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Case Reports

Association of Breast Cancer with Meningioma: Report of a Case and Review of the Literature

Makoto Kubo[1], Takashi Fukutomi[1], Sadako Akashi-Tanaka[1] and Tadashi Hasegawa[2]

[1]Breast Surgery Division, National Cancer Center Hospital, Tokyo and [2]Pathology Division, National Cancer Center Research Institute, Tokyo, Japan

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We report a case of meningioma subsequently developed in a patient with primary breast carcinoma. A 53-year-old woman received a left modified radical mastectomy because of stage IIA breast carcinoma. Histologically, the tumor was a predominantly intraductal carcinoma with negative lymph node metastasis. Estrogen receptor (ER) was negative but progesterone receptor (PR) of the left tumor was positive by immunohistochemistry. Four years later, cranial bone and/or brain metastasis was suspected from a routine follow-up bone scintigram. The patient showed no symptoms or signs at that time. Magnetic resonance imaging (MRI) and angiography revealed that the right parasagittal mass was suspicious of meningioma. A complete tumor removal was performed. On histological examination, this brain tumor was a transitional-type meningioma (meningotheliomatous and fibrous type) without malignant findings. ER was negative but PR was positive also in this tumor. She is currently well 6 years after the initial surgery. A review of the literature is presented with emphasis on the association between breast cancer and meningioma, which indicates a possible hormonal relationship. The knowledge of this association is important in the differential diagnosis of patients with breast cancer who develop central nervous manifestations.

Key words: breast cancer – meningioma

INTRODUCTION

It has been reported that the incidence of meningioma is increased in patients with breast cancer (1). The increased risk of developing meningioma was reported to be 1.57–1.90 times after breast cancer according to data from the Swedish Cancer Registry and from the United States Surveillance, Epidemiology and End Results (SEER) Program (2,3). It is therefore important to differentiate a solitary brain metastasis from a meningioma, which is a potentially curable disease. Hormonal relationships between meningioma and breast cancer have also been suggested (4,5). The pregnancy and/or menstrual cycle is sometimes related to the rapid increase of meningiomas (6). We report here a case of meningioma subsequently developed in a patient with primary breast carcinoma.

For reprints and all correspondence: Takashi Fukutomi, Department of Surgical Oncology, National Cancer Center Hospital, 1–1, Tsukiji 5-chome, Chuo-ku, Tokyo 104-0045, Japan

CASE REPORT

A 53-year-old postmenopausal woman with a left primary breast carcinoma (T2N0M0: stage IIA) was referred to our hospital. She had no past or family history of malignancies. The tumor size was 3.1 cm in diameter at the first consultation. As for the diagnostic procedures, mammography (MMG: Mammomat 3, Siemens, Germany) revealed an ill-defined, spiculated tumor shadow with diffuse microcalcifications in the left breast. An irregular hypoechoic–tumorous lesion could be detected in the upper-outer quadrant of the left breast by ultrasonography (US: EUB-515 with a 7.5 MHz transducer; Hitachi, Tokyo, Japan). A modified radical mastectomy of the left breast was carried out in July 1995. Histological examination revealed that the left breast tumor was a predominantly intraductal carcinoma, histological grade 3, with negative lymph node metastasis (0/14) (Fig. 1). Estrogen receptor (ER) was negative but progesterone receptor (PR) of this tumor was positive by immunohistochemistry (Fig. 2). Whereas the size of the invasive component was only 1.7×1.0 cm in diameter (20%), the size of the intraductal component was 6.2×3.0 cm

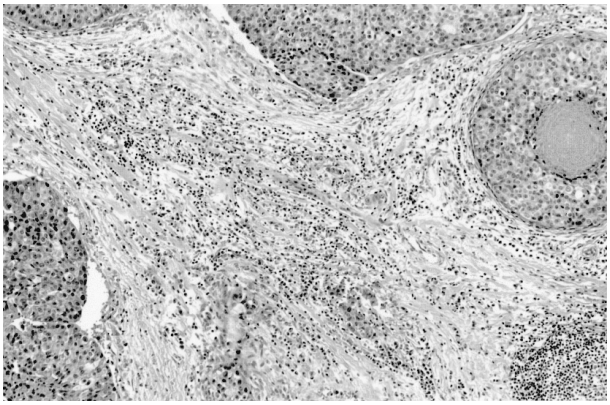

Figure 1. Histopathological examination of the left breast tumor.

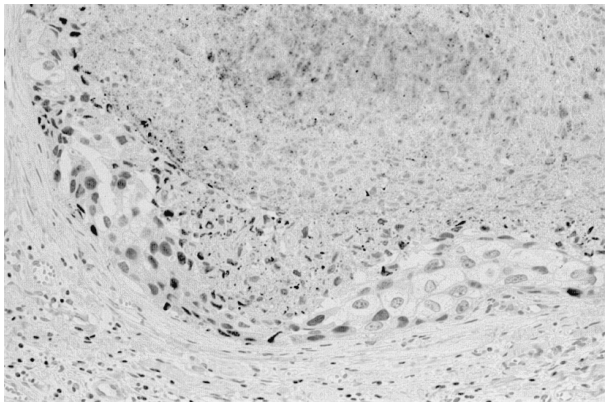

Figure 2. Immunohistochemical examination of the left breast cancer by progesterone receptor (PR).

in diameter (80%). Lymphatic invasion by tumor cells was negative but vascular invasion by tumor cells was positive. Positive p53 nuclear immunoreaction (RSp53, Nichirei, Tokyo, Japan) and strongly positive HER-2 overexpression (Dako Japan, Tokyo, Japan) by immunohistochemical staining were observed in this tumor. No adjuvant chemotherapy was given to the patient. Four years later, cranial bone and/or brain metastasis was suspected from a routine follow-up bone scintigram. The patient showed no symptoms or signs at that time. No other metastatic lesion was detected by abdominal ultrasonography and chest X-ray. Bone X-ray of the skull revealed no abnormalities. Magnetic resonance imaging (MRI) demonstrated a circumscribed lesion in the right parasagittal region with low signal intensity on T1-weighted imaging and with weakly high intensity on T2-weighted imaging. The tumor was homogeneously enhanced by gadolinium, whereas a metastatic tumor is not homogeneously enhanced. Angiography demonstrated a hypervascular mass in the same region. These imagings revealed that the tumor was suspicious of meningioma of the right parasagittal region. However, there was a possibility of a solitary brain metastasis. Tumor markers (CEA, CA15-3, ST-439) were all within the normal ranges. A complete tumor removal was performed in June 2000. Histologically, this brain tumor was composed of spindle cell proliferation and increasing collagen bundles. It was a transitional-type meningioma (meningotheliomatous type and fibrous type) without malignant findings (Fig. 3). ER was negative but PR was positive also in this tumor (Fig. 4). The patient is currently well 6 years after the initial surgery for breast cancer.

DISCUSSION

We have two other patients with probable meningiomas subsequently developed after primary breast carcinoma. One of these two breast cancers was PR-positive despite the lack of ER, just as in the present case. Course observation was selected for these two patients because of the meningioma-like masses with stable size by imaging modalities and no symptoms or signs. Also seven (8.3%), including this patient, of 84 patients whose meningiomas were removed at our hospital from May 1981 to June 2000 had undergone surgical treatment for breast cancer. The remaining six patients except for this one had been treated at another hospital. Therefore, the data were not available in detail. The clinicopathological characteristics of the three patients with breast cancer and meningioma treated at our hospital are summarized in Table 1.

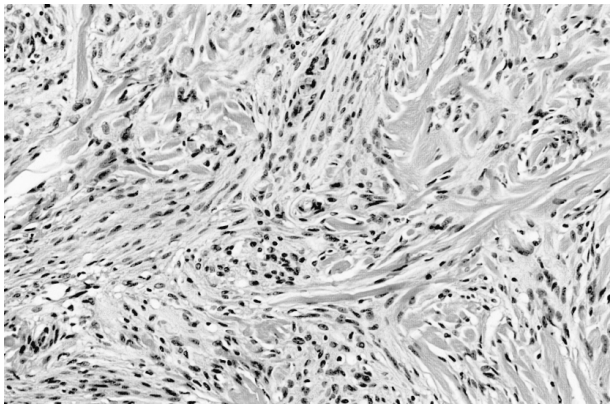

Figure 3. Histopathological examination of the brain tumor.

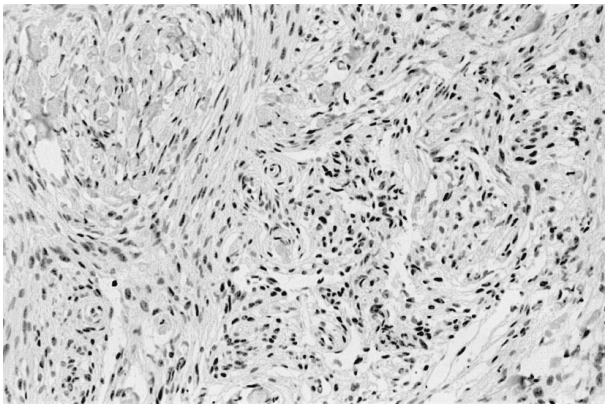

Figure 4. Immunohistochemical examination of the meningioma by PR.

Table 1. Clinicopathological features of three breast cancers in patients with meningioma

Case	Age (years)/ gender	TNM clinical classification	Histological classification	Grade*	Immunological finding sHER-2/p53†	Hormone receptor ER/PR‡	Treatment for meningioma
1	53/F	T2N0M0	Invasive ductal carcinoma Predominantly intraductal Poorly differentiated	3 (3–3–3)	(+)/(+)	(–)/(+)	Operation
2	59/F	T2N0M0	Adenosquamous cell carcinoma Well differentiated	2 (2–2–2)	(–)/(–)	(–)/(–)	Follow-up
3	70/F	T1N0M0	Invasive lobular carcinoma Intraductal	2 (1–3–1)	(–)/(–)	(–)/(+)	Follow-up

F, female; (–), negative; (+), positive. *Histological grade (nuclear–structure–mitosis). †HER-2 overexpression/p53 nuclear immunoreaction. ‡ER, estrogen receptor; PR, progesterone receptor.

It has been reported that breast cancer is the second most common cause of intracranial metastases (4). We previously reported seven cases of breast cancer recurrence limited to the central nervous system (CNS) without other visceral metastases (5). In that study, premenopausal patients with negative hormone receptor status were more likely to develop this kind of recurrence, regardless of the histological type.

As we reported here, a patient who has symptoms and signs suggesting a space-occupying lesion of the central nervous system after treatment for breast cancer does not always have brain metastases. Many case reports have suggested an association between breast cancer and meningioma (1,4,7–9). On the other hand, Backhouse et al. reported a case with optic nerve breast cancer metastasis mimicking meningioma (10).

Meningiomas occur twice as frequently in women as in men (4). In addition, some of the meningiomas were reported to express more PRs than ERs (11). Grunberg et al. reported the usefulness of anti-progesterone for recurrent meningiomas (12). Rona et al. reported that 64% of 33 meningiomas examined showed some level of progesterone receptor messenger RNA expression with which the immunohistochemistry data correlated well (13). Also, the resected meningioma in this report expressed weakly positive PRs in spite of the ER negativity, just like the hormone receptor status of the primary breast cancer in the present patient. Blankenstein et al. reported estrogen receptor-independent expression of progesterone receptor in human meningioma (14). Only one group described the ER and PR status of both breast cancer and meningioma of nine patients who developed meningioma diagnosed by surgical materials after resection of breast cancers (15). They reported two initial breast cancers and four subsequent meningiomas in nine of their cases that were positive for PR assay. In their report, all patients were alive after 1–11 years follow-up. Based on these findings, a hormonal interrelationship, particularly progesterone, is suggested for breast cancers and meningiomas. Meanwhile, alterations of the BRCA1 and BRCA2 genes are not common pathogenetic events in the development of meningiomas (16). There was no evidence for PTEN mutations in families with breast cancer and brain tumors (17). Further studies will be required to clarify the hormonal relationships between breast cancers and meningiomas.

The onset and types of neurological symptoms of metastatic breast cancer and intracranial meningioma are so similar that it is difficult to differentiate them (15). As in this case, Lee et al. documented two meningiomas detected incidentally by bone scintigraphy (18). Computed tomography (CT), magnetic resonance imaging (MRI) and angiography may be the useful diagnostic imaging modalities for this type of tumor (15,19). It is important to differentiate a CNS metastasis from a meningioma, which is a curable condition.

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