〈Case Report〉

A Case Report of Matrix-Producing Carcinoma of the Breast during Lactation
― A secondary publication ―

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ABSTRACT Matrix-producing carcinoma (MPC) of the breast is relatively rare. We report on a case of MPC of the breast during lactation. A female in her 30s noticed a lump in the upper inner and outer quadrants of her left breast 9 months into her pregnancy. She came hospital at one month after delivery. Ultrasonography revealed a hypoechoic tumor with an unclear border region. An MRI revealed a breast tumor approximately 19 mm in size, with dynamic studies demonstrating early contrast and ring enhancement. A core needle biopsy was performed, resulting in an histopathological diagnosis of invasive carcinoma [Estrogen receptor-, Progesterone receptor-, Human epidermal growth factor receptor 2(HER2)-; stage Ⅰ, T1cN0M0]. Breast-conserving surgery and a sentinel lymph node biopsy (SLNB) were performed. The SLNB was negative for cancer. Chemotherapy (FEC100, DTX75) and radiotherapy were performed as adjuvant therapies. Seventeen months after surgery, the patient is recurrence-free.

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INTRODUCTION

Matrix-producing carcinoma (MPC) of the mammary gland is a mix of the epithelial elements of carcinoma and a cartilaginous osseous stromal matrix[1]. It is categorized as a Type 1 subtype of metaplastic cancer[2,3]. This cancer is characterized

FOOTNOTES

This report is secondary publication which was previously published in Rinsho Nyusen in *Japanese*[1]. Since many literatures referred in original Japanese article were written and published in Japanese, the selected reports described in English were mainly referred.

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by the sudden transition of the tumor tissues to a mucosal matrix and/or cartilaginous osseous stromal matrix, with no transitional component, such as spindle cells or osteoclasts[2-4]. It is a relatively rare tumor and its occurrence is reported to be less than 1% of all breast cancers[5]. This case report and additional referential discussion is on our patient who had an MPC of the breast during lactation.

CASE REPORT

Patient

A female in her early thirties.

Main complaint

She recognized a tumor mass in her left breast during the 9th month of her pregnancy. The tumor mass was confirmed at her one month post-delivery checkup. She was soon after referred to Japan Community Healthcare Organization Kurume General Hospital for further examinations.

Previous medical history

Nothing in particular. She had just delivered her second child and was breastfeeding at the time of the initial diagnosis.

Family medical history

There was no history of breast or ovarian cancer in her biological family.

Initial Condition

An approximately 2 cm sized tumor mass was palpable in the left upper inner and outer quadrants, which had a clear border with a smooth surface, and mobility was positive. No tumor was palpable in the axillary lymph node.

Blood biochemistry finding

Tumor markers such as CEA and Ca15-3 were in the normal range (0.7 and 11.4 ng/ml, respectively). Other blood tests and biochemistry findings showed no abnormalities.

Mammography Finding

The background parenchymal enhancement (BPE) showed a dense breast. An asymmetric density was found in the left U/0 area (Category 3) (Fig. 1).

Ultrasonographic finding

Ultrasonography revealed a hypoechoic tumor mass of 16.5 x 19 mm with a clear border upper inner and outer quadrants of the left breast, partially

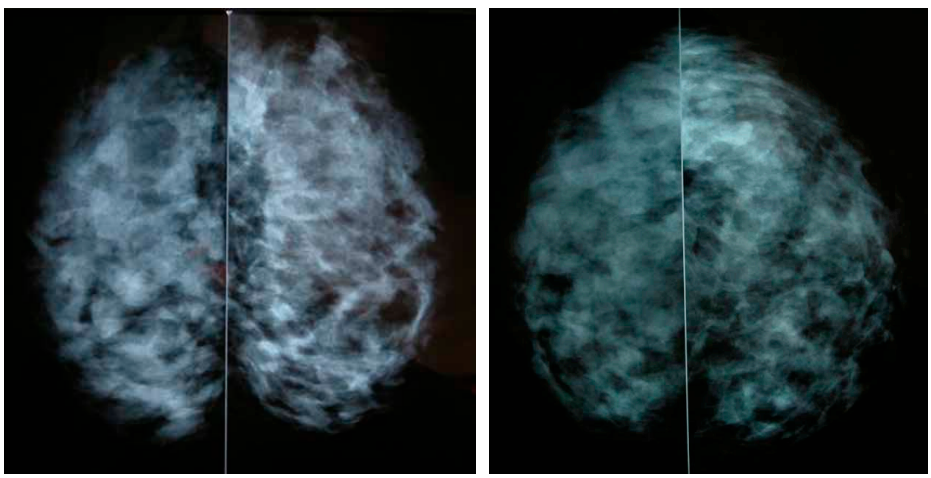


Fig. 1. Mammography (MLO, CC)
An asymmetric density was found in the left U/0 area.

rough. The posterior echo showed irregularity and the anterior border was unclear.

The tumor had a rich blood flow and the histological type was assessed as fibroadenoma and solid tubular carcinoma (Category 3b) (Fig. 2). The patient was lactating and the test images showed that fibroadenoma was the most likely. Thus, a cytology test was performed first, instead of a biopsy.

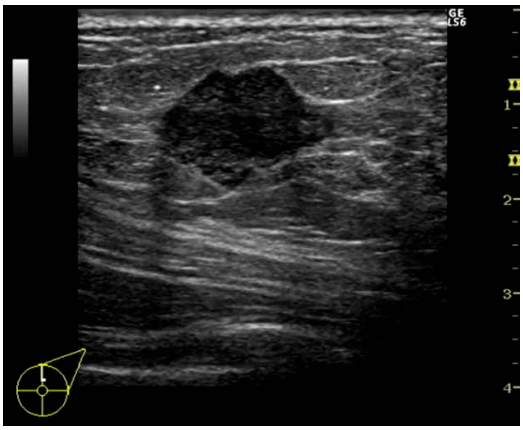


Fig. 2. Ultrasonographic finding
Ultrasonography revealed a hypoechoic tumor mass of 16.5 x 19 mm with a clear border upper inner and outer quadrants of the left breast, partially rough. The posterior echo showed irregularity and the anterior border was unclear.

Breast MRI finding

MRIs demonstrated a contrasted tumor mass in the left breast from the early phase, which was compatible with breast cancer. A T1-weighted image showed a high signal density around the tumor mass, rim enhanced, and a T2-weighted image showed an area with high to low internal density (Fig. 3).

Thoraco-abdominal contrast enhanced CT finding

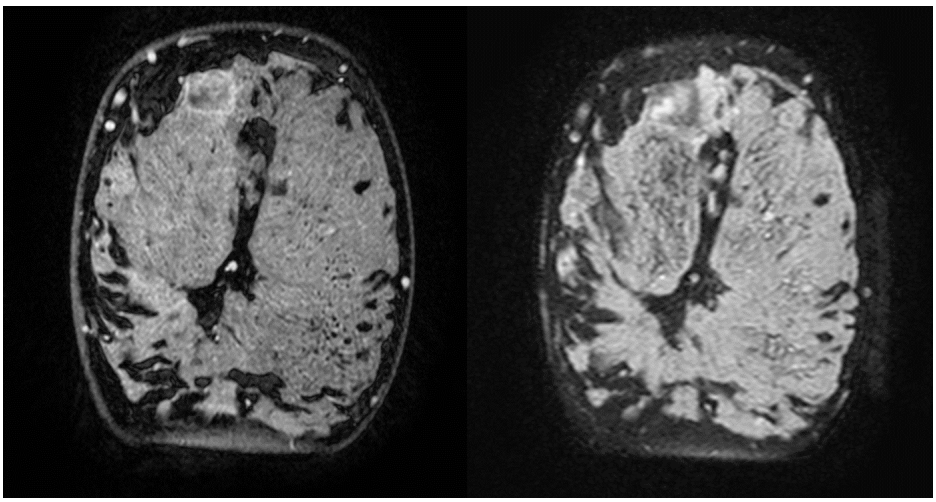
A tumor mass with contrast effect was found in the upper inner and outer quadrants of the left breast from the early phase. There were no enlarged lymph nodes that might signal a metastasis to the axillary lymph nodes. No other metastases were found.

Bone scintigraphic finding

No bone metastasis was found.

Fine needle aspiration cytology finding

Category: malignant. Increased nucleocytoplasmic ratio. Cells with increased chromatin in the nuclei found both sparsely and conglomerately in the necrotic background. Enlarged nucleus and



T1-weighted image T2-weighted image

Fig. 3. Breast MRI finding (T1W1, T2W1)
MRIs demonstrated a contrasted tumor mass in the left breast from the early phase. A T1-weighted image showed a high signal density around the tumor mass, rim enhanced, and a T2-weighted image showed an area with high to low internal density.

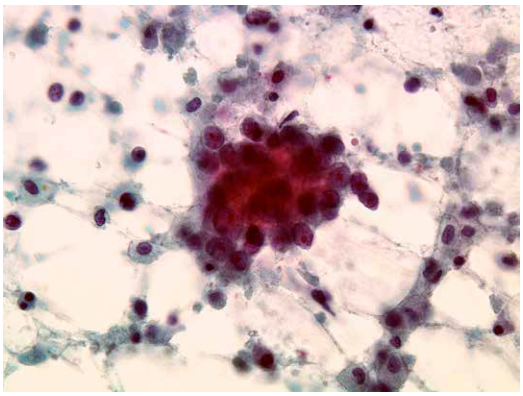


Fig. 4. Fine needle aspiration cytology finding
Cells with increased chromatin in the nuclei found in the necrotic background. Enlarged nucleus and columnar cells were found.

columnar cells were also found (Fig. 4).

Core needle biopsy

Category: malignant. Histological type: invasive breast ductal carcinoma. The cancer was triple-negative; estrogen receptor-negative (ER Allred score: 0), progesterone receptor-negative (PgR allred score: 0), and human epidermal growth factor receptor 2(HER2) negative (0). The mitotic count had 40 in 10 views (mitotic index 4), and an invasion of high grade nuclear atypical tumor cells was identified (nuclear grade: 3, (nuclear atypia: 3, mitotic count: 3)). The surrounding area of the carcinoma had a cellular territory with a matrix-like stroma.

From all of the above, the patient was diagnosed with left breast cancer, T1cN0M0 stage I. Breast-conserving surgery and a sentinel lymph node biopsy were performed. Axillary dissection was unnecessary due to the negative results for both touch smear cytology and one-step nucleic acid amplification for the sentinel lymph node.

Macroscopic finding

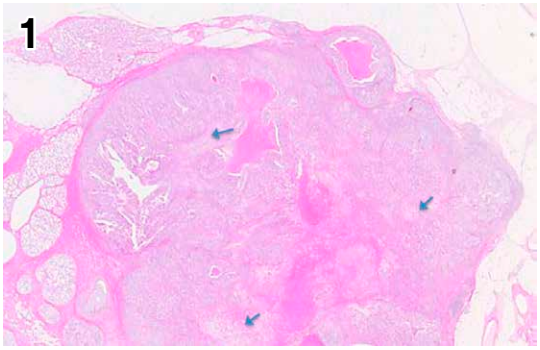
The solid, white tumor was 15 mm x 14 mm. The inside had partial necrosis (Fig. 5).

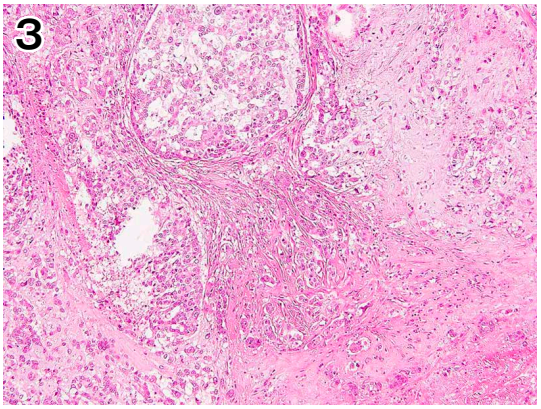
Fig. 5. Removed specimen
The solid, white tumor was 15 mm x 14 mm. The inside had partial necrosis.

Histopathological finding of the removed tumor

An oval growth in the tumor was found to have lactating mammary glands in the background. The tumor component was located in the peripheral area and the tumor component had a matrix-producing and necrosis towards the center area (Fig. 6-1). Cancer cell growth of a relatively high grade nuclear atypia was found and lactating mammary glands in the background in the peripheral area (Fig. 6-2). Cartilaginous osseous stromal matrix-producing was found in the area surrounding the cancer cells, which resulted in a diagnosis of MPC, a rare form of metaplastic cancer (Fig. 6-3). Vessel invasion was not found.

Immuno-histochemistry tests were ER negative, PgR negative, and HER2 negative. Histopathological stump was also negative.





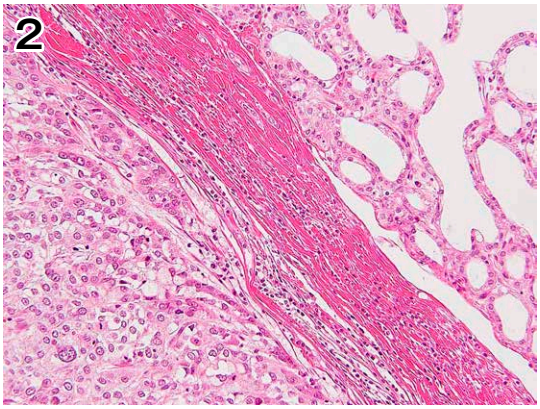


Fig. 6.
1 Histopathological finding of the removed tumor Magnified images
An oval growth in the tumor was found to have lactating mammary glands in the background. The tumor component was located in the peripheral area and the tumor component had a matrix-producing (carcinoma?) and necrosis towards the center area (shown with arrow ←)

2 H.E. Stain (high magnification view)
Cancer cell growth of a relatively high grade nuclear atypia in the peripheral area and the change of the mammary glands in the background.

3 H.E. Stain (medium magnification view)
Cartilaginous osseous stromal matrix-producing (carcinoma?) was found in the area surrounding the cancer cells.

Therapeutic course

For post-operative adjuvant therapy, four courses of FEC100 therapy (5-FU 500 mg/m^2, Epirubicine 100 mg/m^2, Cyclophosphamide 500 mg/m^2), and four courses of DTX75 therapy (DTX 75 mg/m^2) were performed. Following chemotherapy, radiotherapy (50 Gy total) was performed on the residual breast. Seventeen months after surgery, the patient is recurrence-free.

DISCUSSION

MPC was first reported by Wargotz *et al.* in 1989[2]. MPC is characterized by an overductal carcinomatous component with a direct transition to parts with cartilaginous or osseous differentiation which lack an interspersed spindle cell component[2,3]. The pathogenesis, progress, standardized treatment protocols and prognosis of MPC are limited because of a lack of large scale clinical studies.

There is a report of poor prognosis for MPC when compared with invasive ductal breast cancer

in general, and there is also a report of relatively preferable prognosis among metaplastic cancers[6]. Under immuno-histopathological examination, MPC is usually triple negative[3], and the MPC in this case report was indeed a triple negative breast cancer (TNBC).

A strong ring enhancement in the CTs and MRIs in many cases is one of the diagnostic imaging characteristics. This means that a greater portion of the epithelial carcinoma component exists in the tumor peripheral area and a larger cartilaginous osseous matrix component exists in the center[7]. Therefore, angiogenesis that brings enhancement effectiveness seems to be distributed in the tumor peripheral area. A similar ring enhancement was found in this case as well.

It is also reported that ultrasonographic images of MPC often demonstrate a ring state[7]. The tumor based matrix component and collagenous fibers intricately cross with each other and become a reflection source with a high echo[8, 9]. On the other hand, the tumor peripheral area where tumor cells are dense demonstrates a low echo. Thus, a ring can be observed. The matrix component of the patient in this case report was mixed with the tumor component and therefore didn't show the typical ring state[8, 9]. However, after a more detailed examination of the patient's ultrasonography, the tumor peripheral area showed a lower echoic image compared to the internal echo, and the cell density of the tumor mass was higher in the peripheral area. These findings were compatible with MPC.

The occurrence of breast cancer during lactation is reported to be relatively rare at less than 3%[10]. In recent years, there was a report indicating a relationship with the BRCA1 gene. Breast cancer during lactation is said to have no characteristic histological type, but often shows triple-negative. We could find no published reports about MPC of the breast during lactation. There are more than a few patients with breast cancer during lactation who go undiagnosed. Finding a cancer by palpation or mammography is difficult due to the development of mammary gland tissues during lactation, and there could also be separate mammary gland issues caused by breast feeding. Therefore, breast cancer is sometimes found in an advanced stage. Breast cancer during lactation has been recognized for its poor prognosis[10]. However, a recent report has stated that if the disease is diagnosed at an early stage, the prognosis is as good as that of breast cancer for patients of a similar age[11]. Lactating mammary glands during the perioperative period can be a concern, but with proper care, post-operative inflammation and wound infection can be prevented. Patients at our facility take an anti-prolactin and cool down the breasts to suppress the amount of breast milk production.

The number of late marriages and late childbirths is increasing, meaning that the number of breast cancers during pregnancy and the subsequent lactating period will also likely increase. Therefore, a larger variety of histological types will be expected in the future.

Not only are there very few reported cases on MPC of the mammary glands, but there also aren't any established treatments nor well described biological characteristics or prognoses. It is the same with breast cancer during lactation. No gene search has been done in this case on these specific condition, and more cases need to be collected to be examined in the future to study the relationship with juvenile breast cancer and BRCA mutation.

CONCLUSION

MPC is a very rare metaplastic breast variant type and currently there aren't sufficient findings or expertise about it. We could not locate any previously published literature on MPC of the breast during the lactating period and therefore are sharing our experience in this case report.

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