

Diagnostic Imaging Pathways - Ovarian Cancer (Staging)

Population Covered By The Guidance

This pathway provides guidance on the staging of adult female patients with ovarian cancer.

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Quick User Guide

Move the mouse cursor over the **PINK** text boxes inside the flow chart to bring up a pop up box with salient points.

Clicking on the **PINK** text box will bring up the full text.

The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

Pathway Diagram

Date reviewed: October 2013
Please note that this pathway
is subject to review and
revision

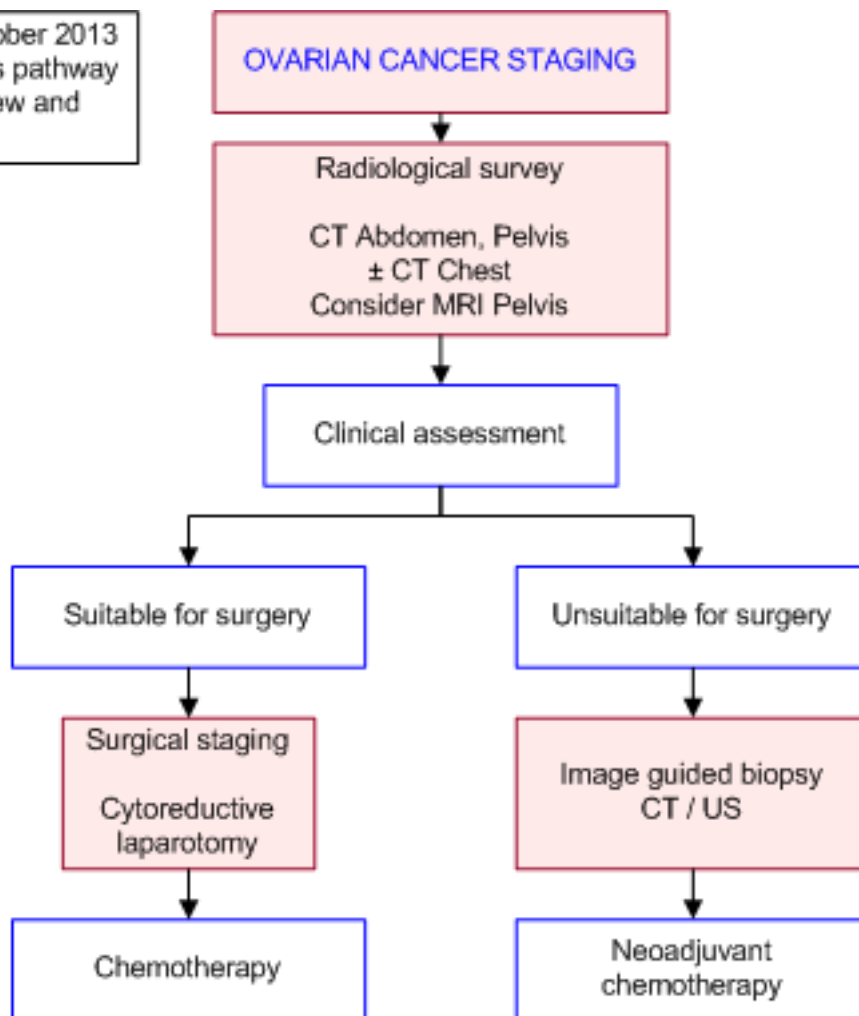


Image Gallery

Note: Images coming soon

Teaching Points

- Imaging is used in the preoperative assessment of ovarian cancer to define the extent of disease, which helps guide the most appropriate primary therapy
- MDCT is the imaging modality of choice in preoperative imaging of ovarian cancer. Preoperative imaging generally includes CT abdomen and pelvis (and may include CT chest). Combined PET/CT shows promise for staging, but more evidence is required
- MRI should be used when CT is contraindicated or for "problem-solving" inconclusive CT findings
- Image guided core biopsy using CT or US provides an immunohistological diagnosis and guides further management

Image Guided Biopsy

- In patients for whom initial radical cytoreductive surgery is considered inappropriate (such as those with widespread bulky disease, or in a poor clinical state), a tissue sample can be taken using image guided core biopsy (IGCB). This allows for an immunohistological diagnosis of the tumour and may guide further management
- IGCB can also differentiate between benign causes of ovarian masses and distinguish between primary and secondary ovarian cancers, which all have very different treatment strategies. A study of 110 patients with malignant ovarian masses, found that it was very difficult to distinguish between primary and metastatic ovarian lesions based on imaging features on CT, MRI or US [12](#)
- IGCB of peritoneal or omental lesions is usually performed under CT or US guidance, and is considered to be effective, safe and well tolerated. In several studies, IGCB provided site specific histological diagnoses in 77-91% of patients with peritoneal carcinomatosis. [13,14,15](#) Complications were few and included local bruising, discomfort and one report of a rectus sheath haematoma which was treated conservatively [14](#)

Computed Tomography (CT) And Nuclear Imaging

Computed Tomography (CT)

- MDCT is the imaging modality of choice in preoperative imaging of ovarian cancer. Preoperative imaging generally includes CT abdomen and pelvis. MDCT can detect local disease as well as nodal involvement and distant metastases. [7](#) If a chest radiograph has not been performed, a CT chest can be considered
- The Radiological Diagnostic Oncology Group compared US, MRI and CT for diagnosis and staging of advanced ovarian cancer in a group of 280 patients. [8](#) They found no significant differences for the overall diagnostic accuracy of CT & MRI using receiver operating characteristic curves (ROC 0.91 for both MRI & CT). For staging advanced disease, they found that CT had good sensitivity and specificity for detecting peritoneal disease (92%, 82% respectively). This was similar to MRI and superior to US. For lymph node and hepatic parenchymal disease, CT had low sensitivity (40-43%) but good specificity (89-96%)
- CT has been investigated for its ability to predict successful surgical cytoreduction. Forstner et al performed a prospective study assessing the value of CT & MRI in predicting tumour resectability. They found the PPV of CT to predict successful tumour resectability was 92%. [9](#) Several groups have tried to create preoperative criteria based on imaging findings in order to

predict surgical outcome, but none have been universally validated. This is likely due to differences in available surgical expertise, individual surgeons' preferences & institutional preferences

- **A limitation of CT is poor detection of small peritoneal metastases. Advances in CT technology, such as helical CT allowing for thinner slice collimation, have improved detection to an extent. Coakley et al examined detection rates of peritoneal metastases using preoperative spiral CT, and showed an overall sensitivity of 89% for all size lesions. However for lesions <1cm, the sensitivity was only 42% [11](#)**
- **The benefits of CT over MRI include shorter examination time and wider availability**
- **More recently, studies have compared CT with combined PET/CT, and have generally shown more accurate staging with PET/CT [18,19](#)**

Nuclear Imaging

- **The use of fludeoxyglucose (18F) positron emission tomography (FDG-PET) for ovarian cancer staging is not well supported in the literature**
- **FDG-PET has poorer sensitivity & specificity for detecting new ovarian cancers when compared to CT & MRI (sensitivity 58%, specificity 76-78%). [16,17](#) The limitations of FDG-PET include high financial cost, limited resolution, poor sensitivity at picking up early stage lesions and false positive results (e.g. dermoid cysts, endometriosis, gastrointestinal activity)**
- **The combination of PET & CT may prove more promising, particularly for diagnosing advanced disease and detecting recurrent tumour. However the additional benefits over CT alone are not yet fully established**
- **Two studies have examined the use of PET/CT for staging of ovarian cancer. [18,19](#) In these prospective studies, PET/CT & CT staging were compared using histological staging as the gold standard. PET/CT showed an overall better accuracy (concordance with histological staging) than CT (69-75% vs 53-55%). PET/CT was also more sensitive at detecting distant metastases (75-83% vs 40-50%). Some issues that were found in these studies were underdiagnosis of small stage I lesions due to their limited FDG uptake, and overdiagnosis of peritoneal dissemination due to physiological uptake by the bowel. Another major limitation of these studies is their small patient populations**
- **Although combined PET/CT shows promise in ovarian cancer staging, larger multicenter studies should be undertaken to verify the accuracy of PET/CT**

Magnetic Resonance Imaging (MRI)

- **MRI is often used as a “problem-solving” modality due to its ability to accurately evaluate common benign conditions (e.g. Fibroids, dermoid cysts). MRI has several limitations in staging when compared with CT such as higher**

cost, problems with covering the entire abdomen and pelvis, longer examination times and limited accessibility

- **Studies comparing MRI to CT have generally shown similar sensitivities and specificities between the modalities. In one meta-analysis, contrast enhanced MRI had the same sensitivity but better specificity [10](#)**
- **Due to the above reasons, the use of MRI should be limited to when CT is contraindicated or when CT findings are inconclusive**

Ovarian Cancer And Staging

Ovarian Cancer

- **Ovarian cancer is the 7th most common cause of death in Australian women, despite accounting for less than 3% of cancers. Incidence of 11 per 100 000 women [1](#)**
- **Ovarian cancer tends to present late (nearly 60% present with stage III-IV disease), due in part to non-specific symptoms and associated delay in diagnosis. The vast majority of ovarian cancers remain intra-abdominal, and metastases are rare at initial presentation [2](#)**
- **Risk factors include family history of ovarian or breast cancer and associated genetic syndromes (e.g. BRCA mutations, hereditary nonpolyposis colorectal cancer syndrome)**
- **Protective factors may include oral contraceptives, late menarche, early menopause, multiparity and breast feeding (possibly through decreased ovulation, or increased progesterone levels)**
- **There is emerging evidence that primary ovarian cancer should be considered as a part of the ovarian carcinoma, Fallopian tube carcinoma and primary peritoneal carcinoma complex [3](#)**

Staging Of Ovarian Cancer

- **There are two main staging classifications - FIGO4 and TMN (AJCC) [5](#)**
- **Exploratory laparotomy is both the gold standard investigation for staging, and the standard treatment of ovarian cancer. Comprehensive cytoreductive surgery includes total abdominal hysterectomy, bilateral salpingo-oophorectomy, omentectomy, lymphadenectomy, peritoneal washings and random peritoneal biopsies. Successful cytoreductive surgery is associated with better survival rates [6](#)**
- **However, up to 40% of patients with apparent early stage disease may be understaged at laparotomy. This may be due to factors relating to the patient (e.g. pregnant at time of diagnosis), the surgeon (e.g. lack of subspecialist training), or the tumour (e.g. microscopic retroperitoneal nodal metastases not removed at primary surgery)**

- **Imaging is used in the preoperative assessment of ovarian cancer to define the extent of disease, which helps guide the most appropriate primary therapy**

TMN	FIGO	Description	5Y Surv
Tx		Primary tumour cannot be assessed.	
T0		No evidence of primary tumour.	
Tis		Carcinoma in situ (limited to tubal mucosa).	
T1	I	Growth limited to ovaries (one or both).	93%
T1a	Ia	Tumour limited to one ovary; capsule intact, no tumour on ovarian surface. No malignant cells in ascites or peritoneal washings.	
T1b	Ib	Tumour limited to both ovaries; capsules intact, no tumour on ovarian surface. No malignant cells in ascites or peritoneal washings.	
T1c	Ic	Tumour limited to one or both tubes with any of the following: capsule ruptured, tumor on ovarian surface, malignant cells in ascites or peritoneal washings.	
T2	II	Tumour involves one or both ovaries	70%



		with pelvic extension.	
T2a	IIa	Extension and/or metastasis to the uterus and/or tubes.	
T2b	IIb	Extension to and/or implants on other pelvic structures.	
T2c	IIc	Pelvic extension and/or implants (T2a or T2b) with malignant cells in ascites or peritoneal washings.	
T3	III	Tumor involving one or both ovaries with histologically confirmed peritoneal metastasis outside the pelvis.	37%
T3a	IIIa	Microscopic peritoneal metastasis outside pelvis.	
T3b	IIIb	Macroscopic peritoneal metastasis outside the pelvis ?2cm greatest diameter.	
T3c	IIIc	Peritoneal metastasis outside the pelvis and ?2cm greatest diameter and/or regional lymph node metastasis.	
Nx		Regional lymph node metastasis cannot be assessed.	



N0		No regional lymph node metastasis.	
N1	IIIc	Regional lymph node metastasis.	
M0		No distant metastasis.	25%
M1	IV	Distant metastasis (excluding peritoneal metastasis).	

Anatomic stage / Prognostic groups

Stage I	T1	N0	M0
Stage Ia	T1a	N0	M0
Stage Ib	T1b	N0	M0
Stage Ic	T1c	N0	M0
Stage II	T2	N0	M0
Stage IIa	T2a	N0	M0
Stage IIb	T2b	N0	M0
Stage IIc	T2c	N0	M0
Stage III	T3	N0	M0
Stage IIIa	T3a	N0	M0
Stage IIIb	T3b	N0	M0
Stage IIIc	T3c	N0	M0
	Any T	N1	M0
Stage IV	Any T	Any N	M0

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References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. [Download the document](#)

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