The Role of PET/CT Imaging in the Evaluation of Recurrent Ovarian Cancer

THESIS

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بسم الله الرحمن الرحيم

﴿وَعَلَّمَكَ مَا لَمْ

تَكُنْ تَعْلَمُ وَكَانَ

فَضْلُ اللهِ عَلَيْكَ

عَظِيمًا﴾

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Elham Ahmed

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PET: Positron emission tomography.
18F-FDG: 18 flurodeoxyglucose
68Ge: Germanium-68
ACFs: Attenuation Correlation Factors.
ADC: Apparent diffusion coefficient.
AFP: Alfa Fetoprotien.
BGO: Bisthmuth germinate.
BOTs: Borderline ovarian tumors.
BSO: Bilateral salpingo-oopherectomy.
CA 153: cancer antigen 153.
CA 19-9: Cancer antigen 19-9
CA-125: Cancer antigen 125
CCCs: Clear cell carcinomas.
CEA: Carcino-embryonic antigen
Ce-CT: Contrast enhanced computed tomography.
CT: Computed tomography.
FDG: Fluoro-2-deoxy-d-glucose.
FIGO: Féderation Internationale de Gynécologie et d'Obstétrique
FN: False negative
FP: False positive
TN: True negative
TP: True positive
DWI: Diffusion weighted imaging.
GSO: Gadolinium oxyorthosilcate.
HCG: Human chorionic gonadotropin.
HGSCs: High grade serous carcinomas.
HRT: Hormone replacement therapy.

HU: Hounsfield units.
IGCB: Image-guided core biopsy.
ld-CT: Low Dose computed tomography.
LGSCs: Low grade serous carcinomas.
LSO: Lutetium oxyorthosilicate**.**
MDCT: Multi-detector computed tomography.
MIP: maximum intensity projection.
MMMT: Malignant Mixed Mù llerian Tumors
MOGCTs: Malignant Ovarian Germ Cell Tumors.
MRI: Magnetic resonance imaging.
NNCN: National Cancer comprehensive network
NPV: Negative predictive value.
OC: Ovarian cancer.
OEC: Ovarian epithelial carcinoma.
PPV: Positive predictive value.
RMI: Risk of malignancy index.
SCSTs : Sex Cord Stromal Tumors
SLL: Second-look laparotomy
SUV: Standard uptake value.
T.M: Tumor marker
TAH: Total abdominal hysterectomy.
TVUS: Trans-vaginal ultrasound.
US: ultrasound.
WHO: World Health Organization

Introduction

Cancer is a major cause of death in the developed world, and is becoming a significant issue for developing countries ***(Jones et al., 2006).***

Ovarian cancer is the 2nd most common gynecologic malignancy (after cervical cancer) with life time risk 1.7%. Although its incidence has decreased slightly over the past 30 years, it currently is the most common cause of death among women with gynecologic malignancy ***(Hongju et al., 2011).***

The majority of ovarian cancers (up to 90%) arise from the surface epithelium of the ovary. Of the epithelial tumors, the most common type is serous adenocarcinoma. The remaining 10% of all ovarian cancers are germ cell tumors (such as teratomas, dysgerminomas and yolk sac tumors), sex cord stromal tumors ***(Schwarz et al. 2009).***

Ovarian cancer spreads early by implantation on both the parietal and the visceral peritoneum before spreading through the lymphatics and involving the inguinal, pelvic, para-aortic, and mediastinal lymph nodes. The serum tumor marker CA-125 is elevated in nearly 80% of patients with advanced ovarian cancer. This tumor marker is widely used to assess the effectiveness of therapy and to detect tumor recurrence.

Abnormal marker levels often precede clinical and radiologic signs of disease recurrence ***(Schwarz et al. 2011).***

Serum CA-125 assay, physical examination, and anatomic imaging have been widely used to evaluate patients with ovarian cancer. Cytoreductive surgery followed by chemotherapy is the mainstay of primary treatment for high grade early and advanced stage disease ***(Hongju et al., 2011).***

Despite high clinical response rates after optimal debulking surgery and combination chemotherapy, 50- 75 % of patient still experience disease relapse ***(Armstrong et al., 2006).*** However, due to the recent emergence of alternative targeted therapies, which are designed to manage small-volume recurrent disease, positron emission tomography (PET) combined with computed tomography (CT) may play an important role in detection of recurrent ovarian cancer ***(Hongju et al., 2011)***.

PET/CT is used for early detection of patients with suspected recurrent ovarian cancer, rising CA-125 levels, and negative CT or MRI imaging results. In addition, PET/CT is also able to detect disease recurrence in the absence of elevated CA-125 levels. However, it remains the anatomic information provided by CT significantly improve the overall diagnostic accuracy of PET ***(Gu et al., 2009).***

PET/CT can differentiate between nodal metastasis & inflammatory adenopathy and fibrotic changes on the basis of significantly increased metabolic activity, even in normal sized nodes. However, PET/CT is limited with high false negative rates in detection of small or necrotic lymph nodes ***(Choi et al., 2006).***

In this work, the characters and the patterns of spread of recurrent ovarian cancer, the strength and limitations of PET/CT for detection of disease relapse will be discussed.