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Clinical Radiology
The Royal College of Radiologists

Recommendations for cross-sectional imaging in cancer management, Second edition

Ovarian cancer

Faculty of Clinical Radiology

Contents

Ovarian cancer

Clinical background

Ovarian cancer is the most frequent cause of death from gynaecological malignancy [1] and in the UK there were 7,116 new cases diagnosed in 2011.[1] There has been a 56% increase in the incidence of ovarian cancer in women aged 15–39 since the mid-1970s.[1] Neoplasms of surface epithelial origin account for 90% of malignant ovarian tumours, most commonly serous, followed by endometrioid, mucinous and clear cell cancer.[2] The majority occur over the age of 50 years.[1] Spread is by local extension, transcoelomic, and less commonly by the lymphatic and haematogenous routes. Transcoelomic spread is most commonly seen in the omentum, the under surfaces of the diaphragm, surfaces of small and large bowel, surface of the liver, and the pouch of Douglas. Lymphatic spread is via the ovarian vessels to the para-aortic nodes, via the broad ligament and parametria to pelvic sidewall nodes and the round ligament to the external iliac and inguinal nodes.

Who should be imaged?

Patients with a high clinical suspicion of ovarian cancer based on the initial ultrasound, CA-125 level and menopausal status, should be imaged using CT[3] to assess degree of peritoneal involvement, particularly if chemotherapy is planned as a primary treatment. Patients presenting with peritoneal carcinomatosis should be imaged to assess the extent of disease, plan biopsy, and assess other possible primary pathologies. CT is routinely used to monitor response to therapy and to detect recurrent disease.[4] MRI is used to characterise indeterminate ovarian cysts or masses found on ultrasound, particularly in young patients or when CA-125 is normal or only slightly elevated.[4]

Staging objectives

- To determine if optimal surgical cytoreduction is feasible (the definition of optimal cytoreduction is no residual disease >1 cm). This assessment requires the identification of peritoneal involvement in the omentum, subphrenic spaces, falciform ligament, gastro-splenic and gastro-colic ligaments, serosal surfaces of small and large bowel, small bowel mesentery and ascites. Disease over 1 cm in diameter in these areas that are surgically difficult to resect must be clearly indicated.
- To determine involvement of pleural surfaces.
- To detect lymph node enlargement, particularly in the retroperitoneum, superior diaphragmatic and pre-cardiac regions.
- To identify deposits on the liver and splenic surfaces and intra-parenchymal metastases within the liver (<1%) and spleen.
- To identify urinary tract obstruction.

Staging

CT of the abdomen and pelvis should be performed to stage the primary tumour. CT chest may be performed in suspected advanced disease. CT is the most frequently used technique for staging ovarian cancer, but MRI is useful for characterising indeterminate ovarian pathology.

CT

- Oral administration of 1 litre of water as a contrast agent, of which 400 ml to be drunk immediately prior to going onto the scanner (see Tips).
- 100–150 ml of intravenous iodinated contrast medium injected at 3–4 ml/sec.
- MDCT is commenced at 70–80 seconds post-injection.
- Using MDCT, slice thickness will depend on scanner capability. In general, images are reconstructed from one acquisition. Image slice thickness ranges from 1–5 mm. Thin sections are needed for multi-planar reformats, for viewing in the coronal or sagittal planes.

Values of $CTDI_{vol}$ should normally be below the relevant national reference dose for the region of scan and patient group (see Appendix and section on Radiation protection for the patient in CT in Section 2).

MRI Protocol for characterising adnexal masses

Coils	Sequence	Plane	Slice thickness	Field of view	Principle observations
Abdomino-pelvic surface coil	T1W	Axial	5 ± 1 mm		
	T2W	Axial	5 ± 1 mm		
	T2W	Sagittal	5 ± 1 mm		
	T2W*	Oblique axial	5 ± 1 mm	Parallel to uterus (ovarian plane)	Relationship to uterus and ovary
	DWI (b 0,1000)	Axial	5 ± 1 mm	To cover the entire mass	To determine presence of restricted diffusion
	T1W + fat sat	Axial	5 ± 1 mm	To cover the entire mass	To distinguish fat and blood
	T1W + fat sat +gad as dynamic acquisition	Axial	5 ± 1 mm	To cover the entire mass	To identify enhancing soft tissue nodules

** Optional – but is particularly useful in characterising relatively small adnexal masses.*

MRI

MRI should be used to characterise indeterminate adnexal mass lesions,[5] particularly in young or asymptomatic female patients in who the CA-125 is normal or only mildly elevated, and ultrasound is indeterminate or suspicious for malignancy. MRI may be used in selected patients for problems in staging. Sequences can then be tailored to the clinical question.

With MRI of the pelvis, a bowel relaxant (buscopan or glucagon) is strongly recommended.

PET-CT

^{18}FDG PET-CT may be useful on occasion to define disease extent, particularly when follow-up surgery is being considered or detection of recurrence when CA-125 is increasing but CT is negative in cases where further treatment is being considered.[6]

Follow-up

Follow-up is conducted:

- To assess response to chemotherapy and is, therefore, performed at a frequency to correspond with the chemotherapy regimes
- To assess the need for and extent of interval debulking surgery
- When there is marked evidence of recurrent disease (that is, elevation of CA-125) and it is performed to provide a baseline prior to chemotherapy
- Prior to salvage surgery for isolated recurrences.

Tips

- Coronal or sagittal reformatted CT images may be very useful to distinguish between intrinsic liver and splenic lesions and peritoneal deposits in the subphrenic spaces.
- Water-filled bowel may allow better detection of serosal involvement than when filled with positive contrast agent on CT.
- Peritoneal deposits are better demonstrated on contrast-enhanced GRE T1W sequences with fat suppression or high b value DWI and are of value when ovarian pathology is characterised as malignant on MRI.

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