The Collapsed Neonate

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How things have changed

- 20 years ago duration of hospital stay after birth much longer
- SHO experience on post natal wards
- 6 hour discharge
- Increase in home births
- Even post LSCS discharge at 2 to 3 days
- All these mean more neonates presenting to Emergency Facilities

Plan for Session

- Take 1 collapsed newborn
- Follow through initial presentation to ED
- Look at the differential diagnosis and management in the first hour

Baby A

- Arrives with mum at 10pm
- Brought from triage to resus room
- Crash call put out as baby is pale and floppy
- Team members: ED middle grade +/- consultant, general paediatric SHO and registrar, Anaesthetic registrar, PICU registrar, 2 ED nurses

Initial history

- 6 days old
- Born at Term by SVD weight 3.2kg
- Uneventful pregnancy
- Discharged following day
- Formula feeding, bit sicky after feeds
- Gradually more lethargic over past 2 to 3 days.
- Feeding less well
- Vomiting more frequently

Initial Assessment

- Pale
- Resps 60 with some recession
- HR 150s
- Normal CRT
- Very floppy
- Withdraws and cries with painful stimulus
- Oxygen administered
- BM 2.7

Interventions

- Airway adjunct if required
- Continue high flow oxygen
- IV access, urgent blood gas
- Administer 10% glucose 2mls/kg
- Reassess

During the sugar bolus

- Patient starts to have a convulsion
- VBG: H+96, pCO2 6.4, pO2 4.8, Bic 12, BE -15, Lactate 3.2

Aetiology of Neonatal Seizures

Aetiology	Early	Late
Hypoxic/ischaemic	+	
Subarachnoid	+	
IVH	+	+
Subdural	+	+
Cerebral Infarction	+	+
In utero infection		+
Post natal infection	+	+

Neonatal seizure (cont.)

Aetiology	Early	Late
Hypoglycaemia	+	+
Hypocalcaemia	+	+
Aminoaciduria		+
Pyridoxine deficiency	+	Rare
Drug withdrawal	+	+
Familial benign seizures	+	

How to treat the seizure

- Being aware that there is something underlying doesn't change how you manage the seizure which remains as per APLS guidelines
- 1st line, IV lorazepam successfully stops the seizure after 3 minutes
- Now to think what might have caused the collapse, mindful that seizure has become one of the main features.

Consider causes of collapsed neonate

- THE MISFITS

Differential diagnosis

T	Trauma/NAI
H	Heart disease
E	Electrolyte disturbance
M	Metabolic disturbances
I	Inborn error metabolism
S	Sepsis
F	Formula mishaps
I	Intestinal catastrophes
T	Toxins
S	Seizures/ CNS abnormal

T - Neonatal Trauma

- Birth related/ inflicted injury
- Consider head trauma +/- abdominal organ/long bone injury
- All of the above can cause enough blood loss to be shocked
- Absence of CV instability makes less likely
- Isolated head trauma/shaken baby may fit and would certainly fit with seizures in this age group.
- Hypoglycaemia may be because of not being fed or just coincidental

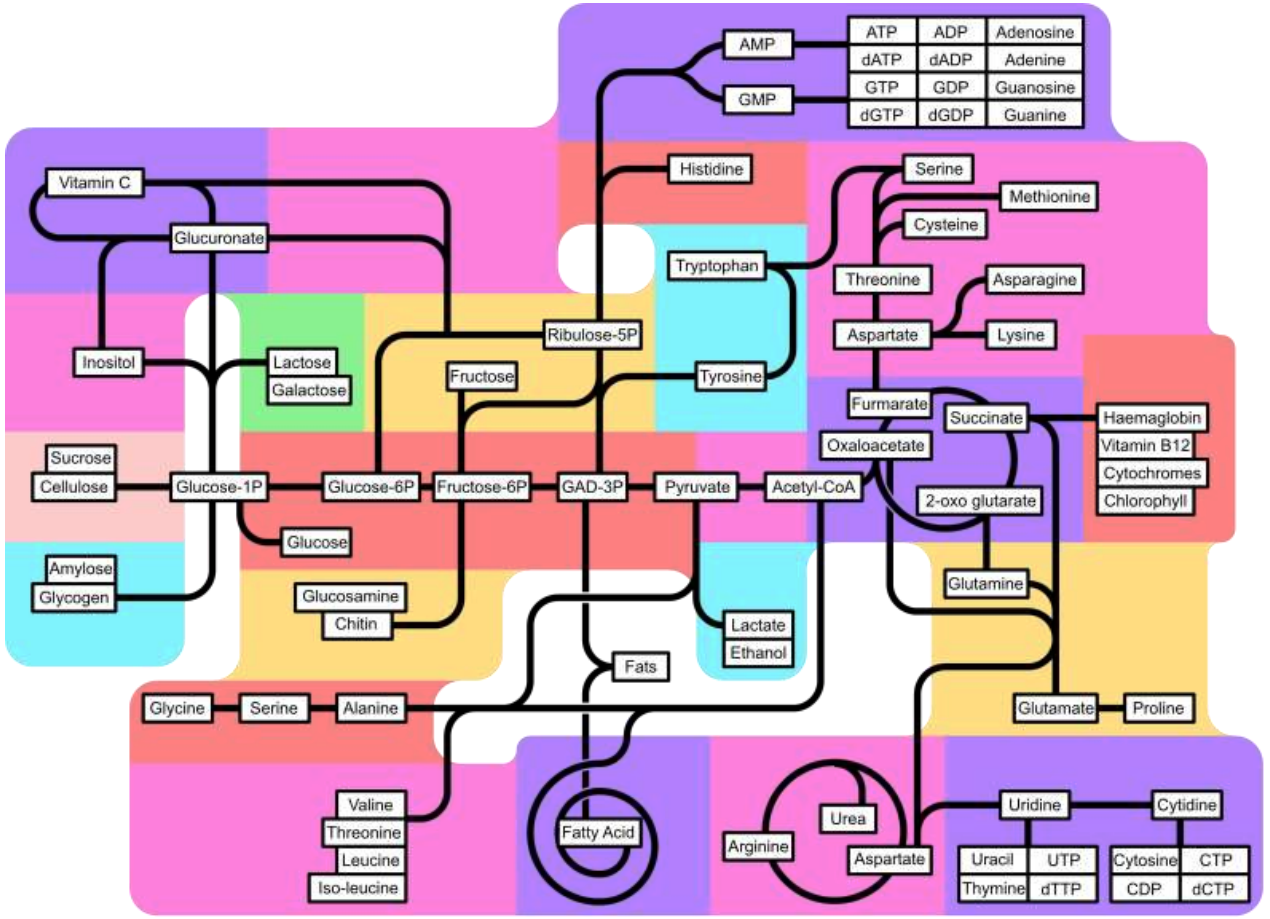
H - Congenital Heart Disease

- Accounts for 10% infant mortality
- Incidence 8-10 per 1000 live births
- Commonest to present in neonatal period are duct dependent systemic outflow tract obstruction, classic being Coarctation of the Aorta
- Unlikely at this point to be able to identify the precise cause and often murmurs are absent, however may have gallop rhythm, hepatomegaly and absent peripheral pulses
- In either case would expect baby to have more signs of CV instability with a significantly worse blood gas
- In these babies it may be the failure to respond to usual therapies that would lead you to suspect CHD and to try using Prostin.

E - Endocrine

- Classic presentation in this group would be Congenital Adrenal Hyperplasia (name given to several AR diseases causing either excessive or deficient production of sex steroids)
- In the collapsed neonate this is due to the type resulting in inadequate mineralocorticoids). Infants present with vomiting, hypoglycaemia, hyperkalaemia and hypotension unresponsive to fluids and inotropes
- Treated with a bolus of hydrocortisone
- Should be electrolyte abnormalities on the blood gas along with CV instability

I - Inborn errors of metabolism



In practice....

- I will not make the diagnosis here...
- It will usually be after dealing with the most common causes of collapse and not sorting the problem out that this will be considered
- These children present with a lactic acidosis, hypoglycaemia, hyperammonaemia or all of the above
- Seizures is often the presenting feature
- My job is to consider this and to send an ammonia with the initial biochemistry, meanwhile treating the hypoglycaemia and consider the use of steroids after discussing with a metabolic specialist

S Sepsis

- This is by far the most common cause of collapse in this age group and therefore
- Must be considered in all collapsed neonates
- Sources of infection
  - CNS (meningitis/ encephalitis)
  - Urinary tract
  - Group B strep septicaemia
- Empirical broad spectrum antibiotics indicated
- 2 peaks of incidence of GBS, 1 early and 1 at 4-6 weeks of age.

Things to consider

- Neonates struggle to mount a febrile response and may be cold rather than febrile
- In ALL collapsed neonates, never a bad idea to give IV antibiotics

Neonate with Sepsis

Other Clinical Features of Sepsis

Temp instability	Hypotension
Resp distress	Tachycardia
Feed intolerance	Apnoea/bradys
Vomiting	Irritability
Abdo distension	High pitched cry
Diarrhoea	Lethargy
Jaundice	Weak suck
Pallor	Convulsions
Skin rash	Full fontanelle

F - Formula mishaps

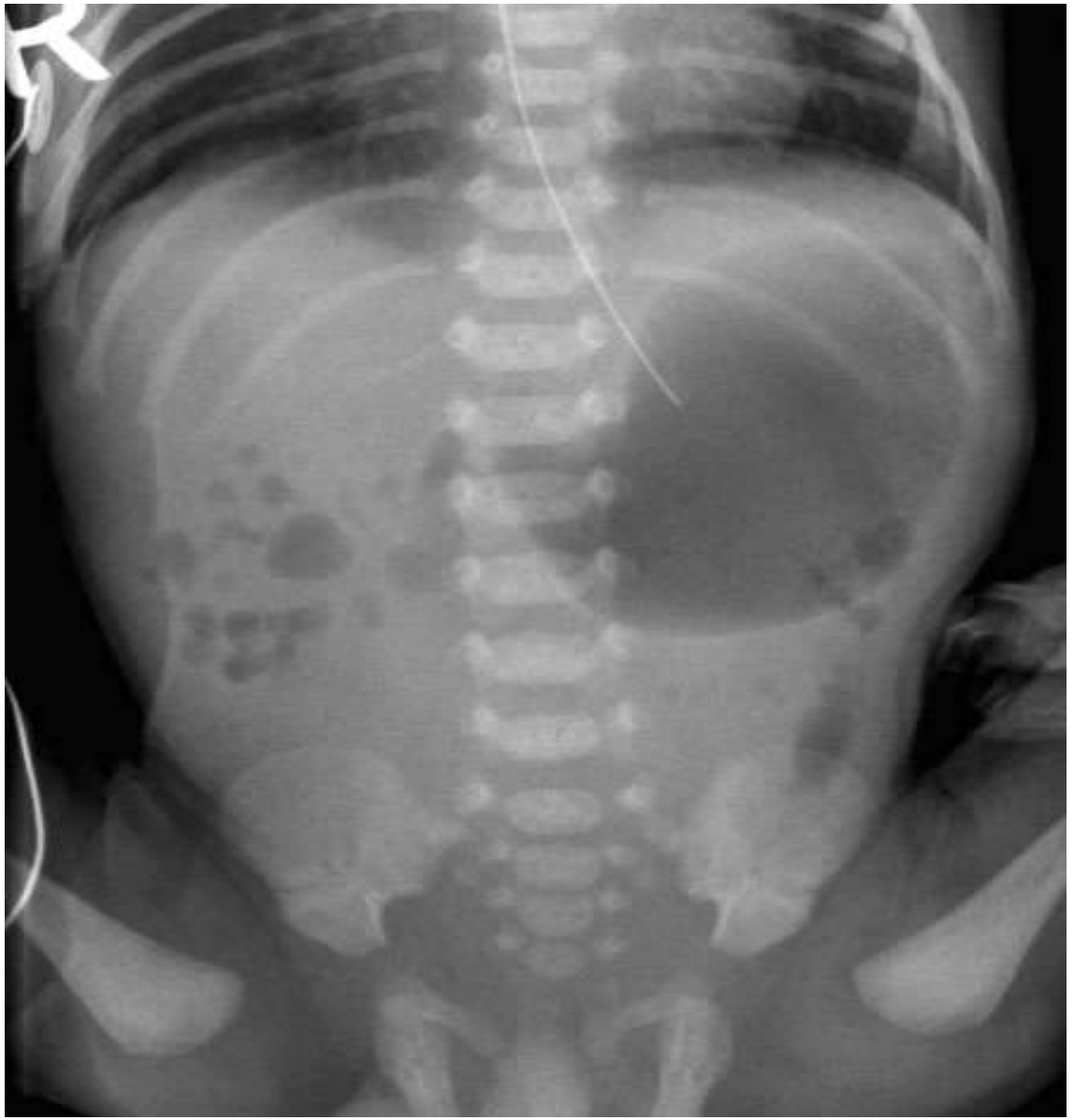
F Formula mishaps

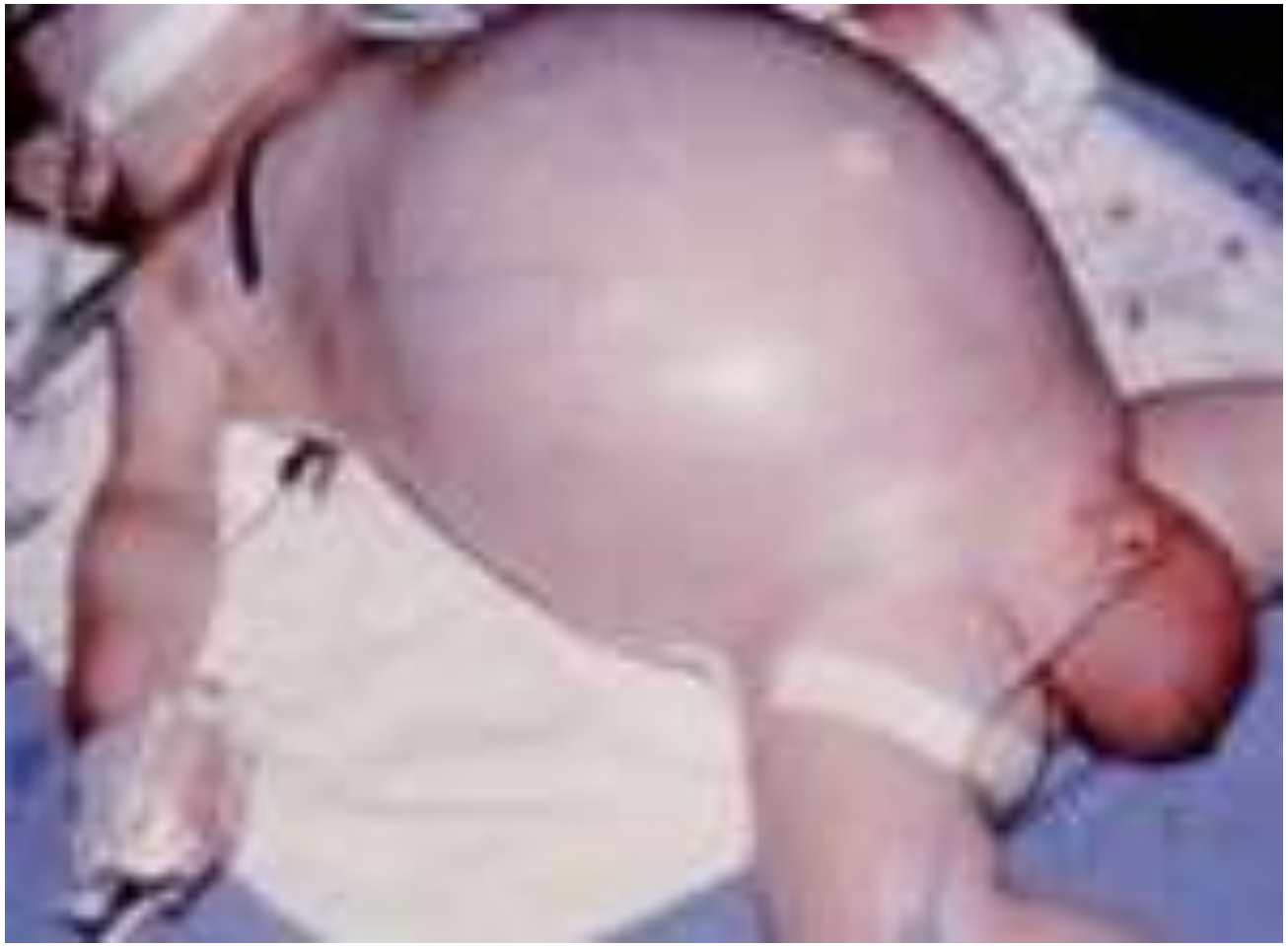
- These are not so common in the western world but parents do sometimes not understand how to make up a formula feed
- Over dilution resulting in hyponatraemia
- Under dilution resulting in hypernatraemia

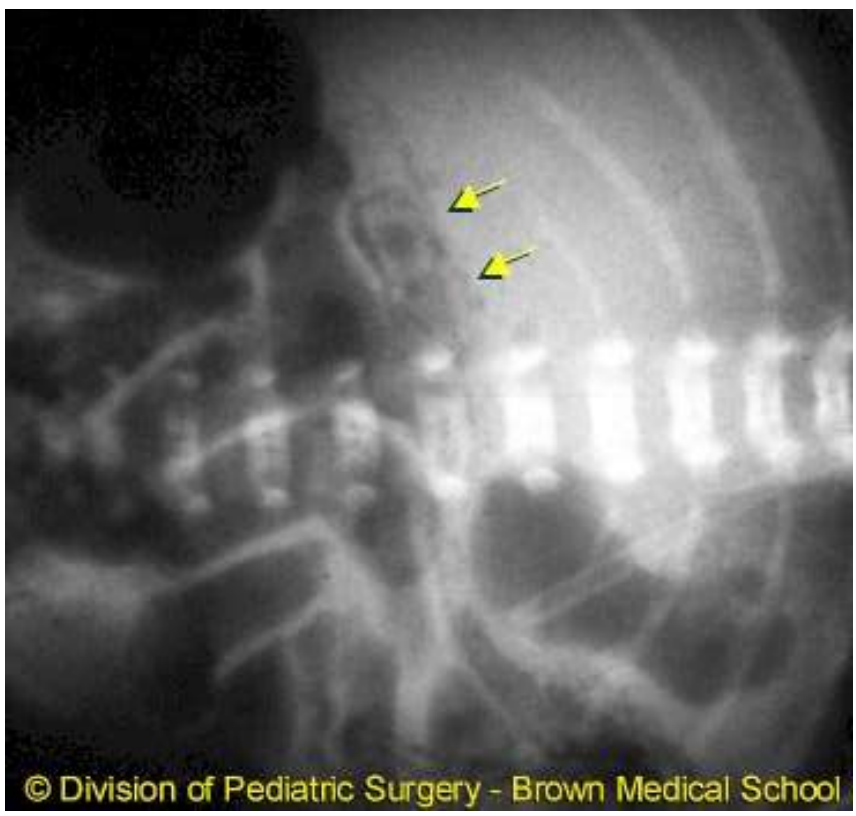
I - Intestinal catastrophes

- Those presenting in the neonatal period tend to be either
- Malrotation with volvulus or
- Necrotising enterocolitis

Malrotation



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I Intestinal catastrophes

- These tend to present with bilious vomiting which is unusual in any age of child and is therefore always significant
- Resuscitation of these children will include all the initial treatments but would then require NGT and the addition of metronidazole to the antibiotic cover.
- These children tend to have obvious abdominal distension as seen in the preceding slides

T - Toxins

T Toxins

- Unusual cause
- Can result from maternal drug ingestion in breast feeding mum
- Overuse of homeopathic/ standard medications
- May be a late presentation of drug withdrawal
- We now have urine tox screen kits in the ED

S Seizures/ CNS

- Difficult to diagnose the underlying cause in ED
- Immature cortical development so may not see typical tonic clonic or generalized seizures
- May see
  - lip smacking
  - abnormal eye / tongue movements
  - apnoea
- Treat according to APLS guidelines

So....back to our baby

- Presented collapsed but oxygenated well, well perfused, no heart murmur, hypoglycaemic, seizing with a low grade temp
- What's the most likely cause?
- What do you do next?
- What other tests need done to confirm?
- Who needs to be involved?

Summary

- Neonates can be tricky....
- Lots of potential issues
- Treat the common
- Do sensible investigations that will help you.
- Awareness of some of the more unusual causes will help you to do appropriate investigations early to assist with diagnosis once you have treated the common.