NEONATAL ANAESTHESIA

Some definitions:

- Neonatal period : first 28 days of extrauterine life
- Preterm infant : one that is born at less than 37 weeks gestation
- Post-gestational age (PGA) : postnatal age + conceptual age

Considerations:

- conceptual age and mother's antenatal history
- PGA and problems of prematurity
- associated congenital abnormalities / syndromes
- problems associated with the surgical condition
- full stomach
- fluid and electrolyte disturbances
- sepsis

Special considerations for the neonate :

- differences in anatomy and physiology compared with the older child
- hypocalcaemia, hypoglycaemia, immature liver function, coagulopathy, temperature regulation
- drug handling differences : doses have to be modified, e.g. thiopentone, morphine, antibiotics
- special attention to asepsis required
- transport to and from NICU / SCN

The Premature / Ex-premature neonate

Needs careful review of:

- Birth events
- Cardiovascular system
    - Congenital heart disease e.g. PDA with medical/surgical therapy

    - Presence of persistent fetal circulation in the ill neonate
- Respiratory system
    - h/o hyaline membrane disease(HMD), presence of bronchopulmonary dysplasia (BPD), mechanical ventilation, oxygen dependancy, apnoeic episodes and efficacy of therapy
- CNS : intraventricular haemorrhage (IVH) – results of ultrasound to be noted
- Eye : retinopathy of the prematurity (ROP) and its severity, care with FiO_2. Note range of SpO_2 that neonate is maintained on in NICU. Ensure functioning Air/Oxygen blender for transport if patient is intubated and ventilated.
- Immature Liver function: PT / PTT may be prolonged
- Metabolic : prone to hypoglycaemia and hypocalcaemia
- Acquired infections e.g. MRSA
- Special attention to Lines and Temperature regulation during transport.

The premature neonate is more prone to apnoeic episodes, especially after anaesthesia. The incidence of postoperative apnoea is 11-37% for infants < 60/52 PGA. The risk of an infant <44/52 PGA developing postoperative apnoea is particularly high.
Infants whose PGA age is <60/52 should generally not be done as day cases as they will need postoperative apnoea monitoring.

References:
1. Steward DJ: Preterm infants are more prone to complications following minor surgery than are term infants. Anesthesiology 56:304, 1982
2. Welborn LG, Rice LJ, Hanallah RS, et al: Postoperative apnea in former preterm infants: Prospective comparison of spinal and general anesthesia. Anesthesiology 72:838-842, 1990

ANAESTHESIA IN THE NEONATAL INTENSIVE CARE UNIT

Operations which are done in the NICU include PDA ligation, laparotomy or insertion of drains for NEC. These are often premies who are critically ill, very small (<1000g) or unstable babies in whom transport may be hazardous; resulting in hypothermia, haemodynamic instability and inconsistent ventilator therapy.
The decision to operate in the NICU can only be made after mutual agreement between the neonatologist, surgeon and anaesthetist.

Preoperative Review:

Medical Status :

- PGA
- Problems associated with prematurity and its severity
- Respiratory : Apnoeic spells, HMD, BPD - assess its severity, O_2 dependancy and the mode of O_2 therapy, Sa O_2 on air
- CVS: PDA, CCF, diuretics and anti-failure agents
- Others: ROP and its severity, IVH, hypoglycaemia, hypocalcaemia and jaundice
- Drug Review

Surgical Status:
Sepsis, volume status, presence of shock and coagulopathy
Review fluid requirements.

Equipment:
Long lines, peripheral lines, arterial lines, umbilical catheters. Try not to use (break the sterility) of long lines; use peripheral lines for giving drugs, blood and blood products.

Respiration:
ETT; oral/nasal, markings at gum/nares
Ventilator settings

Drug Review

Investigations:
FBC, U/E/S/Cr, PT/PTT, GXM, CXR. 2D Echo etc.

Premedication:
Prophylactic antibiotics if indicated.

Conduct of Anaesthesia:

The surgery can be done in the NICU OT or in the cubicle, on the Air Shields “Open Care” or with the patient inside the incubator, at the discretion of the team.
Minimal handling of neonate should be observed, as the sick neonate may decompensate on handling.

Pre Anaesthesia check list :

- Surgeon, scrub nurses and any special equipment
- Blood and blood products are available in the NICU.
- Ventilator and T-piece attached to O_2 source, checked and within reach of the anaesthetist.
- O_2 source : air / O_2 blender available.
- If you are unfamiliar with the ventilator, seek assistance from the neonatologist or NICU respiratory therapist.

- Check correct position of ETT, auscultate for equal air entry and adventitious sounds. ETT should be free of secretions and spare ETT available.
- Baseline ABG may be taken if arterial line present; check correlation between $PaCO_2$ / $TcCO_2$ / $ETCO_2$, and SaO_2.
- A peripheral line should be set up and an extension with 3 way tap placed within reach of anaesthetist.
- Drugs drawn out and labelled clearly with pre-calculated dosage chart
- Resuscitation equipment available and within reach.

Monitors:

ECG, SaO2, NIBP or arterial line, temperature, transcutaneous CO_2 $TcCO_2$ / $ETCO_2$ – displays easily seen.

Technique:

- Intravenous anaesthesia is usually used as there is no anaesthesia machine in NICU. The IV technique usually consists of fentanyl/muscle relaxant or ketamine/muscle relaxant with air/oxygen mixture.
- Check compliance of lungs before and after muscle relaxants are given, adjustment of ventilator settings is usually required after induction and paralysis.
- Check ETT, lines, monitors again if baby is repositioned for surgery.
- Care should be taken to keep to a “safe” SaO_2 (87 - 95%) to avoid ROP.
- Keep meticulous record of fluid intake, boli of fluid to flush drugs from extension line, drug volumes etc.
- There should be 2 anaesthetists present. If an AU nurse is not available, ensure that there is a nurse from NICU present to assist.
- At the end of the procedure, check that the baby is stable and do a formal hand-over to the neonatologist.