PIPADOR REVISION

MRCOG Part 1 Revision Notes

Midgut Development

EMBRYOLOGY • LECTURE 67

VISUAL EXAMINATION REVISION NOTES

2026 Edition

MRCOG Part 1 Revision Notes

Lecture 67: Midgut Development

Embryology • Visual revision edition

COLOUR CODE USED THROUGHOUT THESE NOTES

CRANIAL LIMB	CAUDAL LIMB	VITELLINE DUCT	WALL DEFECTS	CLINICAL

LEARNING OBJECTIVES — tick off as you go

- ☐ Define the midgut's boundaries, blood supply and derivatives.
- ☐ Describe physiological herniation and the 270° rotation.
- ☐ Know the vitelline duct remnants and Meckel's diverticulum.
- ☐ Explain malrotation and midgut volvulus.
- ☐ Compare omphalocele and gastroschisis; explain jejunoileal atresia; plan antenatal care.

1 Boundaries, Supply and Derivatives

IN ONE LINE: *Midgut = just below the bile duct → proximal ⅔ of transverse colon. SMA. The most dynamic segment: it herniates, rotates 270° and returns.*

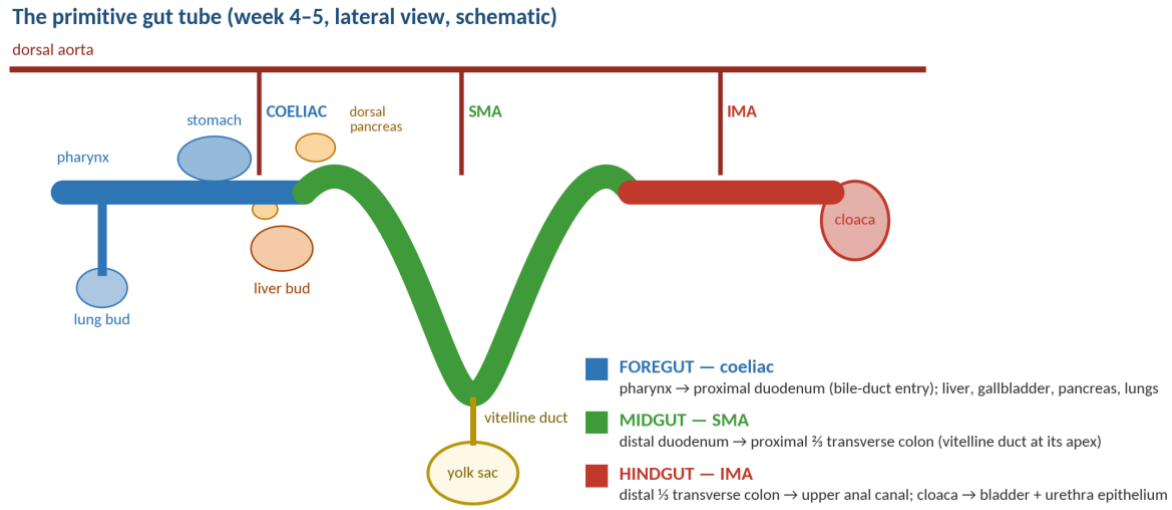


Figure 1. The gut tube (from Lecture 49).

Limb	Derivatives
Cranial limb	Distal duodenum, jejunum, most of the ileum
Caudal limb	Distal ileum, caecum, appendix, ascending colon, proximal ⅔ of transverse colon
Apex	Vitelline duct to the yolk sac — normally gone by ~week 7–9
SMA branches	Inferior pancreaticoduodenal, jejunal/ileal (~15–20), ileocolic, right colic, middle colic; watershed with the IMA near the splenic flexure (Griffiths' point)

2 Herniation and Rotation

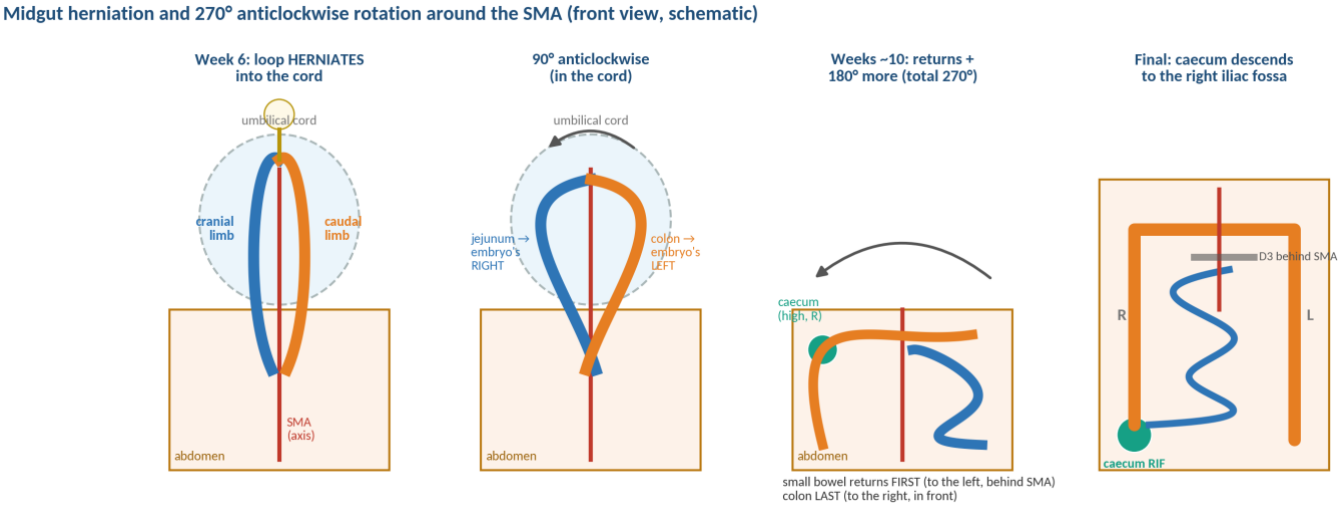


Figure 2. Herniation and 270° rotation.

Step	What happens
Physiological herniation (~week 6)	Gut grows faster than the abdomen (big liver) → loop enters the cord
First 90° (in the cord)	Anticlockwise (viewed from the front) round the SMA — cranial limb to the embryo's right
Return (~week 10)	Small bowel first, passing behind the SMA to the left; colon last, in front; another 180° → 270° total
Fixation	Caecum starts high on the right, then descends to the right iliac fossa; mesenteries fuse to the back wall

> **EXAM HOOK**
>
> Weeks 6–10 after fertilisation = **gestational weeks ~8–12** — bowel in the cord is **normal** on an early scan. **Don't diagnose omphalocele before ~12 weeks.**

3 Vitelline Duct Remnants

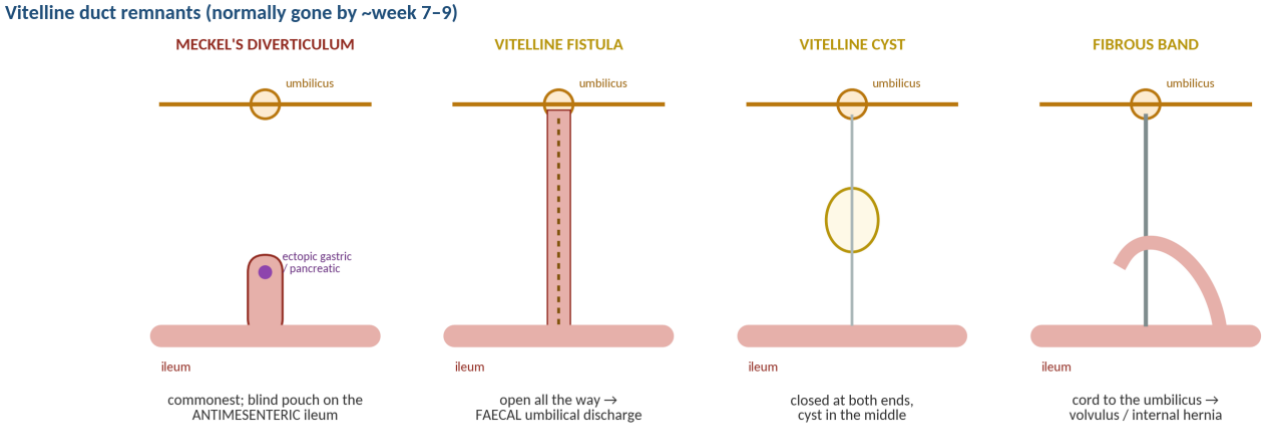


Figure 3. Meckel's and friends.

MNEMONIC / MEMORY HOOK

Meckel's rule of 2s: ~2% of people • ~2 feet from the ileocaecal valve • ~2 inches long • 2 ectopic tissues (gastric, pancreatic) • often presents before age 2 • ~2× more in boys.

- **Complications**: painless rectal bleeding (acid from gastric mucosa), diverticulitis (mimics appendicitis), intussusception (lead point), obstruction (band). **Tc-99m pertechnetate scan** finds the gastric mucosa.

4 Malrotation and Volvulus

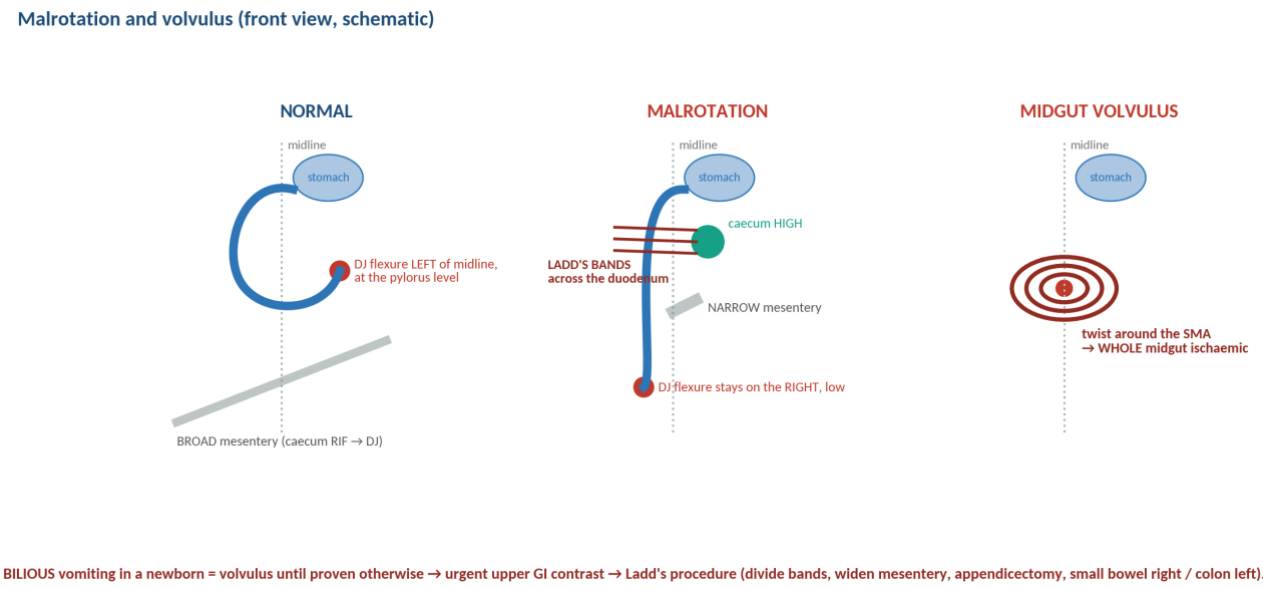


Figure 4. Normal vs malrotation vs volvulus.

- Variants: **non-rotation** (small bowel right, colon left — may be silent), **reversed rotation** (rare; duodenum in front of the SMA), **paraduodenal internal hernias**.

5 Abdominal Wall Defects and Atresia

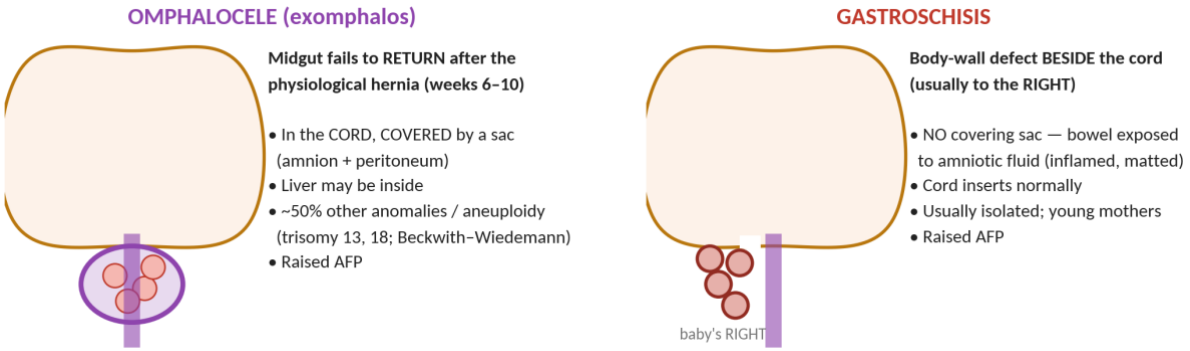


Figure 5. Omphalocele vs gastroschisis (from Lecture 49).

Abdominal wall defects compared

	OMPHALOCELE	GASTROSCHISIS
Sac	YES — amnion + peritoneum	NO — bowel floats free
Site	CENTRAL, through the umbilicus	to the RIGHT of an intact cord
Contents	bowel ± LIVER	bowel (thickened, matted)
Other anomalies	COMMON — cardiac, NTD, BWS; chromosomal ~30% (T13, T18, T21)	UNCOMMON — bowel atresia ~10–15%
Maternal AFP	raised	MARKEDLY raised
Who	older mothers	YOUNG mothers, smoking, deprivation
Plan	karyotype/microarray, echo, MDT	serial scans (bowel, growth), deliver ~37 wk in a surgical centre

Don't diagnose omphalocele before ~12 weeks' gestation — the midgut is normally in the cord until then. Vaginal birth is fine for both unless other reasons.

Figure 6. Side-by-side comparison.

Atresia	Mechanism
Duodenal	Failed recanalisation (Lecture 66) — double bubble, T21
Jejunoileal	Intra-uterine vascular accident (mesenteric occlusion) — can give 'apple-peel' atresia; seen with gastroschisis and volvulus in utero
Presentation	Bilious vomiting (below the ampulla), distension, delayed meconium; antenatally dilated loops ± polyhydramnios

6 Clinical Correlates

OMPHALOCELE

- Offer karyotype/microarray, **fetal echo**, detailed scan; think **Beckwith–Wiedemann**
- Prognosis depends on the associated problems
- Deliver in a centre with paediatric surgery

GASTROSCHISIS

- Usually isolated; young mothers, smoking
- Serial scans for bowel dilatation and growth; stillbirth risk ↑
- Routine early (preterm) delivery **not** shown to help — many plan ~37 weeks; **vaginal birth** fine
- Primary closure or staged silo

★ PEARL

Bilious vomiting in a newborn = malrotation with volvulus until proven otherwise — urgent upper GI contrast; hours matter.

Omphalocele = covered, central, syndromic. Gastroschisis = uncovered, right-sided, usually isolated.

7 MRCOG Exam Pearls — Last-Minute Page

Numbers to know

Wk 6 Herniation (≈8 by LMP)	**Wk 10** Return (≈12 by LMP)	**270°** Anticlockwise rotation	**~2%** Meckel's
~30% Omphalocele chromosomal	**10–15%** Gastroschisis + atresia	**~37 wk** Common gastroschisis plan	**L1** Normal DJ flexure level

HIGH-YIELD CHECKLIST

- ☐ Midgut: below bile duct → proximal ⅔ transverse colon; SMA.
- ☐ Herniates week 6, returns week 10 (8–12 by LMP).
- ☐ 270° anticlockwise round the SMA; small bowel back first.
- ☐ Vitelline remnants: Meckel's, fistula, cyst, band.
- ☐ Meckel's rule of 2s; painless bleeding; Tc-99m scan.
- ☐ Malrotation: Ladd's bands, narrow mesentery → volvulus.
- ☐ Bilious vomiting = urgent contrast study.
- ☐ Omphalocele: covered, central, anomalies, ↑AFP.
- ☐ Gastroschisis: uncovered, right, isolated, ↑↑AFP.
- ☐ Jejunoileal atresia = vascular; duodenal = recanalisation.

Self-assessment — cover the right-hand column

Question	Answer
Artery of the midgut?	Superior mesenteric artery
When does the midgut herniate and return?	Week 6 and ~week 10 (post-fertilisation)
Total rotation and direction?	270° anticlockwise round the SMA
Which part returns first?	Small bowel (cranial limb)
Meckel's diverticulum is a remnant of…?	The vitelline duct
Scan to find a bleeding Meckel's?	Tc-99m pertechnetate
Key contrast finding in malrotation?	DJ flexure not left of the midline
Sac in gastroschisis?	None
Cause of jejunoileal atresia?	Intra-uterine vascular accident
Earliest a scan should call an omphalocele?	~12 weeks' gestation

8 References

- Sadler TW. Langman's Medical Embryology. 14th ed. 2019.
- Moore KL, Persaud TVN, Torchia MG. The Developing Human. 11th ed. 2020.
- NHS Fetal Anomaly Screening Programme Handbook (current edition).