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Case Report

Vaccination-induced inflammatory accumulation of axillary lymph nodes detected by FDG-PET in a breast cancer patient: a case report

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Abbreviations:

FDG-PET: 2-fluoro-2-deoxy-D-glucose positron emission tomography

US: Ultrasonography

FNA: Fine needle aspiration cytology

IDC: Invasive ductal carcinoma

HER2: Human epidermal growth factor receptor 2

CEA: Carcinoembryonic antigen

ABSTRACT

Evaluation of axilla lymph node metastasis is very important in determining the treatment strategy for primary breast cancer. The imaging method 2-fluoro-2-deoxy-D-glucose positron emission tomography (FDG-PET) provides reliable information about metastasis, however it has limitations. A 40-year-old female first noticed a mass in her left breast. Ultrasonography (US) showed an uncircumscribed mass measuring 1.5 cm beneath the nipple in her left breast, and swelling axilla lymph node as metastasis. Primary tumor and 4 axilla lymph nodes were detected as hot spot by FDG-PET. However, we got new information which she received influenza vaccination 4 days before she had undergone FDG-PET before determining the strategy with patient. To decide the plan of treatment, it was necessary to have the reliable imaging result, therefore, we performed the second FDG-PET 25 days after the influenza vaccination. We report a case showing false-positive of axillary lymph nodes by FDG-PET caused by influenza vaccination. Influenza vaccination before FDG-PET examination may cause axillary lymph node accumulations, especially within several days after vaccination.

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Background

The evaluation of axilla lymph node metastasis is very important due to determine the strategy (primary operation or neoadjuvant chemotherapy) for primary breast cancer. Ultrasonography (US) is very convenience technology to evaluate the axilla lymph node and is widely used for early breast cancer in Japan. The fine needle aspiration cytology (FNA) and/or 2-fluoro-2-deoxy-D-glucose positron emission tomography (FDG-PET) should be performed to confirm the diagnosis of axilla lymph node

metastasis in breast cancer patients with suspicious of metastasis by US. The sentinel lymph node biopsy is standard procedure to determine the axilla lymph node metastasis at time of primary breast surgery in early breast cancer with nonsuspicious by FNA and FDG-PET.

FDG-PET is an imaging method that provides insight into the metabolism of glucose in tissues [1]. According to the meta-analysis, the specificity of FDG-PET in lymph node assessment is 94%, but their sensitivity is 63% [2]. As PET has an insufficient negative predictive value, it cannot rule out the existence of metastases. In contrast, FDG-

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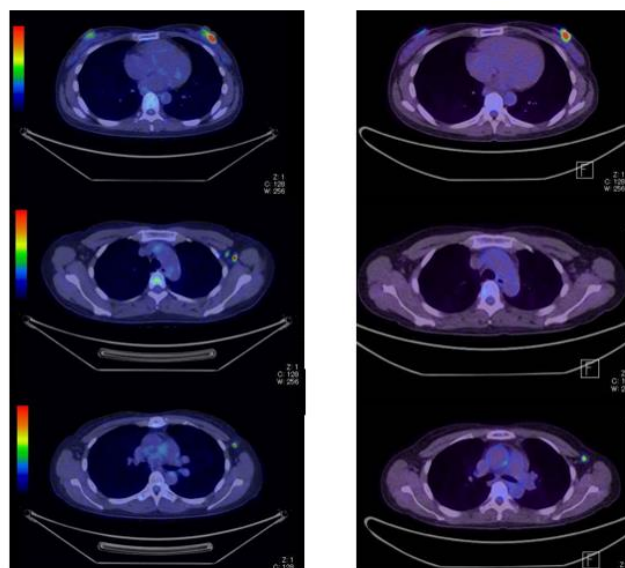
PET is considered to have a high positive predictive value, if metastatic lymph nodes are detected by FDG-PET, therefore, it is often used to diagnose axilla-lymph node metastasis of breast cancer in clinical [3].

However, we report a case showing false-positive of axillary lymph nodes of FDG-PET caused by an influenza vaccination.

Case Presentation

A 40-year-old female first noticed a mass in her left breast. Mammography revealed an indistinct mass in E area. US showed an uncircumscribed mass measuring 1.5×1.3×0.9 cm beneath the nipple in her left breast, and swelling axilla lymph node as metastasis. Primary breast tumor was diagnosed invasive ductal carcinoma (IDC) by US-guided core-needle biopsy. On immunohistochemically analysis, IDC cells were highly positive for both estrogen and progesterone receptors and negative for human epidermal growth factor receptor 2 (HER2). Axilla lymph node metastasis was confirmed according to FNA. Magnetic resonance imaging revealed a circumscribed small enhanced mass with a rapid-plateau pattern beneath the nipple in her left breast. Routine blood and chemical examinations as well as carcinoembryonic antigen (CEA) and carbohydrate antigen (CA15-3) were within normal ranges.

Primary tumor and 4 axilla lymph nodes were detected as hot spot by FDG-PET (figure1). In the cases diagnosed to have 4 or more axilla lymph node metastasis before the operation, we usually discuss neoadjuvant chemotherapy with the patients in practice. However, we got new information which she received influenza vaccination 4 days before she had undergone FDG-PET before determining the strategy with patient. To decide the plan of treatment, it was necessary to have the reliable imaging result, therefore, we performed the second FDG-PET 25 days after the influenza vaccination.



The first FDG-PET

The second FDG-PET

Figure1: The second FDG-PET decrease (four to one) a number of positive lymph nodes by first.

The hot spots were decreased from 4 to 1 lymph node by second FDG-PET (figure 1). Consequently, we decided to precede the primary operation without neoadjuvant chemotherapy. The patient underwent a left modified radical mastectomy with axillary lymph node dissection and immediate reconstruction surgery with implant. In gross observation, the cut surface of mass was 1.2×1.2 cm. Histological examination revealed IDC with histological grade 2. On immunohistochemically analysis, IDC cells were highly positive for both estrogen and progesterone receptors and negative for HER2. The ki-67 labeling index was over 20%. 3 axilla lymph node metastases were detected. As adjuvant treatment, the patient undergoes TC (Docetaxel 75mg/m²+Cyclophosphamide 600mg/m²), and plan to undergo endocrine therapy after the chemotherapy.

Discussion

This is the first report that vaccination caused inflammatory accumulation of axillary lymph nodes by FDG-PET in breast cancer patient. We think this is false positive case of FDG-PET according to decreasing (four to one) a number of positive lymph nodes by first to second FDG-PET, and few metastatic lymph nodes diagnosed by histological examination in surgical specimens compared with first FDG-PET.

FDG-PET is useful in identifying the presence of high metabolic malignant cells used glucose. However, as with all modalities, FDG-PET has some limitations. FDG-PET is known to accumulate in infection and inflammation as well as in malignancy [4]. Immunization such as influenza vaccination may cause inflammation of lymph nodes, which is similar to axillary lymph node metastasis on FDG-PET [5-8]. In such false-positive cases, there is a possibility to be performed unnecessary surgical resection or other toxic treatment.

Shirone et al. reported that four fifth of patients (80%) who underwent vaccination less than 7 days previously showed abnormal accumulations in the axilla during an annual cancer-screening program [9]. In a previous report, abnormal axillary lymph node accumulation was found 10 days after influenza vaccination [10]. Taking account of these reports, influenza vaccination seems to be favorable to avoid two weeks before FDG-PET. In our case, the intervals between vaccination and first FDG-PET were 4 days.

In Japan, many people are performed the influenza vaccination due to official recommendation every year. The influenza vaccination was also recommended before chemotherapy in breast cancer patient by the guideline of Japanese Breast Cancer Society [11]. The influenza vaccination was injected in the deltoid region or the laterally brachial region. A questionnaire about vaccination history including injection site can be helpful to evaluate whether increased FDG accumulation in lymph nodes was caused by vaccination.

Conclusion

We reported a case of false-positive findings on FDG-PET in diagnosis of breast cancer after vaccination. Influenza vaccination before FDG-PET examination may cause axillary lymph node accumulations, especially within several days after vaccination. Questionnaires about vaccination can be helpful to avoid false-positive findings on FDG-PET.

We don't recommend vaccination during two weeks before FDG-PET in early breast cancer patient.

Consent for Publication

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Competing interests

The authors declare that they have no competing interests

Author's contributions

HK has operated this case and analyzed all data. AK, HK, MS, MH, AY, JI, NG, SO, MI, KS, and HI have been involved in drafting the manuscript and revising it critically for important intellectual content. All authors read and approved the final manuscript.

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