Overcalls in Gynaecological imaging
A guide for the non-specialist radiologists

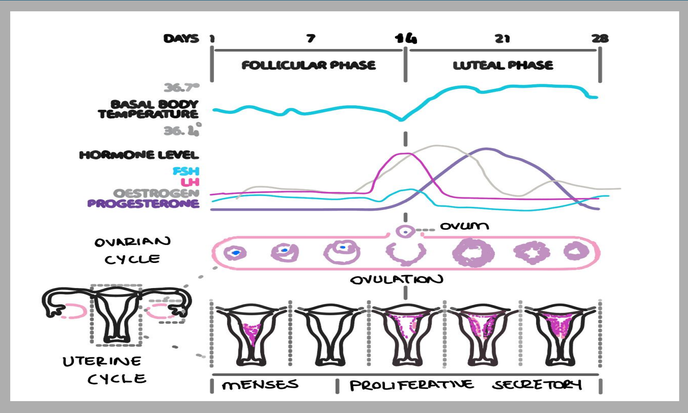
McCullagh R, Dogan E, Cuthbert F
Department of Radiology, Brighton and Sussex University Hospitals NHS Trust

BACKGROUND

Introduction:
The gynaecological oncology multidisciplinary meeting (MDM) often reviews scans where the indications may not always be appropriate or necessary.
Understanding the spectrum of normal appearances in gynaecological imaging can be challenging due to the variable morphology of gynaecological organs throughout the female lifecycle.
Recognising these physiological changes is key to avoiding overcalling normal findings, which helps reduce unnecessary investigations and patient anxiety.

The purpose of our educational exhibit to
1.Summarise and illustrate the normal imaging appearances of the gynaecological organs across different life stages.
2.Deliver practical guidance on distinguishing normal/physiological from abnormal appearances with advice on accurate recognition and reporting to help prevent unnecessary referrals and additional imaging.
3.Present a series of cases with key learning points, discussed in out gynaecological oncology MDT where physiological or benign findings were initially misinterpreted as malignant pathology.

'NORMAL' MENSTRUAL CYCLE



VARIATIONS in NORMAL

Table 1

Normal appearances of the uterus and cervix

Feature	Description
Uterine size	~8 cm in length, ~5 cm in transverse dimension in women of reproductive age, decreases post menopause
Mobility	Uterus is a mobile organ, influenced by orientation (fig 7 and fig 8) and bladder distension
Myometrial enhancement	Inner myometrium enhances avidly; endometrium appears hypo enhancing
Endometrial thickness	Varies with menstrual cycle phase (fig 1), menopausal status and contraceptive use
Cervical enhancement	Later and less avidly than myometrium due to higher fibrous tissue content (fig 6)

US features of normal endometrium

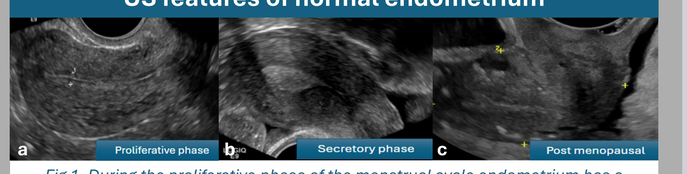


Fig 1. During the proliferative phase of the menstrual cycle endometrium has a trilaminar appearance (a), during the secretory phase, the endometrium thickens (b). Post menopausal endometrium (c) should be thin and uniform [1].

Normal appearances of the ovaries

Normal ovarian volume ranges from 4–16 cm^3 in reproductive-age women and 1.2–5.8 cm^3 after menopause.

Throughout the menstrual cycle, physiological changes alter ovarian appearance and volume. In the first half of the cycle, a dominant follicle develops (fig 2), followed by a corpus luteum in the second half (fig 3).

If the corpus luteum bleeds, it may form a haemorrhagic cyst (fig 4).

These cyclical changes do not occur after menopause (fig 5).

Fig 2. Dominant Follicle | **Fig 3. Corpus luteum**

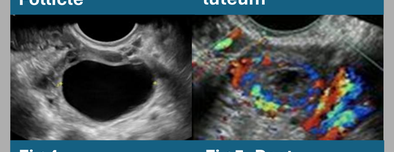
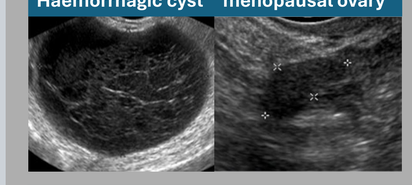


Fig 4. Haemorrhagic cyst | **Fig 5. Post-menopausal ovary**



CT Features of a Normal Uterus and Cervix in Reproductive Age

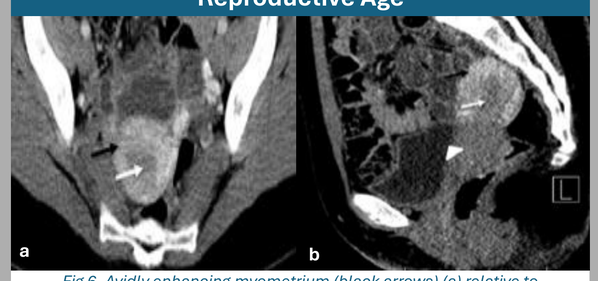


Fig 6. Avidly enhancing myometrium (black arrows) (a) relative to endometrium (white arrows).
Hypo-enhancing cervix relative to myometrium (white arrowhead) (b).

Normal uterus position

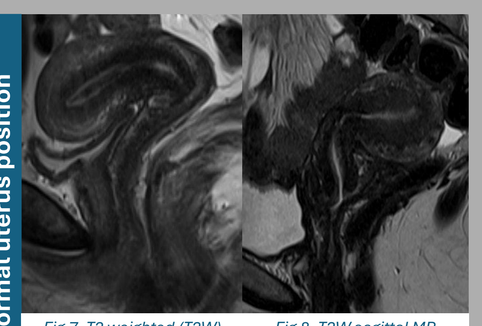


Fig 7. T2 weighted (T2W) sagittal MR shows ***anteverted anteflexed uterus***

Fig 8. T2W sagittal MR shows ***retroverted retroflexed uterus***

Appearance and position of the ovaries are variable on CT, tips to find the ovaries include

- Ovaries lie anterior or anterolateral to the pelvic ureter
- The ovarian veins can be followed from the IVC (right) and left renal vein (left) and followed down to the ovaries
- The suspensory ligaments of the ovary can be identified extending from the ovary to the external or common iliac vessels
- The ovaries are intraperitoneal (vs pelvic lymph nodes which are lateral to the pelvic peritoneum)

Nabothian cysts on MRI

Fig 9. Sagittal T2W MRI showing multiple nabothian cysts at the cervix.
These are benign and require no intervention.

OVERCALLS IN THE CERVIX/UTERUS

Bulky Cervix on CT Mimicking Cancer

Fig 10. Unenhanced CT shows homogenous soft tissue attenuation of the uterus and cervix mimicking a pelvic mass.

Fig 11. On axial images the cervix is bulky, this is confirmed to be normal on the sagittal images.

CT Appearances of the Cervical Cancer

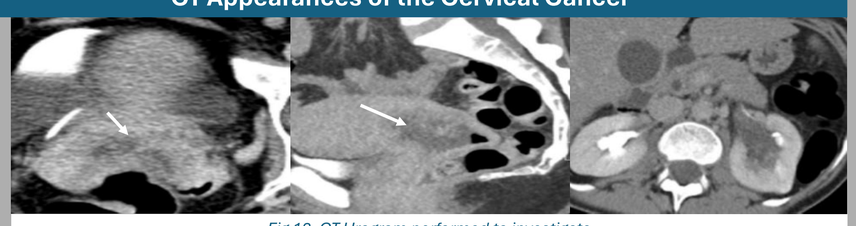


Fig 12. CT Urogram performed to investigate bilateral hydronephrosis
demonstrates a necrotic mass centred on the cervix (arrows) in keeping with tumour.
Parametrial invasion is causing bilateral ureteric obstruction.

Learning points

Cervical tumour **enhances poorly** and is therefore **inconspicuous on the already hypo-enhancing normal cervical stroma** (unless there is gas or necrosis). **Obliteration of the peri-uterine fat** and soft tissue mass are signs of parametrial invasion, **obstruction of the ureter** and **hydronephrosis** is suggestive of more **advanced (FIGO IIIB) disease**.

Post hysterectomy appearances

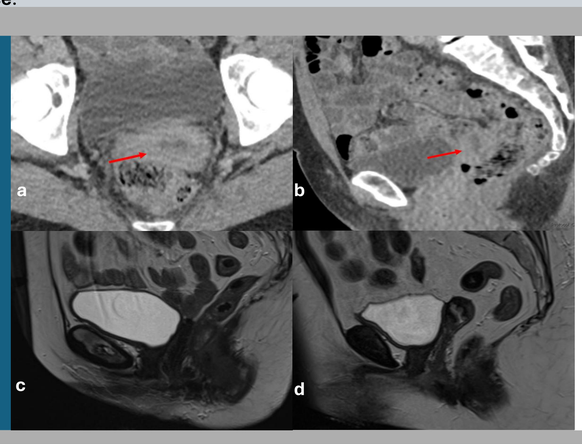


Fig 13. Residual normal appearing cervix (red arrows) in a 58-year-old patient who underwent subtotal hysterectomy for fibroids ten years previously (a and b).

Normal sagittal T2W appearances following a total (c) and subtotal hysterectomy (d).

Learning points

Patients who have undergone **hysterectomy for benign reasons** may have had a subtotal hysterectomy where **the cervix remains in situ**.

This **may mimic a pelvic mass** on axial CT imaging; sagittal reformats may help interpretation. A mass at the vaginal vault, especially after cancer resection requires urgent gynaecological assessment.

'Thickened' endometrium

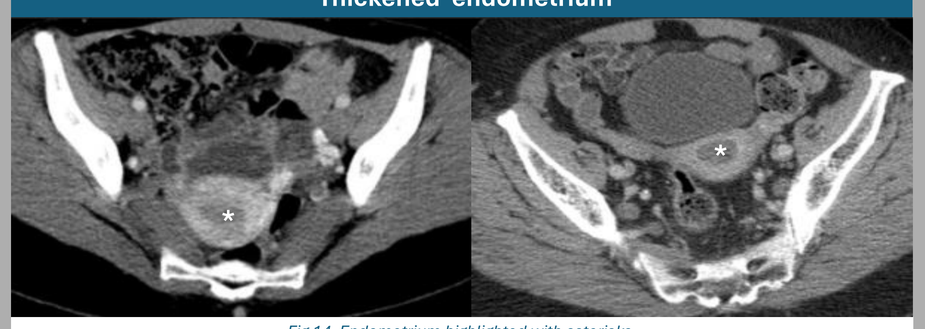


Fig 14. Endometrium highlighted with asterisks.
Endometrial thickness needs to be put into the context of age/ menopausal status (table 2), if thickened on CT then do an TVUS to see if hydrometra or true endometrial thickening that requires sampling.

Table 2: Recommendations for investigating endometrial thickness based on BMS guidance [2]

Clinical information	ET	Action required
PMB	≥4-5mm	Refer for investigation
PMB on HRT	≥4mm if ccHRT (continuous combined) ≥ 7 mm with sHRT (sequential preparation)	Refer for investigation
Post menopausal (No PMB)	≥9-11mm	Refer for investigation
Tamoxifen,* no PMB	Any measurement	No indication to refer
Tamoxifen with PMB	Any measurement	Refer for investigation, scan to check ovaries
Pre/Perimenopausal – symptomatic(day 5-14 of cycle)	≥20mm	Repeat scan/ refer for further investigation

***tamoxifen has a proestrogenic effect on the endometrium and can lead to benign thickening, hyperplasia, polyps and endometrial cancer.**

OVERCALLS IN THE OMENTUM & PERITONEUM

PID

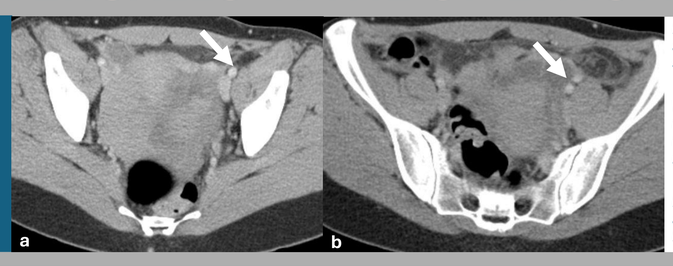


Fig 15. CT demonstrates bilateral mixed solid and cystic adnexal lesions (a) with associated stranding in the anterior peritoneal fat (b).

When correlated with the clinical presentation, the appearances are consistent with bilateral tubo-ovarian abscesses. These findings resolved following antibiotic treatment.

Inflammatory change and haziness in the anterior peritoneal fat (arrows) in keeping with PID-related peritonitis.

Learning points

PID can **mimic malignancy**, particularly when involving the peritoneal fat.
CT findings may include bilateral adnexal lesions, fat stranding and omental thickening
Clinical context is essential for accurate diagnosis**, supported by** ultrasound correlation.
Recognising these features helps avoid unnecessary concern and inappropriate referrals for suspected malignancy.

Malignant ascites

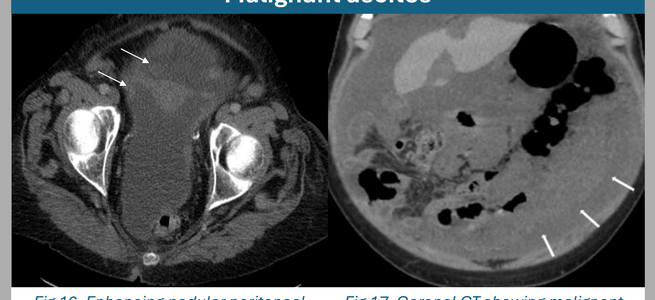


Fig 16. Enhancing nodular peritoneal thickening (arrows) noted with malignant ascites in the absence of an adnexal lesion this may be secondary to peritoneal carcinomatosis.

Fig 17. Coronal CT showing malignant ascites.
Omental disease can be very difficult to see,
particularly in the presence of ascites (arrows).

Benign ascites

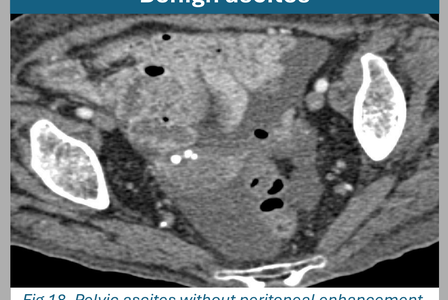


Fig 18. Pelvic ascites without peritoneal enhancement, thickening, nodularity or adnexal masses. Initially misinterpreted as malignancy due to elevated CA125. Imaging features are more consistent with benign ascites. The patient also had a known history of cirrhosis.

Learning points

Ca 125 is a non-specific marker that can be elevated in both benign and malignant conditions causing peritoneal irritation.
Trends over time are more informative than a single isolated value. Benign causes of raised CA 125 include endometriosis, pregnancy, liver cirrhosis, ascites, peritonitis, pancreatitis, and some pulmonary diseases.
A CT scan may be helpful in identifying the underlying cause of a raised CA 125, but MRI of the pelvis is generally not required unless a suspicious ovarian abnormality has been demonstrated on CT or ultrasound.

Benign ascites typically appears as simple, homogeneous low-attenuation fluid, without peritoneal enhancement, thickening, nodularity, or solid components. The radiologist should carefully evaluate the scan for alternative causes, such as cirrhosis or cardiac failure.
Malignant ascites is often accompanied by nodular peritoneal thickening or measurable omental deposits. It most commonly reflects peritoneal carcinomatosis, usually secondary to ovarian, gastrointestinal, or pancreatic malignancies, though primary peritoneal carcinoma should also be considered.

OVERCALLS IN THE OVARIES/ADNEXA

Ovarian torsion

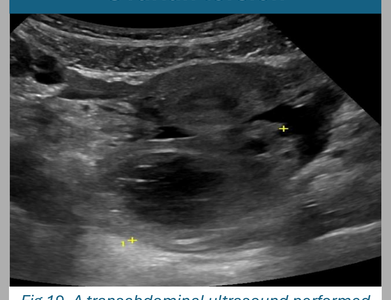


Fig 19. A transabdominal ultrasound performed for right iliac fossa pain and vomiting shows an enlarged right ovary, medially displaced in the pelvis, with surrounding free fluid. A 3 cm haemorrhagic follicle within the ovary appears to have acted as the lead point for ovarian torsion. This was initially misinterpreted as an ovarian mass, and MRI and gynae MDM discussion was recommended.

Ovarian transposition

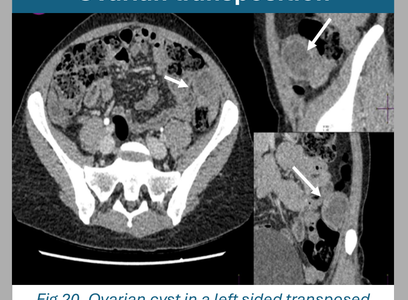


Fig 20. Ovarian cyst in a left sided transposed ovary misinterpreted as an abdominal mass.
Ovarian transposition is done to minimise radiation exposure and damage during pelvic radiotherapy, typically for cervical cancer. One or both ovaries are repositioned, usually to the lower abdomen, where they may mimic an abdominal mass, especially during physiological changes.

Learning points

Adnexal torsion refers to the twisting of the ligaments supporting the ovary, resulting in compromised ovarian blood flow. It can occur with or without an underlying adnexal mass. Patients typically present with sudden-onset, severe lower abdominal pain. Nausea and vomiting are also common.
Adnexal torsion is primarily a clinical diagnosis and may not always require imaging. However, if there is clinical concern, **ultrasound** is the first-line modality and can often confirm the diagnosis, making cross-sectional imaging unnecessary. **CT** may be performed in the acute setting, particularly when the diagnosis is unclear or not initially suspected.
Imaging features of adnexal torsion include:
•A twisted pedicle ("whirlpool sign")
•Enlarged, oedematous ovary
•Underlying lesion acting as a lead point for torsion
•Peripherally displaced follicles
•Uterine deviation or distortion due to twisted ligaments
•Free fluid and/or inflammatory stranding

ACR guidelines on management of incidental adnexal masses [3]

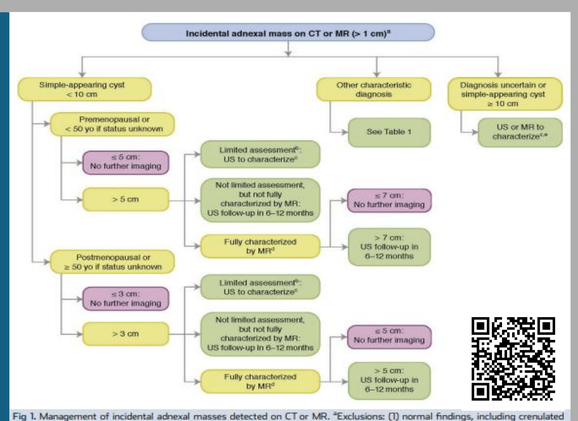


Fig 1. Management of incidental adnexal masses detected on CT or MR. [a]Exclusions: (1) normal findings, including crenulated enhancing wall of corpus luteum, asymmetric ovary without mass, with normal shape; (2) calcifications without associated noncalcified mass; (3) previous characterization with ultrasound (US) or MRI; or (4) documented stability in size and appearance for 2 years. [b]Limited assessment on CT or MR: As defined in the article, this means the cyst is consistent with a simple-appearing cyst, but characterization is limited by low signal-to-noise ratio, artifact, lack of contrast assessment, or incomplete anatomic coverage. [c]US or MRI to characterize means that the study should be performed promptly for further evaluation, rather than in follow-up to assess temporal changes. [d]Fully characterized by MR: As defined in the article, this means the cyst has been characterized with (1) T2-weighted images; (2) pre- and postcontrast T1-weighted images; and (3) complete anatomic coverage in at least two imaging planes. [e]Assumes mass has not already been fully characterized by MR. Yellow boxes indicate using or acquiring clinical data (eg, lesion size), green boxes describe recommendations for action (eg, follow-up imaging), and red boxes indicate that work-up or follow-up may be terminated (eg, if the finding is presumed to be benign).

Peritoneal inclusion cyst

Fig 21. CT demonstrates bilateral fluid collections (arrows) that conform to the peritoneal reflections and envelop both normal-appearing ovaries—findings confirmed on MRI.
The case was referred to the gynaecology MDM due to enlarging adnexal cystic structures seen on MRI. In the context of a history of Hirschsprung's disease with neonatal total colonic resection, the appearances are consistent with peritoneal inclusion cysts

Learning points

•Peritoneal inclusion cysts are non-neoplastic fluid collections often seen in women with prior pelvic surgery or inflammation.
•They typically surround a normal ovary and conform to peritoneal contours.
•MRI helps confirm the diagnosis by demonstrating a normal ovary within or adjacent to the collection.
•Recognition is important to avoid misdiagnosis as ovarian malignancy.

CONCLUSION:

A thorough understanding of the normal spectrum of gynaecological imaging appearances is crucial for accurate interpretation. By improving awareness of physiological variations, non-specialist radiologists can reduce the burden on gynaecological and imaging services, minimise unnecessary concern for patients, and enhance overall diagnostic efficiency.

References:(1) https://www.rcog.org.uk/media/knmjbj5c/gtg_67_endometrial_hyperplasia.pdf , (2)British Menopause Society, British Society of Gynaecological Endoscopy, British Gynaecological Cancer Society, Faculty of Sexual & Reproductive Healthcare, Getting It Right First Time, Royal College of Obstetricians & Gynaecologists. Management of unscheduled bleeding on hormone replacement therapy (HRT). 2024. Available from: https://thebms.org.uk/publications/bms-guidelines/management-of-unscheduled-bleeding-on-hormone-replacement-therapy-hrt/, (3) Patel MD, Ascher SM, Horrow MM, Pickhardt PJ, Poder L, Goldman M, Berland LL, Pandharipande PV, Maturen KE. Management of Incidental Adnexal Findings on CT and MRI: A White Paper of the ACR Incidental Findings Committee. J Am Coll Radiol. 2020 Feb; 17(2):248-254. doi: 10.1016/j. jacr.2019.10.008. Epub 2019 Nov 30,