*sx: surgery, mc: most common

Intussusception

3mo - 3yrs
Aquired

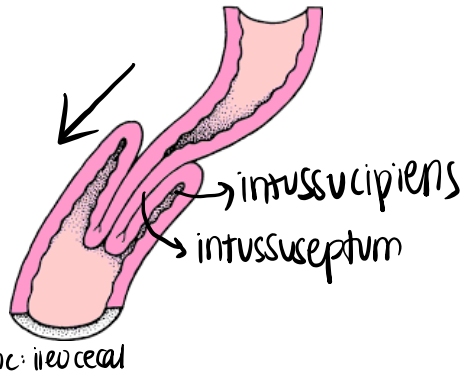
mcc of bowel obstruction in infants & toddlers

Triad
- Bouts of Abdominal pain (knees towards abdomen)
- Palpable Abdominal mass
- currant jelly stool (late)

- Bilious Vomitting

- Diarrhea → constipation
- Dehydration signs (late)
- Bowel sounds ↑ → ↓
- Dance sign (RLQ empty, RUQ full)
- sausage-shaped mass RUQ

- Prolapse to anus (late)



mc: ileocecal

causes:
mcc - Idiopathic (Adenovirus → lymphoid hyperplasia)
- 2ry: leading pt. (meckels diverticulum/tumor)

dx: - X-ray (obstruction signs)
- U/S (target/pseudo kidney sign) diagnostic

- CT/MRI

⚠EMERGENT (can cause ischemia & bowel wall necrosis)

tx: conservative +
- Hydrostatic/pneumatic reduction (mc ✓)
- failure of ↑/late/2ry cause: sx reduction (pull intussusceptum proximally) ± ischemic bowel resection w/anastomosis

---

Hypertrophic pylonic Stenosis (HPS)

↳ in Muscle

2-8 wks
Aquired

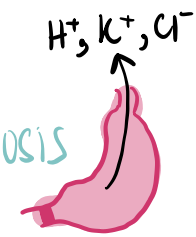
- Projectile non-bilious vomiting

- visible peristaltic waves
- dehydration
- Somnolence

- Olive sign epigastric region

- Hypokalemic hypochloremic Metabolic Alkalosis
  ↳ paradoxical Acidosis / Apnea

↑: 1st born male



dx: - U/S: thickness >4mm
diagnostic length >16mm
- Xray w/contrast: string/double tract sign

⚠EMERGENT

tx: - correct volume, electrolytes & Ph
- Sx: pyloromyotomy (only M., x mucosa)
  ↳ complications: mucosal perforation
  wound infection
  incisional hernia
  emesis
  Duodenal injury

Congenital Diaphragmatic Hernia (CDH)

discontinuity of the diaphragm

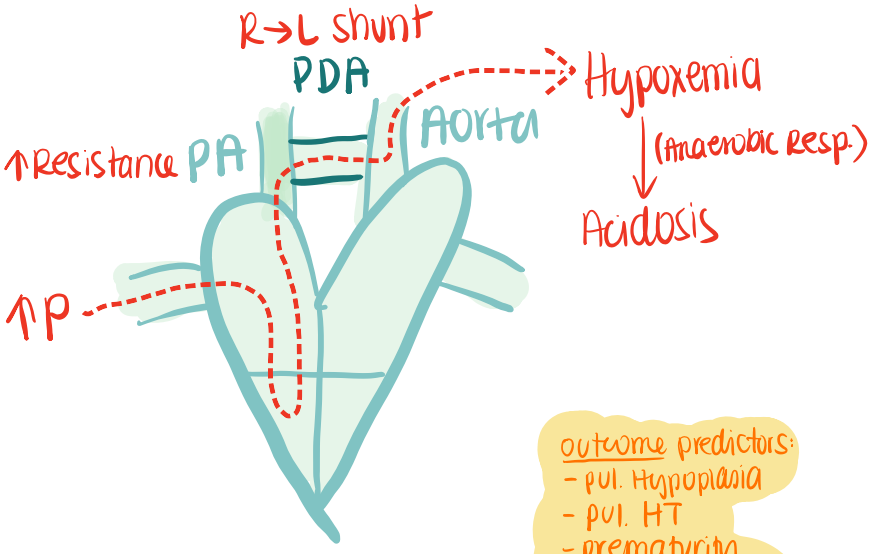
Diaphragm

- septum transversum: central tendon
- Esophageal Mesentry: medial Border
- lateral chest wall MS: lateral Border
- Pleuroperitoneal folds: post. Border

TYPES (Left>)

Postero-lateral (Bochdalek) mc
Ant. (Morgagni-Larrey)
Central
Diaphragm Agenesis
Diaphragm Eventration (intact attachments but lax MS/NS.)

(neonate)
- Pulmonary Hypoplasia
- persistant pulmonary HT
  - ↳ R→L shunting (PDA)
    - ↳ Hypoxemia → Acidosis
- cardio resp. Failure
- mortality (fetus/neonate)
- GI/resp manifestations (infants)
- Asymptomatic (infants)



outcome predictors:
- pul. Hypoplasia
- pul. HT
- prematuring
- other anomalies

dx:
- prenatal: US/MRI
- postnatal:
  - Clinical/PE:
    - Resp distress
    - scaphoid Abdomen (empty)
    - ↓Breath sounds
    - Bowel sounds in thorax
  - X ray ~~diagnostic~~
- Infant:
  - Resp/GI symptoms
  - Xray

mx:

prenatal:
- screen other malformations
- Fetal echo
- genetic studies
- In utero fetal therapy
- Fam counseling
- Delivery planing

postnatal:
- ↓lung compression
- ventilation
- cardiovascular support
- correct pH
- correct pulm HT
- when stable: sx → open / ↳ thoracoscopic

↳ EMERGENT

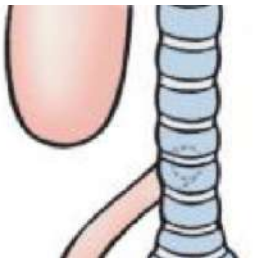
☹ ↓ Survival Rate:
- other malformations
- R. sided effects
  - ↳ Liver herniation
- < 30% lung vol
- ↓ Lung Area: Head Circumference

Esophageal Atresia (EA)

failure

4th-7th gestation wk : foregut → dorsal: Esophageal → Tracheoesophageal septum
→ ventral: Resp.

- polyhydramnios
- Atresia: ✗ gastric bubble
- Fistula: ↑ gastric bubble
- ↑ salivation
- NG tube ✗ pass



EA w/ TEF (mc)

Associated: screen!
- Vertebral
- Anorectal
- Cardiac
- Tracheo
- Esophageal
- Renal
- Limb abnormalities

dx: Xray

tx: - suctioning
↓ XEMERGENT
- Sx depend on gap b/w esophageal ends
  - < 2 vertebrae → ↑ anastomosis
  - 2-6 vertebrae → gastrostomy + delayed anastomosis
  - > 6 vertebrae → gastrostomy + esophagostomy + esophageal replacement later (use other conduits)

Surgery complications:
- ↓ stricture
- ↓ leak
- ↓ recurrence
- ↓ tracheomalacia
- ↓ GERD

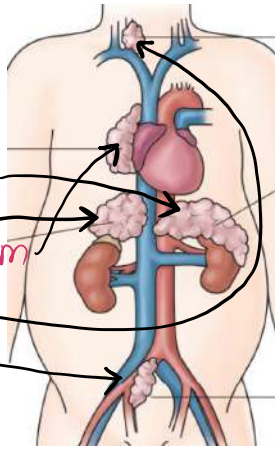
Peds Tumors

mc intraabdominal:
#1 Neuroblastoma
#2 Nephroblastoma (wilms')

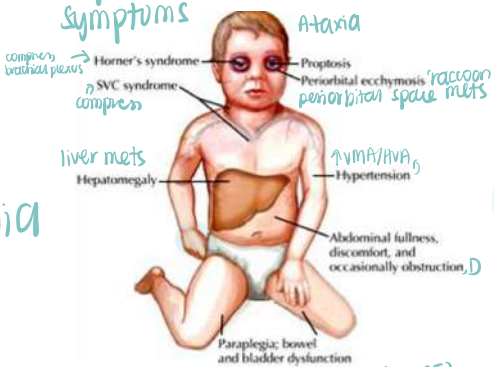
Neuroblastoma 1-4yrs

- unpredictable
- <age: better prognosis
- Abdominal mass → can cross midline, irregular
- ↑sick!
- Bone pain
- weight loss
- fever, sweating, Anemia

sites:
1- Adrenal medulla
2 - SAPNS ganglia
3 - post. mediastenium
4 - pelvis/ neck

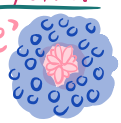


xspecific symptoms



spinal mets: 'dumb-bell on CT'

dx: - VMA/HVA ↑ in urine
- xray (calcification)
- US
- CT/MRI: mets 4 LN/bone/BM/skin/liver 4S
- biopsy: dark blue round cells 'rosette' around neurofibrillary core ('Homer Wright')



tx: Sx: resection ± chemo
↓ risk only
↳ neoadjuvant: intermediate risk
↳ neoadjuvant + adjuvant: ↑risk

Shimada: favorable prognosis
1- mitosis ↓
2- Age ↓
3- differentiation ↑
4- Stroma rich

INSS:
1 → 4 worse
4S: infants w/ distant mets: skin/liver/BM
↓
spontaneous regression
sub-cutaneous nodules
hepato splenomegaly
+ve
↓
Blue berry muffin spots

Wilms' Tumor 3.5 yrs

- better prognosis
- mc renal peds tumor
- <age: poor prognosis
- mc: unilateral, solitary
- mc: sporadic
- Asymptomatic (mc)
- Abdominal pain
- Hematuria
- Abdominal mass → smooth, unilateral
- ↓: fever, UTI, HT, anemia, varicocele, rupture w/ Hemorrhage

from metanephric Blastema

dx: - US
- CT/MRI (Renal V. → IVC)
- Echo (Renal A)
- Arteriography (preoperative embolization)
- Xray (X calcification)
- DMSA
- Bone/Brain scan (mets)

tx: chemo & resection (or)
↳ nephrectomy
↳ if mets: venotomy / hepatic or lung metastectomy

prognostic Factors:
- stage ↑
- Histo ∝
- Age ↓
- recurrence

INTESTINAL OBSTRUCTION

① Malrotation

mc: failure of 90° CCW cecum from RUQ to RLQ

- duodenal obstruction → bilious vomit (bc volvulus/Ladd bands)
- Abdominal pain
- Diarrhea → constipation
- failure to thrive
- bloody stool

dx: - Xray → mc: normal
- small bowel: R & colon: L
- ✗ distal bowel gas
- whirled ◎
- thick wall: chronic volvulus

- UGI contrast ★

tx: - correct fluid, pH
- if shock: ab, inotropics
- if volvulus: urgent SX: Ladd's
  - ✗ Ladd's bands
  - widen mesentric base
  - position bowel
  - ± Appendectomy

outcome:
- recurrance
- infarction
- obstruction (Adhesions)

② Intestinal Atresia

Duodenal w/ Down syndrome
Jejunal ileo colic w/ gastroschisis
colon w/ Hirschsprung disease

dx:
- Antenatal: US (polyhydramnios, "double bubble" duodenal & xray ⇑)
- Postnatal:
- Bile vomit, meconium delay, distension
- Xray (meconium cyst: peritoneal calcification, dilated loop)
- contrast enema (micro colon)

tx:
D → duodeno-duodenostomy
(mc) IJ → resection + Anastomosis
↳ 1ary Anastomosis (R. hemicolectomy + ileo-transverse Anastomosis)
↳ Defunctioning colostomy + staged Anastomosis (gradually)

outcome:
- other anomaly
- length of residual bowel

Type 1: membrane
2: fibrous cord
3 → a: mesentric defect
b: "christmas tree"
4: multiple Atresias

③ Necrotizing Enterocolitis (NEC) 7-10 days

- premature, formula fed, splanchic hypoperfusion ↑
- mc site: terminal ileum, colon
- sepsis/ischemia signs
- bilious vomit
- GI bleeding
- peritonism
- Abdominal wall erythema
- Abdominal mass

Bells classification:
I: initial mx
II: conservative
III: Sx

dx: Xray supine AP
- PV gas
- pneumatosis intestinalis ('soup bubble')
- pneumoperitoneum football sign
- ground glass appearance

mx: - NPO
- restore: pH, temp, glucose, fluid, Hct
- O_2
- Abs
- Analgesia
- Sx → resect
  - ↳ stoma only
  - ↳ clip & drop
  - ↳ drain (PPD)

monitor: serial radiography

Sx indications:
- pneumoperitoneum (Bells III)
- failure to progress
- obstruction
- palpable mass
- fixed bowel
- ↑ erythema

outcome:
- recurrance
- short gut syndrome
- stricture

④ Meconium Ileus w/CF (90%)

simple:
- distension
- bilious vomit 
- x pass meconium
- doughy palpable bowel loops

complicated:
- perforation (pseudocyst)
- Atresia
- volvulus

dx: - xray ("Neuhauser's/"soup bubble", calcification, ↑fluid levels)
- contrast enema (micro colon)
- US (cyst)
- CF: sweat Cl test/gene/immunoreactive trypsinogen ↑ >60

tx:
- water sol contrast enema
- SX → calm + stoma +Appendectomy
  ↳ resect + stoma/Anastomosis
- N-acetylcysteine
- abs
- pancreatic enzyme
- CF tx

meconium plug syndrome
ddx:
- mechanical ileus
- Hirschsprung's

↓(w/CF)

dx: contrast enema
tx: water sol ↑

---

⑤ Hirschsprung Disease

RET gene mutation

w/ Down syndrome

- failure of migration of neural crest
- loss of NCAM
- immunologic attack

short segment
↘ long segment

- absence of ganglion cells
- ↓ peristalsis
- enterocolitis
- distension
- Bilious vomiting 

tx: - decompress bowel (rectal washout/anal stimulation)
- if enterocolitis: ↑, abs, stomas
- SX: long pull through ∓ colostomy
  ↳ ganglionic loop to pelvis, anastomose w/anus
  ↳ Soave's: best technique

outcome:
- leak/stricture
- enterocolitis
- obstruction (adhesions)
- perianal excoriation

dx: - xray
- contrast enema (transitional zone)
- submucosal rectal biopsy ~~diagnostic~~
  absence of ganglion cells suction
- DRE: Saviá sign (expulsion of feces)
- Anorectal manometry
  normal: @ rectal distension → recto-anal ⊖ reflex
  Hirschsprung's: @ rectal distension → ✕ recto-anal ⊖ reflex & overreactivity of sphincter

⑥ Anorectal malformations ♂>

terminal hindgut outside sphincter mechanism

W/ Down syndrome, cat-eye syndrome

most: connection b/w distal rectum & GUT

- mc ♂: recto-bulbar urethral fistula
- mc ♀: recto-vestibular fistula

dx: - P/E!
- xray (lateral) - sacral ratio
- U/S
- echo {r/o VACTERL}

mx: - NPO, NG tube
- fluids
- abs

↑& ↓ puborectalis sling

High ARM	Low ARM
- flat perineum (bc probs ↑ in pelvis)	- Bucket handle
- rectourethral fistula (passage of meconium from urethra)	- opening in perineum
- short sacrum	- Ant. displaced anus
- ↓ sphincter M. contraction	- perineal fistula
- Bifid scrotum/ sphincter close to scrotum	
↳ ↓ continence	↳ ↑ constipation

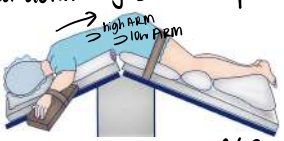
tx:

(3 step) high: colostomy (open, 1) + reconstruction (2) SX (close, 3) ← Emergency
{post. sagittal Anorectoplasty (SARP)}

(1 step) low: reconstruction SX

definitive single stage SX: (low ARM)
- perineal fistula
- Rectum 1cm from skin
- vestibular fistula

Head down so gas moves up



↳ jackknife position
↳ check site of the anal sphincter by muscle stimulation!!

Good Luck :)

Rama Rayyan