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Review

Mesenchymal breast lesions

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Mesenchymal breast lesions encompass a variety of breast diseases. Many of these lesions are rare with only a few case reports in the literature. This article reviews the imaging findings of selected mesenchymal breast lesions, their clinical presentations and method of diagnosis. Mesenchymal lesions are diverse and include haemangioma, granular cell tumour, myofibroblastoma, fibromatosis, pseudoangiomatous stromal hyperplasia, and malignant fibrous histiocytoma. It is important for radiologists to be aware of these lesions as some of them may have malignant potential or demonstrate imaging features that overlap with other malignant lesions.

Introduction

Mesenchymal lesions of the breast comprise a spectrum of lesions that arise in the stroma of the breast. They include fibro-epithelial, fibroblastic and myoblastic, vascular, lipomatous, neural, myogenic, and osseous tumours. In all, there are 17 lesions included in the WHO histological classification of mesenchymal tumours of the breast.[1] Some of these lesions are fairly common, while other lesions are extremely rare with no known prevalence and only a few case reports in the literature. This paper discusses mesenchymal lesions that the authors have encountered in clinical practice, including haemangioma, granular cell tumour (GCT), myofibroblastoma, fibromatosis, pseudoangiomatous stromal hyperplasia (PASH), and malignant fibrous histiocytoma (MFH). Table 1 summarizes the lesions discussed in this article. Additional entities described by the WHO but not covered in the scope of this review article include: angiomatosis, haemangiopericytoma, inflammatory myofibroblastic tumour, lipoma (angiolipoma), neurofibroma, schwannoma, angiosarcoma, liposarcoma, rhabdomyosarcoma, osteosarcoma, leiomyoma, and leiomyosarcoma. When a radiologist encounters one of these entities, familiarity with the radiographic appearance and pathology of mesenchymal lesions will ensure optimal patient management.

Haemangiomas

Haemangiomas are the most common benign vascular tumour of the breast.[2] They typically measure <2 cm.[3] Most commonly they are located in the subdermal or subcutaneous soft tissues.[2,4] Breast haemangiomas are found in 11% of post-mortem specimens and can occur at any age.[3,5–7] They occur more frequently in women than in men.[7]

A haemangioma located in the subdermal or subcutaneous breast tissue is detected as a palpable mass by the patient or physician on clinical breast examination. This typically is the case with male patients, where the superficial location and small breast size contribute to initial detection on physical examination.[4,5] Skin colour changes may be evident. One particular form of haemangioma,

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Table 1
Mesenchymal lesions of the breast with descriptions of selected examples.

	Haemangioma	Granular cell tumour	Myofibroblastoma	Fibromatosis (aggressive)	Pseudoangiomatous stromal hyperplasia (PASH)	Malignant fibrous histiocytoma (MFH)[a]
Demographics	Any age: Female >> Male	Premenopausal females, more commonly in African Americans	Elderly males and post-menopausal females	Any age: Female > Male	Premenopausal women, associated with hormonal therapy Post-menopausal patients, associated with hormone-replacement therapy	Middle-aged to elderly females and less often elderly males Association with prior radiation or other breast malignancy
Mammographic appearance	Oval or lobular masses with well circumscribed or microlobulate borders Tangential views may optimally image their superficial location	Variable mass or density with well-defined or poorly defined margins	Well-circumscribed, round or ovoid, non-calcified masses	Overlaps with malignancy and presents as high-density lesion with spiculate or indistinct margins Lacks calcifications	Typically presents as a dense mass Less commonly, it can also present as focal asymmetry or be mammographically occult	Mass that is denser than the surrounding breast tissue with varied margins
US appearance	Variable with reported Doppler vascularity	Variable, but typically hypoechoic mass	Well-circumscribed, solid, homogeneously hypoechoic masses	Overlaps with malignancy Solid hypoechoic mass with variable irregular borders	Variable with typical appearance of solid, circumscribed, hypoechoic ovoid masses	Well-defined, heterogeneous, hypoechoic masses with solid and cystic components Increased flow on colour Doppler
Management	Diagnose with imaging or tissue sampling Follow with serial imaging Excision for atypical imaging findings, interval growth, or histopathological findings concerning for angiosarcoma	Wide local excision Local recurrence can occur if incomplete excised	Tissue diagnosis, preferably by ultrasound-guided core biopsy	Surgical excision due to malignant radiographic appearance Often treated surgically due to locally aggressive growth pattern	Tissue diagnosis with ultrasound or stereotactically guided biopsy Follow with serial imaging Excision for interval growth or histopathological findings concerning for mixed lesions at histopathology	Definitive diagnosis usually requires surgery Great variability in treatment regimen with optimal management not established

[a] MFH is not considered a mesenchymal breast lesion as per WHO classification.

cutaneous infantile haemangioma, demonstrates a strawberry-like appearance. Deeper infantile lesions may cause a slightly bluish tinge to the overlying skin due to large draining veins.[8]

Histological examination reveals endothelial-lined dilated vascular channels filled with red blood cells.[5] Haemangiomas are subcategorized pathologically as cavernous or capillary depending on the size of the vascular channels.[9] Capillary haemangiomas are composed of capillaries with a larger feeder vessel. Cavernous haemangiomas are formed by groups of abnormal, usually thin-walled, veins[10]

Breast haemangiomas can be detected incidentally on screening mammography. Alternatively, they may require diagnostic mammography when they occur superficially and are palpable. At mammography, haemangiomas often present as oval or lobular masses with well-circumscribed or microlobulate borders (Fig 1a).[4,5,11] Tangential views may optimally image their superficial location.[4] They rarely have associated calcifications, which when present, can be attributed to venous phleboliths or calcified thrombi.[12]

Haemangiomas appear sonographically as superficial, solid masses with varied echotexture and borders. A spectrum of sonographic appearances has been reported. These include well-defined hypoechoic, ill-defined hyperechoic, isoechoic, or sonographically occult masses (Figs 1b, 2a,b).[2,5,12,13] Vascular channels may be seen centrally or peripherally, and high vascularity on Doppler has been reported.[4]

At MRI, haemangiomas appear as lobulate masses with fibrous septa that are isointense to the surrounding fibroglandular tissue on T1-weighted images and homogeneously hyperintense with cystic or cavernous spaces of slow flow on T2-weighted images.[5,9] Flow voids, fibrosis, or thrombi may cause areas of low signal intensity.[5,13] Haemangiomas may demonstrate delayed heterogeneous enhancement or early diffuse enhancement followed by plateau (Fig 2c).[4,5,9] MRA may show high flow vessels centrally or peripherally.[13] At MRI, haemangiomas that enhance intensely are difficult to differentiate from angiosarcomas, which also enhance intensely and are supplied by visible enlarged vessels.[2,5]