Published in final edited form as:

Histopathology. 2017 November ; 71(5): 795–804. doi:10.1111/his.13291.

Benign Vascular Lesions of the Breast Diagnosed by Core Needle Biopsy Do Not Require Excision

Christopher Sebastiano, MD,

Department of Pathology, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Lucas Gennaro, MD,

Department of Radiology, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Edi Brogi, MD,

Department of Pathology, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Elizabeth Morris, MD,

Department of Radiology, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Zenica L. Bowser, MS,

Department of Pathology, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Cristina R. Antonescu, MD,

Department of Pathology, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Fresia Pareja, MD PhD,

Department of Pathology, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Sandra Brennan, MB, and

Department of Radiology, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Melissa P. Murray, DO

Department of Pathology, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Abstract

AIMS—Surgical excision of all benign vascular lesions of the breast identified by core needle biopsy has been recommended in the past to rule out a more serious lesion. In this study we investigated the clinical, radiologic, and pathologic findings in patients diagnosed with a benign vascular lesion at our institution to assess whether excision may be spared for lesions without atypia.

METHODS AND RESULTS—We searched the electronic medical record for patients with a vascular lesion of the breast diagnosed between 2000 and 2015. The study population consisted of

Corresponding Author: Melissa Murray, DO; Department of Pathology, Memorial Sloan Kettering Cancer Center, New York, NY, USA. murraym@mskcc.org, Tel: (212)-639-3720; murraym@mskcc.org.

Disclosure of Interest: The authors declare no conflict of interest.

Authors' Contributions

M.P.M., E.B., S.B. and E.M. conceived the study. C.S., F.P., and Z.L.B. provided clinical data. L.G., S. B., and E.M. provided radiology imaging. L.G. performed radiology review. C.S., M.P.M., E.B., C.R.A. performed pathology review. C.S., and M.P.M., wrote the first manuscript, which was reviewed by all co-authors.

84 patients, 83 females and 1 male. The index diagnoses included 76 benign vascular lesions, 5 vascular lesions with cytologic atypia, and 3 angiosarcomas. A radiologist reviewed all pre and post-biopsy imaging studies; all cases had concordant radiologic and pathologic findings. Based on radiologic and histologic correlation, the vascular lesion accounted for the radiologic target in 40 (48%) cases and was deemed an incidental finding in 44 (52%). 7 of 32 (22%) targeted and 10 of 44 (23%) incidental benign vascular lesions underwent surgical excision; there were no upgrades at excision. No recurrences or clinical events were observed in patients with a targeted or incidental benign vascular lesion with a median followup of 39 months and 40.6 months, respectively.

CONCLUSION—Our data suggest that benign vascular lesions diagnosed on core biopsy with concordant radiologic and pathologic findings do not warrant surgical excision.

Keywords

breast vascular lesion; hemangioma; angiolipoma; angiosarcoma

Introduction

Benign vascular lesions (BVLs) of the breast are uncommon and include hemangiomas (perilobular, capillary, cavernous and venous types) and angiomas. Perilobular hemangiomas tend to be incidental findings, whereas larger hemangiomas may present mammographically and are sometimes palpable.^{1–4} Other BVLs such as papillary endothelial hyperplasia and angiolipomas can also involve the soft tissue or skin of the breast.⁵

Primary breast angiosarcomas (AS) tend to be larger than BVLs, measuring at least 2 cm.^{2,6,7} Since primary AS of the breast may contain well differentiated foci that can closely mimic a BVL, surgical excision of all benign vascular lesions of the breast identified by core needle biopsy (CNB) has been recommended in the past to rule out a more serious lesion, even in the absence of cytologic atypia.^{8,9} Such practice might be excessive in the current era of highly sophisticated and sensitive breast imaging techniques. We investigated the clinical, radiologic, and pathologic findings in a large cohort of patients diagnosed by CNB with a BVL at our institution, and correlated the findings with those in the surgical excision specimen and with clinical followup information, to assess whether excision may be spared for radiologic-pathologic concordant BVLs without atypia.

Materials and Methods

We conducted a computerized search of the Pathology Department database to identify patients who underwent CNB of a breast lesion at our center between 2000 and 2015 and received a diagnosis of a vascular lesion. Since the aim of this study was to examine vascular lesions of the breast parenchyma with radiologic-pathologic concurrence, we excluded patients with vascular lesions primarily involving the skin of the breast. We also excluded patients without follow-up information and cases for which slides were not available for review. Clinical information including patient sex, age at diagnosis, and personal and family history of breast carcinoma, was retrieved from the electronic medical records. This research

was approved by the institutional review board/privacy board of Memorial Sloan Kettering Cancer Center (#17-041 on 1/19/2017) and conducted according to the principles of the Declaration of Helsinki.

A breast radiologist (LG) reviewed all available pre- and post-CNB imaging (mammography, ultrasound, and magnetic resonance imaging [MRI]) studies. The study radiologist assessed the size of the lesion, whether the vascular lesion represented the imaging target or was an incidental finding, reason for biopsy (calcifications, mass, non-mass enhancement [NME], asymmetry), and presence of a residual target after CNB. For calcifications and for mammographically evident, sonographically occult masses, patients underwent biopsy with stereotactic guidance with a 9-gauge vacuum-assisted biopsy (VAB). For MRI enhancement, patients underwent biopsy with MRI guidance with a 9-gauge VAB probe. For sonographically evident masses, patients underwent biopsy with ultrasound guidance most commonly with a 12-gauge (range, 14–9 gauge) automated core biopsy with gauge size dependent on the lesion and physician doing the biopsy. Targeted lesions were defined as lesions for which the histological findings accounted for the imaging characteristics, and were deemed concordant with the lesion seen by the radiologist on pre-biopsy imaging. Incidental lesions were defined as lesions which did not appear to represent the target seen by the radiologist on pre-biopsy imaging, and were incidentally detected in a CNB yielding another lesion concordant with the imaging findings.

All CNB material was submitted in its entirety and routinely processed to obtain at least three 4-micron thick, hematoxylin and eosin-stained (H&E), level sections from each block. All available (H&E) slides from the CNB and subsequent surgical excision were reviewed by a breast pathology fellow (CS), who selected slides representative of the lesion for review together with two breast pathologists (MM and EB). A soft tissue/sarcoma pathologist (CRA) reviewed selected slides. The institutional review board approved this study.

Results

The search yielded a total of 91 patients. Seven patients (5 with incidental findings and 2 with targeted BVLs) were lost to clinical followup. The study population thus consisted of 84 patients, 83 females and 1 male, with CNB diagnosis of a breast vascular lesion. The index diagnoses included 76 BVLs, 5 vascular lesions with cytologic atypia (VLAs), and 3 AS. Mean patient age at diagnosis was 50 years old (range 12–93). Based on radiologic and histologic correlation, the vascular lesion accounted for the radiologic target in 40 (48%) cases and was deemed an incidental finding in 44 (52%). The radiologic and pathologic findings were deemed concordant in all cases. The radiologic and pathologic features of the lesions are summarized in Table 1. Ten of 32 targeted BVLs, 23 of 44 incidental BVLs, 1 of 5 VLAs, and all three AS were found in patients who presented with prior or concurrent breast carcinoma. The remainder of lesions were detected in patients undergoing screening imaging, or as palpable lesions with corresponding imaging studies, who presented to our center for biopsy. Most patients (59/84, 70%) were followed clinically and radiologically, and 25 of 84 patients (30%) underwent surgical excision; in 17 of 25 (68%) patients the excision aimed to remove the radiologic target lesion, including all VLAs and AS. There

were no diagnostic upgrades at excision. The radiologic and pathologic features of the excised lesions are in Table 2.

Benign Vascular Lesions (BVLs)

Targeted BVLs

Patient Characteristics—The patients were all women with a median age of 53 years (range 12–92). Three patients had concurrent breast carcinoma in the ipsilateral breast (2 invasive ductal carcinoma [IDC] and 1 microinvasive carcinoma), and 1 in the contralateral breast (ductal carcinoma in situ [DCIS]). Six patients had prior breast carcinoma in the contralateral breast (1 DCIS, 4 IDC, 1 invasive lobular carcinoma [ILC]); the 4 patients with IDC underwent breast conserving surgery with breast irradiation.

Imaging Characteristics—A total of 32 BVLs were identified as the radiologic target on pre-biopsy imaging. The BVLs consisted of 31 hemangiomas (25 capillary hemangiomas and 6 cavernous hemangiomas) and one case of papillary endothelial hyperplasia. The median size of the targeted BVLs as measured on imaging was 8.4 mm (range 4.5–23.7 mm). Radiologic indications for biopsy included a mammographic and/or ultrasonographic mass (19 cases), mammographic calcifications (1 case), mammographic asymmetry (1 case), and an MRI lesion (11 cases). Five of the biopsies were performed under stereotactic guidance, 16 under ultrasound, and 11 under MRI guidance.

Histologic Findings at Core Biopsy—The capillary hemangiomas consisted of slightly dilated, capillary-like vascular spaces lined by bland endothelium (Fig. 1A). The cavernous hemangiomas consisted of markedly dilated vascular spaces lined by bland endothelial cells and filled with blood (Fig. 1B). Calcifications were identified microscopically in two of the capillary hemangiomas. The single case of papillary endothelial hyperplasia showed a papillary proliferation of bland endothelial cells which appeared to grow within a dilated blood vessel. Additional histologic findings seen in these CNBs included fibrocystic changes in 8 cases and fibroadenoma in another.

Histologic Findings in Surgical Excision—Seven of the 32 (22%) targeted BVLs were excised. Six lesions were excised solely due to the finding of a vascular lesion on CNB, and only 3 revealed residual hemangioma (2 capillary and 1 cavernous). The capillary hemangiomas measured 6 and 10 mm in the excision specimens, and the cavernous hemangioma measured 9 mm; all were histologically identical to the vascular lesion seen in the CNB material. Three excision specimens contained no residual vascular lesion. One patient underwent mastectomy for IDC at a separate site from the BVL; the mastectomy revealed no residual vascular lesion at the biopsy site.

Follow Up Information—Followup imaging was available for 19 BVLs which were not excised. In 6 cases the lesion was no longer detectable after CNB. In 13 cases the lesion remained stable. The median followup time was 39 months (range 90 days to 12.1 years). Twenty-nine patients are NED and 3 died of other causes (1 from metastatic ILC, 1 from systemic amyloidosis, and 1 from metastatic malignant epithelioid neoplasm not otherwise specified).

Incidental BVLs

Patient Characteristics—The patients were all women with a median age of 47 (range 27–73). 9 patients had concurrent carcinoma in the ipsilateral breast (3 DCIS, 5 IDC, 1 ILC) and 6 in the contralateral breast (2 IDC, 3 ILC, 1 myoepithelial carcinoma). Two patients had a prior history of breast carcinoma in the ipsilateral breast (both DCIS) and 6 in the contralateral breast (2 DCIS, 4 IDC). 5 patients had a prior history of radiation therapy (all 4 with prior contralateral IDC, and one with prior ipsilateral DCIS).

Imaging Characteristics—Radiologic indications for biopsy included 17 for calcifications on mammography, 3 for a mass on mammography and/or ultrasound, 2 for asymmetry or architectural distortion on mammography, 7 for a mass on MRI and 15 for NME on MRI. 22 biopsies were performed under MRI guidance, 17 under stereotactic guidance, and 5 under ultrasound guidance. All 44 lesions were perilobular hemangiomas with no imaging correlate.

Histologic Findings at Core Biopsy—Histologically the incidental perilobular hemangiomas consisted of very small dilated vascular channels lined by bland endothelial cells identified around or between breast lobules (Fig. 1C). The mean microscopic size of the incidental BVLs was 1 mm (range 0.5–7). As these lesions were deemed incidental, the CNB yielded other lesions that were concordant with the imaging characteristics of the target lesion (21 fibrocystic changes or sclerosing adenosis, 2 fibroadenomas, 1 intraductal papilloma [IDP], 1 mucocele-like lesion, 2 atypical ductal hyperplasia [ADH], 2 atypical lobular hyperplasia [ALH], 2 lobular carcinoma in situ [LCIS], and 1 IDC).

Histologic Findings in Surgical Excision—Ten (23%) incidental BVLs were excised, including 7 excised for the presence of a high-risk lesion or carcinoma (1 IDP, 1 mucocele-like lesion, 2 ADH, 2 LCIS, and 1 IDC); no residual vascular lesions were identified in the excision specimens. Three lesions were excised due to the finding of a BVL on CNB. Residual hemangioma measuring 1 mm was identified in one excision specimen, which was histologically identical to the BVL on CNB; no residual vascular lesion was present in the remaining two surgical excision specimens.

Follow Up Information—The median followup time was 40.6 months (range 4.6 months to 10.9 years). Forty-three patients show no evidence of disease (NED) and one died of other causes (metastatic IDC).

Vascular Lesions with Cytologic Atypia (VLAs)

Patient Characteristics—A total of 5 CNB yielded VLAs. The patients were 4 women and 1 man with a median age of 56 years (range 49 to 66). One patient had been treated with radiation therapy for IDC in the ipsilateral breast. The male patient had a history of prostate carcinoma treated with external beam radiation. Of note, this patient presented with palpable breast nodularity two years following the diagnosis of prostate carcinoma and a mass was detected on mammography and ultrasound. The CNB of the breast mass yielded a VLA.

Imaging Characteristics—The median size of the lesions as measured on imaging was 11.3 mm (range 5.7–14.1 mm). Radiologic indications for biopsy included 4 for a mass on mammography and/or ultrasound, and 1 for NME on MRI. Two of the biopsies were performed under stereotactic guidance, 2 by ultrasound, and 1 by MRI.

Histologic Findings at Core Biopsy—Histologically the VLAs consisted of dilated vascular channels lined by endothelial cells with at least focal mild to moderate nuclear atypia (Fig. 2A, C). All showed some degree of hypercellularity. None showed anastomosing channels, blood lakes, necrosis, or solid growth. Mitotic activity was minimal or absent in all cases.

Histologic Findings in Surgical Excision—All VLAs were excised; on review of the excision specimens, 2 were classified as hemangiomas and 2 as angiolipomas. No residual vascular lesion was present in one case. In the excision specimens the hemangiomas were well circumscribed and exhibited dilated vascular channels with mild hypercellularity and mild nuclear atypia (Fig. 2B). One hemangioma showed microscopic calcifications. The angiolipomas were intimately associated with adipocytes, moderately cellular with mild to moderate nuclear atypia, and exhibited focal fibrin thrombi (Fig. 2D). On re-review of the CNB material, the intravascular thrombi were noted focally in one of the angiolipomas. Other than slight endothelial nuclear atypia, none of the lesions exhibited any feature of angiosarcoma on excision. The VLA which showed no residual vascular lesion on excision was similar in size on imaging and CNB (5.7 mm and 5 mm, respectively), and was not detectable on post-biopsy imaging; we speculate that it was entirely removed at the time of CNB.

Follow Up Information—The median followup time was 15.8 months (range 45 days to 6.8 years). All five patients are NED.

Angiosarcomas (AS)

Patient Characteristics—Three AS of the breast parenchyma were identified. The patients were all women with a median age of 63 (range 52–76). Two patients had prior ipsilateral IDC (15 and 26 years prior) and one patient had prior ipsilateral DCIS (6 years prior). All three patients had a history of radiation to the ipsilateral breast.

Imaging Characteristics—The median size of the lesions as measured on imaging was 38.3 mm (range 19.8–43 mm). In all three cases the radiologic indication for biopsy was a mass seen on mammography and ultrasound, and the biopsies were performed under ultrasound guidance.

Histologic Findings at Core Biopsy—All three lesions were classified as high grade AS on review of the CNB. Two of the lesions showed prominent anastomosing vascular channels (Fig. 1D) and one had predominantly solid growth (Fig. 1E) with blood lakes (Fig. 1F) and a paucity of recognizable vascular channels. All three lesions showed high grade nuclear atypia and increased mitotic activity. Foci of low grade AS with anastomosing vascular channels were identified at the periphery of one of the lesions.

Immunohistochemistry performed on the lesion with predominantly solid growth showed diffuse, strong positivity for CD31 and CD34.

Histologic Findings in Surgical Excision—All three patients underwent mastectomy, and all showed residual high grade AS. The largest lesion measured 4.6 cm in greatest dimension, as measured grossly. In the other two cases the lesions were multifocal with the largest focus measuring 2.3 cm and 1.7 cm, respectively.

Follow Up Information—The median followup time was 29.1 months (range 14 months to 2.5 years). One patient is NED, one is alive with recurrent AS, and one died of disease.

Discussion

Vascular lesions of the breast are rare and most are benign. Perilobular hemangiomas are detected incidentally in up to 1.3% of mastectomies performed for carcinoma, and in up to 11% of forensic autopsies.^{3,4} Among vascular lesions, AS of the breast, while comparatively even less common than BVLs, is a highly aggressive malignant neoplasm.⁶

To date there is no documented evidence that hemangiomas with benign histologic findings, or even those with cytologic atypia, can give rise to AS.^{9,10} The rationale for excision of BVLs diagnosed at CNB is to avoid underdiagnosis of a primary AS, with only a very well differentiated component sampled on core biopsy. Albeit possible, the actual occurrence of this phenomenon has not been well documented in the literature, and in one recently reported instance the lesion at CNB likely represented what we would classify as a VLA.¹¹ Few studies have examined the clinical followup of vascular lesions with cytologic atypia diagnosed on CNB, and those that have did not show any upgrades on excision or clinical events/recurrences on followup.^{2,10,12}

Incidental perilobular hemangiomas are small enough to be occult on imaging. In our experience most are entirely removed by the CNB. Only one of the perilobular hemangiomas in our series was focally present in the excision specimen. Jozefczyk and Rosen observed no clinical events in 11 patients with perilobular hemangiomas with a median follow-up time of 4.5 years. In their series, however, all hemangiomas were removed by excision or mastectomy.² In our study 10 perilobular hemangiomas were excised with no evidence of upgrade. 36 hemangiomas were not excised and clinical followup for a median of 40.6 months showed no clinical or radiologic progression.

Other hemangiomas, such as capillary or cavernous hemangiomas, are clinically palpable or radiologically detectable. Although they usually cannot be entirely removed by CNB, their growth can be monitored reliably with followup imaging studies. Hemangiomas are often well circumscribed lesions on mammography with an oval or lobular shape.^{12,13} While the ultrasonographic features are variable, the size, margins, and shape are typically similar to that seen on mammography.¹² Mesurolle et al. retrospectively analyzed 15 radiologically detectable breast hemangiomas, 3 of which underwent subsequent surgical excision.¹² There were no upgrades on excision, and no clinical events on followup. Eight patients were followed with mammographic surveillance for a mean of 3.7 years; 6 of the lesions

remained mammographically stable and 2 showed a decrease in size. The authors suggested that, at least with radiologically detectable lesions, excision may be spared if there is radiologic-pathologic concordance and a benign diagnosis on core biopsy.^{12,14} Mammographic surveillance was the preferred imaging modality.

Vascular lesions with cytologic atypia evident on core biopsy material pose a clinical concern, and in our study all of them underwent surgical excision with no evidence of upgrade. Hoda et al. studied 18 cases of VLA involving breast parenchyma, 9 of which underwent subsequent excision.¹⁰ No clinical events were observed in any of the patients with a mean clinical followup of 44 months (range 1–140). The authors suggested that although the lesions showed cytologic atypia and occasionally infiltrative borders, they followed a benign course. Mantilla et al. studied 27 cases of breast VL and found one 9 mm low grade AS on excision out of 15 cases which showed worrisome histologic features on CNB.¹⁵ In the majority of cases, the imaging size of the vascular lesion appears to be a parameter useful to discriminate benign versus malignant vascular proliferations, with all of the benign lesions being less than 2 cm in greatest dimension, whereas most AS are 2 cm or greater.^{6,7} In our series the median size of AS by ultrasound was 3.8 cm, with the smallest spanning nearly 2 cm (1.9 cm). Conversely all of the VLAs were smaller than 2 cm, the largest being 1.4 cm. Yang et al. studied the imaging findings of 24 cases of AS and found a median size of 5.9 cm at time of diagnosis.¹⁶ The majority (19) of these tumors presented as a palpable mass. Three of 16 AS imaged with mammography, were mammographically occult; but all 3 were apparent with ultrasound and MRI examination. The latter two imaging modalities appear to be superior to mammography for diagnosis and surveillance of AS.¹⁶

Two VLAs in our series were reclassified as angiolipomas on surgical excision. Hoda et al. indicate that angiolipoma is to be included in the differential diagnosis of VLAs, as they can be highly cellular, but they are nonetheless benign lesions.¹⁰ Rosen also notes that the periphery of AS may especially resemble an angiolipoma when it involves fat.⁹ Both cases in our study were hypercellular on CNB, contributing in part to their initial classification as atypical. The intravascular thrombi which are characteristic of angiolipomas are a very helpful feature in distinguishing them from AS, as these are not found in AS. Fibrin thrombi were identified in either the CNB or excision specimen of both angiolipomas in our series.

Over the past 15 years all AS and VLAs, and a minority of BVLs, were excised at our institution. Our study documents that most BVLs diagnosed at CNB in recent years did not undergo excision, with stable follow-up. The decision not to excise BVLs was made based on careful radiologic – pathologic correlation. To our knowledge our data set is the largest reported in the literature to date. Potential limitations of this study include its retrospective nature and the relatively low number of BVLs (17/83, 20%) with follow-up excision, although our excision rate is comparable to that in Mesurolle's study (20%). While no clinical events were observed on followup of VLAs, we recommend that all atypical vascular lesions be excised. Our data suggest that benign vascular lesions diagnosed on core biopsy with concordant radiologic and pathologic findings (including incidental perilobular hemangiomas) do not warrant surgical excision.

Acknowledgments

Research reported in this paper was supported in part by a Cancer Center Support Grant of the National Institutes of Health/National Cancer Center Institute (grant No P30CA008748). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

References

1. Schnitt, SJ., Collins, LC. Biopsy Interpretation of the Breast. Philadelphia: LWW; 2009.
2. Jozefczyk MA, Rosen PP. Vascular tumors of the breast. II. Perilobular hemangiomas and hemangiomas. Am J Surg Pathol. 1985; 9:491–503. [PubMed: 4091183]
3. Rosen PP, Ridolfi RL. The perilobular hemangioma. A benign microscopic vascular lesion of the breast. Am J Clin Pathol. 1977; 68:21–23. [PubMed: 868802]
4. Lesueur GC, Brown RW, Bhathal PS. Incidence of perilobular hemangioma in the female breast. Arch Pathol Lab Med. 1983; 107:308–310. [PubMed: 6687795]
5. Rosen PP. Vascular tumors of the breast. V. Nonparenchymal hemangiomas of mammary subcutaneous tissues. Am J Surg Pathol. 1985; 9:723–729. [PubMed: 4061730]
6. Rosen PP, Kimmel M, Ernsberger D. Mammary angiosarcoma. The prognostic significance of tumor differentiation. Cancer. 1988; 62:2145–2151. [PubMed: 3179927]
7. Wang XY, Jakowski J, Tawfik OW, Thomas PA, Fan F. Angiosarcoma of the breast: a clinicopathologic analysis of cases from the last 10 years. Ann Diagn Pathol. 2009; 13:147–150. [PubMed: 19433291]
8. Lakhani, SR., Ellis, IO., Schnitt, SJ., Tan, PH., van de Vijver, MJ. WHO Classification of Tumours of the Breast. Lyon: World Health Organization; 2012.
9. Hoda, SA., Brogi, E., Koerner, FC., Rosen, PP. Rosen's Breast Pathology. Philadelphia: LWW; 2014.
10. Hoda SA, Cranor ML, Rosen PP. Hemangiomas of the breast with atypical histological features. Further analysis of histological subtypes confirming their benign character. Am J Surg Pathol. 1992; 16:553–560. [PubMed: 1599035]
11. Frey JD, Levine PG, Darvishian F, Shapiro RL. Angiosarcoma of the breast masquerading as hemangioma: exploring clinical and pathological diagnostic challenges. Arch Plast Surg. 2015; 42:261–263. [PubMed: 25798409]
12. Mesurolle B, Sygal V, Lalonde L, Lisbona A, Dufresne MP, Gagnon JH, Kao E. Sonographic and mammographic appearances of breast hemangioma. AJR Am J Roentgenol. 2008; 191:W17–22. [PubMed: 18562711]
13. Glazebrook KN, Morton MJ, Reynolds C. Vascular tumors of the breast: mammographic, sonographic, and MRI appearances. AJR Am J Roentgenol. 2005; 184:331–338. [PubMed: 15615997]
14. Mesurolle B, Wexler M, Halwani F, Aldis A, Veksler A, Kao E. Cavernous hemangioma of the breast: mammographic and sonographic findings and follow-up in a patient receiving hormone-replacement therapy. J Clin Ultrasound. 2003; 31:430–436. [PubMed: 14528442]
15. Mantilla JG, Koenigsberg T, Reig B, Shapiro N, Villanueva-Siles E, Fineberg S. Core Biopsy of Vascular Neoplasms of the Breast: Pathologic Features, Imaging, and Clinical Findings. Am J Surg Pathol. 2016; 40:1424–1434. [PubMed: 27340752]
16. Yang WT, Hennessy BT, Dryden MJ, Valero V, Hunt KK, Krishnamurthy S. Mammary angiosarcomas: imaging findings in 24 patients. Radiology. 2007; 242:725–734. [PubMed: 17325063]

Figure 1. Vascular lesions of the breast. Capillary hemangioma (A), cavernous hemangioma (B), and perilobular hemangioma (C). High grade angiosarcoma showing anastomosing vascular channels (D); high grade angiosarcoma with solid, epithelioid morphology (E) and blood lakes (F).

Figure 2.

Vascular lesions with atypia. CNB showing lesion with dilated, non-anastomosing vascular channels and mild nuclear atypia (A). On excision, this lesion was classified as hemangioma (B). CNB showing cellular lesion with mild nuclear atypia (C). On excision, this lesion was classified as angiolipoma (D); note the presence of fibrin thrombi (arrow).

Table 1

Vascular Lesions

CNB Diagnosis	3 AS	5 VLA	32 Targeted BVL	44 Incidental Perilobular BVL
Prior Ipsilateral Carcinoma	2 IDC (received radiation) 1 DCIS (received radiation)	1 IDC (received radiation)	None	2 DCIS (1 received radiation)
Median Imaging Size (mm)	38.3	11.3	8.4	NA
CNB Modality	3 Ultrasound	2 Ultrasound 2 Stereotactic 1 MRI	16 Ultrasound 5 Stereotactic 11 MRI	5 Ultrasound 17 Stereotactic 22 MRI
Excision Diagnosis	3 AS	2 Hemangioma 2 Angiolipoma 1 No residual	3 Hemangioma 4 No residual	1 Hemangioma 9 No residual
Radiologic Followup (If Not Excised)	NA	NA	6 No residual on post-CBX imaging 13 Stable on post-CBX imaging 6 No followup imaging	NA
Median Followup Time (Months)	29.1	15.8	39	40.6
Clinical Followup	1 NED 1 DOD 1 AWD	5 NED	29 NED 3 DOC	43 NED 1 DOC

BVL - benign vascular lesion, VLA - vascular lesion with atypia, AS - angiosarcoma, CBX - core needle biopsy, DOD - died of disease, DOC - died of other causes, NED - no evidence of disease, AWD - alive with disease, NA - not applicable

Table 2

Excised Vascular Lesions

Age	Sex	CNB Diagnosis	Size on Imaging (mm)	Indication for CNB	CNB Modality	Microscopic Size at CNB (mm)	Additional CNB Findings	Excision Diagnosis (size mm)	Followup Time (months)	Clinical Outcome
39	F	BVL	Incidental	Mass on MRI	MRI	1	Sclerosing adenosis	Perilobular hemangioma (1)	14.9	NED
48	F	BVL	Incidental	Mass on MRI	MRI	3	Intraductal papilloma	No residual	68.1	NED
49	F	BVL	Incidental	Calcs	Stereotactic	1	ADH	No residual	53.3	NED
63	F	BVL	Incidental	NME	MRI	2	LCIS, fibrocystic changes, sclerosing adenosis	No residual	43.3	NED
54	F	BVL	Incidental	NME	MRI	1	LCIS, fibrocystic changes	No residual	36.8	NED
56	F	BVL	Incidental	Calcs	Stereotactic	1	ADH	No residual	34.3	NED
35	F	BVL	Incidental	Mass on mammo/US	US	1	Fibroadenoma	No residual	8	NED
44	F	BVL	Incidental	Calcs	Stereotactic	1.5		No residual	42	NED
45	F	BVL	Incidental	NME	MRI	2	IDC	No residual	18.9	NED
53	F	BVL	Incidental	Calcs	Stereotactic	1	Mucocoele-like lesion	No residual	91.8	NED
57	F	BVL	4.9	NME	MRI	4	Fibrocystic changes	Hemangioma, capillary (4)	44.7	NED
70	F	BVL	14	Mass on mammo/US	US	10		No residual	23.3	NED
75	F	BVL	11	Mass on mammo/US	US	9		Hemangioma, cavernous (9)	66	NED
57	F	BVL	8.3	Mass on mammo/US	US	4		Hemangioma, capillary (2)	88.9	NED
52	F	BVL	9.4	Mass on mammo/US	US	1	Fibrocystic changes	No residual	124.7	NED
40	F	BVL	6.4	Mass on MRI	MRI	3	Fibrocystic changes	No residual	118	NED
33	F	BVL	15	Mass on mammo/US	US	4	Fibrocystic changes	No residual	25.5	NED
57	F	VLA	10.6	Mass on mammo/US	US	5		Hemangioma, capillary (5)	9	NED
49	F	VLA	5.7	Mass on mammo/US	Stereotactic	5		No residual	83.3	NED
66	F	VLA	12.3	Mass on mammo/US	Stereotactic	6		Angiolipoma (3)	1.5	NED
61	M	VLA	11.3	Mass on mammo/US	US	8		Hemangioma, capillary (4)	15.8	NED
46	F	VLA	14.1	NME	MRI	9	LCIS	Angiolipoma (4)	66	NED
52	F	AS	19.8	Mass on mammo/US	US	10		AS (17)	29.1	NED
61	F	AS	38.3	Mass on mammo/US	US	5		AS (23)	14	AWD
76	F	AS	43	Mass on mammo/US	US	13		AS (46)	30	DOD

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

BVL-benign vascular lesion, VLA- vascular lesion with atypia, AS- angiosarcoma, ADH-atypical ductal hyperplasia, IDC- invasive ductal carcinoma in situ, DOD - died of disease, DOC - died of other causes, LTFU - lost to followup, NED - no evidence of disease, AWD - alive with disease