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Mucinous carcinoma of the breast: A case report and comprehensive literature review

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Abstract
This is a rare histological type of breast cancer, mucinous carcinoma, which is reported to constitute between 1% and 4% of breast cancers. It has a favorable prognosis and there is no difference in treatment from other histological types. It is more common in older women and it has been found to have a favorable prognosis. This article reports the case of a 54-year-old with a one month's history of an illness, which started with a slow growing and progressive nodule in the lower outer quadrant of left breast for which a core biopsy was done. The biopsy showed mucinous adenocarcinoma, Grade II of SBR.

Keywords: Breast cancer, mucinous breast carcinoma, imaging findings, prognosis, follow-up

Introduction

Breast cancer is one of the most prevalent malignancies and is responsible for about one-quarter of malignancies in females in general [1]. In addition to the predominant subtypes, such as ductal and lobular carcinoma, there are several rarer histological variants, notably, mucinous carcinoma according to the last World Health Organization (WHO) classification [1].

It accounts for 1% to 4% of breast malignancies and is characterized by high mucin production [2, 3]. Two histologic types have been distinguished according to tumor cellularity: mixed and pure [4]. Epidemiologic characteristics, pathogenesis, and clinicopathologic presentation differ in comparison with cases of other histologic types of carcinoma of the breast [3]. It tends to present in postmenopausal age, with an average age of 70 years, and is characterized by a prognosis with a good prognosis [2, 4]. In this report, a 54-year-old female with mucinous carcinoma of the breast is discussed.

Case presentation

We're dealing with a 54-year-old female patient living in Fez, Morocco at present. She has referred for management of a right breast nodule evolving since one month ago.
On general examination, she appeared to have fair general state.

On breast examination:-

- Soft symmetrical B-cup breasts with ptosis.
- Right breast: nodule in the lower outer quadrant of the breast, near the external mammary fold, located 1 cm from the areola, measuring 3 x 2 cm, with an irregular margin associated with mild retraction of overlying skin in that area.
- No abnormalities in the left breast.

There were no palpable supraclavicular and axillary lymph nodes present. On these observations, a bilateral mammography and an ultrasound-guided breast mass biopsy were ordered.

- **Secondary tests**

The two breasts, in a bilateral mammogram, both exhibited an entirely fatty breast density (type A breast pattern). There was a rounded high density lesion in the junction of the outer quadrants of the right breast, heterogeneous, and well circumscribed, with lobulated margins. Nipple and skin appeared to have a normal configuration (Figure 1).

The ultrasound assessment revealed the presence of a lesion in the lower outer quadrant of the right breast located in the 8 o'clock position, 02 cm from the nipple. The lesion is roughly oval, with its long axis parallel to the skin. It is well-defined, with lobulated margins, iso-echoic, and heterogeneous, containing some liquefied areas, particularly at its periphery. It attenuates posterior echoes, with no clearly identifiable calcifications and measure 28 mm in its largest dimensions and 20 mm perpendicularly. This mass is in close contact with the overlying skin (Figure 2).
The nipple-areolar complex, retro areolar region, and skin of both breasts showed no significant abnormalities.
No ductal ectasia or axillary lymphadenopathy was detected bilaterally.
Based on these findings, the lesion was classified as BI-RADS ACR4c.

Histopathological and immunohistochemical findings:-
A core needle biopsy of the right breast lesion (ACR4c) was performed. Histological examination (Figure 3) revealed nests of neoplastic epithelial cells surrounded by mucin pools. The tumor exhibited moderate cytological atypia, with mitotic activity of 12 mitoses per 2mm². No evidence of intraductal carcinoma or vascular emboli was observed. The tumor-infiltrating lymphocytes (TILs) were estimated to be less than 1%.

The diagnosis was reported as grade II mucinous adenocarcinoma of the breast (SBR classification)
A thoraco-abdomino-pelvic computed tomography scan was subsequently performed for secondary lesion evaluation, with no abnormalities present (Except for the previously described lesion in the right breast).

- Based on these findings, the patient was diagnosed with stage T4N0M0 breast cancer (skin invasion), no regional lymph node involvement, and no distant metastasis.

The patient subsequently underwent a margin-clearing breast quadrantectomy and a sentinel lymph node biopsy. Intraoperative frozen section analysis of the sentinel lymph node biopsy revealed no macrometastasis present.
Macroscopical examination showed a mucinous, 29 × 21 mm, solid tumor with partially well-circumscribed borders and a whithish-brown coloration.
The microscopical analysis showed intermediate grade nucleus tumor cells in a mucin lake, with thin bands of surrounding connective tissue. Eosinophillic cytoplasm, hyperchromatic oval-shaped nucleus, and small nucleoli with little formative tubules in the tumor cells, and no lymphovascular and perineural invasion.
The postoperative period for the patient proceeded unproblematic, and she was subsequently discharged. Healing of the surgical wound proper in follow-up in an outclinic. She was subsequently seen in radiotherapy departement for adjuvant therapy.

Discussion
Primary mucinous carcinoma of the breast is a rare form of breast cancer which has specific molecular and clinicopathological features which are different from other types of breast cancer [2]. It is more common in older women and the literature shows that only 1% of the cases occur in women less than 35 years of age [2]. The patient in this report is within the age range of colloid carcinoma of the breast. The studies reveals that 44% of the mucinous breast carcinomas were in the higher outer quadrant of the breast, the remaining 56% were in the upper inner, lower inner, lower outer and central quadrants respectively [2].
This paper aims to review the available literature on mucinous carcinoma of the breast, focusing on clinical presentation, management, and prognostic factors, with an emphasis on treatment outcomes and predictors of survival in this rare subtype of breast cancer.
Whereas conventional invasive carcinoma has well-defined precursor lesions, data on the precursors of mucinous carcinoma, especially mucinous ductal carcinoma in situ (DCIS) is scarce. Patten *et al*. reported various transitional patterns which include cribriform/solid, cribriform/ papillary, papillary, micropapillary, and flat patterns, some of which are associated with more aggressive mucinous carcinoma phenotypes [5]. Some authors have proposed that mucinous breast carcinoma may be a mucinous variant of papillary or lobular carcinoma, which manifests extracellular mucin production because 86% of colloid carcinomas have a micropapillary pattern [6].
Although mucinous breast carcinoma is classified as an invasive tumor, Rosai [7] suggested that this neoplasm may represent a form of carcinoma in situ, which results in stromal invasion due to production of mucin, leading to detachment of epithelial cells from their basement membrane by polarity inversion. There are two subtypes of mucinous carcinoma: pure and mixed subtype that have different radiological and prognostic features [8]. Capella *et al*. also divided pure mucinous carcinoma into two subgroups: Type A (hypocellular), which has a large amount of extracellular mucin with a low number of tumor cells and little intracellular mucin; and type B (hypercellular), which are highly cellular tumours with higher intracellular mucin content [5].
Pure mucinous carcinoma is a well-defined lesion with high mucin content on mammography [9]. The present case showed a mass with increased density on imaging, as mentioned above. On ultrasound, mixed mucinous carcinomas are hypoechoic [9], and pure mucinous carcinoma is isoechoic, which makes the diagnosis worse and can lead to the assumption of a benign lesion and, therefore, a diagnostic delay [2]. That is why the analysis of imaging data should always be accompanied by the analysis of histological data in order to make the right decision regarding the differential diagnosis [9-11]. Mucinous carcinoma of the breast is generally a smaller tumor than that of other breast cancer subtypes. Because of its slow growth, the diagnosis is made at a smaller tumor size at an earlier stage [2]. Microscopical examination of the tumour revealed that the tumour size does not influence the prognosis [12], however, other works have established it as an independent prognostic factor, but the magnitude is not as high as that of the lymph node status, which is directly related to the tumor size [1, 2, 4]. Furthermore, a higher mucin content has been postulated to be associated with a better prognosis [5] since mucin may help to keep the tumor noninvasive [13].
Lymph node involvement is the worst prognostic factor, and it is not common in mucinous carcinoma. The incidence varies with the histological subtype: 2% to 14% for pure mucinous carcinoma and 46% to 64% for the mixed type [2], for which sentinel lymph node biopsy is indicated.

The literature reveals a slight preference for the left breast, with the upper outer quadrant being the most likely to be involved.

Stage II is the most frequent clinical stage at the time of diagnosis and the luminal subtype is the most common molecular phenotype [4, 14].

Mucinous breast carcinoma should be treated as other histological types of breast cancer and includes mastectomy or breast conserving surgery (quadrantectomy) with adjuvant chemotherapy, radiotherapy and hormonal therapy [15].

Colloid carcinoma of the breast has a good prognosis with a 5 year cancer-specific survival of 94% and 20 years of 81% [2, 4, 6]. Survival rates for overall survival are like those of the general population. The micropapillary variant of pure mucinous carcinoma is worse than other subtypes in terms of prognosis, with worse lymphovascular invasion and nodal metastasis [16, 17, 18].

Conclusion

Mucinous carcinoma is a subtype of invasive ductal carcinoma; it is an uncommon entity that mainly affects elderly women. At the time of diagnosis, it is generally smaller of lower nuclear grade, and less likely to spread to the lymph nodes.

Mammography, histopathological confirmation, and appropriate surgical and adjuvant therapy can lead to early diagnosis and treatment and therefore favorable prognosis.

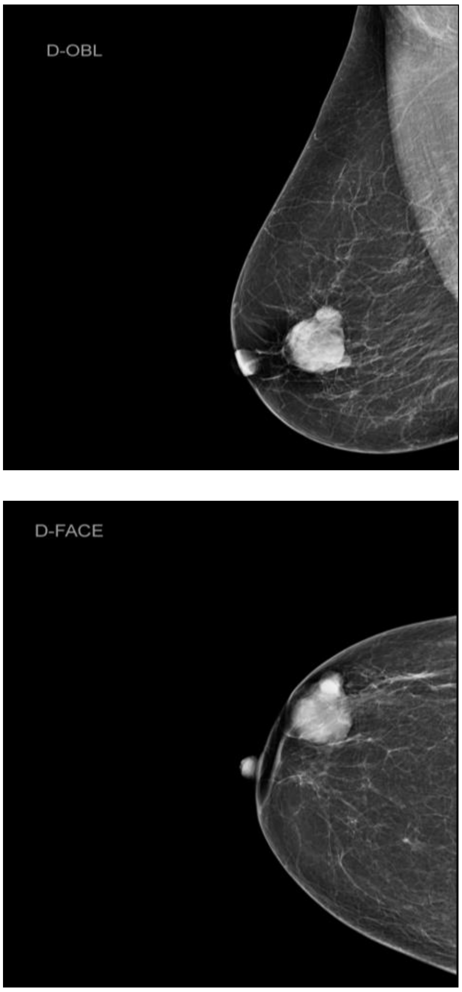


Fig 1: Rounded high density lesion in the junction of the outer quadrants of the right breast, heterogeneous, and well circumscribed, with lobulated margins

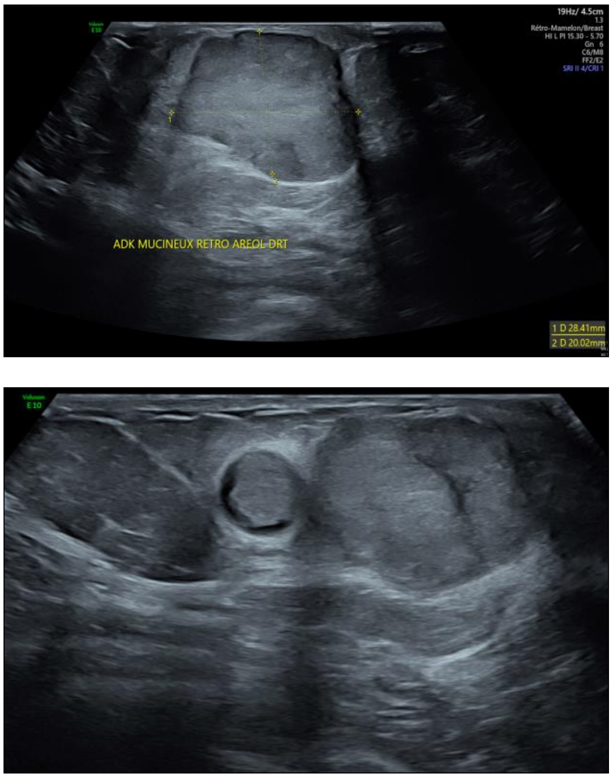
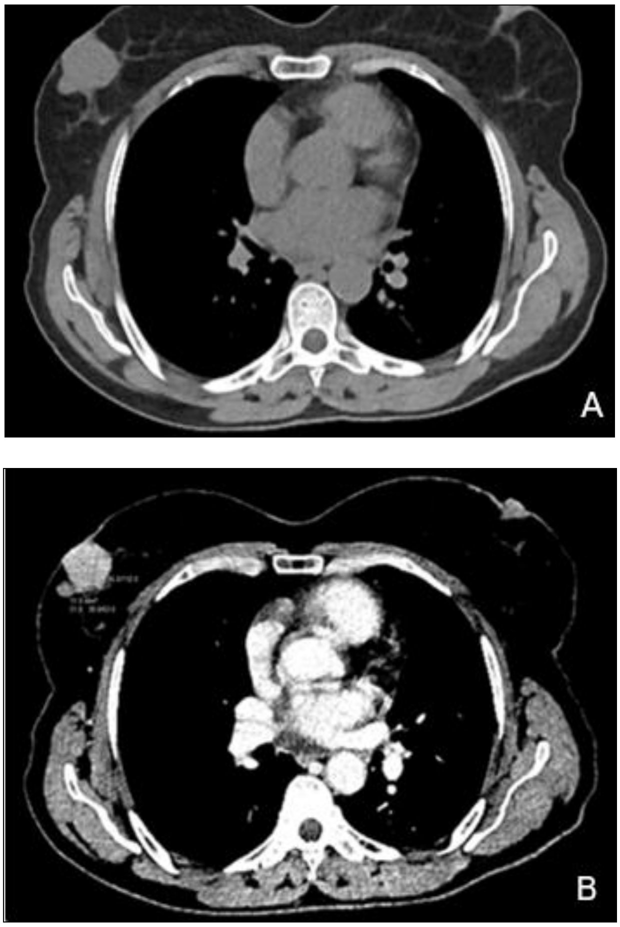


Fig 2: An oval well defined lesion in the lower outer quadrant of the right breast located in the 8 o'clock position, 02 cm from the nipple, with its long axis parallel to the skin, iso-echoic, and heterogeneous, containing some liquefied areas, particularly at its periphery. It attenuates posterior echoes, and measures 28 mm in its largest dimensions and 20 mm in its largest dimensions in a direction perpendicular to its largest dimensions. This mass is in close contact with the overlying skin.



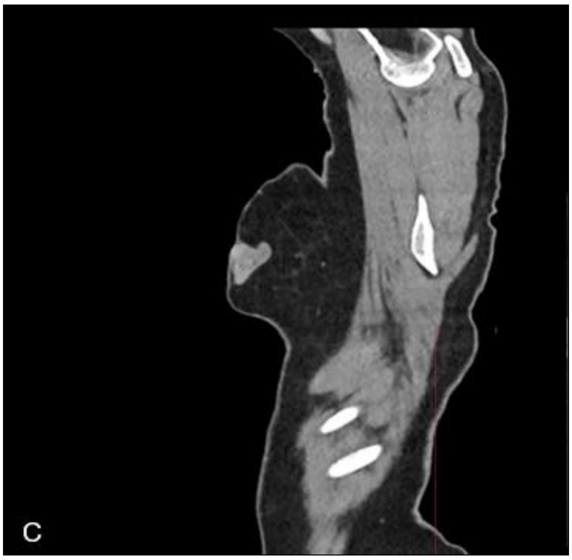


Fig 3: Helical acquisitions in axial (A, B) and sagittal (C) sections were performed, first in a non-contrast phase (A) and then after injection of iodinated contrast material, revealing the presence of a tissue mass in the lower outer quadrant of the right breast. The mass is roughly oval in shape, with lobulated margins, displaying heterogeneous enhancement and showing infiltration of the overlying skin.

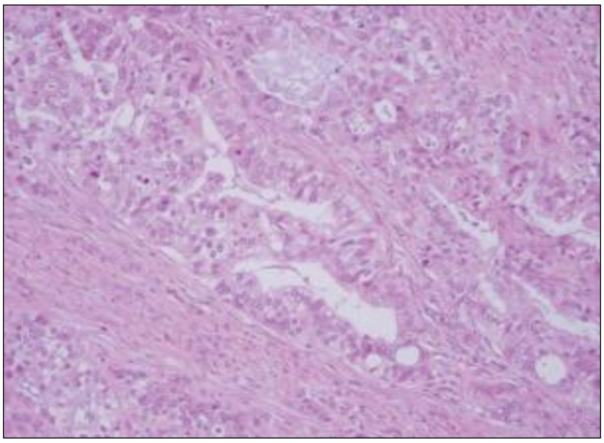


Fig 4: Histologic features of mucinous carcinoma of columnar cells, the cysts are lined by a single layer of tall columnar mucinous cells with focal areas of micropapillary and small tufted structures, similar to those of the uterine endocervix

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Ethics statement: This case report was conducted in accordance with ethical standards. Informed consent was obtained from the patient for the publication of this case and accompanying images.

Competing interests: The authors declare that they have no competing interests.

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