CT and MRI in Advanced Ovarian Cancer: Advances in Imaging Techniques

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Background

Ovarian cancer (OC) is the most lethal gynaecologic malignancy, with the majority of patients presenting with disseminated disease. While CT of the chest, abdomen, and pelvis remains the standard imaging modality for staging, it poses challenges in identifying and assessing the extent of disease, particularly in complex regions.

Accurate pretreatment staging of advanced OC directly influences the patient's primary treatment (primary cytoreductive surgery vs primary chemotherapy) and is vital to streamline patients into appropriate treatment pathways early, which improves patient outcomes.

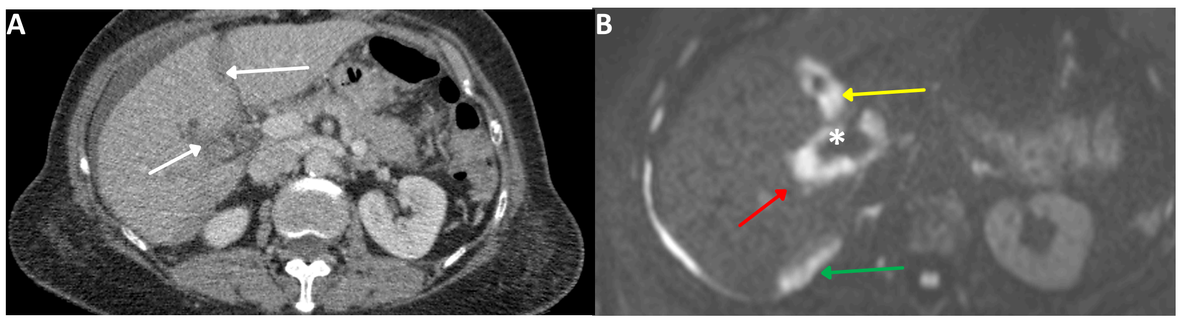
Learning Objectives

- Optimal imaging protocols for CT and MRI in OC
- The typical appearances of peritoneal disease on CT
- How MRI can clarify indeterminate findings on CT
- Challenging imaging areas

Imaging Protocols

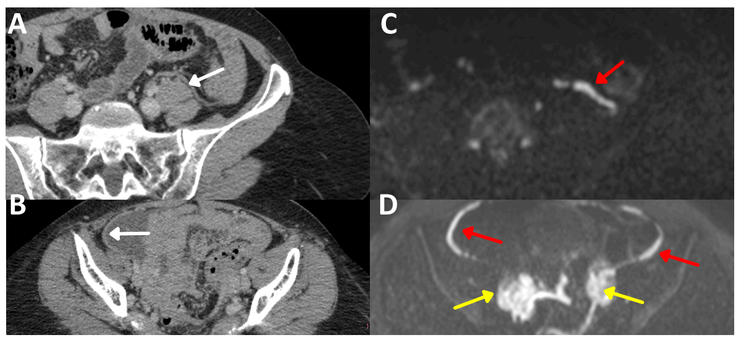
	CT	MRI
Preparation	Generally recommended to fast for 4 hours and empty the bladder 1 hour before the examination	Moderately full bladder Anti-peristaltic agent Multisurface array body surface coil
Imaging coverage	Chest, abdomen and pelvis	Pelvis and abdomen Chest (if possible)
Sequences/Techniques	• Portal venous phase • Thin section axial acquisition (1 - 3 mm) • Coronal and sagittal reformats	1.5 or 3 Tesla T1: · • Axial (3-4 mm) • Axial FS non-dynamic, per and post contrast in separate series (3 mm) • Axial FS dynamic contrast and subtraction (3 mm) • Dixon (fat and water separation) (3mm) T2: • Coronal (upper abdomen) (4mm) • Sagittal (pelvis) (4 mm) • Axial (abdomen & pelvis) (4 mm) • Small FoV (3mm) • DWI (b0, b50, b1000) with ADC reconstruction
Contrast	• Water oral contrast (if tolerated) • IV contrast (iodinated)	Gadolinium contrast

Porta Hepatis and Falciform Ligament



CT and MRI of a patient with metastatic serous ovarian cancer. Contrast enhanced CT (A) shows ill-defined soft tissue at the porta and along the falciform ligament (white arrows) with trace ascites. DWI (B) confirms restricting soft tissue at the porta (red arrow) which encases the portal vein (star). Additionally soft tissue at the falciform ligament (yellow arrow) and at Morrison's Pouch (green arrow). The soft tissue at the porta which encases the portal vein would render the patient irresectable for primary cytoreductive surgery.

Peritoneal



CT and MRI of a patient with high grade serous ovarian cancer. Contrast enhanced CT (A & B) show thickening of the peritoneal reflections (white arrows), where there is ascites. DWI (C & D) of the pelvis show this tissue intensely restricts, in keeping with widespread peritoneal disease (red arrows). Note the intensely restricting adnexal masses are seen in the pelvis (yellow arrows).

Conclusion

CT and MRI are complementary in the assessment of advanced OC. MRI enhances CT findings by improving visualisation of difficult-to-assess regions and detecting unusual metastatic sites. The integration of both imaging modalities allows for more accurate staging, supporting better treatment planning (especially surgical planning) and improving patient outcomes.

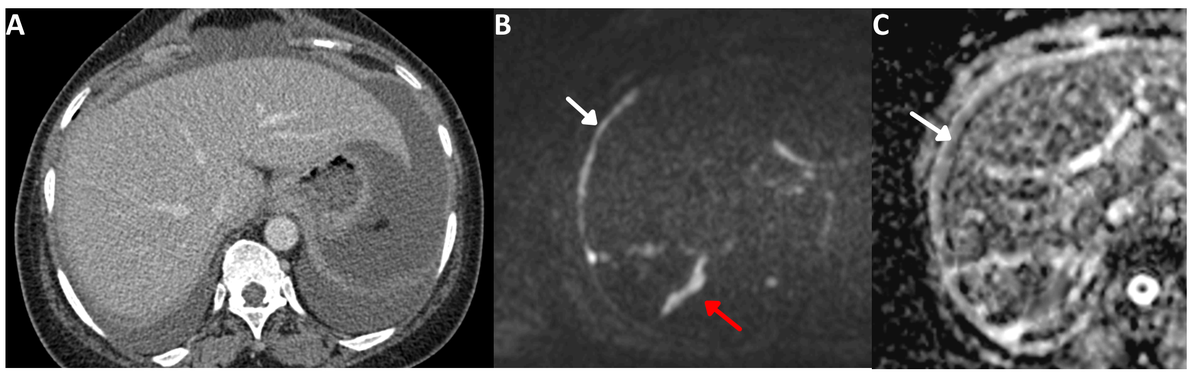
Why MRI?

MRI provides superior soft-tissue contrast and may be particularly useful for evaluating areas which are difficult to assess on CT. A combined approach with both imaging techniques enhances the ability to detect and stage disease.

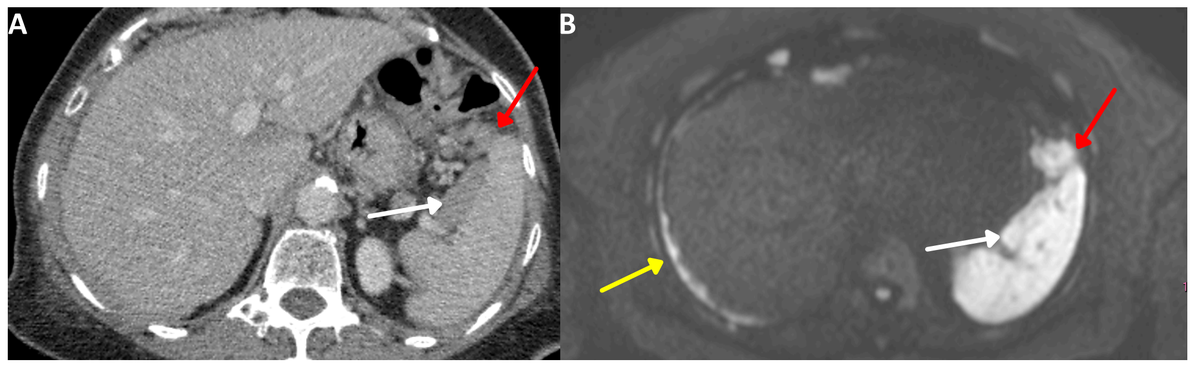
A series of cases is presented to illustrate both typical and atypical imaging findings in advanced OC. The focus is on the use of MRI, a valuable imaging modality for confirming equivocal disease sites observed on CT scans. Certain areas, such as the peritoneal reflections and porta, are better evaluated with MRI. This is particularly important in patients with ascites, where peritoneal disease assessment becomes more challenging.

Accurately assessing the burden and distribution of disease during initial staging is crucial, as it directly influences the patient's primary treatment plan. Furthermore, identifying these sites guides surgical management decisions.

Subcapsular Disease

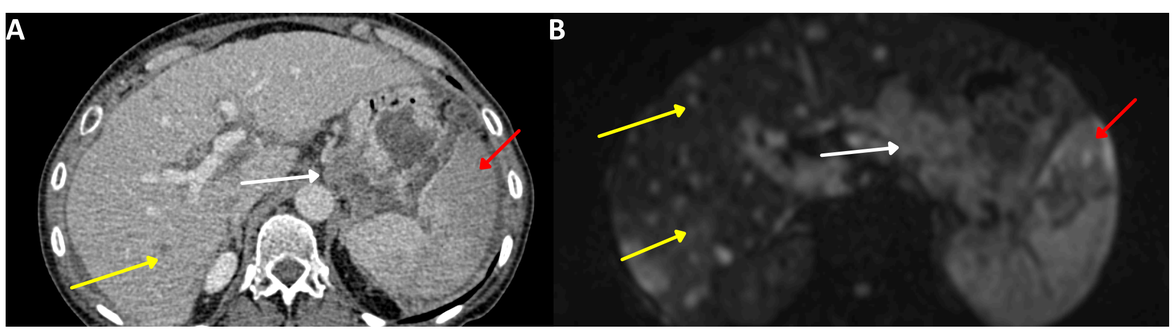


CT and MRI of a patient with high grade serous ovarian cancer. The contrast enhanced CT (A) shows large volume ascites and pleural effusions. Soft tissue along the hepatic capsule is not well appreciated on CT. DWI (B) and ADC (C) images from the accompanying MRI shows restricting soft tissue at the hepatic capsule (white arrows), in keeping with subcapsular disease. Note there is also peritoneal restricting soft tissue in the right paracolic gutter (red arrow).

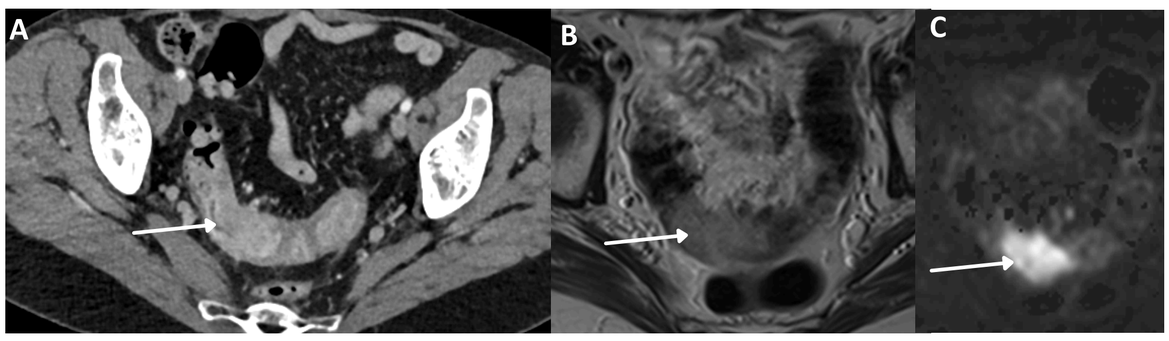


CT and MRI of a female patient with metastatic serous ovarian cancer. Contrast enhanced CT (A) shows lobulated soft tissue at the splenic hilum (white arrows) and omental nodules just anterior to the spleen (red arrows). DWI imaging (B) confirms restricting soft tissue at the splenic hilum and omental nodules. Note on the DWI imaging, restricting subcapsular hepatic disease is well demonstrated (yellow arrows).

Involvement of Stomach/Bowel



CT and MRI of a patient with metastatic high grade serous ovarian cancer. Contrast enhanced CT (A) shows soft tissue in the lesser sac (white arrows) which is inseparable from the stomach serosa. Hypodense lesions in the liver (yellow arrows) are not fully characterised on CT. The spleen in enlarged and shows heterogenous enhancement (red arrows). DWI sequence (B) shows extensive restricting soft tissue in the lesser sac, more extensive than on CT, with invasion into the stomach. Restricting hepatic parenchymal metastases are more numerous than on CT. Splenic parenchymal disease is confirmed.



CT and MRI of a patient with treated high grade serous ovarian cancer presented with nonspecific bowel symptoms and rising CA-125. Contrast enhanced CT (A) shows thickening of the sigmoid colon mucosa (white arrows). Axial T2 (B) shows T2 isointense plaque of tissue on the sigmoid colon which restricts on DWI sequence (C).

References

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