

## Case Report

# Dermatofibrosarcoma protuberans: a tumor in the wide spectrum of the bland-looking spindle cell lesions of the breast

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## Summary

Dermatofibrosarcoma protuberans (DFSP) is a soft tissue tumor, usually occurring as a cutaneous lesion localized to the trunk or extremities; although it has a high rate of local recurrence, its metastatic potential is very low and complete surgical excision is frequently curative. Most of the cases reported as "DFSP of the breast" are tumors arising in the subcutaneous tissue infiltrating the underlying breast parenchyma. To the best of our knowledge, only 5 cases of DFSP of the breast have been reported to date. We herein present a rare case of DFSP of the breast parenchyma in a 41-year-old female with emphasis on the diagnostic clues and the differential diagnosis with other benign and malignant spindle cell lesions of the breast.

## Key words

Dermatofibrosarcoma protuberans • Spindle cell tumors • Breast parenchyma • Soft tissue tumors • Differential diagnosis

## Introduction

Dermatofibrosarcoma protuberans (DFSP) is a relatively common mesenchymal tumor, first described by Darier and Ferrand in 1924 as "recurrent progressive dermatofibroma" <sup>1</sup>. It is a slow-growing neoplasm with limited metastatic potential, but with a high rate of local recurrence, especially when incompletely excised <sup>2</sup>. Generally, DFSP occurs in adults as a nodule or a skin lesion localized to the trunk or extremities <sup>1</sup>. The most striking morphological feature is a proliferation of bland-looking monomorphic spindle cells arranged into a storiform growth pattern and with the typical "finger-like" infiltration into the subcutaneous adipose tissue (honeycomb pattern) <sup>3</sup>. Occasionally DFSP can undergo fibrosarcomatous dedifferentiation, consisting of a proliferation of spindle cells exhibiting a clear-cut "heringbone" growth pattern. More rarely, areas of dediffer-

entiation show the morphology of an undifferentiated pleomorphic sarcoma. Recognition of dedifferentiation is crucial, as these tumors acquire a more aggressive biological behavior, with a higher incidence of local recurrences and distant metastases <sup>3</sup>.

DFSP may occur in the skin of the breast (subcutaneous/dermal location) and its histological diagnosis is usually straightforward <sup>4,5</sup>. Conversely, diagnostic problems may arise when DFSP occurs primarily in the breast parenchyma, as this sarcoma is an unexpected finding in this organ. To the best of our knowledge, only 5 cases of DFSP occurring primarily in the breast parenchyma have been reported so far <sup>6</sup>. We herein report a rare case of DFSP of the breast parenchyma, emphasizing the pathological features and the differential diagnosis with other potential benign and malignant spindle cell mimickers.

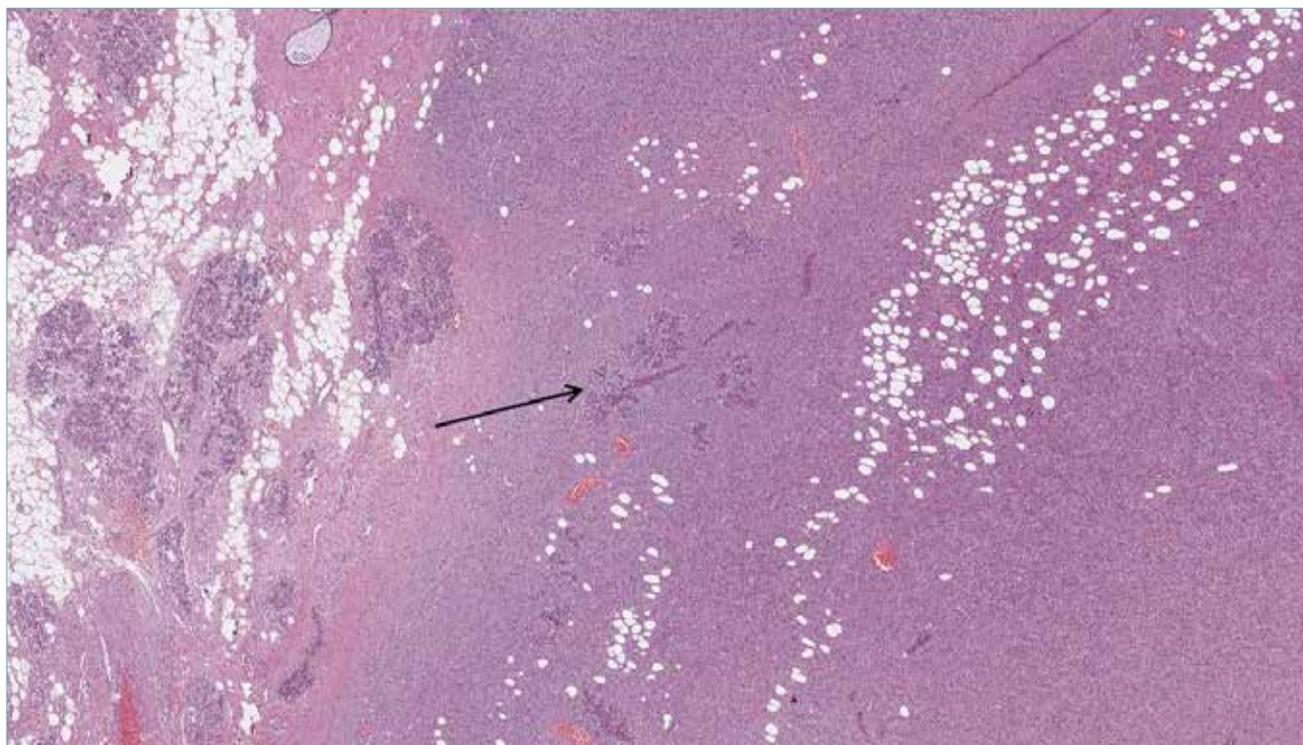
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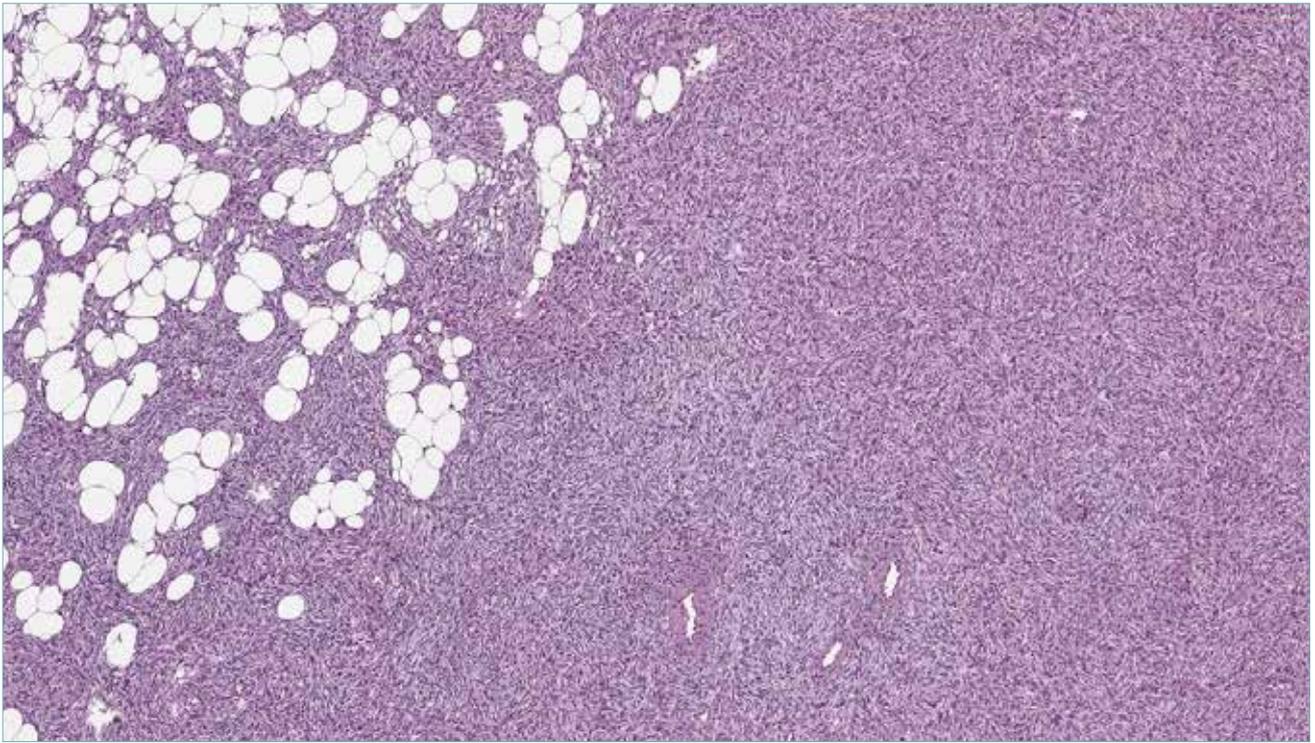
## Clinical findings

A 41-year-old female noticed a rapidly growing nodule at her right breast between upper quadrants. Clinical examination revealed a 5 cm, solid, multinodular lesion, with irregular margins. The nodular mass was not adherent to the overlying skin that appeared undamaged. Clinical history of the patient was unremarkable for neoplastic diseases. Ultrasound and mammography showed a well-circumscribed, round to oval homogeneous mass, with multilobulated borders. Based on radiological findings, a “*giant fibroadenoma or phyllodes tumor*” was suspected. Surgical excision of the mass was obtained without performing a needle core biopsy. Tumor was surgically excised. Gross examination revealed a multinodular tumor mass, with pushing borders, measuring 5 cm in its greatest diameter. The cut surface showed a solid mass, whitish in color and firm in consistency. The surgical specimen was submitted for histological examination in neutral-buffered 10% formalin, dehydrated using standard techniques, embedded in paraffin, cut to 5  $\mu$ m, and stained with hematoxylin and eosin (H&E). Histological examination showed a hypercellular tumor with infiltrative growth pattern, centered in the breast parenchyma

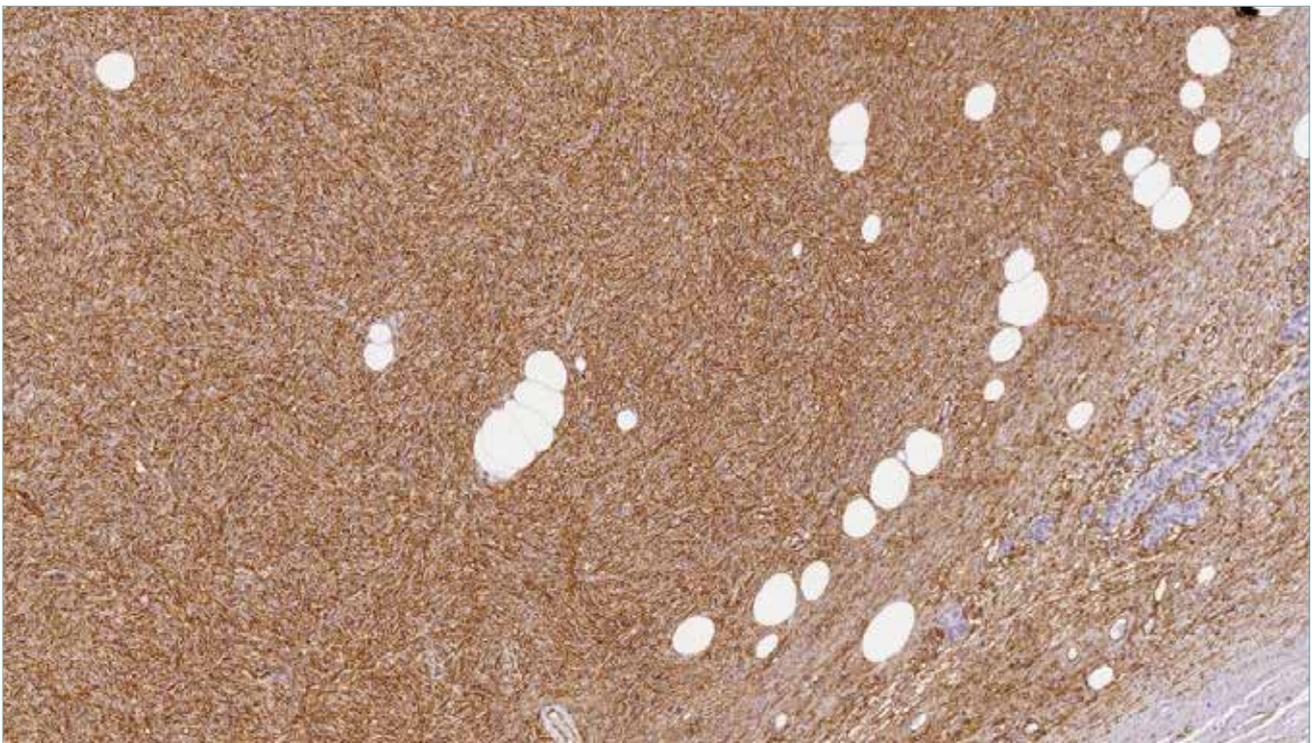
(Fig. 1). It was composed of spindle-shaped cells arranged in a prominent storiform growth pattern. Mild nuclear atypia and a low mitotic index (2 mitoses/10 HPF) were observed. Necrosis and atypical mitoses were absent. The neoplastic cells entrapped mammary ducts/lobules and infiltrated the mammary fat with focal honeycomb pattern (Fig. 2). Subcutaneous tissue and the dermis were not involved by tumor. Immunohistochemical analyses were performed using the standard avidin-biotin-peroxidase method using the Dako automated immunostainer (Dako autostainer link 48, Glostrup, Denmark). A wide panel of antibodies were tested, including vimentin, cytokeratins, desmin, alpha-smooth muscle actin, CD34, EMA, S-100 protein, calponin, p63, STAT-6 and Bcl-2. Immunohistochemical analyses showed diffuse staining only with vimentin and CD34 (Fig. 3). Tumor was negative for all the other antibodies tested. Based on the morphological and immunohistochemical features, the diagnosis of “*dermatofibrosarcoma protuberans of the breast parenchyma*” was rendered. After this diagnosis, the patient underwent nipple sparing mastectomy with immediate reconstruction using breast implant. Postoperative outcome was regular and without pain. No residual tumor was observed in histological examination



**Fig. 1.** Low magnification showing a tumor infiltrating mammary ducts/lobules (arrow) and fat of the breast parenchyma (H&E staining; original magnification, 50x).



**Fig. 2.** Neoplastic spindle cells are arranged in a prominent storiform growth pattern. Neoplastic cells infiltrated the mammary fat with focal “honeycomb” pattern (H&E staining; original magnification, 100x).



**Fig. 3.** Immunohistochemical analysis showing a diffuse cytoplasmic staining with CD34 (Immunoperoxidase staining; original magnification, 100x).

of the mastectomy. The patient is well with no local recurrence at 2-years of follow-up.

## Discussion

DFSP is a rare neoplasm of intermediate malignancy, typically occurring in adults as a dermal or subcutaneous nodule<sup>1</sup>. This tumor is characterized by a significant risk of local recurrence (after incomplete surgical excision) and low incidence of metastasis<sup>7</sup>. DFSP typically originates from the dermis and gradually extends to the deeper soft tissues and may occur at any anatomical site<sup>1</sup>. Its localization to the breast is extremely rare<sup>6</sup> with about 60 cases<sup>4,5</sup> reported in the literature, with most of them involving the mammary skin with extension to the underlying breast parenchyma. Notably only 5<sup>8-11</sup> of these 60 cases were centered in the breast parenchyma. In four cases<sup>12-14</sup>, with the tumor localized both in the subcutaneous and mammary parenchyma, it was not possible to rule out the secondary involvement of the breast.

We report a rare case of DFSP in a 41-year-old female, which was originally interpreted at ultrasound and mammographic examination as a fibroadenoma or phyllodes tumor. Although the morphological features of our case were typical of DFSP, it was the unexpected site, i.e. breast parenchyma, that caused some diagnostic problems. Differential diagnosis revolved around a wide spectrum of tumor and tumor-like spindle cell lesions of the breast<sup>8,15</sup>. Benign spindle cell lesions of the breast, including reactive spindle cell nodule/exuberant scar, nodular fasciitis, myofibroblastoma, leiomyoma<sup>16</sup> and inflammatory myofibroblastic/inflammatory pseudotumor<sup>17</sup>, can be easily ruled out for the lack of infiltrative margins. Apart from these benign lesions, DFSP needs to be distinguished from lipomatous myofibroblastoma, fatty-free/low-fat spindle cell lipoma and solitary fibrous tumor. Both lipomatous myofibroblastoma and spindle cell lipoma share areas with pseudoinfiltrative fibromatosis-like pattern due to the admixture of the spindle cell component with the lipomatous one, along with a diffuse positivity for CD34<sup>18-20</sup>. Unlike DFSP, lipomatous myofibroblastoma and spindle cell lipoma have pushing borders and the fatty component is not the result of the entrapment of the surrounding breast adipose tissue, but it is a true neoplastic component<sup>18,20</sup>. Like DFSP, other bland-looking spindle cell tumors, such as desmoid-type fibromatosis<sup>21-23</sup> and low-grade (fibromatosis-like) spindle cell carcinoma<sup>24,25</sup>, exhibit, at least focally, infiltrative margins, namely finger-like projections of neoplastic cells into adjacent mammary lobules/ducts and fibroadipose

tissue<sup>21,23</sup>. Solitary fibrous tumor can rarely occur in the breast parenchyma<sup>26,27</sup>. Although this tumor shares the diffuse expression of CD34 with DFSP, it has pushing borders and is typically stained with STAT6<sup>28,29</sup>. Desmoid-type fibromatosis of the breast is composed of spindle cells, usually aligned parallel to one another and arranged in long, sweeping fascicles set in a variably fibrous stroma. Unlike DFSP, desmoid-type fibromatosis is CD34-negative, but positive for  $\alpha$ -smooth muscle actin and  $\beta$ -catenin (nuclear staining). Diagnostic clues for the diagnosis of fibromatosis-like spindle cell carcinoma is identification of epithelioid/polygonal cells arranged singly or in small cohesive clusters, better highlighted by means of immunohistochemistry (epithelial markers such as broad-spectrum cytokeratins and EMA)<sup>24,25</sup>. In addition, the demonstration of immunoreactivity for myoepithelial markers, especially p63, in a significant number of neoplastic cells, supports the diagnosis of fibromatosis-like spindle cell carcinoma. DFSP is negative for both epithelial markers and p63.

The present case confirms that DFSP can arise primarily in the breast parenchyma, posing differential diagnostic problems with other benign and malignant bland-looking spindle cells lesions of the breast. As radiological features of DFSP of the breast are not specific, histological examination and diffuse staining for CD34 remain the diagnostic gold standard for a correct diagnosis. In conclusion, we emphasize that the diagnosis of DFSP of the breast can be confidentially rendered if the pathologist is aware of the possibility that this tumor, relatively common to the skin, can rarely arise in this unusual site.

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