PIPADOR REVISION

MRCOG Part 1 Revision Notes

The Embryonic Period

EMBRYOLOGY • LECTURE 52

VISUAL EXAMINATION REVISION NOTES

2026 Edition

MRCOG Part 1 Revision Notes

Lecture 52: The Embryonic Period

Embryology • Visual revision edition

COLOUR CODE USED THROUGHOUT THESE NOTES

ORGANOGENESIS	FOLDING	TERATOGENS	SCANNING	FACE

LEARNING OBJECTIVES — tick off as you go

- ☐ Define the embryonic period and relate it to gestational age.
- ☐ Describe the key events of weeks 3–8 and folding of the embryo.
- ☐ Outline organogenesis by system, including the face.
- ☐ Know critical periods and the classic teratogens.
- ☐ Apply to early pregnancy scanning, miscarriage, ectopic pregnancy and prescribing.

1 Definition

IN ONE LINE: *Weeks 3–8 after fertilisation (gestational weeks 5–10): every major organ is laid down — the period of greatest vulnerability to teratogens.*

- **Fetal period** (week 9 onwards): growth and maturation — fewer gross malformations, but the brain, eyes and genitalia stay vulnerable.
- **Carnegie stages 1–23** stage embryos by form, not age; stage 23 ≈ end of week 8.

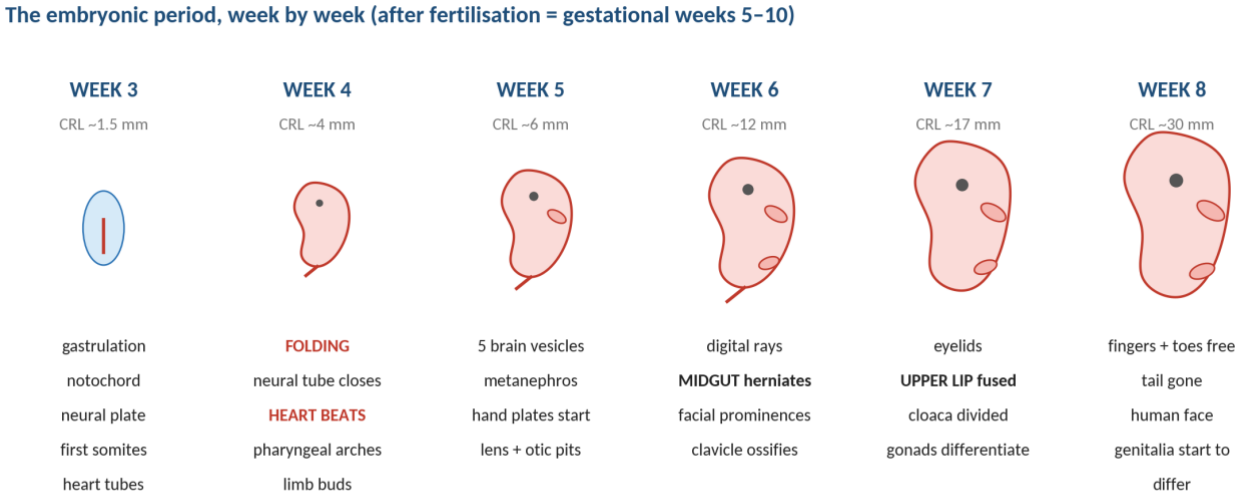


Figure 1. Weeks 3–8 at a glance.

2 Folding (Week 4)

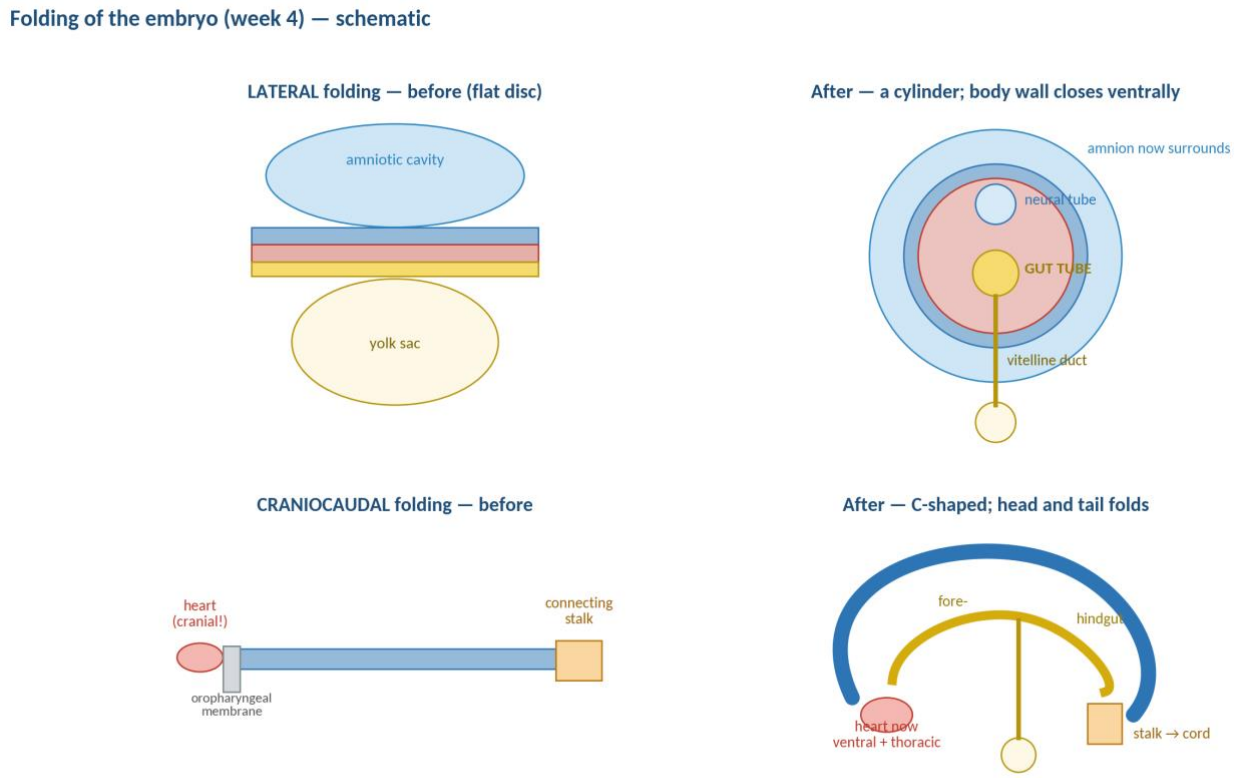


Figure 2. Lateral and craniocaudal folding.

Consequence	Detail
Cylindrical embryo	Somites and neural tube outgrow the disc; edges roll ventrally
Gut tube	Part of the yolk sac taken in; joined to it by the vitelline duct
Heart + septum transversum	Swing from in front of the oropharyngeal membrane to the chest, ventral to the foregut
Ventral body wall + umbilicus	Body wall closes last at the umbilicus (connecting stalk, vitelline duct, allantois) — failure → body-wall defects

3 Organogenesis by System

System	Milestones
Nervous	Neuropores close Day 25 / 27–28; 3 vesicles (wk 4) → 5 (wk 5); neural crest migrates
Heart	Tube fuses ~Day 21–22, beats Day 22–23; D-looping days 23–28; septation weeks 4–7; four chambers by week 8
Lungs	Respiratory bud week 4; TO septum complete ~week 7; pseudoglandular phase weeks 5–17
Gut	Gut tube week 4; midgut herniates week 6, returns by weeks 10–12; cloaca divided by week 7

System	Milestones
Urogenital	Pro- (wk 4) → meso- → metanephros (wk 5; urine from ~wk 10); PGCs arrive wk 5–6; gonads differentiate from wk 7
Limbs	Buds week 4 (upper first); hand/foot plates; digits separated by apoptosis by week 8
Face	Five prominences fuse weeks 4–8; upper lip by ~week 7; palate by ~weeks 10–12
Bone	Clavicle is the first bone to ossify (~week 6); bone-marrow blood formation starts later (~weeks 10–12)

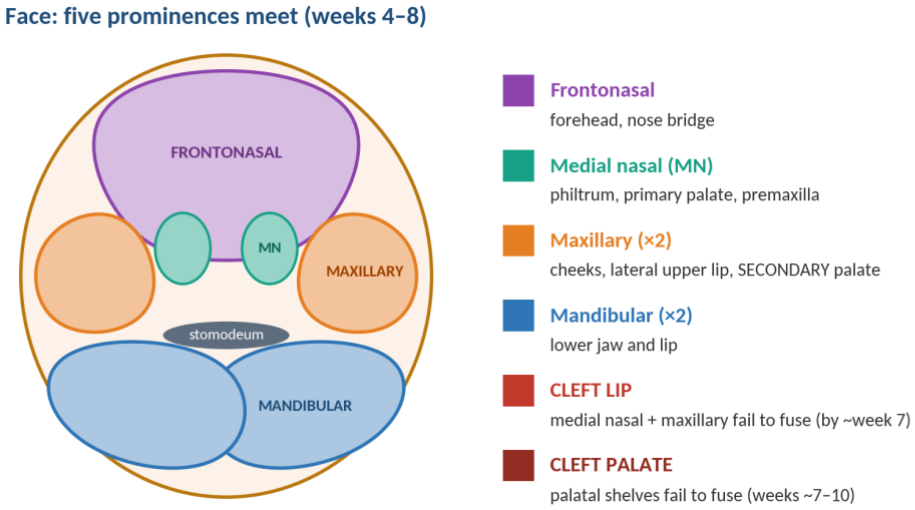


Figure 3. Facial prominences and clefts.

4 Teratogenesis

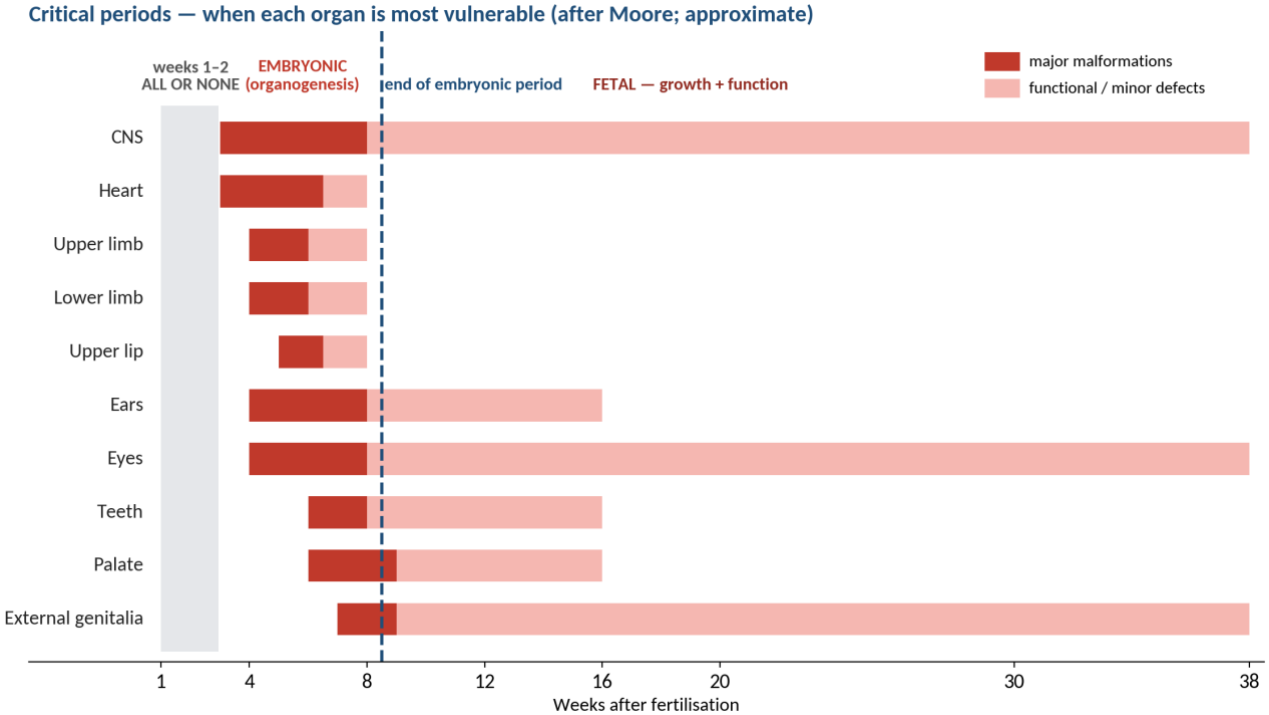


Figure 4. Critical periods by organ.

- **Principles**: effects depend on **stage** (weeks 1–2 all-or-none; 3–8 malformations; 9+ growth/function), **genotype**, **dose** and **mechanism**; outcomes are death, malformation, growth restriction or functional deficit.

Agent	Critical window	Effects
Thalidomide	Days 20–36	Limb reduction (phocomelia, amelia)
Valproate	Weeks 3–4 (NTD)	NTD 1–2%; ~10% major malformations; neurodevelopmental problems in up to ~30–40% — MHRA Pregnancy Prevention Programme
Carbamazepine	Weeks 3–4	NTD ~0.5–1%
Phenytoin	1st trimester	Fetal hydantoin syndrome — clefts, microcephaly, nail/digit hypoplasia
Warfarin	Weeks 6–12	Nasal hypoplasia, stippled epiphyses; later CNS bleeds
Isotretinoin	1st trimester	Craniofacial, cardiac, CNS, thymic — Pregnancy Prevention Programme
Methotrexate	1st trimester	Multiple anomalies; abortifacient
ACE inhibitors / ARBs	2nd–3rd trimester	Oligohydramnios, renal failure, skull hypoplasia — switch before/early in pregnancy
Lithium	1st trimester	Ebstein anomaly — baseline ~1 in 20 000, with lithium ~1 in 1000–2000 (small absolute risk)
Alcohol / tobacco	Throughout	FASD / FGR, preterm birth, abruption
Rubella	1st trimester	Cataracts, deafness, PDA / pulmonary stenosis, microcephaly
CMV / Toxoplasma / Zika	Esp. 1st half	Deafness, chorioretinitis, calcification, hydrocephalus / microcephaly
Maternal diabetes	Periconception	Heart (TGA, VSD), NTD, caudal regression
Maternal PKU	Throughout	Microcephaly, heart defects, FGR

MNEMONIC / MEMORY HOOK

'All-or-none, then anatomy, then function' — weeks 1–2 all-or-none • weeks 3–8 major malformations • weeks 9+ growth and function.

5 Scanning the Embryonic Period

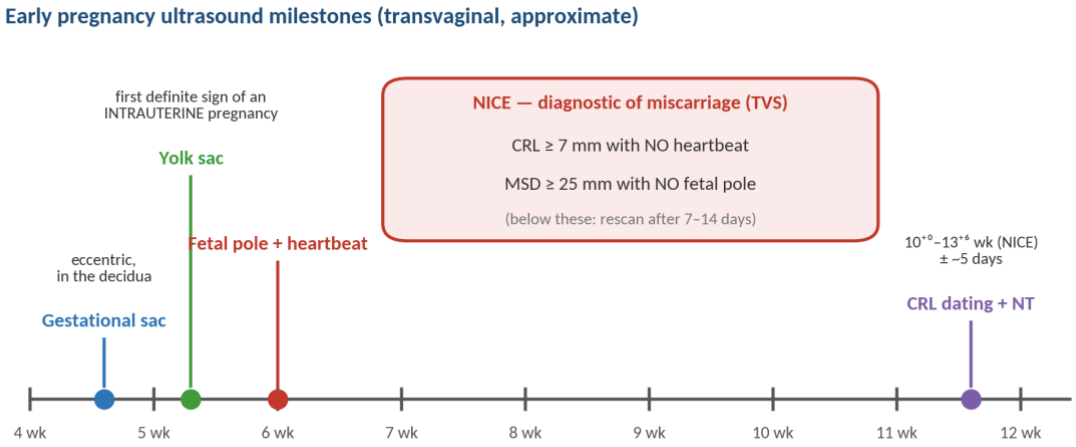


Figure 5. TVS milestones and miscarriage criteria (from Lecture 37).

- **NICE**: CRL **≥ 7 mm with no heartbeat** or MSD **≥ 25 mm with no fetal pole** = miscarriage; below these, rescan in 7–14 days. **Dating by CRL at 10^{+0}–13^{+6} weeks** (CRL 45–84 mm).
- **Screening**: combined test (NT + PAPP-A + free β-hCG) at 11^{+0}–13^{+6}; **NIPT** (cell-free DNA, from 10 weeks) offered in the NHS after a higher-chance result.

6 Clinical Correlates

PREGNANCY OF UNKNOWN LOCATION / ECTOPIC

- TVS + serial hCG (NICE NG126)
- hCG rise **< 63% in 48 h** → ectopic or non-viable; fall > 50% → failing
- Expectant, methotrexate or surgery (salpingectomy/salpingotomy)
- The old 1500–2000 IU/L 'discriminatory zone' isn't used alone

MISCARRIAGE

- ~50% of first-trimester losses are **chromosomal**
- **Threatened miscarriage** with a previous loss: offer **vaginal progesterone** (NICE 2021)
- **Recurrent**: RCOG — 3+ losses (ESHRE 2022 — 2+). Test for antiphospholipid antibodies, uterine anatomy, thyroid; **karyotype the pregnancy tissue**, parents only if an unbalanced result

> **★ PEARL**
> Organs form in **weeks 3–8 after fertilisation = gestational weeks 5–10** — often before pregnancy is confirmed, so **pre-conception counselling** (folic acid, switching valproate, ACE inhibitors, warfarin, isotretinoin; diabetic control) matters most.

7 MRCOG Exam Pearls — Last-Minute Page

Numbers to know

Wk 3–8 Embryonic period (post-fert.)	**Wk 5–10** Same, by LMP	**23** Carnegie stages	**Days 20–36** Thalidomide window
Day 22–23 Heart starts beating	**~30 mm** CRL end of week 8	**≥ 7 mm** CRL, no FH → miscarriage	**63%** Minimum 48-h hCG rise

HIGH-YIELD CHECKLIST

- ☐ Embryonic period = weeks 3–8 post-fertilisation (5–10 by LMP).
- ☐ Week 4: folding, neural tube closes, heart beats, arches, limb buds.
- ☐ Folding → cylinder, gut tube, heart into chest, umbilical ring.
- ☐ Upper lip ~week 7; palate ~weeks 10–12; digits free by week 8.
- ☐ Weeks 1–2 all-or-none; 3–8 malformations; 9+ growth and function.
- ☐ Thalidomide days 20–36; valproate (PPP); warfarin 6–12 wk; ACE-i later; lithium → Ebstein.
- ☐ Diabetes → heart, NTD, caudal regression.
- ☐ NICE miscarriage criteria; CRL dating 10^{+0}–13^{+6}.
- ☐ hCG < 63% rise in 48 h = suboptimal.
- ☐ ~50% early losses chromosomal; progesterone for threatened miscarriage after a previous loss.

Self-assessment — cover the right-hand column

Question	Answer
Embryonic period in LMP weeks?	Weeks 5–10
Four consequences of folding?	Cylinder, gut tube, heart into chest, ventral wall/umbilicus
When does the heart start to beat?	~Day 22–23 (week 4)
Critical window for thalidomide?	Days 20–36 after fertilisation
Valproate risks?	NTD 1–2%, ~10% malformations, neurodevelopmental harm
Lithium-associated heart defect?	Ebstein anomaly
ACE inhibitor fetal effects?	Oligohydramnios, renal failure, skull hypoplasia (2nd–3rd trimester)
Maternal condition causing caudal regression?	Diabetes
CRL without heartbeat that confirms miscarriage?	≥ 7 mm (TVS)
Share of first-trimester losses that are chromosomal?	~50%

8 References

- Sadler TW. Langman's Medical Embryology. 14th ed. 2019.
- Moore KL, Persaud TVN, Torchia MG. The Developing Human. 11th ed. 2020.
- NICE NG126. Ectopic pregnancy and miscarriage. 2019 (updated 2023).
- MHRA. Valproate Pregnancy Prevention Programme (current guidance).
- RCOG Green-top Guideline No. 17. Recurrent Miscarriage. 2023.