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CURRENT TOPICS IN BREAST PATHOLOGY

Vascular tumours of the breast: a comprehensive review with focus on diagnostic challenges encountered in the core biopsy setting

PAULA S. GINTER, PATRICK J. MCINTIRE AND SANDRA J. SHIN

Department of Pathology and Laboratory Medicine, Weill Cornell Medicine, New York, NY, USA

Summary

Vascular proliferations of the breast comprise a spectrum of benign and malignant lesions. In limited samples, such as core needle biopsies (CNB), these lesions may be difficult to distinguish due to significant overlap in morphological features. As the treatment and prognosis of these entities vary widely, it is important for pathologists to consider a complete differential diagnosis and correctly synthesise histological features, results of adjunctive immunohistochemical studies, and pertinent clinical and imaging information, to render an accurate diagnosis in such limited samples. The diagnostic pitfalls of under- or overdiagnosis of vascular lesions sampled in CNB will also be discussed.

Key words: Breast; vascular; core biopsy; angiosarcoma; atypical vascular lesion; haemangioma.

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INTRODUCTION

While rare, vascular proliferations of the breast comprise a range of benign and malignant lesions with significant overlap in morphological features, particularly when encountered in limited samples such as core needle biopsies (CNB). Pathologists must ensure that a complete differential diagnosis is considered to avoid diagnostic pitfalls that can lead to over- and underdiagnosis of these entities in this setting. This review will discuss the clinicopathological features of the most commonly encountered mammary vascular proliferations (Tables 1 and 2), provide practical guidance on how best to approach such lesions in limited samples, and discuss useful ancillary studies (Table 3).

CLINICOPATHOLOGICAL FEATURES OF BENIGN ENTITIES

Haemangioma

Haemangiomas are benign vascular tumours which may be found throughout the body but are rare in the breast. Haemangiomas can be classified as cavernous (most common) or non-cavernous, the latter of which include subtypes described as perilobular, capillary, complex, and venous.[1] Furthermore, in the breast, haemangiomas can be further categorised as parenchymal or non-parenchymal in location.

Based on studies evaluating mastectomies performed for carcinoma and examination of post-mortem breast tissue, the incidence of perilobular haemangiomas has been reported to range from 1.3% to 11%.[2,3] Affected patients can be as young as 18 months and up to 82 years of age.[4,5] Haemangiomas are rarely encountered in men and when present, are typically palpable.[6,7] Most haemangiomas are incidental findings by imaging studies but may be palpable.[8,9] Excluding perilobular examples, which are incidental microscopic lesions, most parenchymal haemangiomas lesions measure less than 2 cm (range 0.3–6.0 cm).[7,8] This is also true for non-parenchymal haemangiomas but with a slightly more narrow range (0.8–6.0 cm).[9,10]

By mammography, haemangiomas are typically superficial in the subcutaneous tissue; however, they may be intraparenchymal and appear as well-circumscribed macrolobulated lesions, with or without calcifications.[5,11–13] The characteristics are non-specific and the differential diagnosis often includes fibroadenoma or cyst. Rarely, they demonstrate features suggestive of carcinoma.[14] On ultrasound, haemangiomas are superficial and more commonly well-circumscribed (than not) with variable echo patterns and parallel orientation. Calcifications may or may not be present.[5,11,12] Lesions may be compressible unless completely thrombosed.[5] Occasionally, cavernous haemangiomas may be confused with complex cysts due to the presence of multiple septations and increased acoustic transmission.[5,12] Haemangiomas typically display a slow, delayed enhancement by magnetic resonance imaging (MRI).[12] While some features may suggest benignity, there are no reliable imaging features that distinguish haemangiomas from angiosarcomas. Definitive diagnosis relies on tissue sampling.

Cavernous haemangiomas

Grossly, cavernous haemangiomas are circumscribed, red-brown and have a spongy texture. Microscopically, they consist of distended, congested vessels supported by a fibrous stroma (Fig. 1A). Typically, the vessels are independent with only rare anastomoses. Areas with small capillary-sized vessels may also be seen. The endothelial lining is flat without hyperchromasia or atypia (Fig. 1B). Thrombosis is common and organisation may result in the formation of papillary endothelial hyperplasia.[1,5,15] Stromal calcifications may also be present.[8,16] Lesions exhibit a variable degree of

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Table 1 Pertinent clinical features of mammary vascular tumours

	Clinical	Size	Radiology	Additional pertinent information
Haemangioma	Children and adults Incidental or occasionally mass lesion Superficial location Parenchymal Non-parenchymal	Commonly <2 cm Parenchymal, range 0.3–6.0 cm Non-parenchymal, range 0.8–6.0 cm	MMG: circumscribed, macrolobulated lesions; ± calcifications	
Angiolipoma	Adults Cellular AL older than low-vascularity AL Cellular AL: incidental Low-vascularity AL: non-painful mass	Cellular AL smaller than low-vascularity AL (mean 0.7 cm vs 2.0 cm)	MMG: round, oval or lobular; isodense US: Cellular: irregular density Low-vascular: hyperechoic	
Papillary endothelial hyperplasia	Children and adults Palpable mass or occasionally incidental	Commonly <2 cm Range 0.4–2.7 cm	MMG: circumscribed nodular lesion; ± calcifications	
Atypical vascular lesion	Older adults 5th to 7th decades Ecchymotic lesions on axillary or mammary skin	Commonly <2 cm Range 0.1–2.0 cm	Commonly occult	Arise following radiation Latency period: frequently 3–6 years
Angiomatosis	Congenital to adulthood Frequently <40 years Breast swelling or painless palpable mass ± skin discolouration Parenchymal	Commonly >2 cm Range 9.0–17 cm	US: multiple irregular or circumscribed anechoic spaces with septa; may extend into subcutaneous tissue or chest wall MRI: T1: diffuse enhancement with cystic dilated structures and thick walls T2: multiple, communicating, high signal tubular structures	
Primary angiosarcoma	Young adults Frequently 3rd to 4th decades Mass lesion without skin changes Parenchymal	Commonly >2 cm Range 5.5–7.0 cm	MMG: ill-defined areas of increased density, without calcifications, may be occult US: ovoid, hyperechoic or heterogeneously echoic solid masses MRI: T1: iso-dense or low intensity lesions T2: hyper-intense with fat suppression	
Secondary angiosarcoma	Older adults Frequently 6th to 7th decades Ecchymotic skin lesions with or without a mass lesion	Commonly >2 cm Range 1.0–4.5 cm	MMG: occult, ± mass lesion US: skin thickening or irregular masses MRI: T1: rapid initial and washout delayed enhancement kinetics T2: diffuse T2 hyper-intense skin thickening	Arise following radiation or in setting of lymphoedema Latency period: frequently 6–7 years

AL, angiolipoma; MMG, mammography; MRI, magnetic resonance imaging; US, ultrasound.

circumscription and some may demonstrate smaller vascular channels infiltrating into adipose tissue at the periphery which simulate the peripheral areas of some low-grade angiosarcomas.[1] Increased number of mitoses, solid growth and haemorrhagic necrosis or 'blood lakes' are not features of cavernous haemangiomas and presence of some or all of these should raise the suspicion for angiosarcoma.

Venous haemangiomas

Venous haemangiomas are characterised by irregularly shaped dilated vascular channels with a variably evident smooth muscle layer within the wall (Fig. 1D). The vessels are lined by flat, cytologically bland endothelial cells. Typically, a well-formed arteriovenous bundle is identified at the periphery of the lesion.[17] The intervening stroma often contains scattered inflammatory cells. Both parenchymal and non-parenchymal examples have been described.[9,17] Endothelial pleomorphism or hyperchromasia, mitoses, 'blood lakes' and invasion (or destruction) of mammary glandular parenchyma are absent. Identification of such features should alert the pathologist to consider an alternative diagnosis (e.g., angiosarcoma).

Perilobular haemangiomas

Perilobular haemangiomas are microscopic lesions comprised of a network of small capillary-sized to ectatic miniature cavernous blood vessels involving either perilobular or extralobular breast stroma (Fig. 1E). While most are solitary, multiple concurrent lesions can be encountered. The vascular spaces lack conspicuous underlying stroma or supporting muscular layer and are filled with numerous red blood cells. While most are lined by flat, bland endothelial cells without atypia, occasionally, nuclear hyperchromasia may be encountered.[8] Vascular anastomoses may be seen but are