



PIPADOR REVISION

MRCOG Part 1 Revision Notes

MRI of the Abdomen and Pelvis

IMAGING • LECTURE 39

VISUAL EXAMINATION REVISION NOTES

2026 Edition

MRCOG Part 1 Revision Notes

Lecture 39: MRI of the Abdomen and Pelvis

Imaging • Visual revision edition

COLOUR CODE USED THROUGHOUT THESE NOTES

PHYSICS	SAFETY / CONTRAST	BENIGN GYNAE	OBSTETRICS	ONCOLOGY
---------	-------------------	--------------	------------	----------

LEARNING OBJECTIVES — tick off as you go

- ☐ Explain T1 and T2 relaxation and how common tissues appear.
- ☐ Know the main sequences (fat-sat/STIR, DWI, MRCP, fast T2) and gadolinium.
- ☐ State MRI safety rules, including in pregnancy and lactation.
- ☐ Describe uterine zonal anatomy and the MRI features of fibroids, adenomyosis and endometriosis.
- ☐ Describe MRI's role in staging gynaecological cancer and in placenta accreta spectrum.

1 Physical Principles

IN ONE LINE: Hydrogen protons in a strong field (1.5 T or 3 T, ~30 000× the Earth's) are tipped by a radiofrequency pulse; how fast they relax gives the image — no ionising radiation.

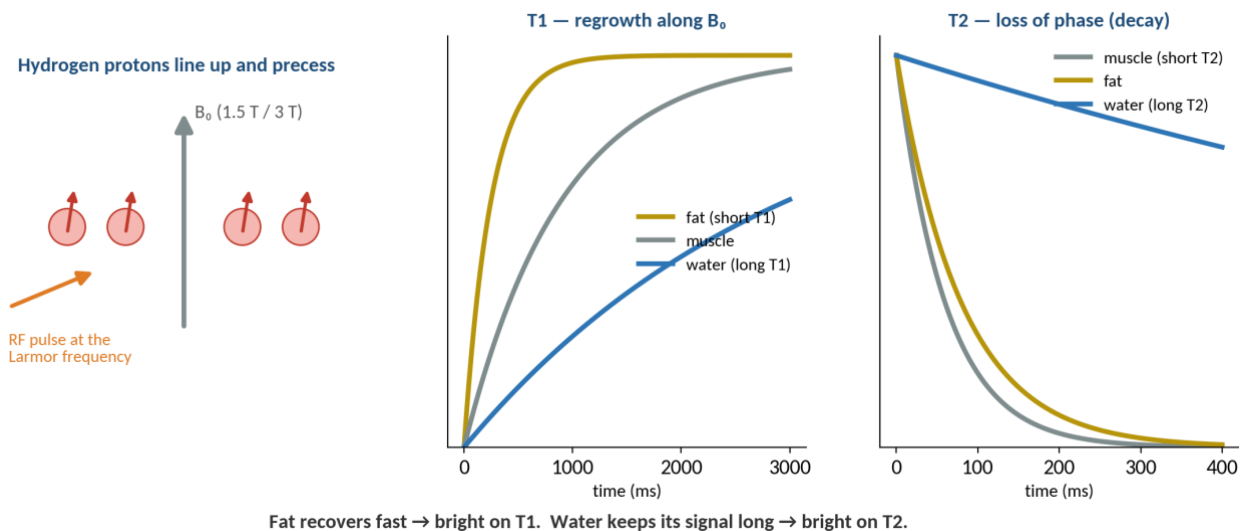


Figure 1. T1 regrowth and T2 decay.

T1 (longitudinal, spin–lattice)

- Time to realign with B_0
- **Short T1 = bright:** fat, subacute blood, gadolinium
- Good for anatomy and contrast enhancement

T2 (transverse, spin–spin)

- Time to lose phase coherence
- **Long T2 = bright:** water, cysts, oedema, endometrium
- Good for pathology and pelvic zonal anatomy

How tissues look on T1 and T2 (simplified)

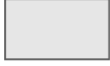
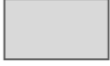
	T1	T2	
Water / urine / simple cyst			WATER WHITE on T2 (think 'WW2')
Fat			FAT bright on BOTH (use fat-sat to prove it)
Muscle			
Fibroid (typical)			FIBROID DARK on T2
Subacute blood (methaemoglobin)			blood products bright on T1 → endometrioma
Air, cortical bone, calcium			
Endometrium			
Gadolinium-enhanced tissue		—	

Figure 2. How common tissues look.

MNEMONIC / MEMORY HOOK

'WW2' — Water is White on T2. Fat is bright on both — prove it with fat saturation.

Sequence	Use
Fat-sat / STIR	Suppresses fat — confirms a dermoid; shows oedema/inflammation
DWI + ADC map	Restricted diffusion (tumour, abscess) = bright on DWI, dark on ADC — key in oncology
Single-shot fast T2 (HASTE)	Very fast — fetal MRI, restless patients
MRCP	Heavily T2-weighted — bile ducts bright; safe in pregnancy
MRA / MRV	Vessels without iodinated contrast

2 Safety and Gadolinium

CONTRAINDICATIONS / CHECKS

- Non-MR-conditional **pacemakers**, older cochlear implants, ferromagnetic aneurysm clips, **metal in the eye**, some neurostimulators
- Check every implant; most joints, clips and **IUDs** are MR-conditional
- Claustrophobia (~5–10%), noise > 90 dB (ear protection)

GADOLINIUM

- Paramagnetic — **shortens T1** → enhancing tissue bright
- **Nephrogenic systemic fibrosis** with poor renal function (eGFR < 30) — mainly older **linear** agents (most withdrawn in Europe); **macrocytic** agents far safer
- **Crosses the placenta** and recirculates in amniotic fluid → **avoid in pregnancy** unless essential
- **Breastfeeding can continue** (tiny amounts in milk)

EXAM HOOK

MRI in pregnancy: no evidence of fetal harm at 1.5 T; use it when ultrasound can't answer the question. Many units **defer non-urgent scans in the first trimester** as a precaution. **Avoid gadolinium.**

3 Pelvic Anatomy and Benign Gynaecology

Uterine zonal anatomy on T2 (schematic)

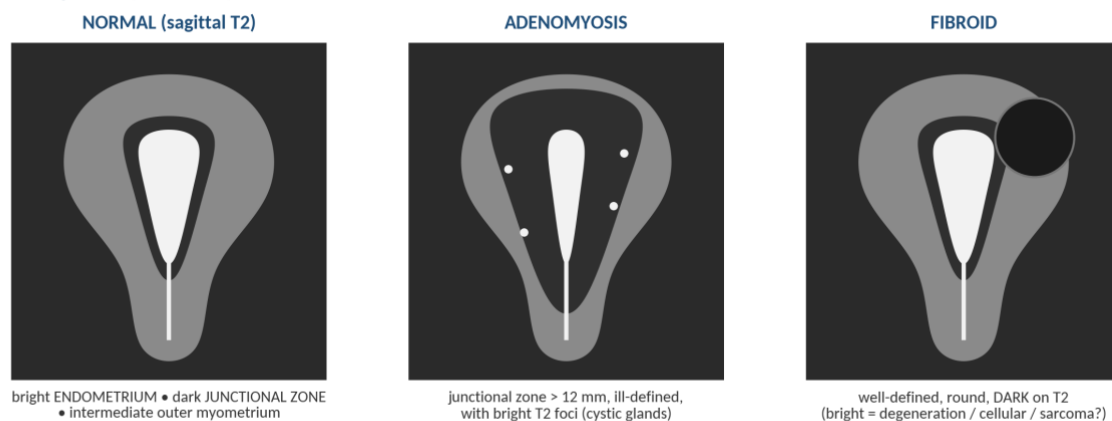


Figure 3. Zonal anatomy, adenomyosis and fibroid on T2.

- **Uterus (T2):** bright endometrium → dark **junctional zone** (inner myometrium) → intermediate outer myometrium; zonal pattern fades in pregnancy. **Cervix:** bright mucus, dark fibrous stroma. **Ovaries:** bright follicles (premenopausal).

Signal 'fingerprints' of pelvic masses (simplified)

	T1	T2	Clue sequence
Simple cyst			—
Endometrioma T1 bright (blood), stays bright on fat-sat			T2 'SHADING'
Dermoid fat signal suppresses on fat saturation			FAT-SAT: drops
Typical fibroid dark T2, well-defined			—
Leiomyosarcoma? heterogeneous T2, necrosis, irregular edge			DWI: restricted
Solid malignant tumour enhancing solid tissue			DWI bright / ADC dark

Figure 4. Signal fingerprints of common pelvic masses.

Condition	MRI features
Fibroids	Well-defined, dark on T2; bright if degenerate or cellular. Maps number/size/FIGO type before myomectomy or UAE. Sarcoma suspicion: heterogeneous, necrosis, irregular edge, restricted diffusion

Condition	MRI features
Adenomyosis	Junctional zone > 12 mm (8–12 equivocal), ill-defined, bright T2 foci, globular uterus
Endometriosis	Endometrioma T1 bright (stays bright on fat-sat) with T2 shading; deep nodules dark on T2 (uterosacrals, rectovaginal septum, bladder, bowel); tethering
Adnexal mass	When ultrasound is indeterminate: fat (dermoid), blood (endometrioma), solid enhancing tissue, restricted diffusion

4 Gynaecological Cancer

Endometrial cancer on sagittal T2 — what MRI decides (schematic; tumour = intermediate grey)



Figure 5. What MRI decides in endometrial cancer.

Cancer	Role of MRI
Endometrial	Depth of myometrial invasion (< or ≥ 50%), cervical stromal invasion, parametrial/vaginal spread, nodes
Cervical	Tumour size, parametrial and side-wall spread, bladder/rectum, nodes; FIGO 2018 allows imaging findings; hydronephrosis = IIIB
Ovarian	CT chest/abdomen/pelvis is the main staging test; MRI characterises an indeterminate pelvic mass
Vulval	Local extent (urethra, vagina, anus) and groin nodes

5 Obstetric Uses

PLACENTA ACCRETA SPECTRUM

- When ultrasound is equivocal — especially **posterior placentas**
- **Dark intraplacental T2 bands**, heterogeneous placenta, **uterine bulging**
- Loss of the myometrial / **bladder** interface (percreta), abnormal vessels
- No gadolinium needed

FETAL + MATERNAL

- **Fetal MRI** (usually ≥ 20 wk): brain (ventriculomegaly, corpus callosum), diaphragmatic hernia (lung volumes), masses, fetal surgery planning
- **Maternal**: appendicitis after inconclusive US; MRCP for biliary disease; hydronephrosis; adnexal mass; brain

ADVANTAGES

- Best soft-tissue contrast
- **No ionising radiation**
- Any plane; functional imaging (DWI)
- Vessels without iodinated contrast

LIMITATIONS

- Cost, availability, long scans
- Claustrophobia, noise, implants
- Motion artefact (breath-holds)
- Gadolinium limits: kidneys, pregnancy

★ PEARL

MRI is the test of choice for **staging endometrial and cervical cancer**, **placenta accreta spectrum** when ultrasound is unclear, **indeterminate adnexal masses**, **fibroid mapping**, and **adenomyosis (junctional zone > 12 mm)**.

In pregnancy the scan itself is regarded as safe — it is **gadolinium** that is avoided.

6 MRCOG Exam Pearls — Last-Minute Page

Numbers to know

1.5 / 3 T Clinical field strengths	> 12 mm Junctional zone — adenomyosis	50% Myometrial invasion cut-off	eGFR < 30 NSF risk with gadolinium
~5–10% Claustrophobia	> 90 dB Scanner noise	≥ 20 wk Usual fetal MRI timing	0 Ionising radiation

HIGH-YIELD CHECKLIST

- ☐ Water dark T1, bright T2; fat bright on both (fat-sat to prove).
- ☐ Fibroid dark T2; subacute blood bright T1.
- ☐ DWI bright + ADC dark = restricted diffusion (tumour, abscess).
- ☐ Gadolinium shortens T1; NSF risk if eGFR < 30 (linear agents).
- ☐ Gadolinium crosses the placenta — avoid; breastfeeding can continue.
- ☐ MRI without contrast regarded as safe in pregnancy; defer non-urgent first-trimester scans.
- ☐ T2 zonal anatomy: endometrium, junctional zone, outer myometrium.
- ☐ Adenomyosis: JZ > 12 mm + bright foci.
- ☐ Endometrioma: T1 bright + T2 shading; dermoid: fat suppresses.
- ☐ Endometrial cancer: < / ≥ 50% invasion, cervical stroma. Cervix: parametrium.
- ☐ PAS: dark T2 bands, bulging, lost bladder interface.

Quick-fire self-test — cover the right-hand column

Question	Answer
Signal of water on T1 and T2?	Dark on T1, bright on T2
Tissue bright on both T1 and T2?	Fat (and subacute blood)
How do you prove fat in a mass?	Fat-saturated sequence — signal drops
Typical fibroid signal on T2?	Dark (low)
Junctional zone thickness suggesting adenomyosis?	> 12 mm

Question	Answer
Classic MRI sign of an endometrioma?	T1 bright with T2 shading
Most important MRI finding for endometrial cancer surgery?	Depth of myometrial invasion (< or ≥ 50%)
Main staging test for ovarian cancer?	CT
Contrast agent to avoid in pregnancy?	Gadolinium
Can a woman breastfeed after gadolinium?	Yes
DWI/ADC pattern of a cellular tumour?	Bright DWI, dark ADC

7 References

- Royal College of Radiologists. Guidance on gadolinium-based contrast agent administration to adult patients. 2019.
- American College of Radiology. Manual on MR Safety. 2020.
- Ray JG et al. Association between MRI exposure during pregnancy and fetal and childhood outcomes. JAMA 2016.
- RCOG Green-top Guideline No. 27a. Placenta Praevia and Placenta Accreta. 2018.