

## Subcutaneous Cavernous and Capillary Hemangiomas of the Breast: Radiologic-Pathological Correlation<sup>1</sup>

### 유방의 피하지방층에 발생한 해면 혈관종과 모세 혈관종: 영상 및 병리 소견의 비교<sup>1</sup>

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Vascular tumors of the breast are uncommon and include hemangioma, angiolipoma, and angiosarcoma. Among breast hemangiomas, capillary hemangiomas are relatively rare in contrast to cavernous hemangiomas. We report two rare cases of cavernous and capillary hemangiomas of the breast by mammography, sonography, and positron emission tomography/computed tomography.

#### Index terms

Breast  
Hemangioma  
Mammography  
Sonography  
Positron Emission Tomography/CT

Received June 28, 2013; Accepted October 16, 2013  
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## INTRODUCTION

Benign hemangiomas of the breast are rare. The mammographic and sonographic appearance of breast hemangiomas have been described in several reports (1-4) but only a few reports have included magnetic resonance imaging (MRI) or positron emission tomography/computed tomography (PET/CT) findings (5, 6). The mammographic features of hemangiomas have been reported as well-circumscribed or microlobulated lesions that may contain calcification (7). The reported sonographic appearance of hemangiomas is a superficial, well-defined, solid lesion with or without calcification. The echogenicity of hemangiomas varies and is mainly hypoechoic (1). PET/CT usually shows the absence of or low <sup>18</sup>F-fluoro-2-deoxy-D-glucose (FDG) uptake (5). We report two cases of breast subcutaneous hemangiomas, one of which were a cavernous hemangioma and was two capillary hemangiomas in a breast.

## CASE REPORT

### Case 1

An 80-year-old woman had a 6-month history of a palpable mass in the left breast. On physical examination, there was a soft, nontender movable nodule in the left upper inner quadrant. No skin change was visible over the palpable nodule.

Mammography showed a 1.7 cm sized, well-circumscribed lobular isodense nodule in the left upper inner breast palpable site (Fig. 1A, B). No evidence of associated calcification was detected. This nodule was assessed as Breast Imaging Reporting and Data System (BI-RADS) category 0, and breast sonography was recommended. Sonography revealed a 1.7 cm sized, well-circumscribed lobular hypoechoic nodule in the upper inner quadrant of the left breast, subcutaneous fat layer (Fig. 1C). This nodule was categorized as BI-RADS category 2. A core needle biopsy was performed at the request of the patient because it was palpable.

A histological examination showed dilated vessels congested with red blood cells and lined with endothelial cells, suggesting cavernous hemangioma (Fig. 1D, E). The patient refused to undergo surgical excision and was referred for follow-up with periodic imaging surveillance.

## Case 2

A 72-year-old woman had a 1-month history of a palpable mass in the right breast. On physical examination, there was a soft, non-tender movable nodule in the upper inner quadrant of the right breast. No skin lesion was noted over the palpable nodule.

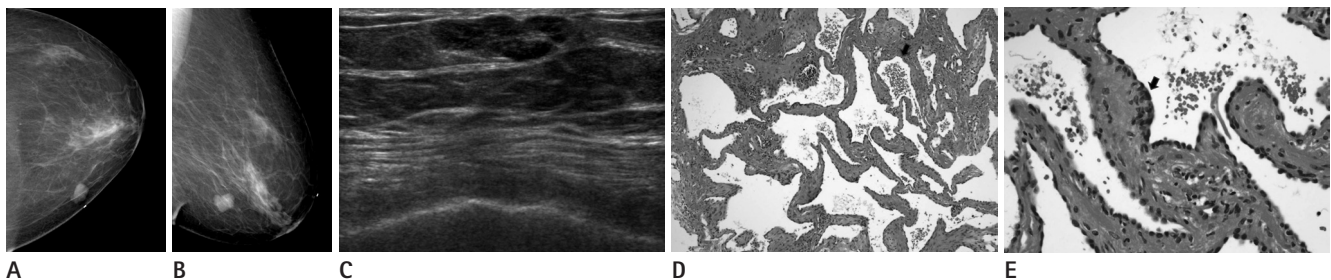
No definite corresponding mammographic abnormality was detected in the upper inner palpable area on mammography. Instead, mammography showed a 1 cm sized, partly obscured oval hyperdense nodule without calcification in the right breast upper outer quadrant (Fig. 2A, B). The palpable nodule in the upper inner quadrant and the nonpalpable nodule in the upper outer quadrant were assessed as BI-RADS category 0, and breast sonography was recommended.

On sonography, two nodules were identified in the subcutaneous fat layer of the right upper breast. A 1.2 cm sized, well-circumscribed oval hyperechoic nodule in the upper outer quadrant of the right breast was supposed to be correlated with the nonpalpable nodule on mammography (Fig. 2C). A 2.2 cm sized, partly indistinct oval mixed isoechoic nodule in the palpable site of the right breast upper inner quadrant did not show a definite mammographic abnormality (Fig. 2D). These two nodules were assessed as BI-RADS category 2, and follow-up was recommended. The patient was incidentally diagnosed with left breast cancer by ultrasound-guided core needle biopsy and

underwent PET/CT during staging workup for the left breast cancer. PET/CT revealed a partly ill-defined oval isodense nodule without FDG uptake in the upper outer quadrant of the right breast (Fig. 2E, F). Another palpable nodule in the right breast upper inner quadrant was not visible on PET/CT. She underwent a modified radical mastectomy for left breast cancer. ultrasound-guided needle localization with an excisional biopsy was also performed for the two nodules on the right breast at the request of the patient. Both lesions were confirmed as capillary hemangiomas on histological examination (Fig. 2G, H).

## DISCUSSION

Hemangiomas are a rarely reported benign vascular tumor of the breast. Localized hemangiomas are classified into four groups by their origin: perilobular hemangiomas, parenchymal hemangiomas, subcutaneous hemangiomas, and venous hemangiomas (7). Hemangiomas are classified as capillary or cavernous hemangiomas by the size of their vascular channels. Cavernous hemangiomas are the most common type of breast hemangioma. In contrast to cavernous hemangiomas, capillary hemangiomas are relatively rare (8). Capillary hemangiomas of the breast are relatively rare and they are usually clinically unapparent, whereas cavernous hemangiomas may reach a size where they can be palpated (8). Mesurolle et al. (1) reported only two cases of capillary hemangioma and 14 cavernous hemangiomas among 16 cases in their study. Two case reports of cavernous hemangioma are available in the Journal of the Korean Radiological Society (3, 4). These reports present subcutaneous cavernous hemangiomas with mammography, sonography, and



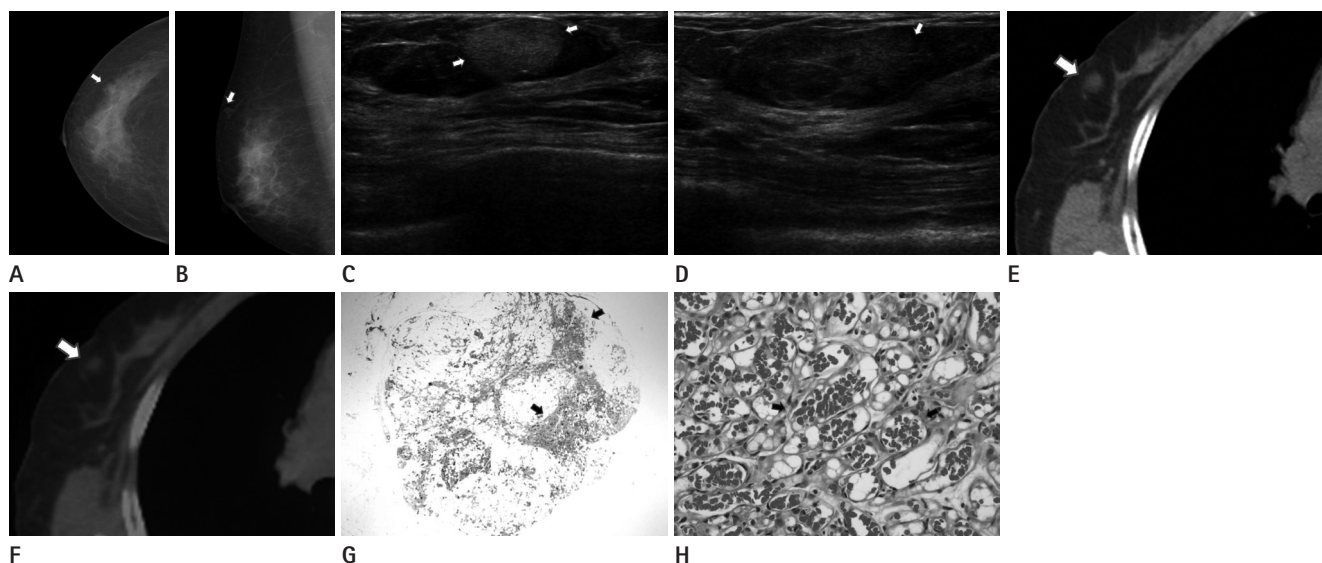
**Fig. 1.** An 80-year-old woman with cavernous hemangioma in left breast.

**A, B.** Craniocaudal and mediolateral oblique mammograms show a well-circumscribed lobular isodense nodule at palpable site.

**C.** Transverse sonography shows a well-circumscribed lobular hypoechoic nodule in subcutaneous fat layer.

**D.** Microscopic examination reveals dilated vessels (arrow) congested with red blood cells (H&E stain,  $\times 40$ ).

**E.** Numerous large vascular channels that share a common wall and lined with a single layer of endothelial cells (arrow) without any atypical cells, suggesting cavernous hemangioma (H&E stain,  $\times 100$ ).



**Fig. 2.** A 72-year-old woman with two capillary hemangiomas in right breast.

**A, B.** The patient presented with a palpable mass in the right breast upper inner quadrant. Craniocaudal and mediolateral oblique mammograms show no abnormality at the palpable site. A partly obscured oval isodense nodule (arrows) was incidentally detected in the right breast upper outer quadrant.

**C.** Transverse sonography of right upper outer breast shows a circumscribed oval hyperechoic nodule (arrows) in subcutaneous fat layer.

**D.** Transverse sonography of right inner breast shows a palpable partly indistinct oval mixed isoechoic nodule (arrow) in subcutaneous fat layer.

**E.** Nonfused CT image shows a partly ill-defined oval isodense nodule (arrow) in right upper outer breast. Another palpable nodule in right upper inner breast was invisible.

**F.** Fused PET/CT image demonstrates no definite increased FDG uptake at nodule (arrow) in right upper outer breast.

**G.** Excisional biopsy was also performed for two nodules. Microscopic examination of palpable nodule in right upper inner breast reveals infiltrative tumor (arrows) into adjacent adipose tissue (H&E stain,  $\times 12.5$ ). Another nonpalpable nodule had a similar microscopic feature (not shown in figure).

**H.** It is composed of congested very small blood vessels that resemble capillaries (arrows), lined with a single layer of endothelial cells (H&E stain,  $\times 400$ ).

Note.—FDG = fluoro-2-deoxy-D-glucose, PET/CT = positron emission tomography/computed tomography

MRI findings. However, no reports have included a biopsy-proven capillary hemangioma with PET/CT findings. It is very important to establish the exact diagnosis of cavernous and capillary hemangiomas, which require a differential diagnosis from angiosarcoma (8, 9).

Cavernous hemangiomas are composed of multiple large dilated blood-filled vessels with a shared common wall. The vessels are supported by fibrous stroma. Small capillary-dimension vessels may be seen in portions of a cavernous hemangioma. In many cavernous hemangiomas, vascular channels drift into the fatty parenchyma becoming small at the periphery, which duplicates the histological appearance of peripheral parts of an angiosarcoma (9). In contrast to the cavernous type, capillary hemangiomas are composed of small, capillary-sized vascular channels lined by endothelial cells. Fibrous bands, which subdivide lesions, are variably present. Large, muscular vessels may be present within and at the periphery of the tumor.

The mammographic features of hemangiomas are nonspecific. It has been reported as well-circumscribed or microlobulated lesions that may contain calcification (7). Hemangiomas are often located superficially either subdermally or within the subcutaneous tissue so the tangential view can be useful. In our cases, a cavernous hemangioma appeared as a microlobulated oval isodense nodule, and the capillary hemangiomas appeared as partly obscured oval hyperdense nodules.

No reports are available on sonographic criteria to distinguish the two types of breast hemangiomas. The sonographic appearance of hemangiomas has been reported as superficial, well-circumscribed, solid masses consistent with benign lesions (2). Microlobulations or indistinct margins are less often observed. The echotexture of hemangiomas varies but is mainly hypoechoic. In our cases, a cavernous hemangioma appeared as a subcutaneous circumscribed oval hypoechoic nodule and the capillary hemangiomas appeared as partly indistinct or circumscribed

oval mixed isoechoic or hyperechoic nodules. Mesurolle et al. (1) reported only one case of isoechoic lesion among nine breast hemangiomas with sonographic findings in their study. Other cases included two hypoechoic, three hyperechoic, and three complex echo patterns. Isoechoic echogenicity likely accounts for the difficulty in identifying hemangiomas against a fatty background. This may explain the relatively small percentage of isoechoic hemangiomas detected by ultrasound in previous studies (1). In these cases, the exact localization of the mass may help the radiologist identify lesions and make a correct diagnosis. A primary breast mass can be excluded when the mass is definitely located anterior to the anterior layer of the superficial pectoralis fascia (2). Differential diagnoses of the subcutaneous mass include hematoma, lipoma, sebaceous cyst, and hemangioma on sonography. A breast hematoma demonstrates avascular complicated or complex cystic mass and is often fluid-fluid. History of trauma or previous intervention is vital. The lipoma and benign fat-containing lesions show a typical radiolucent circumscribed mass on mammography (10). The fat-fluid level on lateral view may be seen. A sebaceous cyst typically involves the dermis, and dermal layer involvement should be carefully investigated (2). Most common sites include areas of redundant skin folds such as the inframammary fold, parasternal, and axilla.

Breast hemangiomas present either absent or low FDG uptake on PET/CT. However, a case of hemangioma with increased  $^{18}\text{F}$ -FDG uptake (simulating malignancy) has also been reported. Blood retention in the hemangioma results in focal ischemia and may accelerate anaerobic glycolysis, leading to high FDG uptake (5). In our case 2, the two capillary hemangiomas did not show increased FDG uptake. One capillary hemangioma in the upper outer quadrant of the right breast appeared as a partly ill-defined oval isodense nodule on the nonfused CT image. The other palpable capillary hemangioma in the upper inner quadrant of the right breast was invisible on the nonfused CT image, although subcutaneous nodules could be easily demonstrated in surrounding fat tissue.

Contrary to previous studies, this palpable nodule was also invisible on mammography and CT. These atypical image findings of the capillary hemangioma in our case can be explained by correlations with pathologic and radiologic findings. The microscopic examination demonstrated an ill-defined infiltrative lesion between abundant adipose mimicking angiolipoma. So-

nography also revealed a partly indistinct margin. This nodule might be difficult to distinguish from subcutaneous fat tissue on mammography and PET/CT because of its indistinct nature and large fatty component.

It is difficult to distinguish between the two types of breast hemangiomas using imaging findings. One study suggested that dynamic MRI may be helpful in the differential diagnosis. Haya-saka et al. (6) reported on the dynamic MRI appearance of a mixture of capillary and cavernous hemangiomas. They suggested that intensive enhancement in the early phase of gadolinium-enhanced dynamic imaging is consistent with the capillary type, and that the gradually enhanced portion is consistent with the cavernous type.

There is no difference in treatment between cavernous and capillary hemangiomas. When a breast hemangioma is confirmed histologically via core needle biopsy, complete excision is usually recommended (9). A core needle biopsy is insufficient because peripheral portions of a cavernous hemangioma may be indistinguishable from low-grade angiosarcoma in a small sample.

In conclusion, we describe two cases of cavernous and capillary hemangioma of the breast with radiologic-pathologic correlations. We expect that our image findings of breast hemangiomas will be beneficial for differentially diagnosing other similar breast lesions.

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## 유방의 피하지방층에 발생한 해면 혈관종과 모세 혈관종: 영상 및 병리 소견의 비교<sup>1</sup>

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유방의 혈관종양은 흔하지 않다. 혈관종양에는 혈관종, 혈관지방종과 혈관육종이 있으며 대부분은 혈관육종이다. 유방의 혈관종 중에서 모세 혈관종은 해면 혈관종과 비교할 때 상대적으로 드물다. 저자들은 유방에 발생한 해면 혈관종과 모세 혈관종 2예의 유방촬영술, 초음파와 양전자방출단층촬영술 소견을 보고하고자 한다.

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