Case Reports in Oncology

Case Rep Oncol 2022;15:816–826
DOI: 10.1159/000526535
Received: June 29, 2022
Accepted: August 4, 2022
Published online: September 26, 2022

Case Report

Fibromatosis-Like Metaplastic Carcinoma: A Triple-Negative Breast Cancer with Clinically Indolent Behavior

Khoa Hong Pham[a] Chu Van Nguyen[a, b] Tu Anh Do[a] Han Thi Pham[a] Kien Hung Do[a] Duc Thanh Le[a]

[a]National Cancer Hospital, Hanoi, Vietnam; [b]Hanoi Medical University, Hanoi, Vietnam

Keywords
Fibromatosis-like metaplastic carcinoma · Treatment · Pathology · Prognosis

Abstract
Fibromatosis-like metaplastic carcinoma is a special variant of spindle cell carcinoma, a type of metaplastic carcinomas. It has a favorable prognosis, unlike other metaplastic carcinomas, with a particular clinical behavior characterized by frequent local recurrence, the meager potential for axillary lymph nodes, and distant metastases. We presented the case of a 51-year-old female with a large mass on the left breast, which was successfully removed by surgical resection. The pathological diagnosis was fibromatosis-like metaplastic carcinoma with the help of morphology and immunohistochemistry adjustment.

Introduction

Fibromatosis-like metaplastic carcinoma (FLMC) of the breast is a rare entity of the metaplastic breast carcinomas (MBC) group. FLMC is a newly described MBC because of their resemblance to pure fibromatosis, its propensity for local recurrence, and favorable prognosis among the MBCs [1–3]. There are only a few individual case reports of about 69 cases of FLMCs that we have found in the English literature over the past 20 years [2–12]. They can pose significant diagnostic problems to pathologists. The diagnosis is potentially challenging because of the morphologic overlap with other low-grade spindle cell lesions [2]. Here, we presented a case in which we focus on her diagnosis and differential diagnosis to raise our awareness of such lesion.

Correspondence to:
Chu Van Nguyen, nguyenvanchu@hmu.edu.vn

Case Rep Oncol 2022;15:816–826
DOI: 10.1159/000526535

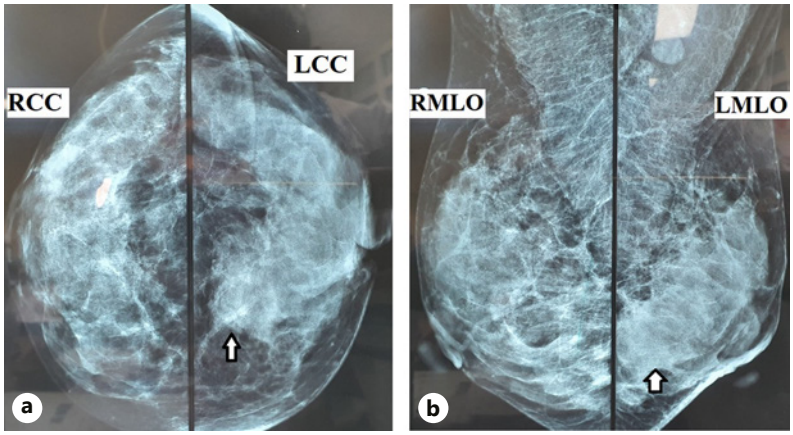

Fig. 1. Mammographic findings: the craniocaudal view (**a**) and the mediolateral oblique view (**b**). A soft tissue lesion of irregular margins measuring about 36 × 26 mm, suspicious for malignancy, seen in the lower and inner quadrant of the left breast (arrow).

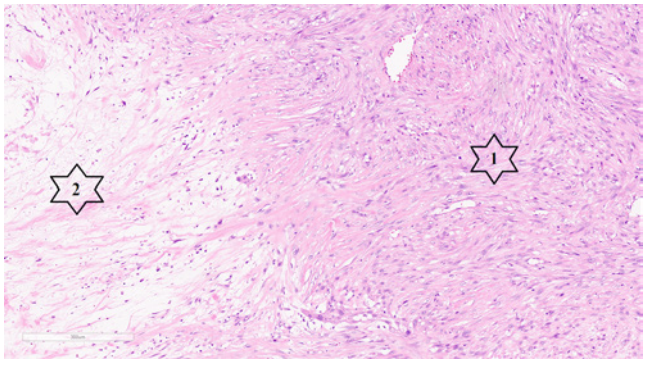

Fig. 2. Microscopic picture showed homogeneously spindle-shaped cells (the first star) with a myxoid amorphic matrix (the second star) (HE stain, ×10).

Case Presentation

A 51-year-old female patient, nonsmoker, postmenopausal, was admitted to Vietnam National Cancer Hospital in April 2022 with a large mass on the left breast. The patient detected this tumor 3 month ago with a smaller size. Clinical examination revealed a painless, immobile mass near the nipple-areola in the inner upper quarter. Ultrasound and mammography of the left breast demonstrated an irregular margin, deep, and heterogeneous hypoechoic mass, 36 × 22 mm in size (Fig. 1). Microcalcification was not found. Some small axillary lymph nodes with straightforward nodar hilar and thick capsules were seen, too. Ultrasonic criteria were suitable for BIRADS V. The tumor was needle core biopsied under the guidance of ultrasound.

Pathology and Immunohistochemistry

The diagnosis of needle core biopsy was the primary spindle cell sarcoma of breast on the H&E-stained slides. After removing the tumor by modified radical mastectomy and axillary lymph node dissection, the specimen was grossly evaluated and histopathology was performed.

The tumor was unencapsulated, solid with a gray-white, fibrous, and firm cut surface. On H&E-stained slides, the tumor showed homogeneously spindle-shaped cells with a myxoid amorphic matrix (Fig. 2). The tumor was comprised entirely of low-grade spindle cells mixing with a few entrapped benign ducts (Fig. 3). No discrete squamous differentiation or ductal carcinoma in situ (DCIS) was identified. Some areas had broad, finger-like projection features,

Case Rep Oncol 2022;15:816–826
DOI: 10.1159/000526535

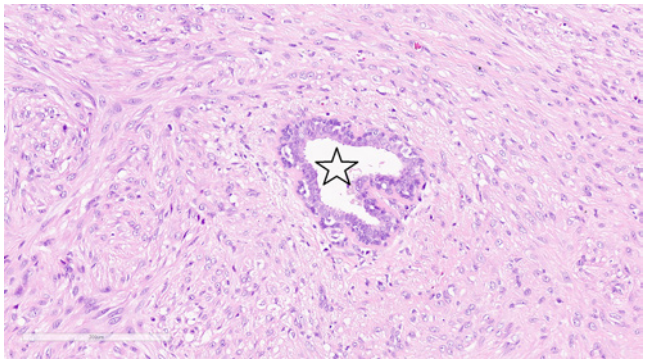

Fig. 3. Illustrated picture comprised entirely of low-grade spindle cells mixing with few entrapped benign ducts (lumen of duct – star) (HE stain, ×20).

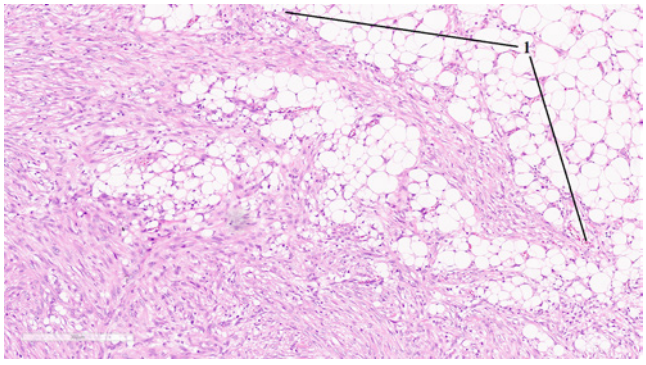

Fig. 4. Photomicrograph indicated that the areas of peripheral invasion were found with broad, finger-like projections of neoplastic cells (1) (HE stain, ×10).

Table 1. Histopathological features of FLMC

Characteristic	Description
Growth pattern	Nodular, or infiltrative with finger-like extensions, or partially nodular
Tumor cellularity (×10 objective)	Tumor cell, and collagen and related intercellular elements: Grade 1 plus (≤25% cells, ≥75% collagen, and related intercellular elements); Grade 2 plus (50% cells and 50% collagen); and Grade 3 plus (≥75% cells and ≤25% collagen)
Nuclear atypia (compared with the nuclei of normal fibroblasts)	Absent or minimal (1 plus)
Mitoses/10 HPF (hot spot)	Ranging from none to three

surrounded by scattered lymphocytes and mesenchyma (Fig. 4). According to Gobbi's classification [6] (Table 1), the growth pattern was infiltrative with finger-like extensions; tumor cellularity was graded as 2+ (50% cells and 50% collagen). The nuclear atypia was minimal (1+) compared to normal fibroblasts' nuclei. Mitotic figures were inconspicuous. No metastasis on 14 axillary lymph nodes was seen.

We considered a broad differential diagnosis because of morphologic presentation. These were pure fibromatosis, adenomyoepithelioma, inflammatory myofibroblastic tumor, myofibroblastoma, pseudoangiomatous stromal hyperplasia, and FLMC. Then, a broad panel of immunohistochemical stains were assigned to narrow these differential diagnoses.

On immunohistochemical stains, spindle cells expressed pan-cytokeratin (Fig. 5) and actin diffusely (Fig. 6). Some entrapped benign ducts were the internal positive control of

Case Rep Oncol 2022;15:816–826
DOI: 10.1159/000526535

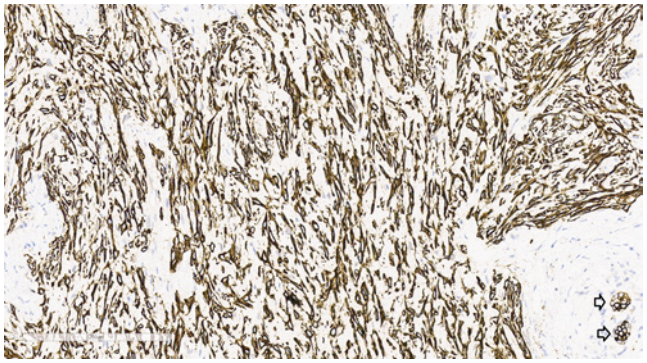

Fig. 5. Micrograph illustrated the pancytokeratin positive cancer cells and two entrapped benign ducts (arrow) (IHC stain, ×20).

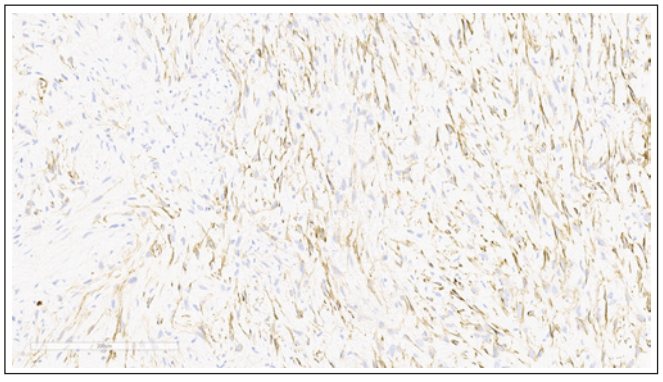

Fig. 6. Microscopic picture displayed the cancer cells of positive actin (IHC stain, ×20).

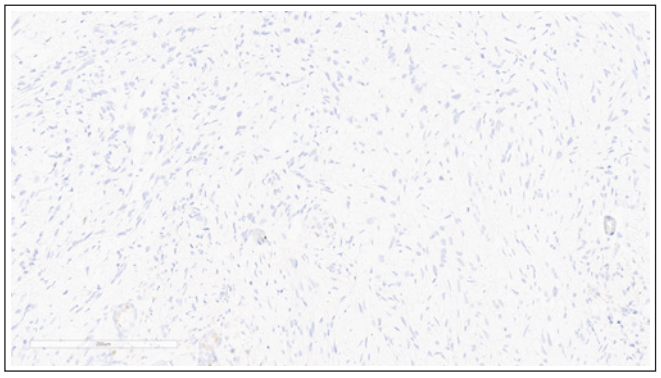

Fig. 7. Micrograph showed no expression ER of cancer cells (IHC stain, ×20).

pan-cytokeratin (Fig. 5 – arrow). They were negative for ER, PR, and Her2/neu (Fig. 7). Ki67 index was low (less 5.0%) (Fig. 8). The above immunohistochemical findings excluded the primary spindle cell sarcoma of breast.

Finally, the morphology and IHC results confirmed a fibromatosis-like metaplastic carcinoma with leiomyoid differentiation.

Treatment and Follow-up

The patient was operated on only by a modified radical mastectomy, combined with axillary lymph node dissection. The patient has been regularly followed up once a month by clinical examination and preclinical tests such as imaging diagnosis, thoracic X-ray, and abdominal and breast area ultrasounds. Over the three following months, her results showed no residual tumor or distant metastasis, and she is alive with free disease.

Case Rep Oncol 2022;15:816–826
DOI: 10.1159/000526535

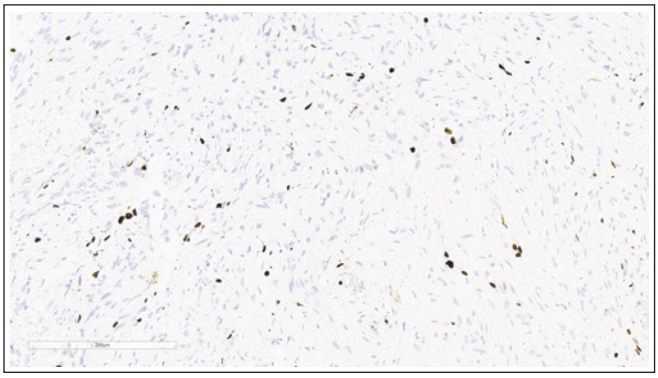

Fig. 8. Photomicrograph demonstrated low Ki67 index of cancer cells (IHC stain, ×20).

Discussion

FLMC is a variant of metaplastic spindle cell carcinoma recently described. It is a rare and low-grade subtype. FLMC variant is distinguished from others because of its unique low-grade appearances, like pure fibromatosis, propensity for local recurrence, and favorable prognosis. Some authors prefer fibromatosis-like tumor to emphasize their dominant phenotype and avoid "carcinoma" nomenclature. The primary component consists of spindle cells, whereas less than 5% of the tumor is composed of epithelial elements or carcinoma. In addition, its biological behavior is shiftless [7]. However, distant metastases are still possible. Indeed, of the 68 cases of FLMCs we have found in the English literature of the past 20 years, 4 cases had distant metastases, rendering the term "carcinoma" appropriate (Table 2) [5, 12].

FLMC is a potentially challenging diagnosis, particularly on core needle biopsy, because of its morphologic similarity to many other low-grade spindle cell lesions in the breast. A definitive diagnosis of FLMC is aided by identifying epithelial foci, using a panel of immunohistochemical antibodies specific for epithelial and myoepithelial differentiation. However, lack of cytokeratin demonstration in a core needle biopsy does not exclude a diagnosis of FLMC until the entire lesion is removed and thoroughly examined. Therefore, suspicion of FLMC from a core needle biopsy should require a complete resection.

The tumors are locally aggressive with an increased risk of recurrence, but the potential for axillary and distant metastases is low. Complete excision with adequate margins is curative in the majority of cases. No definitive conclusions can be made about the clinical behavior of FLMC. Continued studies of FLMC in addition to close clinical monitoring of patients following removal of these tumors will hopefully shed new light on specifications regarding the biologic behavior and appropriate management of these unusual breast tumors.

Clinical Features

FLMC has been reported only in women and is usually seen in older, postmenopausal women. In 2 of the original case series of FLMC, the average age at initial diagnosis was 63.4 years and 66 years [5, 13]. Patients typically present with a unilateral, rapidly enlarging, and palpable breast mass. In some case series, more women presented with a mass in the left breast [5, 7, 14]. These features fit with our patients. Complaints of swelling, tenderness, and nipple inversion have also been reported at diagnosis [7, 14]. FLMCs do not have a predilection for any specific anatomic location in the breast. Metaplastic carcinomas of the breast have variable appearances on mammography and ultrasound imaging modalities. As of the present, to our knowledge, a case series specifically assessing the radiologic findings of FLMC masses has not been performed. Calcifications within these masses are uncommon [15]. Her imaging findings showed no microcalcification.

Case Rep Oncol 2022;15:816–826
DOI: 10.1159/000526535

Table 2. Summary of results of the published studies in FLMC

Author (reference)	Cases, *n*	Age/mean (range)	Side	Size/mean (range – mm)	Epithelioid cluster	+ve node	Distant metastasis	Operation	Adjuvant therapy	Recurrence (interval range, months)	Follow-up months
Gobbi et al. 1999 [7]	30	63 (40–80)	15 L 9 R 9 N/A	2.7 (1.2–7.0)	20 years 10 n	0	0	5 MRM 5 WE + LN 5 WE 8 LE 7 NA	1 RT 1 CT 1 CT + RT 1 RT + HT	8 (5–72); 7 after LE 1 after WE 0 after AT	Range 6–88 (18/30 cases); 1 with second recurrence 9 months after reexcision, treated by MRM
Sneige et al. 2001 [5]	24	66 (55–85)		2.8 (1.0–5.0)		0	2; 1 lung 1 lung, inguinal soft tissue and bone; DOD 17–19 mos	12 MRM 1 MRM with nCT 1 LE + LN 6 LE4 NA	5 RT 1 CT	2 (5–32); 2 after LE 0 after AT	Range 5–90 (18/24 cases); No second recurrence
Kinkor et al. 2002 [8]	4	(54–72)	NA	(2.0–3.5)	NA	NA	2; DOD	NA	NA	NA	NA
Schafernak et al. 2006 [9]	1	59	NA	3.0	NA	0	NA	LE	NA	NA	NA
Rekhi et al. 2007 [4]	1	77	L	2.0	Y	0	0	LE	RT	NR	16
Podetta et al. 2009 [6]	2	79 (72–85)	N/A	4.4 (3.0–5.7)	N/A	0	0	1 MRM 1 WE + LN	1 RT	NR	Range 21–27
Nonnis et al. 2012 [12]	1	73	N/A	2	N/A	0	0	LE	No	1 (9)	73; Second recurrence: 2 months after reexcision, treated by WE
Pagnon et al. 2017 [10]	1	66	L	NA	Y	0	0	LE	RT	NA	NA
Zhao et al. 2018 [2]	3	57 (51–65)	2 L 1 R	3.5 (3.0–4.0)	2 Y 1 N	0	0	2 MRM 1 WE	2 CT 1 CT + RT	1 (13)	Range 12–49
Victoor et al. 2020 [11]						0					
Present case, 2022	1	52	L	3.5	No	0	0	MRM	0	0	3

AT, adjuvant therapy; (n)CT, (neoadjuvant) chemotherapy; DOD, died of disease; HT, hormonal therapy; L, left; LE, lumpectomy; LN, axillary lymph node dissection; MRM, modified radical mastectomy; n, no; NA, not available; NGS, next-generation sequencing; R, right; RT, radiotherapy; WE, wide excision; y, yes.

Case Rep Oncol 2022;15:816–826
DOI: 10.1159/000526535

Pathology

Average FLMC size is approximately 3 cm (range of 1–7 cm) [5, 7]. In this study, the patient's tumor was more significant than usual. The characteristic feature of FLMC is the presence of small, cohesive clusters of fusiform to polygonal epithelioid cells with rounded nuclei and prominent nucleoli scattered among the spindle cell [5, 7]. To clarify, over 90–95% of the tumor cells are fibroblast-like spindle cells and resemble pure fibromatosis with mild to no atypia. Clusters of epithelioid cells, or less frequent glandular and squamous elements, can be focally present in FLMC [1, 12, 15]. Malignant squamous and glandular elements may be admixed with the neoplastic spindle cells, emphasizing the metaplastic nature of these tumors. However, these should account for less than 5% of the total [1]. Therefore, it is vital to observe at higher magnification, and a thorough tumor sampling is recommended to avoid missing a small area of epithelioid differentiation [10]. These small clusters are usually seen in a gradual histologic transition to the neoplastic spindle cells [7]. Detecting these epithelial components will facilitate the differential diagnosis between FLMC and sarcomas. This detail represents a valuable clue to addressing the differential diagnosis. However, the tumor in this study missed epithelial components and showed a pure spindle cell appearance with actin diffusely positive, suggesting a whole transition from epithelial-to-mesenchymal differentiation [11].

In the previous reports, 33% of FLMC did not have recognizable squamous or glandular elements [4, 5, 7, 14, 16]. However, most of FLMC tumors exhibit irregular infiltrative margins with broad, finger-like projections of neoplastic cells into the surrounding mammary structures and soft tissue [5, 7]. The notable similarity between FLMC and pure fibromatosis is the proliferation of low-grade spindled fibroblast-like cells and stellate myofibroblast-like cells [5]. Scattered invasion of acute and chronic inflammatory cells may be seen within and at the periphery of FLMC [1]. This feature was also observed in our case. The combined FLMC and other in situ carcinomas, such as DCIS, lobular carcinoma in situ carcinomas, such as DCIS, and lobular carcinoma in situ, have also been reported in some reports [5, 7]. The nature of the interaction between these epithelial lesions of the breast and FLMC remains uncertain.

The diagnosis of metaplastic spindle cell carcinoma, including FLMC, may not be evident in tumors composed exclusively of spindle cells. However, we must always keep in mind this histopathological type. In this regard, the risks of undersampling may happen in the core needle biopsy. In these instances, a panel of immunohistochemical stains is generally needed to distinguish metaplastic spindle cell carcinoma from other spindle cell lesions of the breast. In all cases of metaplastic spindle cell carcinoma, the epithelial origin of the spindle cells should be demonstrated by using cytokeratin immunohistochemical stains [1, 7, 14, 17, 18]. Cytokeratin-specific antibodies most frequently used in these tumors include broad-spectrum and high molecular-weight cytokeratins (AE1/AE3, pankeratin), basal cytokeratins (cytokeratin 5 [CK5], CK34BE12, CK14), and luminal cytokeratins (CK7, CK19, CAM 5.2) [1, 17, 18]. Koker and Kleer [17] suggest that metaplastic carcinomas may arise from a single stem cell or a standard progenitor cell capable of differentiating into other cell types. More recent publications have suggested that the metaplastic components in spindle cell carcinomas actually demonstrate an immunostaining pattern more compatible with myoepithelial differentiation. Dunne et al. [18] suggest that the myoepithelial phenotype may represent a transition between epithelial and sarcomatous differentiation. In this report, actin was positive. It is suitable with Dunne's suggestion. The spindle cells in FLMC are typically negative for smooth muscle myosin heavy chain and EMA, but epithelial components may be positive with EMA. The proliferation index of FLMC (Ki-67) is usually less than 5% [5]. In addition, FLMC and the majority of metaplastic carcinomas of the breast are negative for estrogen receptor, progesterone receptor, and Her2/neu [5]. Moreover, the authors observed immunoreactivity of the tumor for basal cytokeratin but negative for luminal cytokeratin [10], suggesting a basal-like molecular subtype,

which has better prognostic than other TNBCs, as our previous cohort [19]. The immunophenotype of our patient is consistent with the above study results.

FLMC can pose significant diagnostic problems to pathologists. Especially to a core needle biopsy, given predominantly spindle cells with mild atypia, however, revealing prominent infiltration into the adjacent soft tissues, diagnosis of a low-grade sarcoma was favored over a metaplastic carcinoma to be the closest differential diagnosis. The complex histopathogenesis makes it necessary to perform additional IHC studies to exclude metaplastic carcinoma when the diagnosis of fibromatosis, low-grade mesenchymal tumor, or even phyllodes tumor is made on standard H & E staining. Because FLMC may be underdiagnosed as benign, the use of immunohistochemical studies, especially for cytokeratins and SMA, is essential in the evaluation of any spindle cell proliferation of the breast [5].

Differential Diagnosis

A combination of clinical history, imaging, and especially pathological morphology, IHC can help further in establishing the diagnosis. Accurate diagnosis of low-grade spindle cell lesions in the breast is potentially challenging because the differential diagnosis is broad and includes many lesions that are considered rare in the breast. In general, the differential diagnosis for any metaplastic carcinoma depends on the degree of atypia in the tumor. As mentioned previously, FLMC represents a low-grade variant of spindle cell carcinoma and is essentially a neoplasm composed almost exclusively of cytologically bland spindle cells. The differential diagnosis includes pure fibromatosis, exuberant scars, reactive spindle cell nodules, nodular fasciitis, inflammatory myofibroblastic tumor, myofibroblastoma, pseudoangiomatous stromal hyperplasia, phyllodes tumor, dermatofibrosarcoma protuberans, and spindle cell sarcomas [7].

In this case, we have to separate from malignant phyllodes tumors with prominent, expanded stromal proliferation that may not have a readily identifiable benign epithelial lining, therefore may resemble other spindle cell neoplasms of the breast, including metaplastic carcinomas and sarcomas.

Finally, primary sarcomas in the breast are also rare but represent a fundamental entity required to distinguish from FLMC. Primary sarcomas usually require extensive sampling to exclude the epithelial component of metaplastic spindle cell carcinomas. Some common mammary sarcomas are fibrosarcomas, liposarcomas, and pleomorphic undifferentiated sarcomas (previously malignant fibrous histiocytoma) [7]. Primary sarcomas can be distinguished from FLMC by the increased nuclear atypia, brisk mitotic rate, and occasional distinct architectural patterns observed in primary sarcomas.

Overlapping histological features are not uncommonly encountered in this type of lesion, making the diagnosis challenging in some cases. It is, therefore, important to accurately recognize these lesions' pathology, to avoid inappropriate management. Knowledge of the different morphological, immunohistochemical, and molecular features and correlation with the clinicoradiological features are essential to eventually make the correct diagnosis [12, 20].

Treatment and Prognosis

FLMC represents a low-grade variant with clinically indolent behavior, similar to pure fibromatosis. Although the biological behavior of this subtype is unclear, wide local excision or mastectomy with clear resection margins, no axillary dissection appears to be an adequate treatment approach [6]. However, FLMCs have the minor potential for local recurrence and distant metastasis. According to Gobbi et al. [7], FLMCs have an increased incidence of local recurrence, but have low potential for regional lymph node or distant metastasis. Then with the case treated by local excision, assessment of the surgical resection margins is critical, which will control the local recurrence rate. Reviewing English literature suggests that metastasis in FLMC seems to be related to the more extensive primary tumor. In contrast, the risk

of local recurrence seems to be related to inadequate resected margins. In Gobbi's study, 8 of 18 FLMC cases developed local recurrence within 5–72 months after diagnosis. He suggested that the behavior and prognosis of these tumors are similar to that of pure fibromatosis. That wide excision with clear margins or simple mastectomy should be sufficient for the initial treatment of FLMC [7].

Because of the low potential for lymph node metastasis, axillary lymph node dissections are not advised [1, 6]. In addition, radiation and chemotherapy are also unnecessary [7, 14]. Some recent data also did not mention the help of either chemotherapy or immunotherapy on FLMC subtype [21, 22]. Though data are limited, there may be a slight risk for distant metastasis in patients with FLSCC, necessitating close clinical monitoring following excision. However, the risks of distant metastasis seem to be lower than that for other carcinomas of the breast [5].

Conclusion

The case suggested that though FLMC is rare, it cannot be ignored. Furthermore, it reminds us that in the pathological diagnosis of breast disease, especially spindle cell lesions, it is crucial to remember comprehensive differential diagnosis. To sum up, it is very important to avoid the pitfalls of diagnosis and to ensure the correctness of diagnosis by getting enough clinical-radiological data, pathology and IHC information.

Statement of Ethics

Ethical approval is not required for this study in accordance with local guidelines. The authors certify that they have obtained all appropriate patient consent form. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that her name and initial will not be published and due efforts will be made to conceal her identity, but anonymity cannot be guaranteed. Written informed consent was obtained from the patient for publication of the details of their medical case and any accompanying images.

Conflict of Interest Statement

The authors declare no potential conflicts of interest concerning research, authorship, and publication of this article.

Funding Sources

The authors received no financial support for the research, authorship, and/or publication of this article.

Author Contributions

Khoa Hong Pham participated directly in the diagnosis, treatment, and examination of the patient, performed a literature review, drafted of the components of the case reports, and assisted in formatting the presented material. He should be considered the major author.

Chu Van Nguyen performed the diagnostic consultant of the H&E and immunohistochemical staining, literature review, drafting of the components of the case report, and formatting of the presented material. Han Thi Pham took part in the pathological diagnostic consultant of the patient and assisted in literature review. Tu Anh Do, Kien Hung Do, and Duc Thanh Le took part in the diagnostic and treatment consultant and assisted in literature review.

Data Availability Statement

All data analyzed during this case report are in this article. Please feel free to give further inquiries to the corresponding author for a clear understanding.

References

1 Dwyer JB, Clark BZ. Low-grade fibromatosis like spindle cell carcinoma of the breast. Arch Pathol Lab Med. 2015;139(4):552–7.
2 Zhao Y, Gong X, Li N, Zhu B, Yu D, Jin X. Fibromatosis-like metaplastic carcinoma of breast: a challenge for clinicopathologic diagnosis. Int J Clin Exp Pathol. 2018;11(7):3691–6.
3 Cserni G, Quinn CM, Foschini MP, Bianchi S, Callagy G, Chmielik E, et al. Triple-negative breast cancer histological subtypes with a favourable prognosis. Cancers. 2021;13(22):5694.
4 Rekhi B, Shet TM, Badwe RA, Chinoy RF. Fibromatosis-like carcinoma – an unusual phenotype of a metaplastic breast tumor associated with a micropapilloma. World J Surg Oncol. 2007;5(5):24.
5 Sneige N, Yaziji H, Mandavilli SR, Perez ER, Ordonez NG, Gown AM, et al. Low-grade (fibromatosis-like) spindle cell carcinoma of the breast. Am J Surg Pathol. 2001;25(8):1009–16.
6 Podetta M, D'Ambrosio G, Ferrari A, Sgarella A, Dal Bello B, Fossati GS, et al. Low-grade fibromatosis-like spindle cell metaplastic carcinoma: a basal-like tumor with a favorable clinical outcome. Report of 2 cases. Tumori. 2009 Mar–Apr;95(2):264–7.
7 Gobbi H, Simpson JF, Borowsky A, Jensen RA, Page DL. Metaplastic breast tumors with a dominant fibromatosis-like phenotype have a high risk of local recurrence. Cancer. 1999;85(10):2170–82.
8 Kinkor Z, Svitáková I, Ryska A, Kodet R, Hrabal P. Metaplastic spindle-cell (fibromatosis-like) carcinoma of the breast – report of 4 cases. Cesk Patol. 2002 Oct;38(4):164–8.
9 Schafernak KT, Policarpio-Nicolas MLC, Wiley EL, Laskin WB, Diaz LK. A 59-year-old woman with a spindle cell lesion of the breast. Low-grade (fibromatosis-like) spindle cell carcinoma of the breast. Arch Pathol Lab Med. 2006 May;130(5):e81–3.
10 Pagnon IP, Mies BP, Martinez MT, Jaimes LP, Cabanillas AMR, Heras ER, et al. Metaplastic breast carcinoma "fibromatosis like," associated with intraductal papilloma. Case report and literature review. Hum Pathol Case Rep. 2017;9:15–8.
11 Victoor J, Bourgain C, Vander Borght S, Vanden Bempt I, De Rop C, Floris G. Fibromatosis-like metaplastic carcinoma: a case report and review of the literature. Diagn Pathol. 2020;15(1):20.
12 Nonnis R, Paliogiannis P, Giangrande D, Marras V, Trignano M. Low-grade fibromatosis-like spindle cell metaplastic carcinoma of the breast: a case report and literature review. Clin Breast Cancer. 2012 Apr;12(2):147–50.
13 Gobbi H, Simpson JF, Jensen RA, Olson SJ, Page DL. Metaplastic spindle cell breast tumors arising within papillomas, complex sclerosing lesions, and nipple adenomas. Mod Pathol. 2003 Sep;16(9):893–901.
14 Carter MR, Hornick JL, Lester S, Fletcher CDM. Spindle cell (sarcomatoid) carcinoma of the breast: a clinicopathologic and immunohistochemical analysis of 29 cases. Am J Surg Pathol. 2006;30(3):300–9.
15 Leddy R, Irshad A, Rumboldt T, Cluver A, Campbell A, Ackerman S. Review of metaplastic carcinoma of the breast: imaging findings and pathologic features. J Clin Imaging Sci. 2012;2:21.
16 Conrad C, Miller DL, Kaiser C, Jauch KW, Nieß H, Huss R. Spindle cell metaplastic breast carcinoma with leiomyoid differentiation: a case report. Breast Care. 2011;6(3):230–3.
17 Koker MM, Kleer CG. p63 expression in breast cancer: a highly sensitive and specific marker of metaplastic carcinoma. Am J Surg Pathol. 2004;28(11):1506–12.
18 Dunne B, Lee AHS, Pinder SE, Bell JA, Ellis IO. An immunohistochemical study of metaplastic spindle cell carcinoma, phyllodes tumor and fibromatosis of the breast. Hum Pathol. 2003;34(10):1009–15.
19 Nguyen CV, Nguyen QT, Vu HTN, Pham KH, Phung HT. Molecular classification predicts survival for breast cancer patients in Vietnam: a single institutional retrospective analysis. Int J Clin Exp Pathol. 2021;14(3):322–37.
20 Rakha EA, Aleskandarany MA, Lee AHS, Ellis IO. An approach to the diagnosis of spindle cell lesions of the breast. Histopathology. 2016;68(1):33–44.

Case Rep Oncol 2022;15:816–826
DOI: 10.1159/000526535

21 Rizzo A, Ricci AD, Lanotte L, Lombardi L, Di Federico A, Brandi G, et al. Immune-based combinations for metastatic triple negative breast cancer in clinical trials: current knowledge and therapeutic prospects. Expert Opin Investig Drugs. 2022 Jun;31(6):557–65.
22 Rizzo A, Cusmai A, Massafra R, Bove S, Comes MC, Fanizzi A, et al. Pathological complete response to neoadjuvant chemoimmunotherapy for early triple-negative breast cancer: an updated meta-analysis. Cells. 2022 Jun 7;11(12):1857.