

HYPOCALCAEMIA

RECOGNITION AND ASSESSMENT

- Term or preterm babies birth weight ≥ 1500 g: total serum calcium < 2 mmol/L or ionised fraction < 1.1 mmol/L
- Preterm baby, birth weight < 1500 g: total serum calcium < 1.75 mmol/L or ionised fraction < 1 mmol/L

SIGNS

- Early onset occurs in first 2–3 days of life and is usually asymptomatic
- Late onset develops after first 2–3 days of life and typically occurs at the end of the first week
- Most babies are asymptomatic and identified on screening
- Characteristic sign is increased neuromuscular irritability including:
 - jitteriness and irritability
 - generalised/focal seizures
 - non-specific symptoms e.g.:
 - poor feeding
 - lethargy
 - apnoea
- prolonged QTc on ECG
- rare presentations:
 - stridor
 - bronchospasm
 - pylorospasm

CAUSES

- Early onset:
 - prematurity
 - intrauterine growth restriction
 - infants of diabetic mother
 - hypoxic ischaemic encephalopathy
 - hypomagnesaemia
 - hypoparathyroidism
 - syndromes e.g. DiGeorge syndrome
 - maternal hyperparathyroidism
- Late onset:
 - high phosphate load – cow's milk, renal failure
 - hypomagnesaemia
 - parenteral nutrition
 - exchange transfusion
 - alkalosis
 - maternal hypercalcemia
 - maternal vitamin D deficiency
 - transient hypoparathyroidism
 - syndromes and genetic mutations e.g. DiGeorge and Kenny-Caffey syndromes

INVESTIGATIONS

- Serum calcium
 - only monitor if risk factors, most babies with hypocalcaemia are asymptomatic
 - well preterm baby with birth weight > 1500 g and well term babies of diabetic mothers receiving milk feedings on day 1 of life do not need testing routinely
 - ionised calcium preferred
 - if using total calcium, measure albumin and correct for hypoalbuminemia
- Phosphate

- Magnesium
- Persistent hypocalcaemia or severe hypocalcaemia despite adequate calcium therapy:
 - 25-hydroxyvitamin D level
 - renal function tests
 - liver function test
 - alkaline phosphatase
 - parathyroid hormone level
 - urinary calcium:creatinine ratio
 - ECG for prolonged QTc interval
 - if pseudohyperparathyroidism suspected, X-ray hand
 - chest X-ray for thymic shadow
 - if hypoparathyroidism suspected, renal ultrasound
 - if DiGeorge syndrome suspected, echocardiography
 - genetic test for gene mutations or suspected syndrome e.g. DiGeorge syndrome

MANAGEMENT

See **Flowchart: Diagnostic approach to neonatal hypocalcaemia**

Asymptomatic babies

- Most babies with early onset hypocalcaemia recover with nutritional support; so early feeding provides adequate calcium
- Babies requiring IV fluid: add calcium gluconate 10% 0.46 mmol/kg/day (= 2 mL/kg/day) to IV fluid and give as continuous infusion
- baby tolerating oral feeds: give 0.25 mmol/kg oral 6-hrly

Symptomatic hypocalcaemia

- If seizures, prolonged QT interval, apnoea, unstable, hypotension or poor feeding give IV calcium gluconate 10% 0.11 mmol/kg (= 0.5 mL/kg) over 5–10 min followed by maintenance
- dilute with sodium chloride 0.9% or glucose 5% 4 mL to each 1 mL calcium gluconate 10% to give a concentration of 45 micromol/mL. Can be given undiluted via central line in an emergency
- doses up to 0.46 mmol/kg (= 2 mL/kg calcium gluconate 10%) have been used
- **maximum rate of administration** 22 micromol/kg/hr
- Stable baby or following acute treatment
 - oral calcium dose 0.25 mmol/kg 6-hrly
 - if enteral feeds not tolerated add calcium gluconate 10% 0.5 mmol/kg/day to IV fluid as above
- If symptomatic hypocalcaemia: hypomagnesaemia – magnesium sulphate 100 mg/kg IV/ deep IM 12-hrly for 2–3 doses
- Vitamin D deficiency give 1000–2000 units daily and adjust dose according to response
- Hyperphosphataemia
 - high calcium, low phosphate diet
 - human milk is preferable, if not available, use formula with low phosphate 60/40 and oral calcium

IV calcium precautions and considerations

- Extravasation can cause skin and subcutaneous tissue necrosis (see **Extravasation guideline**). Monitor IV site closely
- Continuous infusion preferred to bolus, but use bolus for initial management in symptomatic hypocalcaemia
- Bolus IV calcium can cause dysrhythmias – administer slowly over 5–10 min with cardiac monitoring
- Calcium can be given via UVC provided catheter tip is in vena cava
 - inadvertent administration into portal vein can cause hepatic necrosis
- Do not mix calcium solutions with those containing phosphorus or bicarbonate as this can cause precipitation

SUBSEQUENT MANAGEMENT

- Monitor bone profile and phosphate levels according to clinical need
- If calcium normal after 48 hr treatment, halve maintenance dose
- If calcium fails to normalise investigate for underlying cause
- For extreme preterm babies with late onset hypocalcaemia [see **Metabolic bone disease (MBD)** guideline]
- Hyperphosphataemia – calcium and phosphate normalise in 3–5 days. Stop calcium after 1 week and switch to normal formula in 2–4 weeks

Flowchart: Diagnostic approach to neonatal hypocalcaemia

