بسم الله الرحمن الرحيم
PROBLEMS OF THE NEWBORN

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A most important characteristic of the neonate is instability of the various hormonal and neurogenic control systems. This results partly from immature development of the different organs of the body and partly from the fact that control systems have not become adjusted to the new way of life.
RESUSCITATION

Skilled resuscitation of the newborn should be available wherever babies are born. Resuscitation of the newborn has been divided into basic and advanced resuscitation.

**Basic resuscitation:** For the baby who does not breathe at birth, after placing the baby under the radiant heater and clearing the airways.
Basic resuscitation comprises:

1- Artificial ventilation via face mask. The baby is correctly positioned with the neck slightly extended and intermittent positive ventilation initiated with adequately sealed face mask. A starting pressure of up to 30 cm of water followed by a pressure of 10-15 cm of water at a rate of 30-40 breaths /min.
External cardiac compression. If the patient is bradycardiac, external cardiac compression is applied by grasping the chest with both hands, placing the thumbs over the junction of the middle and lower third of the sternum and applying pressure using both thumbs.
3- Giving naloxone. If the mother has received a narcotic analgesic within 4 hr. of delivery and the baby fails to breathe regularly when artificial ventilation is stopped.
Advanced resuscitation:

Indications for advanced resuscitator to attend deliveries:

A- During labor and delivery
1- Fetal distress including low fetal pH.
2- Thick meconium staining of amniotic fluid.
3- Caesarean section.
4- Forceps or ventous delivery.
5- Abnormal presentation.
6- Prolapsed cord.
6- Antepartum hemorrhage.

B- Maternal conditions
1- Diabetes. 2- Fever
3- Heavy sedation.
4- Concomitant illness.
5- Severe hypertension and/or proteinuria.

C- Fetal conditions
1- Multiple pregnancy.
2- Preterm labor less than 37 weeks
3- Post-term labor more than 42 weeks.
1- Tracheal intubation. Advanced resuscitation comprises:

Intubation is done under direct vision using a laryngoscope and an appropriate size of tracheal tube. After tracheal intubation, one need to check that there is satisfactory excursion of the chest wall.
During artificial ventilation cardiac compression is continued if indicated.

2- Drug administration.

Adrenaline can be given via endotracheal tube or into umbilical vein. Calcium gluconate is given for persistent bradycardia. A transfusion of group O negative blood should be given if the infant remains pale.
Resuscitation needs to be performed quickly and skillfully and the baby should not become hypothermic.

3- Management of meconium aspiration.

The oropharynx must be aspirated. If meconium is present in the trachea, a tracheal tube is inserted and the meconium aspirated. If the baby becomes bradycardiac, +ve pressure ventilation will need to be started.
LOW BIRTH WEIGHT INFANTS

* Low birth weight is defined as a birth weight less than 2500 g at birth.
* Infants weighing less than 1500 g at birth are very low birth weight infants.
* Infants weighing less than 1000 g at birth are extremely very low birth weight infants.
Clinical categories of neonatal care:

Intensive care has been categorized as maximum and high dependency intensive cares.

A- Maximum intensive care includes babies:

1. Receiving assisted ventilation.
2. Of less than 27 weeks’ gestation.
3. With a birth weight of < 1000 g for the first 48 hours after birth.
4- Who require major emergency surgery for the preoperative period and postoperatively for 48 hr.
5- Who are receiving peritoneal dialysis.
6- Who require exchange transfusions complicated by other disease processes.
7- With severe respiratory disease in the first 48 hr. of life.
8- With recurrent apnoea.
9- With significant requirements for circulatory support. **High dependency intensive care includes babies:**

1- Requiring total parental nutrition.
2- Who are having convulsions.
3- Being transported by a trained skilled neonatal nurse alone.
4- With arterial line or chest drain.
5- With respiratory disease in the first 48 hr. of life.
6- With recurrent apnoea.
7- Who require an exchange transfusion alone.
8- Who are more than 48 hr. postoperative and require complex nursing procedures.
9- With tracheostomy for the first 2 weeks.

It is particularly important for VLBW infants to be kept dry, warm and covered during resuscitation.
Active resuscitation is initiated early unless the baby is vigorous, breathing normally and pink.

**Stabilizing VLBW infant**

On arrival on the baby unit, the infant is quickly weighed, placed in an incubator and briefly examined to assess the baby’s clinical condition and identify any congenital abnormalities.
Artificial ventilation: artificial ventilation may be required because of immature lungs and weakness of the muscles of respiration combined with a highly compliant chest wall. Adequate ventilation can prevent the development of hypoxia, lung atelectasis, secondary surfactant deficiency and circulatory failure.
Circulation: the infant’s circulation is assessed from the heart rate and skin perfusion and blood pressure. A very helpful guide is the toe-core temperature differential which should not exceed 2 °C. Circulatory support is often required with colloid and inotropic drugs.
Monitoring: infant’s heart rate, respiratory rate and temperature are monitored. The infant’s oxygenation needs to be closely monitored to avoid hypoxemia which may result in ischemic damage and hyperoxemia which may produce retinopathy. PaO$_2$ is kept between 50-90 mmHg. Arterial line allows direct continuous measurement of blood pressure and blood sampling.
A chest X-ray is taken to assess the infant’s lung and the position of the endotracheal tube and umbilical artery catheter.

**Temperature control**: special attention needs to not allow the baby to become hypothermic.

**Fluid balance and metabolic monitoring**: usually 40-60 ml/kg of fluid is sufficient on the 1\textsuperscript{st} day.
Fluid intake is altered according to the infant’s urine output, blood pressure, acid-base balance and clinical assessment of the peripheral circulation. Hypoglycemia is prevented by establishing an IV infusion containing dextrose.

**Antibiotic therapy:** VLBW babies requiring ventilator support are usually giving antibiotics.
Specific problems of VLBW

I- Temperature control

VLBW infants become hypothermic very readily. They have a large surface area relative to their weight and they have relatively little brown fat and subcutaneous fat. Preterm infants cannot shiver and are nursed naked. Keeping infants warm to avoid hypothermia improves their survival.
VLBW infants are nursed in closed incubators or under radiant warmers. They should be clothed as far as possible. For infants below 2 kg the room temperature needs to be about 26 °C, for those over 2 kg it should be about 24 °C to achieve a neutral thermal environment.
2- Respiratory problems
A- Respiratory distress syndrome (RDS)
It occurs in about 9 / 1000 live births. Infants at increased risk are preterm infants, infants of diabetic mothers and those with rhesus isoimmunization. RDS occurs when there is deficiency of surfactant because the production of type II pneumocytes in the lungs is reduced.
After 36 weeks’ gestation surfactant is usually produced in adequate quantities. After 32 weeks; gestation it is possible to manage respiratory distress syndrome successfully. Administration of corticosteroids to the mother 24 hr. preceding delivery will increase the production of surfactant. More recently TRH giving antenatally combined with corticosteroids promotes surfactant production.
RDS occurs in about 60% of infants born before 30 weeks gestation, but in only 35% after a full course of antenatal corticosteroids. Respiratory distress develops within 4 hr. of birth with worsening of hypoxia, hypercapnea and acidosis for the first 2-3 days.
Investigation

1- Chest X-ray shows glass appearance of the lung fields.
2- Air bronchogram shows air in the bronchi contrasting with the surrounding opaque lung fields and heart.
3- When the disease is severe, the lungs appear as a white out when they cannot be differentiated from the heart.
Management
1- Added oxygen and ventilator support started early if the disease is severe.
2- Sufficient peak pressure is given to expand the lungs and positive end expiratory pressure to maintain airway patency on expiration.
3- Maintain satisfactory blood pressure and circulation.
4- Analgesia is given to babies requiring mechanical ventilation.
5- Muscle relaxant is used for babies with severe disease.
6- Antibiotics are given as group B streptococcal infection may mimic RDS.
7- The major recent advance in the management is giving synthetic surfactant therapy directly into the lungs via the tracheal tube.
B- Apnoea of prematurity

Some VLBW infants develop recurrent apnoeic attacks in the first few weeks of life. It is related either to prematurity or infection. Other causes include anemia, a patent ductus arteriosus and aspiration of milk feeds. Breathing will be established by tactile stimulation. Giving theophylline, ambient oxygen or ventilator support is required.
3- Nutrition

A- Breast feeding

Preterm infants fed on breast milk appear to absorb it easily than formula feeds, to be at a lower risk of developing necrotizing enterocolitis and have a higher intelligence quotient in childhood. Breast milk has a lower energy content than formula feeds and infants grow slower on it.
Sodium, calcium and phosphate supplements may be needed if infants are purely breastfed.

**B- Formula feeds**
They contain a higher concentration of protein and minerals and additional sodium, phosphate and calcium.
C- Nasogastric feeding

Enteral feeding is introduced for infants less than 30 weeks’ gestation, or those with respiratory distress or who are ill where there is a risk of regurgitation and aspiration. The milk is usually given in frequent small bolus via the nasogastric tube.
D- Parenteral nutrition

It is often required to supplement or replace enteral feeding in infants receiving intensive care. It is often used for VLBW infants on artificial ventilation for RDS or with necrotizing enterocolitis. Short period parental nutrition can be given via a cannula in a peripheral vein. Long term parental nutrition is given via a central catheter placed in the right atrium.
Complications are:-
1- Infection
2- Hyperglycemia
3- Fluid and electrolyte imbalance
4- Metabolic acidosis
5- Cholestatic jaundice.
4- Osteopenia
Preterm infants may become poorly mineralized and may develop rickets. Infants at most risk are those receiving prolonged parenteral nutrition or breast milk alone.
All VLBW should have regular monitoring of their plasma phosphate and calcium and their supplementation together with vitamin D if necessary.
Intraventricular hemorrhage and ischemic brain injury

Intraventricular hemorrhage occurs in the rich network of capillary vessels lying alongside each lateral ventricle. Intraventricular blood may lead to ventricular dilatation and hydrocephalus. Ischemic lesions may occur and become cystic and filled with cerebrospinal fluid.
6- Anemia

Early anemia of prematurity is due to deficient erythropoiesis combined with reduced red cell survival. It is important to maintain Hb of sick newborn infants above 12 g/dl. Blood transfusion is usually required if Hb concentration drops below 8 g/dl or if the infants become symptomatic with poor feeding, poor weight gain, respiratory distress or apnoea.
Supplemental iron is given from 3 weeks of age. The role of erythropoietin therapy is being assessed.

7- Necrotizing enterocolitis
It is an inflammatory condition of both large ad small intestine characterized by the presence of gas in the bowel wall and sometimes in the portal tract which may lead to bowel perforation.
It is probably due to a combination of ischemia of the bowel wall and infection. Predisposing factors include hypotension, early feeding and umbilical catheterization. The baby presents with poor feeding or vomiting and abdominal distension and blood stained stool.
The skin of abdominal wall becomes tense, shiny and discolored. Abdominal radiograph shows distended loops of bowel and the bowel wall is edematous and may contain intramural gases.
**Treatment**

1- Stop oral feeds and start nasogastric suction.
2- Intravenous fluids.
3- Broad spectrum antibiotics.
4- Surgery for infants deteriorating or develop perforation.
8- Retinopathy
There is early proliferation of the retinal vessels which regresses fully. Sometimes it progress to fibrosis, distortion and scarring of the retina which may result in retinal detachment, visual impairment or blindness. It can occur in preterm infants who nursed for long periods with high concentrations of $O_2$. Cryotherapy to the retina is sometimes used.
Jaundice in the newborn

Breakdown of RBCs results in the production of indirect, unconjugated bilirubin which is insoluble in water and is carried in the serum bound to albumin. This bilirubin is conjugated in the liver by glucuronyl transferase system enzymes to form water soluble bilirubin glucuronide which is excreted in the bile.
Jaundice is common in newborn babies as:

1- There is marked breakdown of RBCs in the first few days of life.

2- The glucuronyl transferase system in the liver is less well developed in the immediate newborn period. Jaundice may be a manifestation of an underlying disorder. In addition, bilirubin may cross the blood brain barrier and cause neuronal damage (kernicterus).
**Manifestation:**
1- The infant becomes irritable, reluctant to feed and has increased muscle tone with hyperextension of the back and neck.
2- Sensorineural deafness, cerebral palsy and mental retardation.
Jaundice presenting at less than 24 hours of age

1- Hemolysis is the most severe in the newborn, may be caused by: Rhesus or ABO incompatibility
2- G6PD deficiency, this X-linked recessive disorder is deficiency of an enzyme which is essential for survival of RBCs.
3- Bruising and polycythemia.
4- Intrauterine infection with rubella, cytomegalovirus, toxoplasmosis and syphilis.

**Jaundice at 2-14 days**

1- Physiological jaundice is the most common cause of jaundice in the newborn. It usually starts on the 2\textsuperscript{nd} or 3\textsuperscript{rd} day of life and lasts for only a few days.
2- Infection particularly urinary tract infection.
3- Hemolytic jaundice.
4- Breast milk jaundice but it is not necessary to interfere with breastfeeding.
**Prolonged jaundice**

1- Breast milk jaundice is the commonest cause of prolonged jaundice and gradually declines over several weeks.

2- Congenital hypothyroidism.

3- Galactosemia is a rare metabolic disorder and is associated with vomiting and hepatomegaly.
4- Infection as urinary tract infection.
5- Neonatal hepatitis and biliary atresia. A useful clinical marker is that the stool becomes pale or white and the urine is dark in color. Biliary atresia is treated surgically.

Management of jaundice
Assessing the clinical importance of the jaundice requires consideration of the baby’s age and gestation as well as the absolute level of bilirubin.
Treatment is by phototherapy or exchange transfusion. Light converts bilirubin into harmless pigments. The baby is usually placed under a bright light. As the baby is nursed exposed, the infant is at risk of hypo- or hyperthermia. The eyes are covered because of the brightness of the lights.
Fluorescent light

Baby with mild jaundice
In term infants with hemolytic disease it was found that clinical evidence of kernicterus no longer occurred when the bilirubin level was kept below $360 \text{\mu mol/l}$. Phototherapy and exchange transfusion will be initiated at lower bilirubin levels in preterm infants, in infants who are ill or if a further rise in bilirubin is anticipated from hemolysis.