Don't Forget The Bubbles

NEWBORN QUERIES

Facilitators Guide

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Facilitator level **Senior trainee/ANP and above**
Learners level **Junior trainee/ANP/staff nurse**
Target audience **This module is aimed at junior paediatric trainees, as well as trainees of any level who are involved in the care of newborns and want to build their confidence in identifying and managing common conditions with which neonates may present to a healthcare setting.**

OUTLINE

- **Main session – 4 x case studies including basic knowledge and key learning**
- **Quiz**
- **Take home learning points**

PRE-READING FOR LEARNERS

Learners should read the following links prior to the session:
https://dontforgetthebubbles.com/performing-the-newborn-check/

GeekyMedics Babycheck outline

https://dontforgetthebubbles.com/whats-formula-formula/

https://www.youtube.com/watch?v=dJ_dasmimE4

CASE 1 - A BUMP TO THE HEAD

You are the SHO on the postnatal ward. The midwife on duty performing newborn checks NIPE) comes to you concerned about a lump she has felt on a baby's head. She asks you to review the lump. She reports that otherwise there are no other concerns with baby.

What are the important points to cover in history and examination?

- **Perinatal history**
  - What was the mode of delivery? – caput is associated with vaginal delivery, ventouse delivery increases the risk of a cephalhaematoma or chignon.
  - What was baby's presentation? - a cephalic presentation is more associated with a caput, especially if there has been a long labour.
- **History of the swelling**
  - When was the lump first noticed?
  - Has the appearance or size of the swelling changed? - a rapidly expanding swelling would make you concerned about a subgaleal haemorrhage
- **Associated symptoms**
  - Any neurological signs such as lethargy, irritability or seizure activity? - such signs are suggestive of an underlying intracranial pathology.
  - Any difficulties in feeding
- **Maternal history**
  - Were the antenatal scans normal? - could there be a congenital cause for the swelling?
- **Examination**
  - Assess the characteristics of the lump as this will help you to narrow down your diagnosis – size of the lump? Bound by sutures? Fluctuant or boggy? Overlying skin changes such as bruising would be concerning for a non-accidental cause.
  - A top-to-toe examination of baby should be performed, assessing vital signs and both cardiovascular and neurological status. Any instability could be indicative of subgaleal (subaponeurotic) bleed or intracranial pathology. Care should be taken to examine for any signs of bruising or injury that could indicate a non-accidental cause for the swelling such as skull fracture.
  - Head circumference is useful is assessing if the swelling is expanding, such as in a subgaleal bleed.

What are your main differentials?

A caput succedaneum is the most common birth associated head lump in newborns followed closely by chignon and cephalhaematoma. A subgaleal is a rarer occurrence.

A **caput succedaneum** is a swelling seen on a baby's head at birth, usually over the presenting part of a baby's head in a head-down delivery. It is an oedematous serosanguinous swelling that crosses the suture lines and is caused by pressure on baby's head when sat in the pelvis against the cervix. It can be associated with bruising. It doesn't require any treatment and should resolve in the first 48 hours of life.

A **chignon** is similar to a caput in that it is an oedematous serosanguinous swelling that crosses suture lines, but it is caused by a ventouse delivery. It is associated with bruising, and often a demarcated boundary of the suction cup is visible. It doesn't require any treatment and will resolve over a few days.

A **cephalhaematoma** is caused by bleeding between the periosteum and the bones of the skull and is therefore bound by the suture lines. It is a fluid-filled swelling that does not cross the suture lines. It is more common in instrumental deliveries but can still be present in normal vaginal or c-section deliveries. There is no treatment required, and the swelling should resolve between 2 weeks to 2 months. Sometimes, resolution of the swelling leaves behind a hard, ossified scalp swelling. Babies with cephalhaematoma are at an increased risk of jaundice and anaemia and this should be included in parental safety netting advice.

A **subgaleal (or subaponeurotic) haemorrhage** is a bleed between the periosteum-covered skull bones and the overlying galea aponeurotica and is therefore not bound by the sutures. They are rare, but more commonly seen in instrumental deliveries, especially with repeated or incorrect application of the ventouse cup and is caused by rupture of veins. There is a large potential space to lose circulating volume into (extending from the orbits anteriorly to the occiput posteriorly), which can make these potentially life-threatening bleeds.

Management is supportive including volume and blood product replacement, coagulopathy correction with some babies needing intensive care support. More significant bleeds are also associated with encephalopathy and skull fractures, whilst less severe bleeds are associated with an increased risk of jaundice. Resolution of the swelling once stable takes 2-3 weeks.

What red flag features should you examine/look out for?

- A subgalaeal haemorrhage is an important swelling to rule out, so therefore it is crucial to examine for any features that would suggest this is a more serious head lump:
  - Boggy, fluctuant swelling that crosses the suture lines
  - A swelling that changes position depending on gravity
  - A swelling that has a fluid thrill
  - Swelling that extends over the forehead and down to the ears (ears can be displaced with extensive haemorrhage)
  - More serious signs would be related to a drop in circulating volume such as abnormal observations, respiratory distress, pallor, prolonged capillary refill time, or neurological changes such as lethargy or irritability.
- Safeguarding concerns – with any lump on the head, an important differential to consider is non-accidental injury (NAI), especially if the swelling doesn't fit with the appearance or history of a common post birth swelling. Ensure you take a clear perinatal and birth history to elicit if the swelling could be due to birth. Make sure to establish any midwifery safeguarding concerns, asking if there is any involvement with social services or the safeguarding team. Baby should have a full top to toe examination looking for any other marks or bruises or signs of injuries that would be in keeping with suspicions of NAI.

Assuming there are no red flags, how would you manage this patient?

If baby has a normal clinical examination, with no features of a worrying swelling (e.g subgaleal haemorrhage), as well as normal observations, it is unlikely any treatment other than monitoring will be needed. If you are suspecting a cephal-haematoma, blood tests should be done to monitor bilirubin levels, as well as reassurance and safety information provided to parents. However, if there were any concerns it would be important to get a senior review.

Take home learning points:

- Most neonatal head swellings are related to the birth process, but a thorough assessment is always warranted to exclude more serious underlying pathology.
- Any unexplained head lump, particularly one accompanied by bruising or other skin findings, should raise suspicion for a potential safeguarding concern, including non-accidental injury.
- Swelling that is boggy, crosses suture lines, changes with position, or appears to be rapidly expanding—especially if accompanied by systemic signs of illness—is a red flag for a subgaleal haemorrhage, which can be life-threatening and requires urgent evaluation.

CASE 2 – FEEDING DIFFICULTIES

You are a junior doctor working in ED. Thomas, a 3-week-old baby, is brought in by his parents with concerns that he is vomiting after every feed.

What are the important points to cover in the history?

- **Feeding history**
  - Breast or bottle feeding?
  - Frequency of feeds and volume of feed if bottle feeding or duration of feed if breastfeeding. Ensure an accurate weight is recorded so that you can work out the volumes in ml/kg/day. If baby hasn't regained their birth weight, use the birth weight for calculations.
  - Any recent change in feeds e.g. new formula.
- **History of the vomiting**
  - When did the vomiting start?
  - Is the vomit projectile – is the vomit forceful enough to fly over the parents' shoulder and miss both baby and them, or does it go over baby's clothes and parent's clothes (non-projectile)?
  - Are the vomits bilious or bloody?
  - Are the vomits large, whole feed vomits or possets?
  - What is the relation of the vomits to feeding?
- **Associated symptoms**
  - Weight loss, including whether baby has regained their birth weight.
  - Urine and stool output per day – is the baby dehydrated? Is there any diarrhoea?
  - Fever could indicate a septic cause of vomiting.
- **Perinatal history**
  - Any risk factors for sepsis such as maternal history of Group B Strep, prolonged rupture of membranes, maternal fever around delivery.
- **Red flag symptoms:**
  - Bilious vomiting with or without abdominal distention indicates a surgical cause such as malrotation or volvulus.
  - Projectile vomiting, and losing weight, are both signs of pyloric stenosis.
  - Lethargy, poor feeding or fever could indicate an infective cause such as sepsis or urinary tract infection (UTI).
  - Signs of dehydration.

What would be your initial steps in assessing this baby?

- Top-to-toe examination including a head circumference (vomiting can be a sign of raised intracranial pressure). Pyloric stenosis can present with a palpable olive-like mass in the right upper quadrant (hypertrophy of the pyloric muscle).
- Measure and plot weight and length centiles, as vomiting with weight loss is a red flag for pyloric stenosis, severe GORD, CMPA or malabsorption.
- Routine observations to assess for signs of sepsis or dehydration.
- Perform a gas to assess electrolytes for biochemical dehydration and acid-base disturbance as is seen in pyloric stenosis.
- Urinalysis to rule out a urinary tract infection.
- Calculate feed volumes in ml/kg/day to ensure baby is not being overfed.

You find that Thomas examines well, weighs 4.1kg which plots on the 50th centile (birth centile was 75th, weights at 5 days and then 2 weeks were both 50th centile), and is currently having 105ml formula every 3 hours. No red flags were identified in the history or examination.

How would you manage this baby?

With a non-concerning history and clinical examination, and with feed volumes of 210mls/kg/d, it is likely that this baby is being overfed. At 3 weeks old, a target of 150mls/kg/d (75mls every 3 hours) would be more appropriate.
His weight is following the centiles, so baby is gaining weight well.
Having a discussion with parents about feed volumes, frequency, pacing feeds and recognising feeding cues would be appropriate, remembering that parents may be tired and stressed.

How much milk is normal?

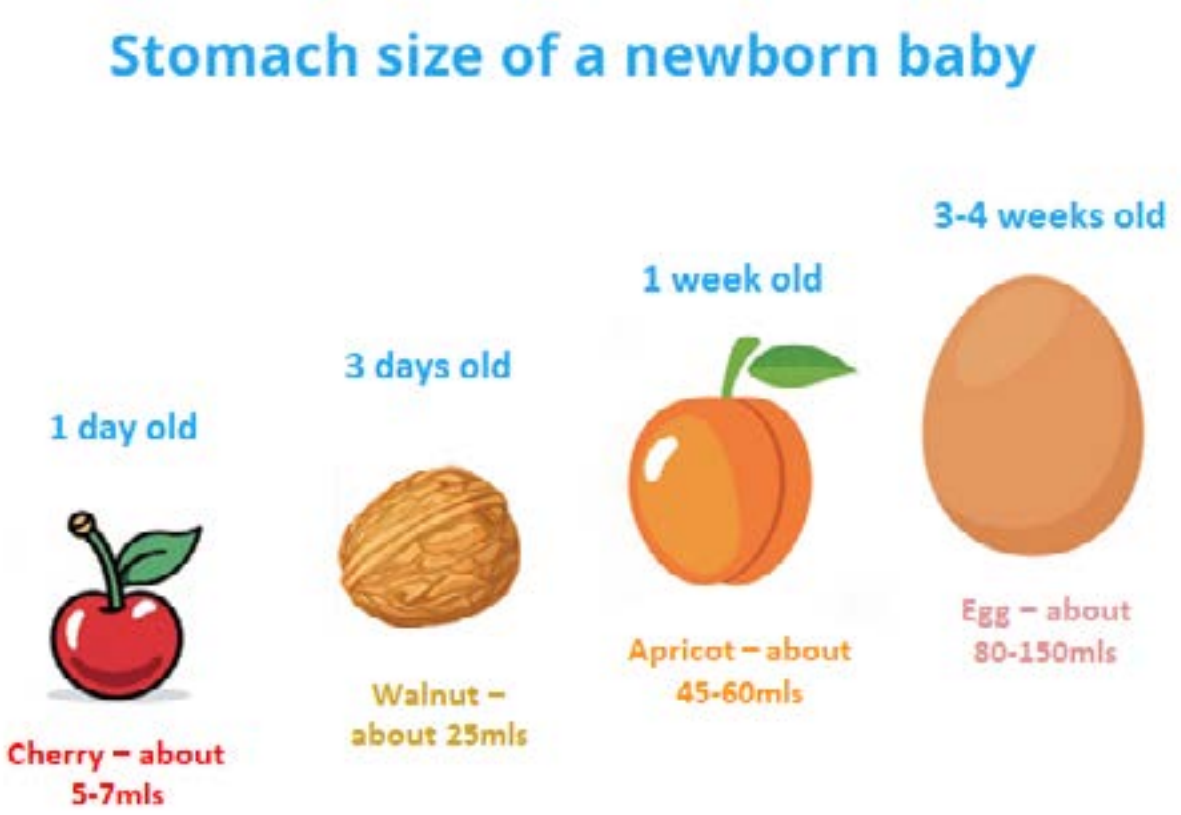
A rough guide for newborn milk requirements is:

- 60mls/kg/d on Day 1 of life
- 90mls/kg/d on Day 2 of life
- 120mls/kg/d on Day 3 of life
- 150mls/kg/d on Day 4 of life onwards

This guide is easier to follow in babies who are bottle fed (expressed or formula milk), however it is harder to monitor volumes when breastfeeding.
Most infants will actively feed for between 10 and 30 mins per feed, but many will comfort suck and take short breaks/sleep in between. An easier way to evaluate if baby is breastfeeding adequately is to look at indications of good feeding, like appropriate weight gain and nappy output. Most babies should pass one stool and 1-2 wet nappies in the first couple of days of life. Wet nappies should then increase by 1 per day until they are having approximately 6 wet nappies per day. Stool output can vary significantly between babies but ideally will be 2 bowel movements a day.

Newborns will feed more frequently due to their smaller stomach size and this can range from cluster feeding hourly to feeding every 3-4 hours. Feeding patterns may also change depending on time of day/night. On average, babies feed 8-12 times in 24 hours. As babies grow, the time between feeds will gradually increase.

The following infographics can be useful to show parents to give them an idea of stomach volume and therefore appropriate feed volumes:



What safety netting advice would you give parents?

It is normal for babies to have small milky vomits, especially as they have a liquid diet and spend most of their time lying down. As baby grows, the vomiting should reduce. If parents noticed any of the following, they should seek medical attention:

- Projectile vomiting
- Green (bilious) vomit
- Abdominal distention
- Diarrhoea
- Reduced wet nappies (less than 4–6 in 24 hours)
- Poor weight gain or weight loss
- Lethargy, fever, or feeding difficulties

Infant feeding can be stressful for parents so signposting to feeding support websites may also be helpful:
https://www.unicef.org.uk/babyfriendly/support-for-parents/

https://www.nhs.uk/baby/breastfeeding-and-bottle-feeding/breastfeeding/help-and-support/

As Thomas' parents are leaving, they ask your advice about what milk is best.

What advice would you give them regarding breastfeeding and formula feeding?

Breast feeding/bottle feeding with expressed breast milk has many proven benefits over feeding with formula milk. Breastmilk provides tailor-made nutrition for babies; as baby grows, breastmilk changes in composition to ensure nutritional needs are being met. Breastmilk is also beneficial for baby's immunity. Maternal antibodies pass from mum to baby in breastmilk providing passive immunity against certain diseases for baby. Breastmilk is also associated with lowering the risk of the following health conditions:

- Gastrointestinal infections
- Ear infections
- Necrotizing enterocolitis (NEC) (in preterm babies)
- Severe chest infections
- Sudden infant death syndrome (SIDS)
- Asthma, obesity, and Type 1 diabetes (later in infancy/childhood)

Not all parents are able to breastfeed, and some babies may require formula due to feeding difficulties or medical reasons. The priority is that the baby is feeding

well, gaining weight appropriately, and meeting developmental milestones, regardless of the feeding method.

If parents choose formula feeding:

- Recommend sticking to first infant formulas until the baby is 12 months old.
- Advise against giving cow's milk or plant-based alternatives before 1 year of age.
- Reassure them that there is no benefit to one infant first formula over another.

Take home learning points:

- Whilst breastfeeding has many benefits for both mother and baby, ensuring that baby is well-fed and thriving is the priority.
- Assess growth using centile charts. A baby following a consistent centile (even if it's lower than at birth) and with no clinical concerns is usually reassuring.
- Consider pyloric stenosis in any baby aged 2–8 weeks with projectile vomiting and faltering weight gain. Feel for an "olive-like" mass in the RUQ and check for a hypochloraemic metabolic alkalosis on blood gas.

CASE 3 - UMBILICAL CORD ISSUES

Grace, a 7 day old baby is brought to ED by her parents as they are concerned about her umbilical cord, reporting that it looks a bit red. They also report that she has been a bit fussy today, and think she felt a bit warm earlier on in the day. Grace's parents are worried about whether they have been caring for the cord correctly and ask you for some advice.

What are your main differentials?

Ompahlitis is an infection of the umbilical cord stump. It presents with erythema of the periumbilical skin, oedema and offensive discharge. It is most commonly caused by staphylococcus and streptococcus species, and E.coli. Risk factors for omphalitis include prematurity, prolonged rupture of membranes, perinatal maternal infection and inappropriate cord care. Rarer associations include leukocyte adhesion deficiency and neonatal alloimmune neutropenia.

Treatment is with parenteral antibiotics due to the risk of serious complications. Omphalitis can progress to necrotising fasciitis of the abdominal wall and life-threatening sepsis if not treated sufficiently.

Umbilical granuloma is small persisting lump of umbilical tissue that is present after the cord has separated and fallen off. They are typically reddish-pink, moist lumps that are not painful. They develop in approximately 1 in 500 babies.
Mild infection and delayed cord separation can increase the risk of an umbilical granuloma forming. Treatment options include an at-home salt application treatment or in-hospital treatment using silver nitrate to cauterise the overgrown tissue (see **https://www.alderhey.nhs.uk/conditions/patient-information-leaflets/gastro-oesophageal-reflux-gord/** for more information).

Umbilical hernia. After birth, when there is no longer a need for the umbilical cord, the abdominal muscles gradually close the gap where the cord was attached. Failure of this process allows an umbilical hernia to develop. The hernia can contain fat, omentum or bowel. Umbilical hernias are more common in African populations, in premature or low birth weight babies and babies with Trisomy 21, Beckwith-Weiderman and Marfan's syndrome.
Umbilical hernias are painless, reducible swellings, and have a very low risk of complications such as incarceration and strangulation. Most umbilical hernias

will close spontaneously by the age of 4 years. If an umbilical hernia is still present after the age of 4 years, the child will need referral to a paediatric surgical team as spontaneous closure of the hernia is unlikely.

You take a history and examine Grace. You find that she was well after birth, although Mum mentions a history of prolonged rupture of membranes for 48 hours. (PROM – the time between maternal waters breaking and delivery should be less than 24 hours in terms babies, and less than 18 hours in preterm babies. Longer durations increase the risk of neonatal infection). Grace's symptoms began this morning. She hasn't been feeding as well in the last 24 hours compared to previous days. Parents describe her umbilical cord as always being a bit oozy. The cord separated on Day 6. On examination, Grace appears well with normal observations. Her temperature is 37.4°C. The skin surrounding her umbilical is erythematous, and the cord stump is oozing yellow discharge.

What investigations would you want to perform?

Given that omphalitis is the most likely diagnosis, the next investigations to carry out would be blood tests (including FBC, CRP and blood culture) and a bacterial swab of the umbilical stump. If the baby was systemically unwell you would need to consider a full septic screen in addition, including a blood gas, chest x-ray, urine and CSF cultures.

What would your next steps in management be?

This baby require hospital admission and treatment with IV antibiotics.
Treatment should be according to local guidelines but will ideally be broad-spectrum (such as benzylpenicillin and gentamicin, or cefotaxime and amoxicillin) to cover both gram-positive and gram-negative organisms. Once culture and sensitivity results are available, antibiotics can be adjusted accordingly.

The baby will need close monitoring for signs of non-responsive to antibiotics due to the risk of sepsis and abdominal wall necrotising fasciitis.

Grace's parents mentioned they had some queries about umbilical cord care.

What is the umbilical cord, and what advice would you give to parents about good cord care?

The umbilical cord consists of one umbilical vein (carries oxygenated blood from the placental to baby) and two umbilical arteries (carry de-oxygenated blood from baby to the placenta). These vessels are covered in Wharton's Jelly, which is enclosed by a smooth coating called amnion.

After birth, the cord is no longer required so is clamped and then cut. Delaying cord clamping by 1 minute if baby clinically well has many benefits for baby, which include improving transitional circulation, increased red blood cell volume, and decreased risk of intraventricular bleeds.

It is useful to advise parents about keeping the umbilical cord dry. They can give babies a sponge bath but must not bathe babies fully in the bath until the cord has fallen off. They should also avoid covering the stump with the nappy (the nappy can be folded down underneath the stump) as this will help the cord to dry out quicker. Dry cord care helps to prevent potential umbilical cord complications such as infection and delayed separation.

The cord should fall off in the first 7-10 days of life. If the cord hasn't separated by 3 weeks of age it would be important to seek medical help. The cord should never be removed manually.

Take home learning points:

- Proper umbilical cord care involves keeping the stump clean and dry to prevent infection and promote separation.
- The umbilical cord usually falls off by day 10 of life. Further assessment is required if the cord hasn't separated by 3 weeks of life.
- Any clinical suspicion of omphalitis requires prompt treatment with IV antibiotics and monitoring to prevent complications like sepsis or necrotising fasciitis.

CASE 4 – JAUNDICE

You're the paediatric registrar on call, and receive a phone call from a community midwife. She has been to see Anisa, a 2 day old baby girl, at home with her parents. The midwife felt that Anisa looked a bit jaundiced so performed a transcutaneous bilirubin (TCB) measurement which has plotted above the phototherapy line. She is referring Anisa in for assessment in the Children's Assessment Unit.

You examine Anisa and agree she looks jaundiced so therefore decide further investigations are needed. What initial investigations would it be important to perform?

- FBC to assess Hb and retics may indicate a haemolytic cause of the jaundice.
- Split bilirubin to determine if the jaundice if unconjugated or conjugated to help you narrow down differentials. Most neonatal jaundice is unconjugated (physiological, breastmilk, ABO/rhesus incompatibility jaundice, sepsis).

A high split bilirubin (>25 micromol/L) is concerning of liver disease such as biliary atresia, so any baby with a raised split bilirubin needs urgent discussion with a liver centre. You should also check for pale stools as this is another sign of liver disease.

- DAT and blood group may indicate a blood group or rhesus incompatibility causing a haemolytic jaundice.
- Liver function tests

Anisa's bilirubin level is 235micromol/L.

Using the correct graph, plot Anisa's serum bilirubin level. She was born at 37+4 weeks, is currently 51 hours old and was born at 9:30am.

https://www.nice.org.uk/guidance/cg98/resources

What are your main differentials for the possible causes of Anisa'a jaundice?
Physiological jaundice is a normal response in both breastfed and formula fed babies. It is due to the higher number of neonatal red blood cells, as well as the dominant type of haemoglobin at birth being HbF (foetal haemoglobin).
Newborns have a high proportion of fetal haemoglobin (HbF), which has a shorter lifespan (60-90 days) than adult haemoglobin (HbA, 120 days), leading to increased red cell breakdown and bilirubin production.

Immature gut bacteria results in reduced conversion of bilirubin to urobilinogen, as well as immature liver enzyme reducing conjugation of bilirubin. Higher levels of non-excretable bilirubin results in increased enterohepatic circulation and reabsorption of bilirubin. Physiological jaundice peaks on days 3-5 of life and should resolve by day 14 of life (day 21 in preterm babies).

Breastmilk jaundice is an unconjugated hyperbilirubinaemia seen in breastfed infants who are otherwise healthy. The mechanism is not well understood, but factors contributing to the development of breastmilk jaundice have been studied and proposed. It is suggested that factors in breastmilk such as beta-glucuronidase increase the reabsorption of bilirubin.

Breastfed babies have smaller, less frequent stools in comparison to their formula fed counterparts. This increases intestinal transit time and enterohepatic circulation and therefore bilirubin reabsorption is increased. It usually presents in the first week of life (after 24 hours of age) and peaks in week 2 of life.

ABO incompatibility is caused by a difference between maternal and foetal blood groups. It is mostly seen in maternal O blood group with a foetal A or B blood group. The IgG anti-A and anti-B antibodies are able to cross the placenta and cause foetal red cell destruction. This haemolysis can result in hyperbilirubinaemia and the baby presents as jaundiced with a mild anaemia after day 1 of life. ABO incompatibility causing haemolytic disease of the newborn does not need a sensitising event in comparison to rhesus incompatibility.

Follow up is required for any baby who required phototherapy treatment for haemolytic jaundice, or for a baby with a positive DAT result (excluding a weakly positive result). The baby will need to be started on folic acid and to have a repeat FBC 2 weeks after discharge home to monitor the anaemia.

Blood group	Red cell antigens	Plasma antibodies	Recipient of blood from	Donor of blood to
A	A	B	A and O	A and AB
B	B	A	B and O	B and AB
AB	A+B	---	All blood types	AB only
O	---	A+B	O only	All blood types

Rhesus disease of the newborn occurs when a rhesus D (RhD) negative mother has a RhD positive baby (inherited from a RhD positive father). The maternal immune system recognises the foetal rhesus positive antibodies as foreign and subsequently makes IgG anti-D antibodies against the RhD positive foetal cells. IgG antibodies can cross the placenta and will destroy the foetal red blood cells, thus causing foetal haemolysis, anaemia and jaundice.

The severity of rhesus disease varies and can range from mild anaemia and jaundice to foetal hydrops (secondary to foetal anaemia) and intrauterine death.

Unlike ABO incompatibility, RhD incompatibility requires a sensitising event where the maternal circulation is exposed to foetal red cells, such as birth, trauma, miscarriage or termination of pregnancy. For this reason, rhesus disease of the newborn is more common in second pregnancies, following a sensitisation event in the previous pregnancy.

Rhesus disease of the newborn can be prevented by administration of anti-D antibodies during pregnancy to RhD negative mothers at 28 and 34 weeks, or following a sensitisation event. The anti-D antibodies will bind to the RhD positive foetal cell antigens to prevent the maternal immune system mounting a response and therefore preventing destruction of the foetal red cells.

Rhesus disease tends to present as an unconjugated jaundice with a varying severity of anaemia and possible hepatosplenomegaly on day 1 of life. Prompt treatment and careful monitoring is required as there is an increased risk of severe hyperbilirubinemia and kernicterus.

Sepsis (including UTIs) can cause hyperbilirubinemia, presenting as jaundice in the first day of life. This is secondary to systemic infection. Liver dysfunction results in reduced bilirubin conjugation, and decreased hepatic perfusion causes reduced bilirubin clearance. Bacteria and toxins can also cause haemolysis, increasing production of bilirubin.

Jaundice secondary to sepsis can be unconjugated or conjugated. It is also often associated with other signs of systemic infection such as poor feeding, lethargy or irritability, fever or respiratory distress. As well as phototherapy if required, treatment must include broad-spectrum antibiotics (e.g. benzylpenicillin and gentamicin) to treat sepsis, escalating treatment as appropriate.

Other, less common, causes of jaundice should always be in your list of differentials:

• Endocrine conditions such as **hypothyroidism**, and metabolic conditions such as **galactosaemia** and **hereditary fructose intolerance** can cause an unconjugated hyperbilirubinemia.

• **Glucose-6-phosphate-dehydrogenase deficiency (G6PD)** is an X-linked recessive condition that predisposes to haemolysis of red blood cells when exposed to certain triggers. The G6PD enzyme works to protect red blood cells, and without this enzyme they breakdown more readily. It is more prevalent in certain ethnicities; Middle Eastern, Mediterranean, African and South East Asian communities are more at risk.

• Defectivity or deficiency in bilirubin conjugating liver enzymes, as in **Gilbert's syndrome** and **Crigler-Najjar syndrome** respectively, can cause an unconjugated hyperbilirubinaemia.

• Biliary system malformations such as **biliary atresia** will cause a conjugated hyperbilirubinaemia.

What would your next steps in managing Anisa's jaundice be?

Anisa's bilirubin level is above the treatment threshold for her age and gestation, so therefore she needs admitting to hospital and starting on phototherapy treatment. She will need bilirubin monitoring whilst on treatment, the initial level after starting phototherapy should be taken at 4-6 hours, and as long as her bilirubin is responding to treatment, subsequent levels can be taken at 6-12 hourly intervals.

Once the serum bilirubin level is at least 50micromol/L below the phototherapy threshold on the gestation appropriate graph, phototherapy can be stopped. A rebound serum bilirubin level will need to be performed 12-18 hours from when the phototherapy treatment was stopped to ensure the bilirubin remains at a safe level post treatment.

In a baby who is still jaundiced after 14 days for a post-37 week gestation baby, or after 21 days for a pre-37 week gestation baby, a prolonged jaundice screen needs to be carried out. This involves assessment of weight and feeding, urine and stool (looking for dark urine and pale stools as a sign of a conjugated hyperbilirubinemia), and carrying out the following bloods tests.

- A full blood count and retics to assess for haemolysis.
- A bilirubin level with split fraction to look for conjugated hyperbilirubinemia.
- Group and DAT should be performed to rule out a haemolytic cause for the jaundice.
- A G6PD level is especially important in babies of at-risk ethnicities.
- Thyroid function should be performed to rule out congenital hypothyroidism.
- Metabolic screening should be carried out if there is risk or suspicion of metabolic disease.

Anisa's parents ask you why she needs to be treated for jaundice. What are the risks of untreated jaundice?

The main complication of severe unconjugated jaundice is kernicterus. In severe hyperbilirubinemia, unconjugated bilirubin can cross the blood brain barrier causing neurotoxicity. Deposition of bilirubin in the basal ganglia can progress to a permanent brain injury called kernicterus.

The initial symptoms include high-pitched cry, hypotonia, lethargy and fever, which progress to hypertonia, opisthotonus, seizures and coma. If not treated urgently, kernicterus can cause long-term disability including cerebral palsy, sensorineural hearing loss, gaze palsy and developmental delay.

Neonates at higher risk of kernicterus include premature infants, newborns with haemolytic disease or sepsis and conditions that reduce the bilirubin-binding capacity of albumin such as acidosis or hypalbuminaemia.

Treatment should be with phototherapy and very close monitoring of both bilirubin levels and neurological status. If bilirubin levels continue to rise despite phototherapy, consideration needs to be given to treating with immunoglobulins (IVIG) or exchange transfusion.

QUIZ QUESTIONS: (10 MINUTES)

Question 1.

Which swelling is bound by suture lines and presents as a firm, fluctuant swelling that can result in jaundice?

A. Caput Succedaneum
B. Cephalhaematoma
C. Subgaleal haemorrhage
D. Chignon

Question 2.

Which of the following is a red flag feature for subgaleal (subaponeurotic) haemorrhage? Select all that apply:

A. Boggy, fluctuant swelling
B. Swelling restricted by suture lines
C. Prolonged capillary refill time and pallor
D. Swelling changes with position or has a fluid thrill

Question 3.

Which of the following is not a proven benefit of breastfeeding?

A. Lower risk of NEC in preterm babies
B. Increased risk of Type 1 diabetes
C. Decreased risk of SIDS
D. Protection against ear infections

Question 4.

How much formula should a newborn receive on Day 3 of life?

A. 60ml/kg/day
B. 90ml/kg/day
C. 120ml/kg/day
D. 150ml/kg/day

Question 5.

List two important symptoms parents should look for that would warrant urgent medical review in a vomiting newborn.

Possible correct answers include any 2 of:

1. Bilious vomiting
2. Projectile vomiting
3. Poor feeding
4. Lethargy
5. Vomiting and not opening bowels
6. Vomiting and fever
7. Abdominal distension

Question 6.

Which of the following about umbilical hernias is true?

A. They are usually painful.
B. They rarely close spontaneously.
C. They require urgent surgical referral and review.
D. They often close spontaneously by 4 years of age.

Question 7.

Describe two key pieces of advice you would give parents about caring for a newborn's umbilical cord.

- Dry cord care – making sure not to bathe baby in water before the cord has fallen off, and folding the nappy below the stump to prevent moisture from the nappy preventing drying.

- Never manually remove the umbilical cord stump. It will usually fall off by Day 10 of life.

Question 8.

Which of the following is most likely to cause early-onset jaundice (within the first 24 hours of life)?

A. Breastmilk jaundice
B. Physiological jaundice
C. ABO incompatibility
D. Cephalhaematoma

Question 9.

Which test is used to confirm haemolytic disease of the newborn due to rhesus incompatibility?

A. Coombs (Direct Antiglobulin) test
B. FBC including a blood film
C. Serum bilirubin
D. Glucose-6-phosphate dehydrogenase test

Question 10.

In Rh incompatibility, which maternal and foetal blood types are most likely involved?

A. Mother Rh+ and fetus Rh−
B. Mother Rh− and fetus Rh+
C. Mother Rh− and fetus Rh−
D. Mother Rh + and fetus Rh+

Question 11.

What is kernicterus?

A. Jaundice limited to the skin
B. A benign condition requiring no treatment
C. Bilirubin-induced neurological dysfunction due to deposition in the brain
D. A type of bacterial meningitis in neonates

Question 12.

Which of the following is NOT a typical clinical feature of kernicterus?

A. Hypotonia and lethargy
B. Irritability and a high pitched cry
C. Hyperreflexia and arching of the head and back (opisthotonus)
D. Bradycardia and temperature instability

Take home tips (learning points)

1. Jaundice presenting before 24 hours of age is pathological and requires further investigation.

2. Severe untreated jaundice can lead to kernicterus. Prompt recognition and management is essential to prevent encephalopathy and brain injury.

3. Jaundice, pale stools and a raised (>25micromol/L) conjugated bilirubin level are concerning for underlying liver or biliary system disease which require urgent specialist input and management.

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