NECROTISING ENTEROCOLITIS (NEC) • 1/3

RECOGNITION AND ASSESSMENT

Definition

Acute inflammatory disease in newborn intestine characterised by haemorrhagic necrosis, which may lead to perforation and destruction of the gut. Clinical presentation usually comprises triad of abdominal distension, gastrointestinal bleeding and pneumatosis intestinalis (air in bowel wall on abdominal X-ray)

Modified Bell's criteria

Stage 1: Suspected NEC – clinical signs suggestive but X-ray non-diagnostic

- Systemic signs:
  - temperature instability
  - apnoea
  - bradycardia
  - lethargy
- Intestinal signs:
  - increased gastric residuals
  - abdominal distension
  - vomiting
  - blood in stools
- Radiological signs:
  - normal or mild intestinal dilatation
  - thickened bowel loops

Stage 2: Definite NEC: mild-to-moderately ill – abdominal X-ray demonstrates pneumotosis intestinalis and/or gas in biliary tract

- Systemic signs: see **Stage 1** +/- mild metabolic acidosis, mild thrombocytopenia, raised CRP
- Intestinal signs: see **Stage 1** + absent bowel sounds, +/- localised abdominal tenderness, abdominal cellulitis or right lower quadrant mass, bright red blood and/or mucus from rectum (exclude local pathology)
- Radiological signs: significant intestinal dilatation, pneumatosis intestinalis, portal vein gas, +/- ascites, persistently abnormal gas pattern (e.g. localised dilated loop of bowel seen on serial X-rays or gasless abdomen)

Stage 3: Advanced NEC – severely ill, bowel intact or perforated

- Systemic signs: see **Stage 2** + hypotension, bradycardia, severe apnoea, combined respiratory and metabolic acidosis, DIC, neutropenia
- Intestinal signs: see **Stage 2** + signs of generalised peritonitis, marked tenderness, distension of abdomen
- Radiological signs: see **Stage 2** + pneumoperitoneum +/- ascites

Risk factors

- Prematurity
- Intrauterine growth restriction
- Absent or reversed end-diastolic flow on umbilical arterial Doppler antenatally
- Perinatal asphyxia
- Low systemic blood flow during neonatal period (including duct-dependent congenital heart disease)
- Significant patent ductus arteriosus
- Exchange transfusion
- Formula milk
- No antenatal corticosteroids
- Infections with: klebsiella, enterobacter, anaerobes

Differential diagnosis

- Sepsis with ileus
- Bowel obstruction
- Volvulus
- Malrotation
- Spontaneous intestinal perforation:
  - associated with early postnatal corticosteroids or indomethacin
  - abdominal X-ray demonstrates pneumoperitoneum but does not show evidence of pneumatosis intestinalis
- Systemic candidiasis:

- clinical signs can mimic NEC with abdominal distension, metabolic disturbances, hypotension and thrombocytopenia
- Food protein-induced enterocolitis syndrome (FPIES)
- usually preceded by thrombocytosis in association with formula milk
- take thorough feeding history, and establish any temporal relationships with type of feed

INVESTIGATIONS

Abdominal X-ray

- Supine antero-posterior view
- If perforation suspected but not clear on supine view, left lateral view

Not all babies will have radiological findings associated with NEC (Stage 1)

Blood tests

- FBC: anaemia, neutropenia and thrombocytopenia often present; early return to normal carries good prognosis
- Blood film: evidence of haemolysis and toxic changes (e.g. spherocytes, vacuolation and toxic granulation of neutrophils, cell fragments, polychromatic cells)
- CRP, but a normal value not informative in initial phase
- U&Es
- Blood gas: evidence of metabolic acidosis (base deficit worse than -10), raised lactate
- Coagulation screen
- Blood cultures

IMMEDIATE TREATMENT

Always discuss management with consultant neonatologist

In all stages

- Nil-by-mouth
- Transfer baby to neonatal intensive care and nurse in incubator
- If respiratory failure and worsening acidosis, intubate and ventilate
- Gastric decompression
- Free drainage with large nasogastric tube (size 8)
- NEC often associated with significant third spacing of fluid into peritoneum
- Triple antibiotics: flucloxacillin, gentamicin and metronidazole
- IV fluids/PN: total volume ≤150 mL/kg
- Long line when stable and bacteraemia/septicaemia excluded
- Pain relief, consider morphine/diamorphine infusion (see **Pain assessment and management** guideline)

Stage 2: Proven NEC (confirmed radiologically)

- If breathing supported by nasal CPAP, elective intubation to provide bowel decompression (see **Intubation** guideline)
- Give IV fluid resuscitation sodium chloride 0.9% 10 mL/kg for shock and repeat as necessary. Shock is most common cause of hypotension in babies with NEC (see **Hypotension** guideline)
- If coagulation abnormal, give FFP (see **Coagulopathy** guideline)
- If thrombocytopenia and/or anaemia occur, transfuse (see **Thrombocytopenia** guideline)
- Discuss with surgical team: may need transfer to surgical centre

Stage 3: Advanced NEC (fulminant NEC with/without intestinal perforation)

- Treat as for **Stage 2** and refer to surgical team: may need laparotomy or resection of bowel in surgical centre

SUBSEQUENT MANAGEMENT

In recovery phase

- In **Stage 1:** if improvement after 48 hr, consider restarting feeds slowly (see **Nutrition and enteral feeding** guideline) and stopping antibiotics
- Take into account type of milk in the context of baby's feeding history before episode
- In **Stage 2:** if abdominal examination normal after 7–10 days, consider restarting feeds

- some may need longer period of total gut rest
- stop antibiotics after 7–10 days
- In **Stage 3:** discuss with surgeon and dietitian before restarting feeds

Late complications
- Recurrence (in about 10%)
- Strictures (in about 10% non-surgical cases)
- Short bowel syndrome and problems related to gut resection
- Neuro-developmental delay

MONITORING TREATMENT
- Observe general condition closely and review ≥12-hrly
- Daily:
- acid-base status
- fluid balance (twice daily if condition unstable)
- electrolytes (twice daily if condition unstable)
- FBC and coagulation (twice daily if condition unstable)
- repeat X-ray daily or twice daily until condition stable. Discuss with consultant/surgeon

LONG-TERM MANAGEMENT
- Advise parents about signs of bowel obstruction
- Medical +/- surgical follow-up after discharge
- Contrast studies if clinically indicated for strictures
- Appropriate developmental follow-up

Parent information
Offer parents information on NEC, available from http://www.bliss.org.uk/necrotising-enterocolitis-nec