Clinical note

False positive in pelvis in a PET-CT scan due to ovarian reimplantation: A case report

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A propósito de un caso: falso positivo en pelvis en un estudio PET-TAC debido a una reimplantación ovárica

ABSTRACT

We present the case of a 36-year-old premenopausal woman with a background of surgically-treated cervical neoplasm. She underwent a positron emission tomography-computed tomography scan (PET-CT scan) for evaluation of the new appearance of abnormal inguinal lymph nodes. The study showed two hypermetabolic nodules in the pelvic region suggestive of corresponding to an implant and to tumor involvement of the lymph node, respectively. After clinical evaluation and a new PET-CT scan, it was considered that these uptake foci corresponded to physiological activity of the FDG secondary to ovarian activity in a patient with ovariopexy. This article demonstrates the importance of having complete clinical information about the patients before evaluating the studies. We also present a review of the medical literature on the cervical neoplasm and metabolic behavior of the adnexa in relation to the menstrual cycle of premenopausal women.

Resumen

Presentamos el caso de una mujer de 36 años con antecedente de una neoplasia de cérvix, tratada quirúrgicamente, a la que se le realizó un estudio PET-TAC para caracterizar unas adenopatías inguinales de nueva aparición. La PET mostró 2 nódulos hipermetabólicos pélvicos, sugestivos de corresponder a un implante y a una adenopatía tumoral, respectivamente. Tras una reevaluación clínica y con un nuevo estudio PET-TAC, se evidenció que dichos focos de captación correspondían a actividad fisiológica de fluordesoxiglucosa secundaria a la ovulación en una paciente con ovariopexia. Este artículo muestra la importancia de disponer de una información clínica exhaustiva de los pacientes antes de valorar los estudios. Asimismo, realizamos una revisión bibliográfica sobre el carcinoma de cérvix y el comportamiento metabólico de los anexos en relación con el ciclo menstrual en mujeres premenopáusicas.

Introduction

Positron emission tomography with fluordeoxyglucose (PET-FDG) is currently a first line diagnostic tool for the study of oncological patients. Since its introduction in our country in the 1990s the indications and number of examinations performed with this technique have exponentially increased.

The development of hybrid equipment or the PET-CT scan has aided the definitive consolidation of this technique in the medical setting. This technological innovation has two main advantages which should be pointed out. The first advantage is its capacity to detect lesions not visualized with PET whether because of their infracentimetric size or their being neoproliferative processes with very low or null radiopharmaceutical uptake. The second advantage lies in that the joint use of these two techniques provides more precise localization of the deposits of 18F-FDG and secondarily increases the specificity of the test. This is of special interest in the evaluation of lesions localized in the abdominopelvic cavity. Nonetheless, there are situations in which it may be difficult to determine the benignity or malignancy of hypermetabolic foci detected by PET, mainly in oncologic patients submitted to surgery and radiotherapy.

The uptake of 18F-FDG by tissue or an organ is related to the glycolytic intake of this structure. Since this is not a purely oncotropic...
tracer, uptake of this radiopharmaceutical has been described in numerous physiological and benign processes. It has even been demonstrated that up to 30% of tumor uptake of $^{18}$F-FDG may be due to newly formed granulation tissue and the macrophages included in the tumor.

We believe that the present case is of special interest since with only one example it demonstrates how it is essential to know the physiological variants of $^{18}$F-FDG uptake as well as the different treatments performed for correct interpretation of PET-CT scan studies.

**Clinical case**

We present the case of a 36-year-old woman with a history of squamous cervical carcinoma diagnosed 3 years previously. The patient had undergone radical hysterectomy and bilateral pelvic lymphadenectomy via laparoscopy with preservation of adnexa. The final staging of the patient was IB1 according to the classification of the International Federation of Gynecology and Obstetrics (FIGO). The patient received periodic gynecologic controls as well as an annual MR pelvic examination. A MR pelvic control showed bilateral inguinal adenopathies of 12 mm of probable reactive etiology but of new appearance. A PET-CT scan was performed for better characterization of the adenopathies and extension study.

The images of PET-CT scan fusion of the whole body demonstrated a 20 mm hypermetabolic (SUV max. 4.51) nodule in the common left iliac region (fig. 1) and several lymph nodes in the left infrarenal paraortic region with $^{18}$F-FDG uptake within the upper limit of normality (SUV max. 2.5). Likewise, we observed a nodular hypermetabolic lesion of 27 mm (SUV max. 7.06) in the left hemipelvis (fig. 2). The inguinal adenopathies did not present pathological FDG uptake. The differential diagnosis of these lesions considered tumor etiology as the first option.

The case was presented to the Committee of Gynecology who reported that the adnexa had been reimplanted by request of the patient in order to preserve fertility. Another PET-CT scan was carried out prior to an echography because of the suspicion that the lesions might correspond to the reimplanted adnexa in an ovulatory phase. The echography demonstrated the presence of a right ovary centered in the middle line with an incipient luteus body. PET-CT scan showed that the nodule localized in the left hemipelvis did not present FDG uptake (fig. 3). The nodule localized in the common iliac in which FDG uptake persisted corresponded to the right ovary in an ovulatory phase. The patient continues to undergo follow up controls and remains free of disease.

**Discussion**

Cervical neoplasms represent the second cause of death by cancer in women between 25 and 45 years of age, being second to breast cancer and are responsible for around 10% of the total number of deaths by cancer. Populational screening for the early detection of human papilloma virus infections and precancerous lesions constitute the basis of prevention campaigns.

The clinical stage using the FIGO classification and lymph node infiltration are the 2 most important prognostic factors of this disease. Numerous studies have demonstrated the utility of PET in the study of cervical neoplasms as both a method of initial disease staging and to restage women with clinical or radiological suspicion of tumor recurrence.

Consequently, since January 2005 the National Health Care Service and different insurance companies in the United States have authorized and cover PET studies in patients with cancer of the cervix. One of the first articles reporting the value of PET as a prognostic factor and method of lymph node staging in this disease was carried out by Grigsby et al. in 2001 in a group of 101 women with recent

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**Figure 1.** The axial slices PET and CT scan demonstrated a hypermetabolic nodule (SUV max. 4.51) of 20 mm of maximum diameter in the common left iliac region and several lymph nodes in the left infrarenal paraortic region.
diagnoses of cancer of the cervix. In this retrospective study PET demonstrated significantly greater sensitivity than CT scan in the detection of nodal infiltration in the pelvic region and paraaortic chain. Moreover, multivariate analysis showed the presence of tumoral disease in this latter localization to be the most important prognostic factor of tumor relapse.

Our patient presented here had 3 interesting facts which should be commented upon. Firstly, it is of note that although the patient had a previous history of cancer of the cervix, she was clinically asymptomatic and did not demonstrate any sign or serological evidence of tumor recurrence. As shown in the Bayes theorem applied to the imaging methods, the pretest probability of disease is an important factor when calculating the sensitivity, specificity, positive and negative predictive values. In this respect, a recent article evaluated the efficacy of PET-CT scan as a follow up method after initial treatment for early detection of disease recurrence in patients with cervical cancer. This study showed that only 44% of the hypermetabolic foci detected by PET in asymptomatic patients finally corresponded to true positive results compared to 71% of the symptomatic women. Thus, the clinical situation of the patient and the evolution of the tumoral disease are important factors to take into account in the interpretation of PET studies. The second fact of note and something which has not been clearly quantified in the scientific literature is the need to perform correct anamnesis and having information related to the different types of treatments undertaken, with special emphasis on surgical interventions carried out. In the present case, knowledge that the patient had undergone an ovarian transposition by extrapelvic ovariopexy would have saved the need for new imaging tests and even the repetition of the PET study. This technique of fertility preservation has shown to be effective in young

Figure 2. The axial slices of PET and CT scan showed a hypermetabolic nodular lesion (SUV max. 7.05) of 27 mm of maximum diameter in the left hemipelvis.

Figure 3. The coronal slices of the initial whole-body PET study show a hypermetabolic lesion in the left hemipelvis and a hypermetabolic nodule in the common left iliac region. In the coronal slices of the later PET the previously mentioned lesions had disappeared.
women submitted to pelvic radiation because of different types of neoplasms, mainly those of cervical, vaginal and/or rectal neoplasms. The objective of this procedure is to distance the ovaries from the field of irradiation. Ideally, this intervention is carried out by laparoscopy, placing the ovaries laterally between the aortic bifurcation and the low pole of the kidney. Since they may migrate and to facilitate radiological detection, the point of repositioning is identified with metallic clips. Lastly, the third aspect of note is the metabolic behaviour of the ovaries in relation to the menstrual cycle in premenopausal women. Although the presence of focal uptake of $^{18}F$-FDG at the level of the uterus or ovaries in postmenopausal women is indicative of pathology or tumoral disease, this same phenomenon in premenopausal women may correspond to a functional or tumoral process. Using PET, Lerman et al. analyzed the metabolic behavior of the endometrium and the ovaries in relation to the menstrual cycle in a group of 285 women. They found that endometrial uptake of $^{18}F$-FDG is clearly increased during the menstrual period and the ovulatory peak, while uptake in the ovaries is only physiologically present in the latter. Likewise, they reported that neither contraceptive nor hormone therapy produced secondary uptake of the radiopharmaceutical in the endometrium. Therefore, knowing the phase of the menstrual cycle of the patient may enormously aid in the interpretation of these studies and solve possible uncertainties with respect to these uptakes. In case of doubt, an echographic study may be of great use. This technique not only easily identifies the localization of the ovaries but also the phase in which they are. It may be especially indicated in patients such as ours with a history of pelvic neoplasm submitted to extrapelvic ovariopexy and who did not know the phase of the cycle because of the presentation of iatrogenic amenorrhea.

References