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More accurate detection and localization of ovarian cancer in PET imaging

Ovarian cancer causes more deaths than any other cancer in the female reproductive system.[1] Accurate staging determines optimal therapy.

Accurate detection of ovarian cancer is critical as 75% of patients present with advanced-stage disease at the time of diagnosis.[2]
- PET/CT can help detect the precise location for biopsy guidance in the preoperative setting.

- PET/CT is useful for detection of disease in patients with suspected recurrence with:
  – normal CA-125 and normal imaging
  – increased CA-125 and normal imaging

PET/CT leads to more accurate detection of Ovarian Cancer in recurrent disease[3]

	Sensitivity	Specificity	Accuracy
CA-125	62%	91%	67%
Contrast Enhanced CT	84%	91%	85%
PET/CT	95%	100%	95%

"Patients do not benefit from treatment if there are no imaging findings to support recurrent disease in the setting of an increased CA-125. PET/CT is particularly helpful in selecting patients for site-specific treatment planning such as biopsy, surgery, or radiotherapy."[2]

PET/CT significantly alters patient management of recurrent ovarian cancer in 57% of patients.[4]

American College of Radiology (ACR) Appropriateness Criteria: Staging and follow-up of ovarian cancer[5]
- PET/CT is a valuable tool for diagnosing and staging advanced disease and detecting recurrent tumor.

- The use of PET combined with serum tumor marker CA-125 has a 98% sensitivity.
- Second-look laparotomy is no longer routinely performed because the noninvasive diagnosis of recurrence removes the need for unnecessary surgery.

Medicare recognizes the utility of PET and PET/CT in ovarian cancer.[6]

Initial Treatment Strategy (formerly Diagnosis and Staging)
- To determine if the beneficiary is an appropriate candidate for an invasive diagnostic or therapeutic procedure; or
- To determine the optimal anatomic location for an invasive procedure; or
- To determine the anatomic extent of tumor when the recommended anti-tumor treatment reasonably depends on the extent of the tumor.

Subsequent Treatment Strategy (Restaging)
- After completion of treatment for the purpose of detecting residual disease
- For detecting suspected recurrence or metastasis

- To determine the extent of a known recurrence
- If it could potentially replace one or more conventional imaging studies when it is expected that conventional study information is sufficient for the clinical management of the patient

Restaging applies to testing after a course of treatment is completed, and is covered subject to the conditions above.

Monitoring response to therapy
PET is covered for monitoring tumor response to treatment during the planned course of therapy (ie, when a change in therapy is being considered).

The ordering physician is responsible for documenting the medical necessity of the PET scan and that it meets these criteria.

PET/CT reveals the extent of metastases in patients with ovarian cancer
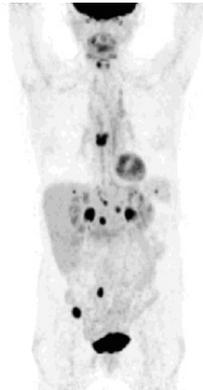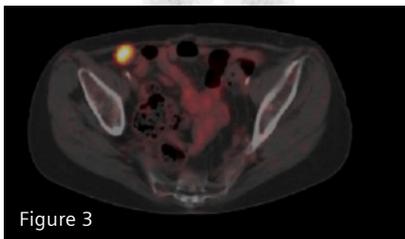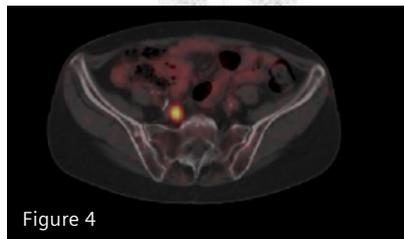

Figure 1

Figure 2

Figure 3

Figure 4

Data courtesy of University of Tennessee Medical Center, Knoxville, Tennessee, USA

History

A 71-year-old female with history of ovarian cancer was previously treated with aggressive surgical treatment with total abdominal hysterectomy, bilateral salpingo-oophorectomy, and tumor debulking followed by chemotherapy. Patient now presented with abdominal swelling and increasing serum tumor marker CA-125 levels with concern of recurrent disease.

PET/CT findings and pathology

PET/CT ordered for subsequent treatment strategy (STS) for ovarian cancer. Comparisons made to initial PET/CT images taken 4 years prior at the time of diagnosis (Figure 1). Current study reveals disease spread involving multiple retroperitoneal and mediastinal lymph nodes as well as new right lower quadrant peritioneal metastasis (Figure 2). Axial-fused views demonstrate new hypermetabolic nodular density in the pelvis that is inseparable from the anterior abdominal wall (Figure 3) as well as nodular density anterior to the sacrum (Figure 4). All are consistent with progression of metastatic disease.

Overall evaluation

A preoperative PET/CT scan in patients with advanced ovarian cancer may alter therapy, direct surgery, and provide a baseline for subsequent treatment monitoring. 50% of patients relapse within 5 years, therefore PET/CT utilized for early detection of recurrent disease is critical and can detect metastatic lesions associated with the bowel wall or underneath the diaphragm, which are difficult to detect with CT alone.[3]

In addition, PET/CT has been shown to be an effective imaging tool in patients with increased CA-125 level as well as in the setting of normal CA-125 level and clinical symptoms of recurrence.[7]

[1] Centers for Disease Control and Prevention: Ovarian Cancer Statistics. https://www.cdc.gov/cancer/ovarian/statistics/index.htm.

[2] Viswanathan C, et al. Positron emission tomography-computed tomography imaging for malignancies in women. *Radiol Clin North Am*. 2013 Nov;51(6):1111-25.

[3] Bhosale, et al. Clinical utility of positron emission tomography/computed tomography in the evaluation of suspected recurrent ovarian cancer in the setting of normal CA-125 levels. *Int J Gynecol Cancer.* 2010 Aug ;20;(6):936-44.

[4] Prakash et al. Role of PET/CT in ovarian cancer. AJR. 2010; Jun;194(6):W464-70.

[5] ACR Appropriateness Criteria; Staging and follow-up of Ovarian Cancer http://www.acr.org/~/media/684EF1D6715A43D586FC717F5412E27A.

[6] CMS Publication 100-03, Medicare National Coverage Determinations Manual, Chapter 1, Part 4, Section 220.6). Available at http://www.cms.hhs.gov/manuals/downloads/ncd103c1_part4.pdf

[7] Brunetti. PET/CT in gynecologic malignancies. *J. Radiol Clin North Am*. 2013; Sep;51(5):895-911.