PIPADOR REVISION

MRCOG Part 1 Revision Notes

CT

MEDICAL PHYSICS • LECTURE 508

VISUAL EXAMINATION REVISION NOTES

2026 Edition

508

MRCOG PART 1 REVISION NOTES | MEDICAL PHYSICS

CT

Physics of computed tomography, Hounsfield units, contrast, dose, pregnancy and O&G indications

HU	Water = 0	≈ 10 mSv	Iodinated contrast
Hounsfield units	Air = −1000	CT abdomen/ pelvis	Renal/allergy check

■ KEY FACTS: Learning objectives

- Define computed tomography (CT), Hounsfield units, windowing and contrast phases.
- Explain CT acquisition (rotating tube/detectors, helical multislice) and image reconstruction.
- Describe radiation dose, contrast risks, artefacts, CT in pregnancy and O&G indications.

508.1 Key definitions

Term	Definition
Computed tomography (CT)	Cross-sectional imaging using a rotating X-ray source and detectors with computer reconstruction
Hounsfield unit (HU)	Scale of X-ray attenuation relative to water: HU = 1000 × (μ_tissue − μ_water) ÷ μ_water
Window level / width	Centre and range of HU values displayed as grey shades (soft tissue, lung, bone windows)
Helical (spiral) multislice CT	• Continuous tube rotation while the table moves • Many detector rows → fast volume acquisition
Pitch	Table movement per rotation ÷ beam width — higher pitch, lower dose, faster scan
Contrast phases	Arterial (≈ 25–35 s, CTPA/angiography), portal venous (≈ 60–70 s, staging), delayed/excretory (urogram)

■ IN PLAIN ENGLISH: CT

CT takes many X-ray measurements from all around the body and uses a computer to build **slices**. Each pixel's brightness reflects how much X-ray it absorbed (HU). It is fast and excellent for the chest and abdomen, but gives a **higher radiation dose** than plain X-rays.

508.2 Principles

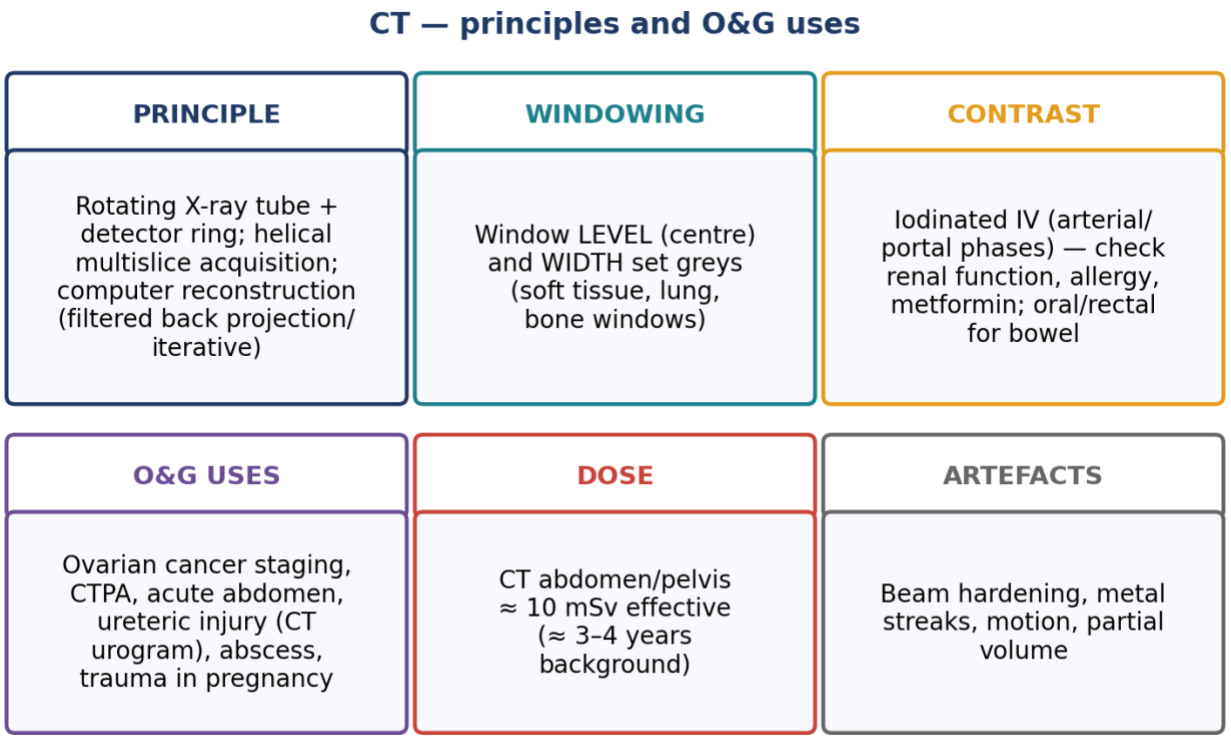


Figure 508.1 — CT principles and uses

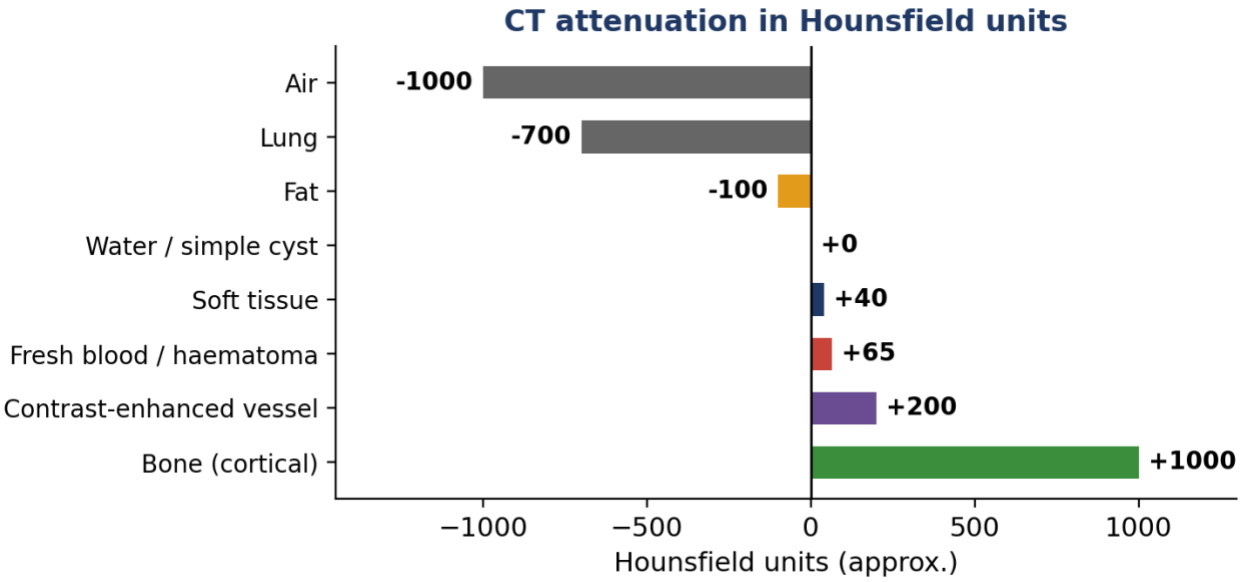


Figure 508.2 — Hounsfield units

- Reconstruction: filtered back projection or iterative/AI-based reconstruction (lower dose for same quality).
- Windowing: soft-tissue window (level ≈ 40, width ≈ 400 HU), lung (−600/1500), bone (400/1800) — the same data viewed differently.
- Multiplanar reformats (coronal, sagittal) and 3-D reconstructions from volume data.

508.3 Contrast media

Topic	Details
Iodinated IV contrast	• Risks: hypersensitivity (premedicate/avoid if previous severe reaction), contrast-associated AKI (check eGFR, hydrate), thyroid effects • Metformin — check local guidance in renal impairment
Pregnancy	• Iodinated contrast crosses the placenta — check neonatal thyroid function (heel-prick screening usually sufficient) • Use when clinically necessary
Breastfeeding	Continue — negligible excretion
Oral/rectal contrast	Bowel opacification for abdominal staging/collections

508.4 Dose and pregnancy

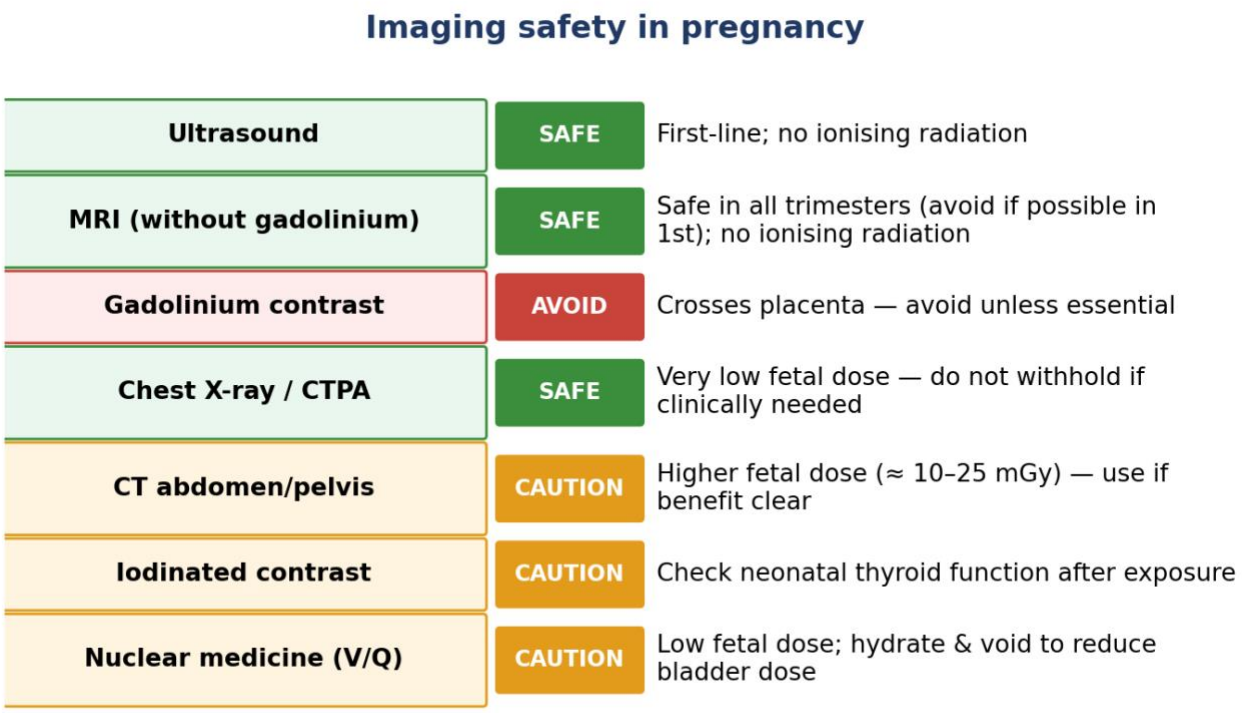


Figure 508.3 — Imaging safety in pregnancy

- Typical effective doses: CT head ≈ 2 mSv, CT chest/CTPA ≈ 4–7 mSv, CT abdomen/pelvis ≈ 10 mSv (≈ 3–4 years of background radiation).
- **CTPA vs V/Q in pregnancy**: CTPA gives a lower fetal dose but higher maternal breast dose
  - V/Q (perfusion-only) lower breast dose — choice per local guidance and CXR findings (RCOG GTG 37b).
- CT abdomen/pelvis in pregnancy (≈ 10–25 mGy fetal dose) is acceptable when clinically needed (trauma, suspected appendicitis when USS/MRI inconclusive)
  - Use dose-reduction protocols.

508.5 O&G indications and artefacts

Indication	Role
Ovarian cancer	• Staging CT chest/abdomen/pelvis: omental cake, peritoneal deposits, ascites, nodes, liver/lung metastases • Planning cytoreduction • Response assessment
Cervical/endometrial cancer	Nodal and distant staging (PET-CT for cervix); radiotherapy planning
Pulmonary embolism	CTPA
Postoperative complications	Abscess, haematoma, bowel/bladder injury, ureteric injury (CT urogram — delayed phase)
Acute abdomen/trauma	Perforation, obstruction, solid organ injury
Artefacts	Beam hardening (dark streaks between dense structures), metal streaks, motion, partial volume averaging, noise in obese patients

■ **COMMON PITFALLS**

Requesting CT when ultrasound or MRI would answer the question without radiation.

Forgetting renal function before iodinated contrast.

Avoiding CTPA in a pregnant woman with suspected PE.

508.6 Must-know summary

■ **EXAM TIP**

- CT = rotating X-ray tube + detectors → computer-reconstructed slices; helical multislice.
- HU: air −1000, fat ≈ −100, water 0, soft tissue +20–80, blood +40–70, bone up to +1000; windowing changes display.
- Iodinated contrast: allergy, AKI, thyroid (neonatal check after pregnancy exposure).
- Doses: CT abdomen/pelvis ≈ 10 mSv; CTPA lower fetal but higher breast dose than V/Q; use when clinically needed in pregnancy.

■ **MNEMONIC / MEMORY AID**

HU ladder — 'Air −1000, Fat −100, Water 0, Bone +1000'.