PATHOLOGICAL JAUNDICE IN NEWBORN

Neonatal SHO should be contacted if baby develops jaundice

Neonatal SHO should consider following facts

- Baby is well or unwell
- Success or failure of breast feeding
- Family history jaundice
- Percentage weight loss from birth weight – more than 10% is significant
- Examination (hepatosplenomegaly, petechiae, pallor)

Refer in house phototherapy charts

<table>
<thead>
<tr>
<th>Age</th>
<th>PHOTOTHERAPY</th>
<th>EXCHANGE TRANSFUSION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HEALTHY NEWBORNS ≥35 WEEKS GESTATION</td>
<td>NEWBORNS &lt;35 WEEKS GESTATION OR ANY RISK FACTORS</td>
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<tr>
<td>Day 1</td>
<td>Any visible jaundice</td>
<td>260 mmol/l (15 mg/dL)</td>
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<tr>
<td></td>
<td>260 mmol/l (15 mg/dL)</td>
<td>170 mmol/l (10 mg/dL)</td>
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<tr>
<td>Day ≥3</td>
<td>310 mmol/l (18 mg/dL)</td>
<td>250 mmol/l (15 mg/dL)</td>
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- Term and preterm newborns with hyperbilirubinaemia should be treated with phototherapy or exchange transfusion guided by the following cut-off levels of serum hyperbilirubinaemia:
  *(Weak recommendation, very low quality evidence)*

- Clinicians should ensure that all newborns are routinely monitored for the development of jaundice and that serum bilirubin should be measured in those at risk:
  - in all babies if jaundice appears on day 1
  - in preterm babies (<35 weeks) if jaundice appears on day 2
  - in all babies if palms and soles are yellow at any age
  *(Strong recommendation, very quality evidence)*

- Phototherapy should be stopped once serum bilirubin is 50 mmol/l (3 mg/dl) or below the phototherapy threshold.
  *(Weak recommendation, expert opinion)*
• **Causes – Jaundice within the first 24 hours is always pathological**
  - Haemolytic Jaundice (Rh, ABO, Others)
  - Sepsis
  - Congenital infections

**Causes – Day 02-10 post delivery**
- Mostly physiological
  - Bruising
  - Haemorrhage
- Pathological
  - Haemolytic Jaundice
  - polycythaemia
  - Sepsis

**Prolonged Jaundice could be pathological** — conjugated bilirubin > 10% of the total (or > 30 micromols /l)
- Day 14 term babies
- Day 21 pre-term babies

**Investigations Consider blood tests**
- SBR (Direct / Indirect) – Refer the appropriate chart
- Blood group of infant and mother
- Direct Coombs test (negative test does not rule out haemolytic jaundice)
- FBC and blood film
- CRP, blood culture, IV antibiotics if unwell

**Consider other blood tests**
- Serum for toxoplasmosis, rubella, syphilis, urinary CMV PCR,
- G6PD. LFTs, Clotting
- Urine for reducing substances

**Phototherapy**
- Take down nappies to maximise surface exposure to phototherapy
- Ensure phototherapy unit at approximately 30 cm from baby and eyes covered
- Minimise removing the infant from under phototherapy e.g. only for breast feeding 3-4 hrly for a maximum of half an hour out of phototherapy
- If bilirubin increasing use double lights and consider transfer to NICU
- Write frequency of SBR and PCV monitoring (4-6 hrly) in notes.
- Monitor response and plot results on charts on appropriate charts for gestation
- Discontinue phototherapy when 2 SBRs below phototherapy line. Recheck SBR 8 hrs after stopping to ensure no rebound of jaundice
- Transfer NICU if rapidly rising SBR, SBR above exchange level

**Pathological Jaundice**
- Jaundice requiring an exchange transfusion
- Rapidly rising bilirubin (> 15 micromols /hour)
Feeding
- Promote and support breastfeeding
- Mother to put infant to the breast before expressed breast milk is given as cup-feeds
- If infant not getting enough, ensure adequate intra-venous fluid– Expressed Breast Milk or formula (always consult Paediatrician)

IV Immunoglobulin – use MUST be discussed with attending consultant
Single dose of 0.5 g/kg of iv immunoglobulin may be effective in reducing the need for exchange transfusion.
Beneficial in rhesus haemolytic disease, may be beneficial effect in ABO incompatibility

Exchange Transfusion is indicated
- Serum bilirubin level is above the exchange line on the appropriate chart
- Rate of rise of unconjugated bilirubin is > 15 micromols/L/hr
- Hydropsfetalis with severe anaemia

The aim of an exchange transfusion is:
- To lower serum bilirubin level and reduce the risk of neuro-disability and kernicterus
- To remove infant’s sensitized red blood cells, circulating antibodies and reduce the degree of red cell destruction
- To control blood volume and relieve potential cardiac failure
- To relieve anaemia and increase the oxygen carrying capacity of the infant’s blood

Potential complications of exchange transfusions
- Catheter infection, air embolism, thrombosis, haemorrhage
- Fluid loss, fluid overload, anaemia, polycythaemia
- Acidosis
- Electrolyte disturbances
- Necrotising enterocolitis

Equipment / Pre-exchange Preparation
- Infant blood chemistry
- Laboratory serum bilirubin (conjugated and unconjugated)
- Blood group
- Direct Coombs Test
- Full blood count and blood film
- Glucose 6 Phosphatase (G6PD) levels
- Urea and electrolytes
- Liver function tests (including conjugated and unconjugated bilirubin levels)
- Glucose
- Clotting studies
- Haemoglobinopathy screen
- Arterial blood gas
- Blood for toxoplasmosis and cytomegalovirus serology and red blood cell enzymes may be necessary if the aetiology of jaundice is unclear
Maternal Blood chemistry

- ABO and RhD group
- Screen for presence of atypical red cell antibodies

Order blood for exchange transfusion (Inform Blood Bank that it is for an exchange transfusion) Ideally plasma-reduced red cells with a haematocrit of 0.50 – 0.55 should be suitable for an exchange transfusion for both hyperbilirubinaemia and anaemia.

**Volume of blood required** = weight x 80ml x 2

**Equipment**

- Umbilical arterial catheter (UAC) (see Umbilical arterial catheter guideline)
- Umbilical venous catheter (UVC) (see umbilical venous catheter guideline)
- Blood warmer / IV infusion pump
- Blood giving set
- Waste bag/bottle for aspirated blood
- Infant monitoring equipment
- Phototherapy unit and biliblanket, if available
- Input – Output chart for records
Performing exchange transfusion

- Obtain urgent blood samples as above
- Communicate with Blood Bank and tell them you require blood for an exchange blood transfusion. Volume of blood required for an exchange transfusion is 80ml x infant’s body weight x 2
- Explain procedure to parents. Document in communication notes
- Consider Vitamin K status. Give 2nd dose on completion of procedure if first dose was intravenous as Vitamin K is removed during exchange transfusions. See Neonatal Formulary for details on dosage.
- Empty stomach contents as infant must be nil by mouth throughout the procedure
- Plan length of procedure, rate of infusion, volume and frequency of aliquots for removal. Ensure continuous monitoring of heart rate, respirations and saturation. Baseline blood pressure should be taken
- Perform umbilical arterial catheterization (see Umbilical arterial catheter guideline). Collect required blood specimens if not already done so. If unable to site a UAC, inform attending neonatal consultant. If a UAC cannot be sited, a peripheral arterial line can be considered, but only after discussion with the attending neonatal consultant. If arterial access cannot be obtained, the attending neonatal consultant must be informed.
- Perform umbilical venous catheterization (see Umbilical venous catheter guideline). If UVC access cannot be obtained, the attending neonatal consultant must be informed. If UVC access cannot be obtained a large bore venous catheter can be inserted after consultation with the attending neonatal consultant.
- Check compatibility of blood for transfusion as per Trust policy.
- Connect blood transfusion to UVC, or venous access, via blood transfusion giving set and blood warmer. Warm blood to 36.7-37 deg
- Connect UAC to waste bottle/bag via 3-way tap and extension tubing
- During the exchange transfusion, record vital signs each 15 minutes. If using a UAC monitor feet for signs of emboli
- Liaise with nurse continuously throughout the procedure
- At onset of procedure, check urea and electrolytes, calcium, glucose, blood gas, spun packed cell volume (PCV)
- If PCV > 55 sodium chloride 0.9% will need to be infused to ensure that the infant’s PCV does not rise suddenly.
- Throughout procedure, check blood gases and glucose every half hour
- Halfway through procedure check spun packed cell volume (PCV), spun bilirubin (SBR) and gas
- A continuous infusion of blood should be run through a venous line to provide the total volume of blood over 4 hrs. The removal of blood should proceed in synchrony over the same time period through an arterial line or UVC if arterial access cannot be achieved
- On completion send further blood specimens to laboratory: arterial blood gas, SBR, spun haematocrit, calcium, urea and electrolytes, full blood count and clotting, glucose, liver function tests (conjugated+unconjugated bilirubin)
- If the haematocrit remains high following the exchange transfusion, a dilutional exchange will be required.
- Perform a cranial ultrasound
- Document procedure and infant’s response