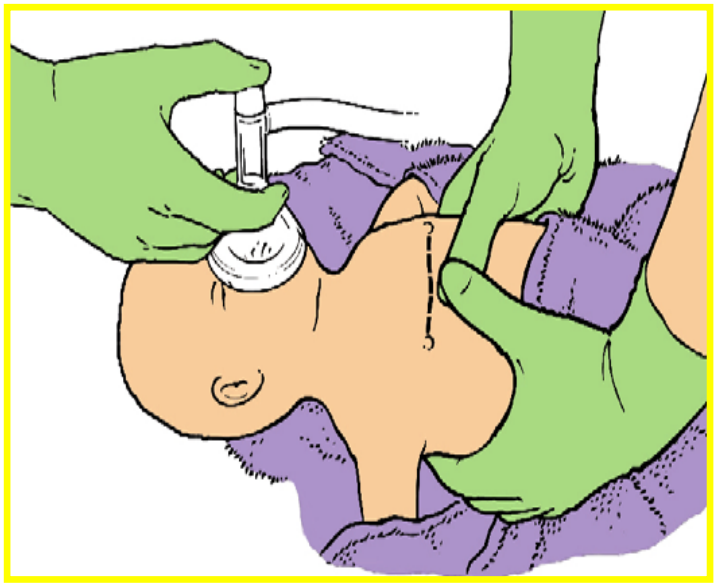
Neonatal Resuscitation Protocol
ILCOR/AHA 2005

A – Airway, suctioning, stimulation, warmth

B – Bag –mask and endotracheal intubation

C – Chest compressions

D - Deficit (volume) and medications



Airway

1. Gentle suctioning without excessive high pressures. Potential to exacerbate laryngospasm, Bradycardia and mucosal oedema.

2. MSL and vigorous neonate- no routine oro/nasopharyngeal suctioning.

3. Watch heart rate, colour and respirations repeatedly.

Ventilation – Positive Pressure

1. Bag mask valve / T Piece

2. Indicated for apnoea, gasping respirations and heart rate less than 100/min.

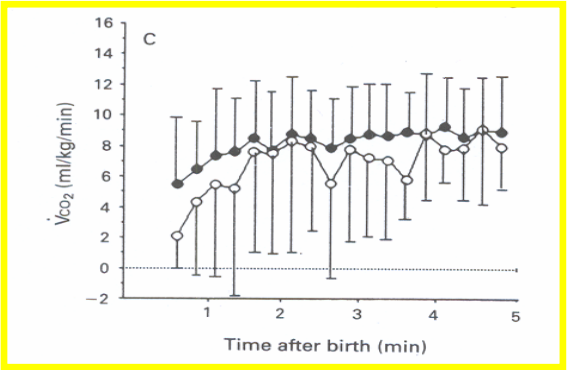
3. Rate 40-60breaths per minute.

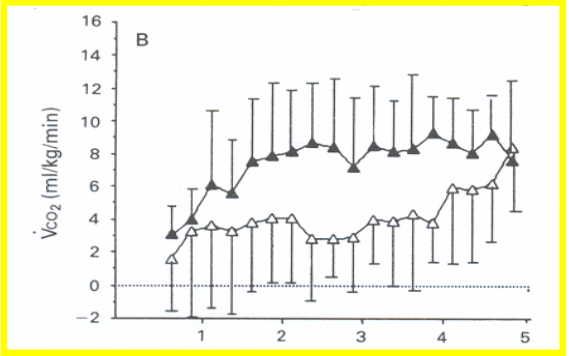
4. Pressure 20-30cmH20

5. Clinical assessment of chest rising and improvement in colour, tone and heart rate.

Pulmonary gas exchange in neonates

Top – 32-36weeks Shaded- assisted ventilation
Bottom - >37 weeks Clear - Spontaneous





Intubation

Indications

1. Bag mask valve in effective.

2. Need for prolonged ventilation

3. Endotracheal route for medications

4. Tracheal suctioning

Tracheal Tube size / Insertion depth

Weight	Gestation	Tube size	Depth
< 1 kg	<28 weeks	2,5mm	6,5-7 cm
1-2kg	28-34weeks	3,0mm	7-8cm
2-3kg	34-38weeks	3,0/3,5mm	8-9cm
>3kg	>38weeks	3,5mm	>9cm

lip insertion depth =weight (kg) plus 6cm

D Biarent et al ,ERC Guidelines 2005

Oxygen and the controversial issues

1. Problems

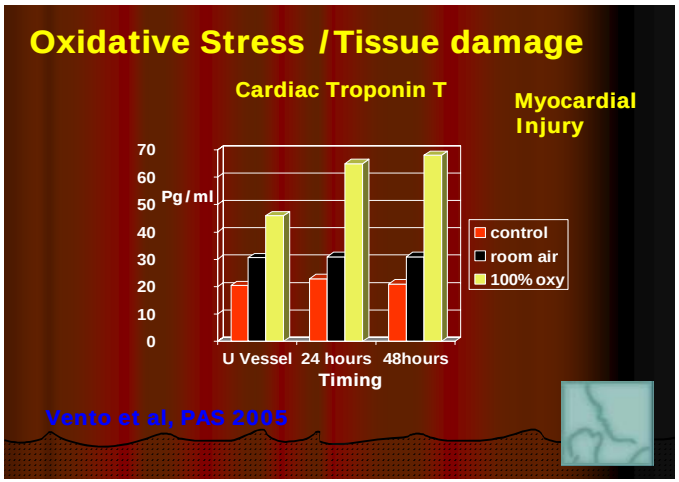
Acute leukaemia
Oxidative stress increased
Increased time to first breath
Prolongs positive pressure ventilation
Increased mortality

2. Controversial

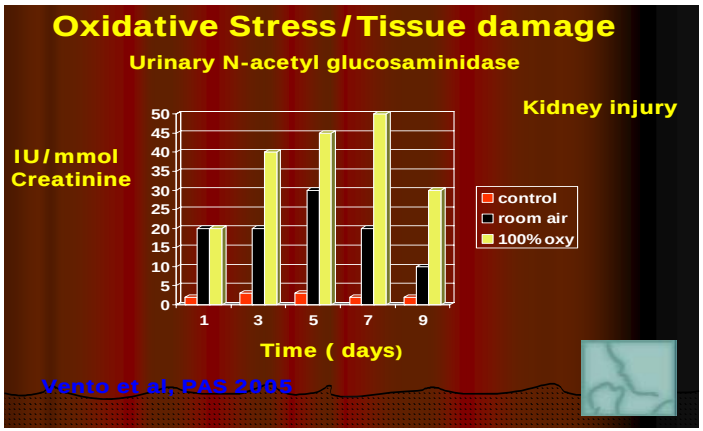
Different for preterm and term
Different for Mild vs severe compromise
Optimum concentration
Target saturation

3. Experimental data

Inflammation of brain, myocardium and lung
Increases neurological damage



Oxygen Paradox – Hypoxic injury occurs most during the re- oxygenation period.



Chest Compressions

1. Debate and controversy.

2. Important clinical target is effective compressions. Adequate depth of force application. At least one third the antero-posterior diameter.

3. Technique – two encircling thumb technique or single hand.

4. Indicated for heart rate less than 60 and after 30 seconds of ventilation and stimulation.

5. Compression ventilation ration 3:1

6.90 Compressions and 30 ventilations in 60 seconds. Three compressions in 1,5seconds.

Volume therapy

It is very difficult to distinguish asphyxic shock from hypovolemic shock in the delivery room.

Look at color, reason for hypovolemic eg. Blood loss, capillary refill time and pulses.

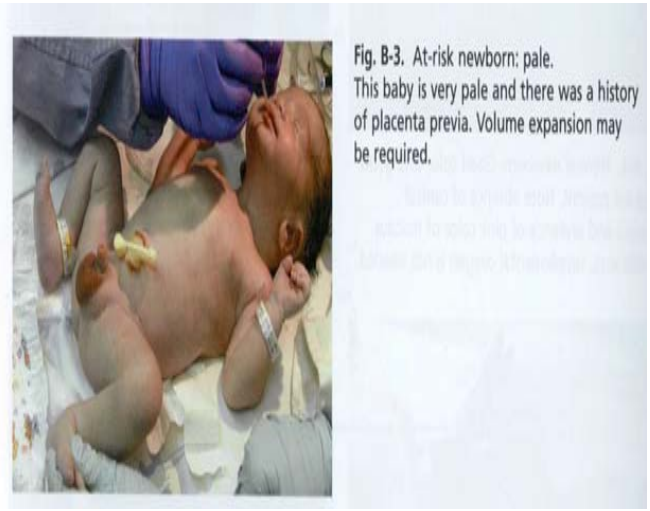


Fig. B-3. At-risk newborn: pale. This baby is very pale and there was a history of placenta previa. Volume expansion may be required.

Saline /Ringers lactate /O negative blood may be used 10ml/kg IV over 5-10minutes.

Fluid infusion may be detrimental to an asphyxiated neonate already compromised by myocardial dysfunction and low cardiac output.

Volume

Recent neonatal studies question volume infusions as most neonates persist with low blood pressures even after instituting therapy.

Volume therapy is associated with low Apgars score, worse base deficit and longer resuscitation time.

Medication

1. Adrenalin: 10-30ug/kg IV.
100-300ug/kg Endo tracheal.

2. Sodium Bicarbonate: 2-4meq/kg IV
Neonate must be fully ventilated.

3. Naloxone: 100ug/kg IV. For Respiratory depression due to opioids.

Bicarbonate actually makes the acidosis worse. Controversial in neonatal resuscitation.

Stopping and withholding Resuscitation

Current guidelines now suggest that after 10 minutes of continuous and adequate resuscitative efforts, discontinuation may be justified if there are no signs of life.

Resuscitation may be withheld under a few circumstances. This requires a team approach involving parents, obstetrician, neonatologist and perhaps anaesthetist.

Conditions

1. Certain death

Gestational age
Anomalies
Weight

2. Other

Borderline prognosis
Burden to child
Parental desires
High morbidity

ILCOR highlights

1. For Apnoea and Bradycardia, the objective is effective ventilation.

2. If no increase in heart rate after intubation and ventilation then check ET position.

3. LMA- Insufficient data for routine use.

4. Oxygen – insufficient data and evidence to determine optimal concentration.

5. MSL – no routine intrapartum suctioning

6. VLBW / 28 weeks – wrapping in plastic increases temperature.

7. Adrenalin IV preferred.

8. No routine use of systemic or selective brain hypothermia.

9. Withholding resuscitation is a Co-ordinated, multidisciplinary approach

Summary

- ♣ Pathophysiology – respiratory cardiac arrest
- ♣ Preparation – equipment, personnel, training
- ♣ Predictive risk
- ♣ Planning
- ♣ Protocol – neonatal resuscitation
- ♣ Post resuscitation care

Conclusion

Neonatal resuscitation is not evidence based. There are a number of controversial issues. The anaesthetist should be aware of the latest recommendations and updates in this regard. The evolution is based on international, multicentred consensus, assessments and analyses.

We still have a long way to go for optimal management.

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