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A case of breast cancer: Suppression of lactation-related FDG uptake 2 days after cabergoline administration

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Abstract

We present a case of a 35-year-old woman with breast cancer in lactation 3 months after childbirth, in which a lactation inhibitor was useful for 18F-FDG PET/CT examination. Via ultrasonography and biopsy with histopathology, we diagnosed the lesion in the upper region of the left breast as invasive ductal carcinoma. She stopped breastfeeding and was administered cabergoline to suppress lactation. Two days after the administration, 18F-FDG PET/CT revealed segmental uptake (10 cm in diameter) and no lactation-related uptakes. Dynamic MRI also revealed a segmental enhancement of the same size as 18F-FDG PET/CT. The lactation inhibitor was useful to delineate the extent of the lesion during the 18F-FDG PET/CT examination.

Keywords

breast cancer, lactation, fluorodeoxyglucose, PET/CT, cabergoline, dopamine receptor agonist

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Introduction

During pregnancy and lactation, prolactin levels increase, which stimulates breast growth in preparation for milk production, resulting in hypermetabolism of breast tissues and making it difficult to interpret 18F-FDG PET/CT images because the accumulation of noncancerous tissue increases.[1]

Cabergoline, a dopamine receptor agonist used in the treatment of hyperprolactinemia, directly stimulates D2-dopamine receptors in the anterior pituitary gland, which suppresses prolactin production. For breast cancer during lactation, it is recommended to stop lactation in advance by taking a single 1-mg oral dose of cabergoline before surgery.[2,3]

Here, we present the case of a 35-year-old woman with breast cancer in lactation 3 months after childbirth, in which a lactation inhibitor was useful for 18F-FDG PET/CT examination.

Case report

A 35-year-old breastfeeding woman who had given birth 3 months earlier presented with a left breast lump. On physical examination, a 9 × 7 cm tumor was found on the upper region of her left breast and a 2.5 × 2 cm lymph node in her left axillary fossa.

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Through ultrasonography (Figure 1) and biopsy with histopathology, we identified the lesion in the upper region of the left breast as invasive ductal carcinoma (Figure 2).

She stopped breastfeeding and was administered cabergoline to suppress lactation. Two days after the administration of cabergoline, 18F-FDG PET/CT was performed. This tumor located in the upper region of her left breast showed segmental uptake (10 cm in diameter) and no lactation-related uptake on 18F-FDG PET/CT (Figure 3).[4] Four days after administering cabergoline, the tumor also showed segmental enhancement of the same size as 18F-FDG PET/CT on dynamic MRI (Figure 4).

After neoadjuvant chemotherapy, total mastectomy with axillary lymph node dissection was performed. The tumor's stage was ypTXN3aM0. Therefore, the chest wall and supraclavicular fossa were irradiated postoperatively.

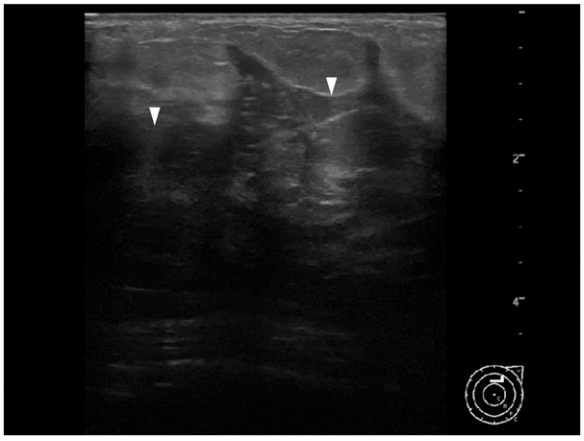

Figure 1. Breast Ultrasound. Ultrasonography revealed a diffuse hypoechoic area within the mammary gland (arrowheads).

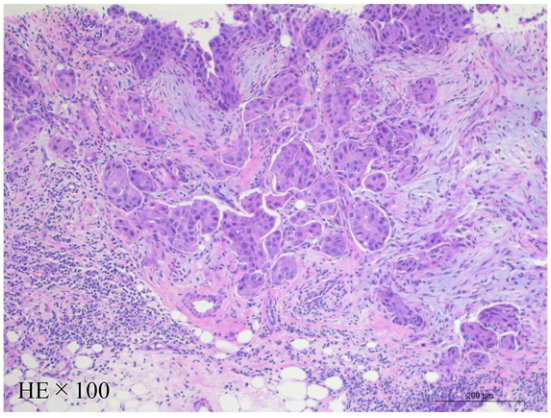

Figure 2. Pathology of core-needle biopsy (Hematoxylin and eosin staining). Cancer cells with large, atypical nuclei and frequent mitotic figures were forming small nests and infiltrating with stromal reactions. Cancer cells also extended to mammary ducts and lobules.

Discussion

Pregnancy-associated breast cancer (PABC) is defined as breast cancer diagnosed during pregnancy, lactation, or within 1 year after parturition. It occurs in 1/3000 pregnancies. The average age of women with PABC is 32–38 years.[5] The diagnosis of PABC is frequently delayed, and it is often diagnosed at an advanced stage due to the engorgement and physiological hypertrophy of the breast. A core-needle biopsy is performed to confirm the diagnosis of breast cancer, and if the patient is actively breastfeeding, the administration of cabergoline to suppress lactation is recommended, which reduces the risk of milk fistula or abscess formation.[2]

Prolactin, which is released from lactotrophs in the anterior pituitary gland, is a hormone that promotes milk synthesis, promoting glucose uptake and lactose synthesis. During the first 6 months of lactation, breast milk contains all the nutrients that newborns need. A lactating woman produces an average of 780 mL of breast milk per day, which has 650 kcal/day of energy. The major carbohydrate in breast milk is lactose, whose content is 7 g per 100 mL and which provides approximately 40% of the energy supplied to the infant.[6,7] During lactation, serum prolactin levels show surges due to neuroendocrine reflexes: the stimulus of the child sucking on the mother's breast suppresses the release of dopamine, a prolactin inhibiting factor, from the hypothalamus and promotes the secretion of prolactin from the lactotrophs.

Lactotroph membranes have the D2 subclass of dopamine receptors (D2 receptors). Dopamine released from the hypothalamus stimulates the D2 receptors and reduces the release of prolactin from the lactotrophs. Cabergoline, one of the D2 receptor agonists, reduces the serum prolactin level and inhibits milk synthesis. The effect of cabergoline, which suppresses serum prolactin, is maximal 2–6 days after its administration.[8] In this case, 18F-FDG PET/CT was performed 2 days after the administration of cabergoline, and contrast-enhanced MRI was performed 3 days after the administration. These images were taken when the serum prolactin level was at its lowest.

The physiological 18F-FDG uptake values for the normal lactating breast parenchyma of PABC patients were significantly decreased in comparison with physiological 18F-FDG uptake values measured in the control group, including those patients who had active malignant diseases other than breast cancer.[1] However, the relationship between breastfeeding cessation or dopamine administration and 18F-FDG uptake in the mammary gland has not been investigated. Decreased milk synthesis due to decreased prolactin levels may have resulted in decreased 18F-FDG uptake and decreased MRI enhancement in the background breast tissue.

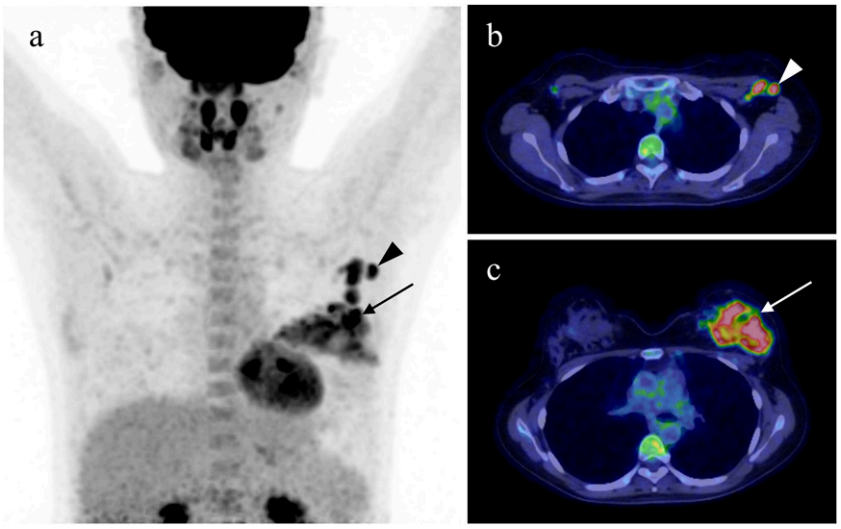

Figure 3. 18F-FDG PET/CT delayed image (120 min) in the prone position (2 days after the administration of cabergoline). (a): 3D-MIP. (b, c): axial fusion images. Background breast fibroglandular uptake was mild (SUVmax = 1.3). Enlarged level I axillary lymph nodes showed increased 18-F FDG uptake (SUVmax = 7.7) (arrowheads). The upper left mammary gland showed segmental 18-F FDG uptake (SUVmax = 8.0) (arrows).

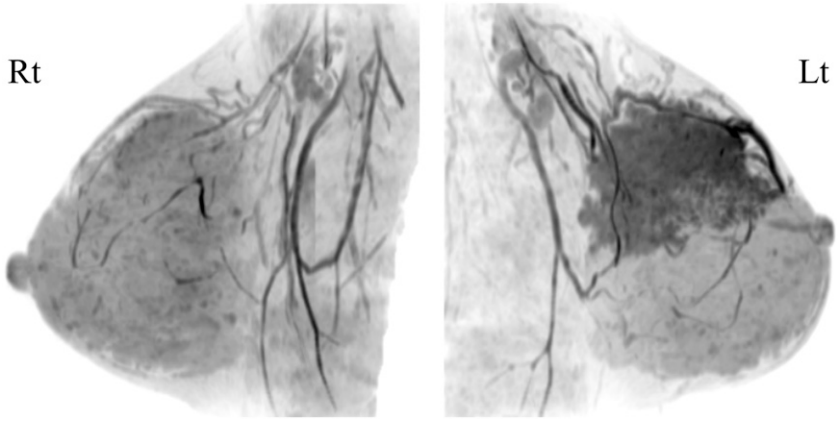

Figure 4. MRI Post-contrast 3D-MIP (3 days after the administration of cabergoline). Background parenchymal enhancement (BPE) was mild. Breast cancer in the upper region of the left mammary gland showed segmental enhancement.

In conclusion, we present the case of a lactating woman with breast cancer. The lactation inhibitor was useful to delineate the extent of the lesion via an 18F-FDG PET/CT examination.

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Declaration of Conflicting Interests

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Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from participant included in the study.

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