

NEONATAL JAUNDICE: PATHOPHYSIOLOGY AND MANAGEMENT

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INTRODUCTION

Jaundice is the most common clinical sign in neonates. It is important to recognise and evaluate for two reasons. Firstly, it may be an indicator of potentially serious underlying pathology, and secondly, a very high level may cause kernicterus (bilirubin encephalopathy). However in the majority of infants it is a normal occurrence and requires no investigation. This article aims to give guidance on recognising which infants require investigation and referral.

It is estimated that two thirds of healthy term newborns and most preterm infants develop jaundice in the first week of life. This is usually due to immaturity of the liver's excretory pathways at a time of heightened production. The resultant jaundice is referred to as physiological.

In the current era of early postnatal discharge from hospital identifying jaundice is becoming more of the responsibility of community midwives and general practitioners.

PATHOPHYSIOLOGY OF NEONATAL JAUNDICE

The normal destruction of circulating erythrocytes accounts for 75% of the daily bilirubin production in the newborn. Senescent RBCs are removed and destroyed in the reticuloendothelial system where the haemoglobin is catabolised and converted to bilirubin. The remainder is due to ineffective erythropoiesis and the destruction of immature erythrocyte precursors, either in the bone marrow or soon after release into the circulation.

In circumstances where bilirubin production is high, it may exceed the binding capacity of albumin, in which case unconjugated bilirubin will enter the brain and cause kernicterus, which may prove fatal. Survivors suffer sensorineural hearing deficit and athetoid cerebral palsy. In the term infant, kernicterus is unlikely to happen below a total bilirubin level of 400 mmol/L. However, important special exceptions to this are where there is a haemolytic cause for the jaundice and in the sick neonate, when kernicterus may occur at significantly lower levels.

PHYSIOLOGICAL JAUNDICE

At birth the cord bilirubin is normally 20-35 mmol/L. It then rises, usually peaking by days 3-4 at about 80 mmol/L which is just clinically detectable. Levels then fall rapidly to reach normal adult values by two weeks of age. This may be slightly prolonged in breastfed infants.

Preterm infants exhibit a higher peak serum bilirubin

concentration occurring on day 5-6 and a longer declining phase, persisting for four weeks or more.

Some factors which may exacerbate physiological jaundice are listed below:

- polycythaemia – delayed cord clamping, maternofetal transfusion
- extravasted blood – bruising, cephalohaematoma, birth trauma
- delayed passage of meconium
- swallowed blood
- hypocaloric feeds
- dehydration (generally due to insufficient intake)
- breast feeding
- prematurity

ASSESSING THE SEVERITY OF THE JAUNDICE

Every jaundiced baby merits evaluation to exclude underlying pathology and to assess the risk potential for bilirubin encephalopathy.

Jaundice usually progresses cephalocaudally. A suggested guideline is that jaundice limited to the head and neck has an average total serum bilirubin (TSB) value of 100 mmol/L. Jaundice extending to the elbows and knees but not as far as the hands and feet correlates with a level of 250 mmol/L, whereas jaundice involving the hands and feet generally means a level greater than 300 mmol/L.

As jaundice regresses, it does so from feet to head, ie the staining of the sclera will be last to resolve.

CAUSES OF JAUNDICE AT DIFFERENT AGES

1 0-24 hours of age

- infection
- haemolysis

2 2-10 days

- physiological
- continuation of causes in 1
- metabolic
- bruising
- breast milk

3 11 days +

- any of the causes in 1 and 2 above
- obstructive jaundice – biliary atresia, viral hepatitis

MANAGEMENT OF JAUNDICED INFANT IN THE COMMUNITY

The following infants require immediate hospital referral:

- jaundice in the first 36 hours of life
- sick infant
- TSB over 300mmol/L
- conjugated bilirubin >25 mmol/L
- rapidly rising bilirubin > 100 mmol/L/24 hours
- presence of jaundice at four weeks age (see below)
- acholuric (pale) stools and dark urine
- jaundice which is not resolving, and for which you have no explanation

The majority of other jaundiced babies can be safely monitored in the community.

If there are concerns with jaundice after seven days of age, then:

- check TSB level if jaundice marked
- ensure sufficient milk intake (150 ml/kg/24 hours)
- ensure weight increasing (expect weight gain of 25-30 Gm/day, and back at birth weight by two weeks of age)
- check colour of urine and stools
- examine the baby

Refer if TSB >300mmol/L, sick infant, or not thriving on sufficient intake.

Review at 14 days. If still jaundiced, then check:

- TSB and split bilirubin (conjugated and unconjugated)
- urinalysis to exclude infection
- continued well-being, thriving and normal examination
- normal colour of stools and urine
- ensure neonatal thyroid screen normal

If any of these are abnormal, or TSB >300mmol/L or conjugated bilirubin >25 mmol/L, then refer.

Otherwise, monitor weekly in community, provided TSB continues to fall steadily.

It is appropriate to discuss every baby who continues to be jaundiced at 28 days with the hospital.

BREAST MILK JAUNDICE

Up to one third of breastfed babies remain clinically jaundiced beyond two weeks of age. This is typically associated with a TSB of 100-300 mmol/L, with a conjugated level of less than 25mmol/L in a healthy thriving breast fed infant. The mechanism appears to be multifactorial, including enhanced enterohepatic circulation and the presence of beta glucuronidase which inhibits the glucuronyl transferase activity in the breast milk.

The diagnosis can only be reliably made by exclusion of pathological causes.

Once the diagnosis has been confirmed the mother should be reassured, and advised that resolution of the jaundice may take as long as three months. Most importantly, breast feeding can safely continue.

TREATMENT OF NEONATAL JAUNDICE

Phototherapy is the most common mode of treatment, being convenient and safe. It works by oxidising the bilirubin molecule to form colourless fragments which are non-toxic and are readily excreted in the urine.

Though phototherapy enjoys a benign reputation it is not without side effects. The commonest ones are diarrhoea, increased fluid loss via the skin, temperature instability, erythematous rash and the bronze baby syndrome.

While under phototherapy it is usual practice to give the infant extra feeds to counter the increased fluid loss. Also, the eyes are covered in view of the potential risk of retinal damage, and the gonads are shielded with a nappy to prevent any light-induced DNA damage. The risk is largely theoretical.

Bronze baby syndrome results from an interaction between cholestatic jaundice and phototherapy. The brown pigment produced stains the infant's skin and lingers for some time after phototherapy has been discontinued.

Exchange transfusion is now only very rarely required, generally for severe *in utero* haemolysis.