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Case Report

Advanced magnetic resonance imaging of mixed mucinous breast cancer: A case report [☆]

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ABSTRACT

Well-differentiated adenocarcinoma, a rare subtype of infiltrating ductal carcinoma, is a kind of mucinous cancer of the breast. It accounts for around 2% of all invasive breast cancers. The average age of presentation is 65–70 years, whereas women under the age of 35 account for 1% of cases. They are classified as pure or mixed carcinomas depending on the amount of mucin they include; knowing the difference is crucial for prognosis and therapy. Despite the lack of sufficient proof, the primary therapy for breast cancer is still surgery. Special forms of breast cancer are still being treated, although this is still a contentious topic. In this article, we intended to present a case of a mixed mucinous carcinoma in a 52-year-old female who was assessed by advanced magnetic resonance imaging.

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Introduction

Mucinous carcinoma of the breast, also known as colloid breast cancer, which makes up around 2% of all breast carcinomas, is a very uncommon subtype of breast cancer according to the most recent WHO classification of breast malignancies [1]. Mucinous breast cancer starts in the milk duct of the breast

before spreading to the tissues near the duct, just like other forms of invasive ductal cancer. Pure type mucinous carcinomas and mixed type mucinous carcinomas are the 2 kinds of mucinous carcinomas, which are differentiated by the tumor's cellularity. The mixed form also includes an infiltrating ductal epithelial component without mucin, whereas the pure type only comprises of tumor tissue with extracellular mucin synthesis in over 90% of the tumor [2]. A low likelihood of lymph

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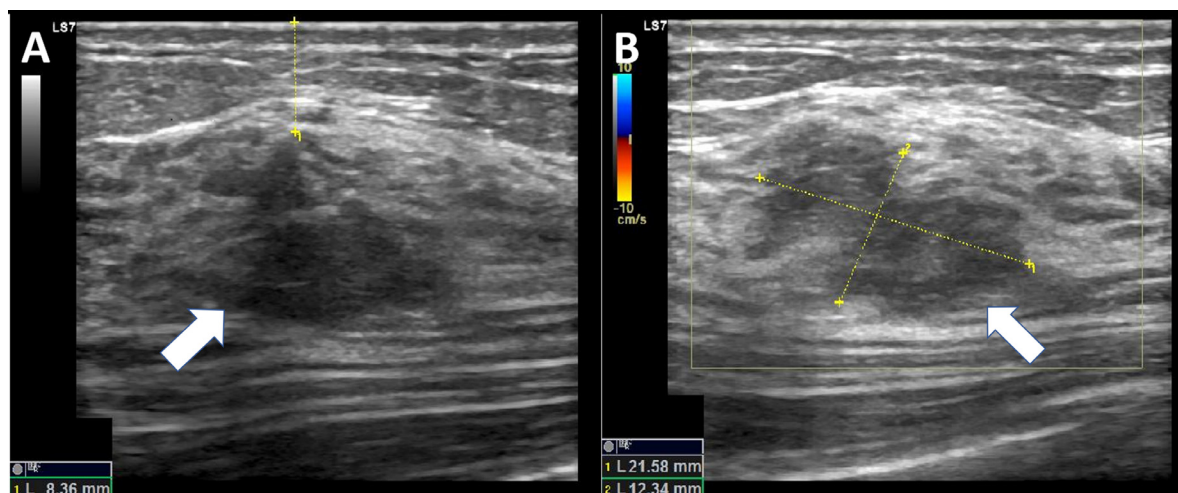


Fig. 1 – Ultrasound images. (A) The distance from the skin to the lesion (arrow) was 8 mm. (B) The lesion (arrow) was hypoechoic and had an irregular shape.

node metastases and a low recurrence rate make mucinous breast cancer a good candidate for treatment. Histopathological analysis is the primary foundation for the precise identification and categorization of mucinous breast carcinomas. In this article, we intended to portrait a 52-year-old Asian woman with a mixed mucinous breast cancer after surgery. Notably, this is possibly the first case that mucinous breast carcinoma was comprehensively investigated by advanced magnetic resonance imaging (MRI).

Case description

A 52-year-old Vietnamese postmenopausal female with normal family and personal medical profile felt painful in the right breast. Clinical examination revealed a small regular mass in the upper outer quadrant of the right breast without ipsilateral axillary lymph nodes. Ultrasonography revealed an irregularly shaped, hypoechoic solid lesion at the 1 o'clock position in the right breast, measuring 22 × 13 mm in diameter. The distance from lesion to skin surface was about 8 mm (Fig. 1). In addition, there were no right axillary lymph nodes on ultrasonography. The lesion was classified as BI-RADS 4C. MRI revealed a hypointense, irregular mass measuring 28 × 19 × 15 mm in the right breast laterally on T1-weighted image without contrast agent that showed mild enhancement in contrast sequences and a strongly hyperintense sequence on T2W with fat suppression without axillary lymph nodes (Fig. 2). The lesion had the apparent diffusion coefficient value of $1.6 \times 10^{-3} \text{ mm}^2/\text{s}$ (Fig. 3). The perfusion of lesion was progressively enhanced without wash-out phenomenon (Fig. 4). Magnetic resonance spectroscopy revealed that there was the elevation of the choline peak. The patient underwent core needle biopsy of the right breast mass in our hospital, and the histopathological findings were mixed mucinous breast carcinoma (Fig. 5).

Immunohistochemical analysis of lesion revealed that 90% of the tumor cells were strongly positive for estrogen receptor (ER) and progesterone receptor (PR), but negative for HER2. Tumor board fully decided that a mastectomy should be performed. A modified radical mastectomy (retains the areola and nipple) of the right breast and axillary nodes clearance was carried out. Pathological findings showed a residual mass of 25 mm of mucinous carcinoma with negative surgical margins. Sentinel lymph node was negative for metastasis. The pathological staging was also as T2N0M0. Postoperatively, she continued to receive the 6 cycles of paclitaxel ($180 \text{ mg}/\text{m}^2$) every 3 weeks. The toxicities were tolerable. Molecular screening showed a score of 2.7 classifying it as a low risk, reason why this patient was treated with tamoxifen because her positivity to receptors and low risk showed in molecular assay. The final clinical and pathological stage IIA was confirmed. The patient is still alive without evidence of relapse.

Discussion

Postmenopausal women with a median age of 70 years are more likely to develop mucinous breast cancer [3]. Younger individuals with an early start of 31 years old had fewer cases recorded. Due to its positivity to ER and PR and negative to HER receptors, this tumor provides an outstanding prognostic histological variation [1–3]. Mucinous breast cancer has several causes, including food, hormones, and reproductive factors.

Mucinous carcinoma often develops slowly and can be quite big when it is discovered. This can be explained by the fact that upon examination, the tumor's mucinous substance does not feel hard or solid [4–6]. Most patients with mucinous breast cancer have a palpable breast lump when they first arrive. Fixation to the chest wall or skin is uncommon but has been documented in big lesions. A significant number of individuals are diagnosed as a result of mammographic abnormalities with extensive screening [1–4].



Fig. 2 – Conventional magnetic resonance images. (A) T1W image showed a hypointense oval lesion (arrow) and (B) T2W STIR showed a strongly hyperintense lesion (arrow).

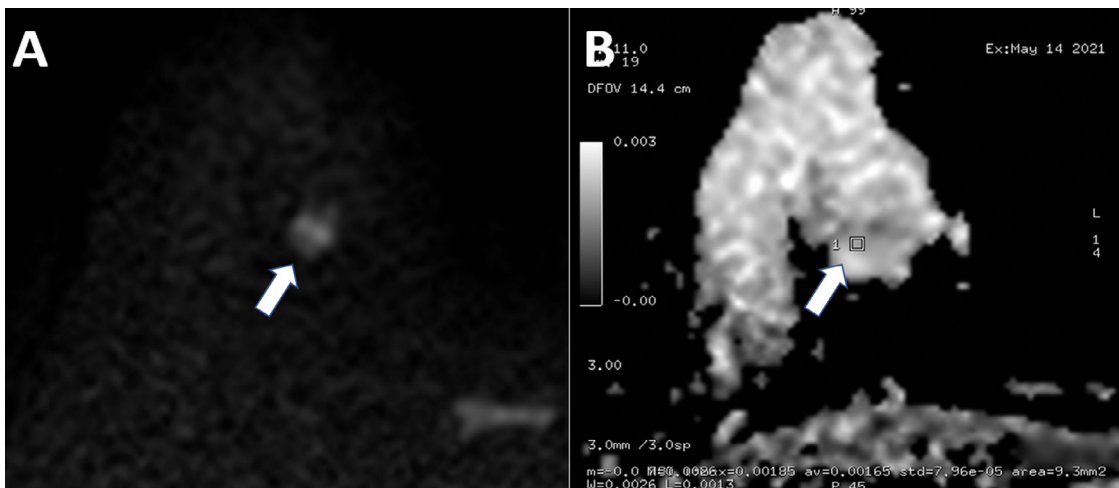


Fig. 3 – Diffusion-weighted imaging. (A) DWI image and (B) ADC map showed that this lesion was not restricted (arrow).

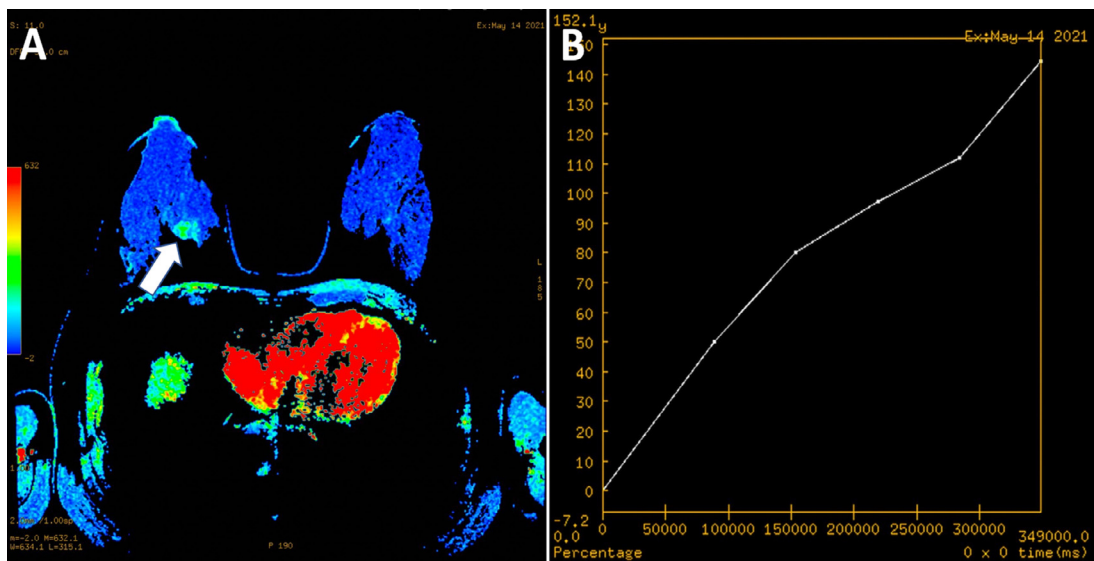


Fig. 4 – Perfusion-weighted imaging. (A) Perfusion map and (B) time signal intensity curve of the lesion (arrow) is gradually enhanced.

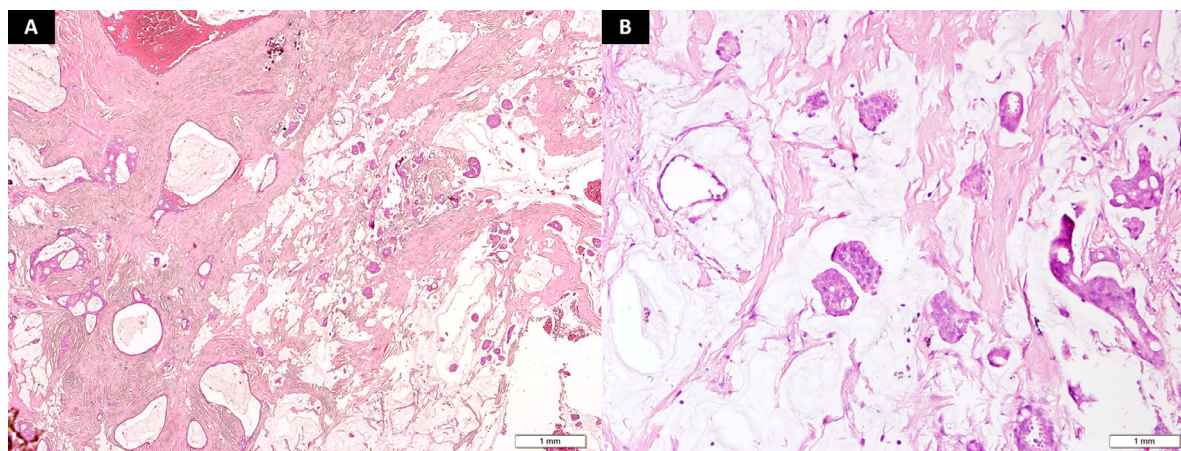


Fig. 5 – Variant that is highly cellularized with floating cell nests in mucin lagoons and large clusters of cancerous cells (H&E, $\times 40$ (A) and $\times 100$ (B)).

Breast lesions that are confined and lobulated on mammography are frequently found to be mucinous carcinomas. The diagnosis of a pure mucinous carcinoma would be more likely with a constrained margin [1,7–9]. Mucinous cancer typically appears as a complicated mass on ultrasonography that has microlobulation, vascularity, and distal enhancement. Based on the echogenicity, the histologic subtype of mucinous carcinoma can be predicted. Pure mucinous cancer has isoechoic masses, whereas mixed mucinous carcinoma exhibits hypoechoic masses [1,7,8]. A lobular form, rim or heterogeneous enhancement, a persistent pattern on the time-intensity curve, and homogenous significantly high signal intensity on T2-weighted images are all characteristics of mucinous carcinoma on an MRI [9]. The diagnostic images of our case were fully consistent with prior documents even though our histopathological findings were mixed mucinous carcinoma. We also believed that the comparative study based on advanced MRI should be performed to update novel knowledge between mixed and pure mucinous breast carcinoma.

Macroscopically, mucinous carcinoma of the breast is visually identified as a glistening, gelatinous tumor with pushing borders and a soft substance. Less than 1 cm to more than 20 cm (mean = 3 cm) are the sizes of the tumors. Microscopically, mucinous carcinoma is distinguished by cell nests floating in mucin lakes that are divided by fine fibrous septae harboring capillary blood vessels. The cell clusters may have tubular arrangements and vary in size and form. In classic mucinous carcinoma, nuclear atypia is typically minimal, although it can occasionally predominate together with mitoses [10,11]. Rarely there is an intraepithelial component that is micropapillary or cribriform. Large cell clusters in mucinous carcinoma, also known as hypercellular or type B mucinous carcinoma, frequently display neuroendocrine development. The traditional non-endocrine kind of mucinous carcinoma is type A, which has higher levels of extracellular mucin. Variants that are pure or mixed have been reported [10,11]. Admixture with aggressive cancer of no particular sort is the most typical. More than 90% of a pure tumor must be mucinous carcinoma. The in situ component might have a cribriform, papillary, or micropapillary pattern. The in situ carcinoma may occasion-

ally produce a lot of luminal mucus. In some instances, immunohistochemistry and specific stains can be used to detect neuroendocrine differentiation (Grimelius).

In terms of immunohistochemistry, the estrogen and progesterone receptors are often positive in mucinous carcinoma, but the expression of androgen receptors is minimal and HER2 is not amplified. There are reports of WT expression in both pure and mixed mucinous carcinomas. Among the MUC gene family, mucinous breast cancer expresses mostly MUC2 and MUC6 [10–12].

Comparing mucinous carcinoma to invasive ductal carcinoma, the former has a better outlook and less frequently develops lymphatic metastases. In 12%–14% of patients, axillary lymph node metastases develop [10–12]. A better prognosis is associated with pure mucinous cancer than mixed mucinous breast carcinoma. The 5-year survival rates without illness vary from 81% to 94% (the latter if lymph nodes are negative). Pure mucinous cancer may develop late distant metastases. Tumor size was identified as an independent predictive predictor but was found to be less important than nodal status in a multivariate study of 11,422 individuals with pure mucinous carcinoma [2]. Since mucin makes up the majority of the tumor volume, other studies have demonstrated that tumor size is not a significant predictive factor and does not affect survival [10–12].

Conclusions

A histological variation frequently seen in postmenopausal individuals is pure mucinous cancer. In this article, we illustrated a postmenopausal patient with mixed mucinous breast carcinoma along with advanced MRI characteristics. The significance of this case report is rooted in the timely and appropriate interdisciplinary care of this special breast cancer. Further study using advanced magnetic resonance imaging to compare between mixed and pure mucinous breast carcinoma should be executed.

Authors' contribution

Nguyen Minh Duc contributed to write original draft. Huynh-Thi Do Quyen, Cao Minh Tri, Nguyen Anh Huy, and Nguyen Minh Duc contributed to undergo diagnostic procedure, collect, and interpret the imaging. Cao Minh Tri, Nguyen Anh Huy, and Nguyen Minh Duc made substantial contributions to collect patient data and clinical data analysis. All authors have read, revised, and approved the final published version of the manuscript. All authors were responsible for submission of our study for publication.

Statement of ethics

Ethical approval was not necessary for the preparation of this article.

Data availability statement

All data generated or analyzed during this study are included in this article and/or its online supplementary material files. Further enquiries can be directed to the corresponding author.

Patient consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

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