	PRENATAL	TIMING	FEATURES	AXR	ASSOCIATIONS
Oes Atresia	Polyhydramnios Small stomach	Immediate	Choking/drooling	Empty or gassy stomach	50% VACETERL
Duo Atresia	Polyhydramnios Large stomach	Immediate	Vomiting – non-bilious	Double bubble	30% Down's
Hy Py stenosis	NAD	2-7wks	Vomit – non-bilious	Large stomach	
Congenital intestinal obstruction	Variable		Vomit –bilious Distension Delayed meconium	Dilated bowel loops	HD commonest Assume VN (laparotomy if in doubt)

Embryology
Foregut develops from YOLK SAC → folds in embryo in 4th week
Pharynx, airway, lungs, oesophagus, duodenum to MDP, HPB system

VOMITING
Forceful ejection of gastric contents (cf posseting = passive regurgitation)

GASTRO-OESOPHAGEAL REFLUX
<12mths = immature LOS + short intra-abdo oesophagus + liquid food + reclined posture
>12mths= LOS matures + solid food + upright posture

Diff dx: posseting/other causes of vomiting
Problems: aspiration, peptic stricture, anaemia, failure to thrive
Ix= contrast studies (exclude OA/DA etc), OGD, pH studies
Mx= thickening agents, keep child upright, motility agents, PPI

VOMITING CHILD

O&G: Age/gestation/BWT

HPc:
Vomiting: (i)onset (ii)bilious vs non-bilious + post-vomit hunger
Bowels: (i)meconium passage and other bowel motions (ii)distension and visible peristalsis
Effects: electrolyte deficiencies, failure to thrive, aspiration, UGIB+ anaemia, stricture, opisthotonus
Causes: ambiguous genitalia (CAH), groin or umbilical lumps (hernia), rash (meningitis), urine (UTI)

PMHx:
Prenatal diagnosis: polyhydramnios causes
CAH/syndromes

FHx: Maternal FHx
First-born male

Diff dx: obstructive (HPS, atresias, HD, malrotation, hernia) vs non-obstructive (meningitis, UTI, CAH, overfeeding)
OE: dehydration/ambiguous genitalia, peristalsis, hernia + RUQ olive/LIF sausage

DEHYDRATED CHILD

	Gen	Neuro	CRT	HR	BP	PULSES	UO	Turgor	Eyes	Mucosa
DEHYDRATION	Unwell	A/V		+	N	N	-	-	Sunken	Dry
SHOCK	Unwell	V/P/U		++	-	Weak	Oliguria	-	Grossly Sunken	Dry

Types:
Isonatraemic: proportional losses of Na+/H20
Hyponatraemia: ICFV up → convulsions so avoid free water
Hypernatraemic : diarrhoea, high insensible water losses
hypertonic ECFV depletes/buffered by ICFV → less marked signs → Na+ <0.5mls/hr

Management:
ORS 50mls/kg over 4hrs + maintenance
IV Fluids NaCl 0.9% 50mls/kg + maintenance

HYPERTROPHIC PYLORIC STENOSIS

Hypertrophic pyloric sphincter causes gastric outlet obstruction

Epidemiology:

Age: 2-7wks Gender: 80% male Race: whites>blacks>asians(rare)
3 risk factors: maternal FHx/young mother/first borne male

Pathology:

Hypertrophy of **circular** muscle

Features:

(i)Vomiting: **non-bilious** (iii)Failure to thrive
(ii)Constant hunger (iv)**Dehydration**

Examination:

Test Feed: **visible peristalsis** from left to right
Mass: **ovoid** mass in **RUQ** (midway between umbilicus and ribcage)

Investigations:

Bloods: **electrolyte** deficiencies/**uraemia**
US: pylorus >**16**mm long/**3**mm thick
Barium: if doubt diagnosis (differentiate from atresias etc)

Paradoxical aciduria
Compensatory phase:
Vomiting with open pylorus → lose H+Cl-Na+K+ in gastric juice/bile/pancreatic juice/intestine
Kidneys excrete HCO3- to compensate → alkaline urine

Decompensatory phase:
Na+ deficit → H+ & K+ preferentially excreted with HCO3- → hypochloraemia, hypokalaemic alkalosis
Advanced alkalosis with acid urine → hypoca2+ and tetany

Management:

1. Correct **fluid/electrolyte** imbalances (Hartmann's 20ml/kg then 9ml/kg/hr)
2. Ramsted's **pyloromyotomy**: cut circular muscle but not mucosa of pylorus
   stay 1mm short of Mayo's vein at pylorus/D1 serosal demarcation

feed next day and discharge

OESOPHAGUS

OESOPHAGEAL ATRESIA

Definition: proximal and distal oesophagus fail to communicate
Upper end = dilated pouch with hypertrophic muscle wall || Lower end= atretic pouch with thin muscle wall

Pathology:	Gross' Classification
EA + DISTAL TOF 84%	A= ISOLATED EA
ISOLATED EA 8%	B= EA + PROX TOF
ISOLATED TOF 4%	C= EA + DISTAL TOF
EA + PROX + DISTAL TOF 3%	D= EA + PROX + DISTAL TOF
EA AND PROX TOF 1%	E= ISOLATED TOF

Features:
Pre-natal: **polyhydramnios** + **absent stomach**
Neonatal: **choking/drooling** (aspirates)
TOF: air enters stomach when baby coughs/cries and **aspirates** gastric secretions into lungs
Assocaitions: 50% VACTERL; tracheomalacia → seal-bark cough

Investigations:
Pre-natal= **polyhydramnios** + **small stomach**
Neonatal: CXR/AXR= site of **NG hold-up** + **stomach gas** presence(TOF)/absence(isolated EA)
Contrast= fistula/gapogram
Endoscopy= OGD/bronchoscopy

Management:
Pre-op: NBM, keep upright, O2, iv fluids, abx, vit K, TPN
Temporising: **Stamm gastrostomy**: allow early enteral feeding
Definitive: **ligate TEF**/EA primary **anastomosis** or **interposition**

DUODENAL ATRESIA

Aetiology:
Most sporadic; 1/3 have Trisomy 21

Pathology:
Failed vacuolation of duodenum at D1/2 → proximal hypertrophy/distal narrowing
Associated with biliary/pancreatic abnormalities eg annular pancreas

Week 4: **epithelial tube** of caudal foregut and cranial midgut surrounded by **mesenchyme**
Week 6: epithelium proliferates to **obliterate** lumen
Week 10: epithealial apoptosis → **vacuolation** → recancalization

Classification:
1. **Membrane** traverses lumen 2. Atretic ends connected by **fibrous cord** 3. Complete **separation** of atretic ends

Features:
Pre-natal: polyhydramnios + dilated stomach
Neonatal: bilious vomiting

Investigations:
Pre-natal: amniocentesis for **Trisomy 21**; US= **polyhydramnios** and **dilated stomach**
Neonatal: AXR: **double-bubble** stomach with no air distally
Others: contrast to differentiate from other atresias; rectal biopsy to exclude Hirschprung's

Diff Dx: oesphgeal atresia (choking/drooling, stomach size but both have polyhydramnios)
HPS (non-bilious vomiting without polyhydramnios, later onset, palpable mass)
Congenital intestinal obstructions (dilated bowel loops on AXR)

Management:
WEB: duodenotomy or endoscopic excision
ATRESIAS: bypass (**duodenoduodenostomy** or duodenojejeunal bypass; former has earlier recovery of function)

DIAPHRAGMATIC HERNIA

Normal development:
Formed by fusion of several structures in week 5-7
Septum transversum → central tendon (head folds→ ventrally/caudally→anterior diaphragm (long phrenic nerve course)
Pleuroperitoneal membranes from somites in C3-5 segments close primitive communication between cavities
Lateral muscular ingrowth from body wall completes diapgraphm muscle

Congenital Defects:
Foramen of Morgagni: between xiphoid and costal origins → present later as small hernia with little effect
Foramen of Bochdalek: defect in pleuroperitoneal segment (T18,21; posterior and left; pulmonary hypoplasia)
Central tendon defect:
Oesphageal hiatus enlarged:

Acquired:
Trauma: blunt force → left>right (liver protective)
Sliding/rolling

GASTROSCHISIS

Isolated anomaly to right of midline

EXOMPHALOS

Via congenital umbilical hernia