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Case Report

Incidental endometrial cancer detected on FDG PET/CT imaging for melanoma ☆,☆☆,★,★★

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ABSTRACT

This case report follows a 66-year-old female who originally presented with malignant melanoma in the left knee and recurrence in the left inguinal region. This prompted a whole body FDG PET/CT scan which showed incidental focal hypermetabolism in the uterus. The diagnosis of endometrial cancer was confirmed at biopsy, and the patient was treated with total abdominal hysterectomy. Melanoma patients are at increased risk of second primary malignancy, and endometrial cancer is a common second primary often diagnosed in cancer survivors. Incidental endometrial focal hypermetabolism should be investigated further for a synchronous malignancy, especially in a post-menopausal woman.

Introduction

The lifetime risk of endometrial cancer for American women is 2.8% with over 66,000 cases predicted to be diagnosed in 2023 resulting in an estimated 13,000 deaths [1,2]. The pathogenesis of endometrial cancer often begins with hormone-induced endometrial proliferation by unopposed estrogen with subsequent progression to endometrial hyperplasia. In this context, premalignant lesions—termed endometrial intraepithelial neoplasias—may then arise and transform into endometrial carcinoma via gene mutation or microsatellite instability [2]. Obesity, insulin resistance and type II diabetes mellitus, anovulation, and other factors that indirectly increase estrogen exposure have also been implicated as risk factors for endometrial cancer [2]. Clinical presentation often arises as vaginal bleeding in a post-menopausal woman but can present as abnormal uterine bleeding (AUB) in reproductive-age women as well. The American College of Obstetricians and Gynecologists recommends further work-

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up with either transvaginal ultrasound or tissue biopsy (definite diagnosis) for women above 45 years old with AUB or women less than 45 years old with a history of unopposed estrogen exposure and AUB [3,4]. The role of FDG PET/CT in gynecological malignancies has been reviewed in recent publications to include initial staging, treatment response, and surveillance imaging [5,6]. Endometrial cancer as a second primary accounts for about 6% of all endometrial cancers [7]. Melanoma survivors have an increased risk of developing additional melanomas and an increased risk of developing other cancers such as breast cancer, prostate cancer, and non-Hodgkin lymphoma [8]. The following case reports the findings of endometrial focal uptake on whole body FDG PET/CT in a patient undergoing malignant melanoma work-up.

Case report

The patient is a 66-year-old female with a past medical history of hyperlipidemia, hypertension, and recurrent episodes of malignant melanoma that originally presented as a left medial knee lesion, about 14 years ago. Two years ago, patient presented with complaints of a new left inguinal region mass. She underwent multiple imaging studies at this time that were concerning for malignant melanoma. Subsequent biopsy confirmed the diagnosis of a recurrent malignant melanoma that was ultimately treated with surgical excision and chemotherapy. As part of the melanoma work-up, patient underwent a whole-body PET/CT scan that showed an endometrial/uterine focus of focal FDG uptake with a max standardized uptake value (SUV_{max}) of 22 (Fig. 1). Follow-up pelvic ultrasound was performed which showed endometrial thickening measuring 1.1 cm with internal vascularity and suspected invasion of the adjacent myometrium. Clinically, the patient did not have any vaginal bleeding or pain, the cervix appeared normal, and the uterus was small and mobile on physical exam. The endometrium was biopsied, and results revealed endometrial adenocarcinoma, endometrioid type, FIGO-grade 1 with squamous differentiation with 80% and 85% nuclear positivity in estrogen and progesterone receptors, respectively. The patient underwent total abdominal hysterectomy and bilateral salpingo-oophorectomy.

Discussion

Patients with a history of malignant melanoma have a ninefold increased risk of developing subsequent melanoma [8]. These patients are also at increased risk for developing other non-cutaneous primary malignancies, such as breast cancer, head and neck cancer, prostate cancer, ovarian cancer, and lymphoma [8,9]. There are also rare incidents of these patients developing uterine cancer [9]. Importantly, the relative risk of developing another primary cancer in patients with a history of malignant melanoma is higher for women compared to men [9]. Endometrial cancer in postmenopausal women commonly presents with abnormal uterine bleeding; however, in some patients, it may be associated with no symptoms, nonspecific symptoms like urinary complaints, or can even be detected incidentally [10].

In the field of oncology, PET/CT has become a vital imaging technique as it facilitates the diagnosis of cancer, response to treatment, surveillance, and detection of recurrence. This patient demonstrated an increased endometrial FDG uptake concerning for hyperplasia or malignancy in the setting of her post-menopausal status [11]. Transvaginal ultrasound is the recommended initial imaging technique to rule out endometrial carcinoma by assessing endometrial thickness and vascularity [4,12]. MRI is used to determine the extent and depth of invasion as well as for staging cancer preoperatively [11]. For the assessment of endometrial cancer, imaging is done in the axial plane of the pelvis for T1 and T2-weighted MRI, while the sagittal plane is used only for T2-weighted images. T2-weighted MRI (T2WI) is the mainstay of pelvic MRI and can be employed with or without contrast-enhanced MRI for cancer staging [13,14]. On T1WI, the tumor appears hypo-to-isointense, and on T2WI it appears to have an intermediate intensity lower than the normal endometrium as seen in this patient. In MRI with contrast, the affected endometrium enhances less than the normal myometrium [15].

While MRI remains the mainstay of diagnostic imaging for pelvic and gynecological malignancies, FDG PET/CT serves as a helpful adjunct [11]. FDG PET/CT can be employed for identifying the primary tumor, detecting extension of the tumor in the pelvis, and nodal metastasis as well as distant metastasis [11,16]. PET/CT also helps monitor response to treatment [12,16]. The presence of malignant cells in tumors increases the overall rate of glucose metabolism and hence the uptake and avidity of ^{18}F-FDG [15]. These areas of malignant growth appear as hypermetabolic endometrial thickening on PET/CT [11]. FDG uptake in endometrial carcinoma correlates to FIGO grade [16]. Quantitative assessment of FDG uptake is reported using a standardized uptake value (SUV), which uses tumor activity concentration, injected dose, and patient size to approximate FDG uptake in a particular region of interest. Endometrial carcinomas typically display an expected mean SUV of 11.2 ± 5.9 (SD), and some have found SUV_{max} to be a reliable predictive marker for the recurrence of tumors and associated mortality [17]. The patient's biopsy results confirmed the presence of FIGO-grade 1 endometrial carcinoma. Per treatment guidelines [2], the patient's intra-uterine low-grade tumor was treated with a total abdominal hysterectomy and bilateral salpingo-oophorectomy.

In their study of the survival of endometrial cancer patients, as a second primary, Medina et al have found that 6% of all endometrial cancers are diagnosed in cancer survivors [7]. Endometrial cancers are common patients with prior breast, ovarian, cervical, and colo-rectal cancers. Although these cancers are of worse histological type and more advanced at the time of diagnosis, the survival is better when compared to patients with primary endometrial cancer. In patients with prior colo-rectal cancer, a subsequent endometrial cancer has a worse prognosis [7].

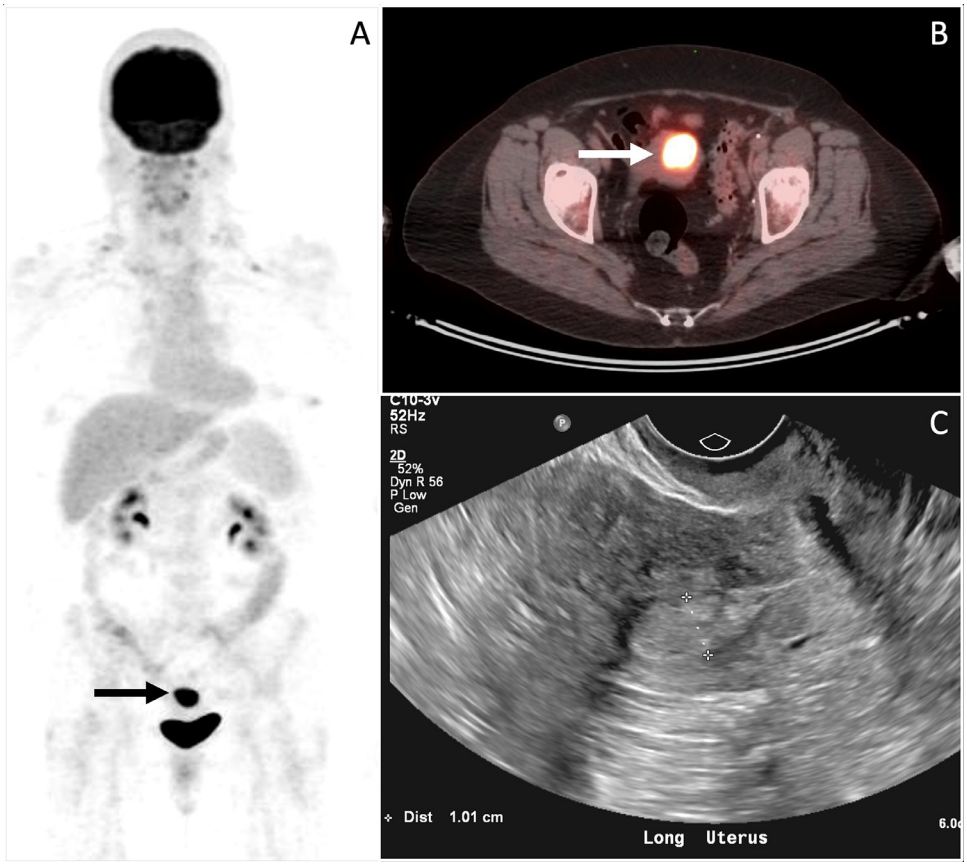

Fig. 1 – (A) The attenuation corrected maximum intensity projection image, acquired about 1 hour after the intravenous administration of 12 mCi of F-18 fluorodeoxyglucose (FDG). Increased FDG uptake is demonstrated over the location of the uterus (black arrow). (B) Axial fused PET/CT image showing focal FDG uptake by the endometrium near the uterine fundus (white arrow) with SUV_{max} of 22 (background blood SUV_{max}: 2.2 and background liver SUV_{max} of 3.4 and liver SUV_{mean} of 2.7). This finding raised suspicion for an endometrial proliferative process. (C) Longitudinal transvaginal ultrasound image showing thickened endometrium, measuring 1.0 cm.

Conclusion

A high index of suspicion is required when dealing with post-menopausal women presenting with incidental focal FDG uptake in the uterus. It is imperative to rule out endometrial cancer in these patients.

Patient consent

A written informed consent was obtained from the patient for the publication of this case report.

REFERENCES

[1] Society AC. Key Statistics for Endometrial Cancer.
[2] Mahdy H, Casey MJ, Crotzer D. Endometrial cancer. Statpearls, Treasure island (FL): StatPearls Publishing LLC; 2023. statpearls publishing copyright © 2023.
[3] ACOG committee opinion no. 557Management of acute abnormal uterine bleeding in nonpregnant reproductive-aged women. Obstet Gynecol 2013;121(4):891–6.
[4] Braun MM, Overbeek-Wager EA, Grumbo RJ. Diagnosis and Management of Endometrial Cancer. Am Fam Physician 2016;93(6):468–74.
[5] Allahqoli L, Hakimi S, Lagana AS, Momenimovahed Z, Mazidimoradi A, Rahmani A, et al. 18F-FDG PET/MRI and 18F-FDG PET/CT for the management of gynecological malignancies: a comprehensive review of the literature. J Imaging 2023;9(10):223.
[6] Khessib T, Jha P, Davidzon GA, Iagaru A, Shah J. Nuclear Medicine and Molecular Imaging Applications in Gynecologic Malignancies: A Comprehensive Review. Semin Nucl Med 2024;54(2):270–92.
[7] Medina HN, Schlumbrecht MP, Penedo FJ, Pinheiro PS. Survival for endometrial cancer as a second primary malignancy. Cancer Med 2022;11(6):1490–501.
[8] Bradford PT, Freedman DM, Goldstein AM, Tucker MA. Increased risk of second primary cancers after a diagnosis of melanoma. Arch Dermatol 2010;146(3):265–72.
[9] Gutman M, Cnaan A, Inbar M, Shafir R, Chaitchik S, Rozin RR, et al. Are malignant melanoma patients at higher risk for a second cancer? Cancer 1991;68(3):660–5.

[10] Genc M, Genc B, Sahin N, Celik E, Turan GA, Gur EB, et al. Endometrial pathology in postmenopausal women with no bleeding. Climacteric 2015;18(2):241–5.
[11] Salem AE, Fine GC, Covington MF, Koppula BR, Wiggins RH, Hoffman JM, et al. PET-CT in Clinical Adult Oncology-IV. Gynecologic and Genitourinary Malignancies. Cancers (Basel) 2022;14(12):3000.
[12] Kilcoyne A, Chow DZ, Lee SI. FDG-PET for Assessment of Endometrial and Vulvar Cancer. Semin Nucl Med 2019;49(6):471–83.
[13] Otero-García MM, Mesa-Álvarez A, Nikolic O, Blanco-Lobato P, Basta-Nikolic M, de Llano-Ortega RM, et al. Role of MRI in staging and follow-up of endometrial and cervical cancer: pitfalls and mimickers. Insights Imaging 2019;10(1):19.
[14] Nurdillah I, Rizuana IH, Suraya A, Syazarina SO. A comparison of dynamic contrast-enhanced magnetic resonance imaging and T2-weighted imaging in determining the depth of myometrial invasion in endometrial carcinoma-a retrospective study. J Pers Med 2022;12(8).
[15] Bollineni VR, Ytre-Hauge S, Bollineni-Balabay O, Salvesen HB, Haldorsen IS. High diagnostic value of 18F-FDG PET/CT in endometrial cancer: systematic review and meta-analysis of the literature. J Nucl Med 2016;57(6):879–85.
[16] Rockall AG, Cross S, Flanagan S, Moore E, Avril N. The role of FDG-PET/CT in gynaecological cancers. Cancer Imaging 2012;12(1):49–65.
[17] Faria SC, Sagebiel T, Balachandran A, Devine C, Lal C, Bhosale PR. Imaging in endometrial carcinoma. Indian J Radiol Imaging 2015;25(2):137–47.