A Case of Mucinous Carcinoma of the Bilateral Breasts

Minoru MORIWAKI, Shigeo NOHARA, Tetsuji KUNIYASU, Mutsumi SAKURADA, Hajime ORITA, Hiroshi MAEKAWA, Koichi SATO and Takeo MAEKAWA
Department of Surgery, Juntendo Shizuoka Hospital

Abstract
We herein report a case of bilateral mucinous carcinoma, a very rare type of breast cancer. The patient was a 54-year-old woman with a large mass in her right breast. And we found a smaller mass in her left breast on imaging, but she had not noticed this tumor.

Key words: breast cancer, mucinous carcinoma, bilateral breast cancer

Introduction
Mucinous carcinoma is rare, accounting for 4.6% of all breast cancers. Bilateral mucinous carcinoma is even rarer, occurring in 0.05% (1/1800) of breast cancer cases. We herein report a case of bilateral mucinous carcinoma of the breast.

Case Report
A 54-year-old woman presented that she had noticed the breast lump for 1 year and it had been growing rapidly for 6 months at that stage.

The initial examination revealed a large mass in the right breast that appeared to contain fluid on palpation (Fig. 1a). Laboratory data was within normal limits and tumor markers were normal.

Mammography (MMG) was not conducted because the tumor was too large. Ultrasound (US) revealed an 8.0 × 12.0 cm mass in the right breast (Fig. 1b, c). The tumor had clear margins. It consisted of a hypoechoic area, a hyperechoic area, and contained a large volume of fluid. The left breast contained a heterogeneous 2 × 1.3 cm mass, with strong echo behind the tumor (Fig. 1d).

Computed tomography (CT) revealed that the large mass in the right breast had low density, and had uniform contents (Fig. 2a, b). Enhanced CT showed the tumor mainly consisted of fluid with an area of high density (Fig. 2c, d). The left breast mass had uniformly high density (Fig. 2b, d).

Magnetic resonance image (MRI) examination of the right breast showed that the tumor had low intensity on T1-weighted imaging. T2-weighted images revealed a high intensity tumor containing a large volume of fluid (Fig. 3a, b). T1-weighted images of the left breast showed a uniform high-intensity mass (Fig. 3c, d).

Positron emission tomography (PET)-CT was performed, using 2-fluoro-2-deoxy-D-glucose (FDG) as the tracer. FDG accumulated in both breasts (Fig. 4a, b, c, d).

Bilateral needle aspiration was conducted and cytological examination revealed bilateral mucinous carcinoma. A biopsy was also taken from the right breast, but this yielded an inadequate specimen. Since the patient wished to have the tumors excised, and because chemotherapy is ineffective against mucinous carcinoma, we decided to operate. We performed a right mastectomy and axillary lymph node clearance while conserving the pectoral muscle. On the left side, we performed a partial mastectomy and dissected the sentinel lymph nodes. The postoperative course was successful, and the patient was discharged after 2 weeks.

Visual inspection of the right breast tumor revealed a multilobular mass containing large quantities of mucus (Fig. 5a). Histological examination
Fig. 1  a On visual inspection a large tumor in the right breast can been seen from the skin discoloration. Palpation revealed a soft spongy mass similar to a cystic tumor.  b, c Ultrasound (US) of the right breast tumor showed a distinct margins, and a hypoechoic mass containing a hyperechoic component.  d US of left breast revealed a tumor with a distinct margins, and heterogeneous contents. The back echo was very strong.  

Fig. 2  a, b Computed tomography (CT) reveals a uniform large tumor of the right breast.  c, d Enhanced CT demonstrates a tumor with slightly high density in an area of partial high density. There is some bleeding of the right breast tumor. The left tumor appears as a high-density mass.
Fig. 3  a, b  Magnetic resonance imaging (MRI) of the right breast reveals a low-intensity mass on T1-weighted imaging and a high-intensity mass on T2-weighted imaging.  c, d  MRI of the left breast tumor reveals a high-intensity mass on the T1 imaging.

Fig. 4  a  Whole body FDG-PET demonstrates a ring-shaped accumulation around the right breast tumor (arrow). There is a small spot of accumulation in the left breast near the nipple (arrow).  b  The lateral view of the right breast tumor, shows the shape of the accumulation more clearly (arrow).  c, d  PET-CT reveals high-density masses in both breasts (arrows).
Mucinous Carcinoma of the Bilateral Breasts

Fig. 5  a Visual inspection of the excised right breast tumor shows a dark red-brownish mass containing a large volume of mucus within a multilobular structure.  b The right breast tumor was positive for estrogen receptors (ER+) (×200).  c The right breast tumor was negative for herceptin receptor antibodies (HER-2-neu-) (×200). The histological diagnosis of the right breast tumor was pure-type mucinous carcinoma, because of consisting large mucinous substances.

Fig. 6  a, b Histological examination of the right breast tumor reveals cancer cells among copious mucin (hematoxylin-eosin (HE) ×100). Cancer cells appear like floating islets in the mucus (HE ×200).

demonstrated cancer cells floating inside mucinous material (Fig. 6a, b). Accordingly, the right breast tumor was diagnosed as a pure-type mucinous carcinoma.

The left tumor was a brownish-red mass on cross-section (Fig. 7a), and histological examination revealed a mixture of floating cancer cells with mucus and numerous ductal cancer cells (Fig. 8a, b). The tumor was therefore diagnosed as a mixed-type mucinous carcinoma.

The immunopathological diagnosis was ER(+), PgR(+), and Her-2-neu(−) bilaterally (Fig. 5b, c, Fig. 7b, c). No metastasis of the axillary lymph nodes was reported. We will continue to follow-up the patient for any future developments.
Discussion

Mucinous carcinoma is a rare form of breast cancer, accounting for 4-6% of breast tumors. Bilateral mucinous carcinoma is even rarer (0.03% of breast tumors)\(^8\). Mucinous carcinoma is categorized histopathologically into two types, a pure type and a mixed type. These two subtypes do not generally differ in size. Low-grade papillotubular breast cancer is the origin of 65% of mucinous carcinomas, most of which are pure type. On the other hand, the mixed type generally arises from invasive micropapillary carcinoma and solid-tubular carcinoma\(^9\), and should therefore be treated like an ordinary invasive ductal carcinoma\(^9\).

Pure type mucinous carcinoma has a low rate of recurrence when smaller than 3 cm\(^2\). However, larger tumors are likely metastasize to the axillary lymph nodes and have a high rate of recurrence\(^6\).

In the present case, the pure-type tumor in the right breast was very large (14 × 12 × 7 cm), and we therefore anticipated axillary lymph node metastasis. However, histopathological examination re-
Mucinous Carcinoma of the Bilateral Breasts

revealed this tumor had vessel infiltration, but no axillary lymph node metastasis (0/6).

The left tumor was smaller than 3 cm, and was diagnosed as a mixed-type mucinous carcinoma without lymph node metastasis.

The present patient requires careful follow-up in order to detect any recurrence or metastasis in future.

The right breast tumor grew rapidly for 6 months; we attribute this to internal bleeding, as visual inspection of this tumor showed a considerable blood-stained component.

On US, most cases of mucinous carcinoma display a lobular pattern and clear margins with a strong back echo and in 20% cases of all, this tumor have calcification5. In the present case, the right tumor showed a lobular pattern with a clear margin line, but the back echo was weak for such a large tumor. Moreover, no calcification was detected, and much of this mass consisted of fluid.

The tumor in the left breast was discovered when the patient underwent US to investigate the contralateral tumor. This tumor was much smaller, and was mixed type. It had distinct margins consisting of an irregular shaped mass and had a strong back echo.

CT revealed that the right breast tumor had low density and was a uniform mass; enhanced CT revealed a high-density mass with large volumes of fluid. The left breast tumor was also a high-density mass but with no fluid and it is similar to previously reported CT findings.

MRI findings in mucinous carcinoma usually include a high intensity, heterogenous mass on T2-weighted images5. In the present case, T1-weighted imaging of the right breast showed a low-intensity mass, while T2-weighted imaging showed a high-intensity mass containing large volumes of liquid. We therefore thought mucinous carcinoma of the right breast was unlikely before needle cytology.

The left breast tumor was a high intensity mass on MRI, and we were unable to diagnose mucinous carcinoma until cytology was conducted because it was too small to find the fluid component. Generally, mucinous carcinoma containing large amounts of mucus tends to show a high intensity mass on T2-weighted MRI images. So this case of the right breast tumor was imaged high intensity mass on T2-weighted MRI. Dynamic curb on MRI is useful for diagnosing benign or malignant lesion. The malignant lesions were mostly spiculated and early phase enhancement rate was high on dynamic curb. But the benign lesions were smooth and an early phase enhancement rate was low, and slow increasing high at late phase.

In our case, the dynamic curb seen on the MRI image shows a low early phase and slowly increasing pattern at late. So the dynamic curb of the right breast tumor showed a similar pattern like a benign lesion.

We performed PET-CT of both breasts. PET is reported to have 89% accuracy in detection of breast cancer5; however, it is unlikely to detect lesions smaller than 10 mm, lobular carcinoma, or ductal carcinoma in situ7. This is because slow-growing and well-differentiated cancers have lower glucose uptake.

A delayed PET-CT image5 is reported to be useful in detecting breast tumors. Boerner5 reports that a 3-hour delayed scan is optimal after FDG administration. However, we usually perform a 2-hour delayed scan because we think it is the best for showing decreasing tracer levels5, so we used this protocol at this case.

In this case, FDG accumulation occurred in both breasts; this was in the form of a ring around the right mass and as a uniform accumulation in the left mass. The tracer did not appear to accumulate in the fluid component of the right breast tumor.

The combination modality of PET-CT is useful in diagnosing a malignant tumor or metastasis. The present case suggests that PET-CT will become more widely used in searching for a primary breast tumor, as well as in detection of metastasis. Nonetheless, this modality was unable to diagnose mucinous carcinoma in the present case.

Histological examination of the right tumor revealed floating cancer cells among copious mucinous mucus, leading to a diagnosis of pure-type mucinous carcinoma.

As mentioned above, pure-type mucinous carcinoma larger than 3 cm usually has a poor outcome because of axillary lymph node metastasis and increased vessel infiltration. In the present case, we chose to perform right mastectomy and to remove the axillary lymph nodes. The left breast tumor appeared smaller than 3 cm on imaging, and mucinous carcinoma was diagnosed by needle aspiration be-
fore operation. We therefore performed a partial mastectomy and removed the sentinel lymph nodes. The histological findings were a combination of invasive ductal cancer cells and mucinous areas, leading to a diagnosis of mixed-type mucinous carcinoma. This tumor tends to have a poor prognosis, similar to that of invasive ductal cancer\(^{11}\). Hence treatment should be as for invasive ductal cancer.

As the right breast tumor was very large, we initially suspected that the left tumor had metastasized from it. However, we now think this unlikely because cancer cells were present in the bilateral intramammary ducts, suggesting that the two cancers had different origins.

Probability of recurrence is low for pure-type mucinous carcinoma but high for mixed-type mucinous carcinoma. In addition, the immuno-pathological diagnosis was ER(+), HER-2-neu(−). Hence, according to the 2005 St. Gallen guidelines, the patient was defined as being at intermediate risk in terms of requirement for post-operative therapy. We didn’t decide whether post-operative chemotherapy or anti-hormonal therapy should be performed in cases such as the present.

We encountered a patient with a large tumor in the right breast, in whom investigations revealed bilateral mucinous carcinoma. Mucinous carcinoma with a large pure type in the right breast and a mixed type in the left breast appears very rarely in the literature. PET-CT was helpful in diagnosing this malignancy, but it was unable to detect the mucinous component.

References