Hypermetabolic Axillary Mass on ^{18}F FDG PET/CT: Breast Cancer Arising from Accessory Breast Tissue

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Abstract Differential diagnosis among several causes of axillary malignant mass is important. The most common cause of palpable malignant axillary mass is metastatic lymphadenopathy. Although carcinoma arising from ectopic breast tissue is rare, the diagnosis should be kept in mind when evaluating malignant axillary mass. In this report we present a case with carcinoma arising from ectopic breast tissue. ^{18}F FDG PET/CT was performed for the purpose of localizing primary breast cancer lesion and systemic evaluation. PET/CT showed hypermetabolic lesions only in the right axilla. There is no evidence of malignancy in both breasts. When nuclear physicians encounter a hypermetabolic axillary mass indicating malignant lesion without evidence of primary breast malignant lesion, carcinoma arising from ectopic breast tissue should be included in the differential diagnosis.

Keywords FDG PET/CT · Accessory breast tissue · Breast cancer

Introduction

Ectopic accessory breast tissue occurs as a result of the failure of resolution of the embryologic mammary ridge, seen first in the sixth week of development. As the embryo develops, all but the pectoral portion of the original

mammary ridge at the area of the fourth intercostal space resolves, leaving normal bilateral pectoral breast tissue [1]. Ectopic breast tissue has been found in multiple locations along the milk line from the axilla to the vulva. Ectopic breasts that arise along the milk line traditionally have been referred to as accessory or supernumerary breasts. Formation of a nipple without obvious underlying breast tissue is also common. When mammary tissue is found in the superior trunk, in the same area of the breast, but outside its periphery, it is traditionally referred to as aberrant breast tissue [2]. Accessory breast tissue is found in 1–2% of humans [3].

Although tumors of aberrant tissue are a rare condition, all tumors occurring in normally located breast tissue can occur in aberrant breast tissue. Cancer originating from accessory or aberrant breast tissue has been reported with an incidence of 0.3–0.6% of all breast cancers, and 70–80% of these cases originated from the axillar region. But occurrence in the infraclavicular area, sternal area, upper abdominal area near the xiphoid process, and genital area has also been reported [1, 4]. Here we report a malignant tumor arising from aberrant breast tissue, which was initially suspected as inflammatory or metastatic lymphadenopathy.

Case Report

A 71-year-old woman presented with a palpable mass on the right axilla, which she had first noticed about 8 years before. Two years before visiting our hospital, the mass began to gradually increase in size. Skin rashes and itching developed around the mass. Physical examination revealed a 3 cm firm movable mass surrounded by irregular skin rashes. The mammography was reported as showing multiple pathological lymphadenopathies in the right axilla,

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and regional distribution of microcalcification in the upper outer portion of the right breast (Fig. 1).

Sonography of the breasts disclosed a 3.3 cm irregular, partially indistinct, hypoechoic axillary mass with direct invasion to the overlying skin (Fig. 2). The patient underwent core needle biopsy. Histopathologic examination of the H&E-stained biopsy specimen revealed invasive ductal carcinoma with NOS type. ^{18}F FDG PET/CT was performed to localize the primary lesion and for systemic evaluation. PET/CT revealed a hypermetabolic right axillary mass (SUVmax 9.6) abutting on the overlying skin with several hypermetabolic lymphadenopathies in the right axilla (Fig. 3). There was no evidence of abnormal hypermetabolic lesion suggesting primary malignancy in the body including the breast or distant metastasis. Therefore, the patient underwent breast conserving surgery and right axillary dissection. Postoperative specimen with H&E staining also showed a relatively circumscribed mass composed of malignant cells with increased nuclear-cytoplasmic ratio, cord-like arrangement, and infiltration of the surrounding tissue, regarded as invasive ductal carcinoma (NOS type) (Fig. 4). On the basis of the histopathological features of the surgical specimen and the findings of the imaging studies, the tumor was diagnosed as a malignant tumor originating from aberrant breast tissue in the axilla. Adjuvant treatment with aromatase inhibitors and radiation therapy was performed due to infiltration of skin and metastatic axillary lymphadenopathies.

Discussion

The differential diagnosis of axillary malignant mass includes cancer of mainly primary breast origin, either from the tail of Spence or from aberrant breast tissue in the axilla, and secondary metastatic carcinoma of axillary lymph nodes. The most common primary site in a woman presenting with metastatic carcinoma of the axillary lymph

nodes is an occult primary breast cancer. Other primary sites include skin, lung, pharynx, thyroid, stomach, pancreas, and colon, as well as Hodgkin's disease and various types of sarcomas [5]. The prognosis of carcinoma arising from aberrant breast tissue is worse than that of normal breast cancer because of early metastasis to lymph nodes [6]. The important criteria for diagnosis are (1) absence of metastatic carcinoma, (2) no continuity with the normal breast tissue, (3) existence of normal breast tissue around the carcinoma, and (4) absence of sudoriparous carcinoma in the axilla.

In our case, the histopathological pattern of axillary mass was compatible with that of breast cancer, but mammography and breast sonography showed no abnormality except fatty change in both breasts. Though the mass showed no element of normal breast tissue, it was superficially located and had irregular shape and angular margin that was distinguished from metastatic lymphadenopathies of deep portion. The same TNM staging and treatment options for normal breast cancer are adopted for ectopic breast cancer. The surgical approach may be wide local excision along with exploration or dissection of local nodal groups. Sentinel lymph node biopsy was recently proposed to localize, recognize and remove metastatic axillary lymph nodes from ectopic breast cancer [7, 8]. Whether ipsilateral breast irradiation offers an advantage is not exactly known. This adjuvant therapy must be considered, however, in case of diagnostic uncertainty between an axillary ectopic breast mass and axillary metastasis from unknown primary breast cancer [9].

Although our case was pathologically proven to be axillary ectopic breast cancer, aromatase inhibitor and radiation therapy as a part of adjuvant therapy was performed due to infiltration of skin and metastatic axillary lymphadenopathies. Improvement in prognosis requires awareness of the potential diagnosis, and early excision of unexplained nodules in the axilla because the prognosis of carcinoma of aberrant breast tissue may be worse than that

Fig. 1 Mammogram shows pathological lymphadenopathies in right axilla, and regional distribution of microcalcification in the upper outer portion of right breast

Fig. 2 Sonogram discloses a 3.3 cm irregular, partially indistinct, hypoechoic axillary mass with direct invasion to overlying skin

of normal breast carcinoma. Differentiation of metastatic axillary lymphadenopathy from occult breast cancer and carcinoma originating from accessory or aberrant breast tissue helps the surgeon to avoid unnecessary ipsilateral prophylactic mastectomy.

^{18}F 2-deoxy-2 fluoro-D-glucose (FDG) has become the most commonly used radiopharmaceutical for PET studies of cancer. Cancer cells exhibit an increased rate of glycolysis, and ^{18}F FDG PET is able to assess a fundamental alteration in the cellular metabolism of glucose. The transport of the radiotracer through the cell membrane via glucose transport proteins, particularly glucose transporter type 1 (GLUT-1), and subsequent intracellular phosphorylation by hexokinase (HK) have been identified as key steps for subsequent tissue accumulation. Because FDG-6-phosphate is not a suitable

substrate for glucose-6-phosphate isomerase, and the enzyme level of glucose-6-phosphatase is generally low in tumors, FDG-6-phosphate accumulates in cells and is visualized by PET [10]. ^{18}F FDG PET is particularly well adapted for women with axillary lymph nodes, which could be secondary to a breast cancer, because it allows detection of breast cancer when mammography fails, for example, as a result of dense breasts or architectural distortion after surgery. Small breast cancer lesions or low-FDG-avid malignant cell types such as invasive lobular carcinoma can be missed on ^{18}F FDG PET [11]. But, there are a few reports that ^{18}F FDG PET can be helpful in localizing occult carcinoma of the breast that presents with metastatic lymph nodes and in excluding other potential primaries [12, 13]. Therefore, when nuclear physicians encounter hypermetabolic axillary lesions

Fig. 3 ^{18}F FDG PET/CT reveals hypermetabolic right axillary mass (SUVmax 9.6) abutting on the overlying skin with several hypermetabolic lymphadenopathies in the right axilla

Fig. 4 Under the skin tissue, a relatively circumscribed mass, regarded as invasive ductal carcinoma (NOS type), is observed (H&E stain, x40)

without obvious suggestion of a primary origin in breast or other organs, carcinoma originating from accessory or aberrant breast tissue should be considered for a differential diagnosis. The combination of PET and CT allows accurate registration of metabolic and anatomical findings of tumor. This yields a clear improvement in diagnostic accuracy and detection of accessory breast tissue as well. More refined high resolution methods, such as positron emission mammography (PEM), designed to improve both resolution and small lesion detectability are expected to have a role in reducing the cases of occult breast cancer [14–16].

Conflict of interest None

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