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Ultrasound Elastography and Magnetic Resonance Imaging Findings of Breast Angiosarcoma Mimicking a Benign Lesion by Elastography: A Case Report

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Abstract

Introduction: Primary and secondary angiosarcomas of the breast are rare neoplasms. Radiologically, magnetic resonance imaging, mammography, and ultrasound (US) findings of angiosarcomas have been reported previously. However, ultrasound (US) elastography findings of angiosarcoma have not been reported yet. Currently, US elastography should be used commonly to decide biopsy or short-term follow- up of breast lesions.
Case Presentation: A 39-year-old female from Adana, Turkey, was admitted to Dr.Turgut Noyan Adana Teaching and Medical Research Center at the breast center of Baskent University, with a palpable right breast mass, which had been enlarging for one year in 2015. Our breast center is a tertiary referral center. B-mode US and US elastography findings suggested that the lesion was benign; however, magnetic resonance imaging showed a mass enhancing intensely at early phases with rapid wash out. The final diagnosis of the mastectomy specimen confirmed low-grade angiosarcoma. If the recommendation would have been based on the elastography findings, it would have been catastrophic because angiosarcomas tend to rapidly increase in size.
Conclusions: B-mode US and elastography findings of breast angiosarcoma may mimic benign lesions.

Keywords: Breast, Magnetic Resonance Imaging, Angiosarcoma, Ultrasound, Elastography

1. Introduction

Breast angiosarcomas are rare tumors accounting for 0.05% of malignant breast neoplasms (1). Angiosarcomas have a tendency to grow rapidly, so they must be diagnosed immediately. In the literature, the imaging findings of angiosarcomas have been reported in case reports or case series, and there are not any specific imaging findings. On mammography, if seen at all, they may present as ill-defined masses with or without calcifications (2). On US, hyperechoic solid masses with accompanying tubular structures or hypoechoic masses have been reported previously.

Generally, hyperechoic breast lesions suggest benign lesions; however, some lesions such as angiosarcoma, invasive ductal and lobular carcinoma, liposarcoma, lymphoma, and metastasis may present as hyperechoic masses. Previously, lesion stiffness measured by US elastography has been shown to have a correlation with the malignant potential of the lesion (3). Shear wave elastography has previously been shown to have an additional value in deciding biopsy or short-term follow-up. Currently elastography has been used more commonly in breast radiology departments, especially in deciding biopsy or short-term follow-up of a lesion. Angiosarcoma of the breast is a rare malignancy with a poor prognosis even after complete resection. It tends to grow and spread rather quickly, thus early diagnosis is important. This case showed benign elastography findings, which can be easily misdiagnosed. Thus, we reported this case of angiosarcoma suggesting a benign lesion with elastography. To date, the elastography findings of breast angiosarcoma has not been clearly described.

2. Case Presentation

A 39-year- old female from Adana, Turkey, was admitted to the Dr.Turgut Noyan Adana Teaching and Medical Research Center of Baskent University, with a palpable right breast mass, which had been enlarging for one year in March 2015. Baskent University is a foundation university and the breast center is a tertiary referral center. There was no associated pain, skin changes, or nipple discharge. The patient's family history was not significant. She had 2 children and breastfeeded her children. She had a history of a left modified radical mastectomy 2 years earlier due to intermediate grade angiosarcoma. She had received radiotherapy and chemotherapy. On examination, the right breast showed a 4 × 4 cm firm, upper inner quadrant mass. There was no palpable axillary lymphadenopathy or mass of the left chest wall. Her previous mammogram, one year earlier, was within normal limits.

The ultrasound (US) and US elastography evaluations were performed using a US system (Acuson S 2000, Siemens, Erlangen, Germany), with a linear transducer that enables scanning with a frequency range of 9 - 4 MHz. Elasticity maps were obtained using shear waves. US and US elastography were performed by a breast radiologist with 15 years of experience. All measurements were done without performing any compression by the radiologist. The radiologist kept the transducer motionless while performing elastography. The quality of the elastography images was assessed by color-coded quality maps provided by the US system, in which the green areas were considered reliable. However, the yellow and red color–coded areas were considered as low-quality scans. A color-coded map was used to confirm that Vs values were valid measurements, obtained from adequate shear waves. If the color-coded map was yellow or red, the Vs measurements were unreliable. If the image was of low quality, the scanning was repeated till high-quality images were obtained.

B-mode US showed an ill-defined, hyperechoic region including finger-like hypoechoic areas in the upper inner quadrant of the right breast without posterior acoustic shadowing or enhancement (Figure 1A). Calcification was not seen in US. The subcutaneous fat had also increased echogenicity; no lymphadenopathy was shown in the right axilla; and the lesion showed increased vascularity by power Doppler (Figure 1B). Differential diagnosis of hyperechoic breast lesions includes both benign and malignant lesions including angiolipoma, hematoma, fat necrosis, metastasis, invasive lobular or ductal carcinoma, and angiosarcoma. On US elastography, when we set the scale to code soft lesions in blue and hard lesions in red, the lesion was coded as a mixture of blue and green areas without any red areas. The shear wave speed is coded on a color scale, ranging from 0.5 to 6.5 m/s. Shear wave US elastography showed low shear wave velocities, ranging from 1.89 to 2.43 m/s (Figure 2). Low shear wave velocities and color codes suggested a benign pathology.

Then, we performed breast magnetic resonance imaging (MRI). T1 weighted MRI showed heterogeneous signal intensity, which could not be distinguished from normal parenchyma. On T2 weighted MRI, the lesion was hyperintense with irregular margins (Figure 3A). Dynamic contrast-enhanced MRI showed 3.5 cm mass enhancing intensely at early phases with rapid wash out (Figure 3B). Time to signal intensity curve showed a Type 3 pattern. Diffusion-weighted MRI showed restricted diffusion within the mass (Figure 4). The MRI findings were highly suggestive of malignancy. All imaging findings were summarized in Table 1. US guided core-needle biopsy was performed and biopsy showed dilated and anastomosing vascular channels dissecting through the breast stroma and fat tissue. The vascular spaces were lined by mildly pleomorphic endothelial cells with rare mitotic figures. Immunohistochemically, tumor cells were diffusely positive for CD31 and CD34, and negative for keratin (Figure 5). The Ki 67 index was 10%. The findings were concordant with histologic and immunohistochemical diagnosis of low-grade angiosarcoma. The patient went to another hospital for mastectomy, and the final diagnosis of the mastectomy specimen confirmed low-grade angiosarcoma.

Positron emission tomography (PET/CT scan) was performed 2 months after the surgery, and it showed a sclerotic metastatic lesion in the T11 vertebrae when compared with the PET/CT scan taken 2 years ago. The patient was treated with radiotherapy, but she passed away 2 years after surgery.

3. Discussion

Commonly, breast cancers are hypoechoic on B-mode ultrasound, and hyperechoic breast lesions are frequently thought to represent a benign finding. Differential diagnoses of hyperechoic breast masses include hematoma, abscess, fat necrosis, lactating adenoma, galactocele, myofibroblastoma, hamartoma, angiolipoma, hemangioma, invasive ductal and lobular carcinoma, liposarcoma, lymphoma, metastasis, and angiosarcoma. Hyperechoic malignant breast masses, which are infrequently seen, can be easily misdiagnosed as a benign pathology.

In our case, angiosarcoma had low color coded scores and velocity values by shear wave elastography, suggesting a benign lesion. Even though the patient had benign elastography findings, the physical examination, and patient's history alerted us to further investigate the lesion. The strong point of our study was that the elasticity characteristics of the angiosarcoma had not been described clearly previously. In contrast to US, MRI showed early rapid enhancement and wash-out pattern of the mass, which was highly suggestive of a malignant neoplasm. Diffusion MRI also showed restricted diffusion, supporting the diagnosis.

Angiosarcomas of the breast may be primary or secondary. Secondary angiosarcomas occur after breast conservation therapy and radiation therapy. In our case, the patient had angiosarcoma of the contralateral breast

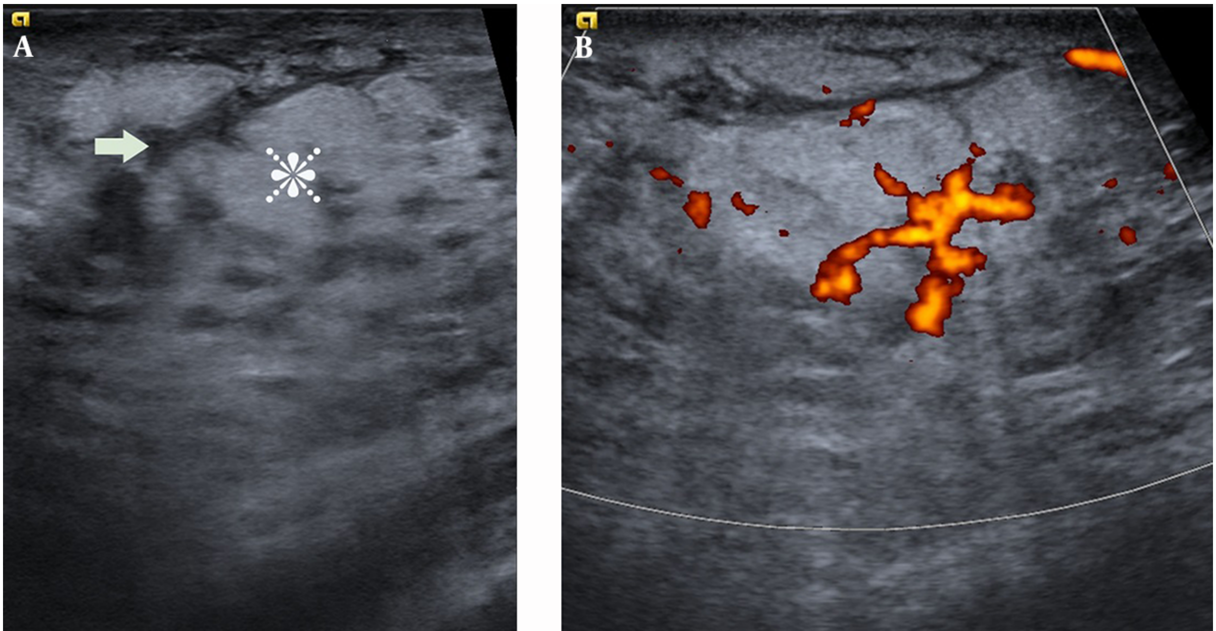

Figure 1. A, B-mode US image showing ill-defined hyperechoic lesions (star) including finger-like hypoechoic areas (arrow) classified as BI-RADS 3; B, Power Doppler image showing increased Doppler flow within the lesion.

Table 1. Summary of Imaging Findings of the Case

US and Doppler US Findings	Elastography Findings	MRI Findings
Non-mass like lesion without any calcification	shear wave velocities ranges between 1.89-2.43 m/s	hyperintense at T2-weighted MRI, hypointense at T1-weighted MRI
Ill-defined hyperechoic lesions including finger-like hypoechoic areas	demonstrate soft lesion on color coded elasticity maps	restricted diffusion
Increased vascularity within the lesion increased echogenicity of the subcutaneous fat tissue		intense enhancement at early phase
Increased vascularity within the lesion		type 3 time-intensity curve

treated with mastectomy and radiotherapy. Generally, radiation induced sarcomas occur between 4 to 30 years after radiation, and secondary soft tissue angiosarcomas usually tend to occur in the radiation field (4). In our case, angiosarcoma occurred in the contralateral breast 2 years after radiation, and the lesion was not in the radiation field, suggesting it might not have been associated with radiation therapy. Instead, it might have been a second primary malignancy or a metastatic lesion. One of the weak points of our study was that it was not clear whether it was a second primary or metastases of the primary angiosarcoma. Nevertheless, the similarity between pathologic characteristics of the masses in both breasts indicated that it was probably metastases of the primary lesion. At the time of diagnosis, the patient also had vertebrae metastasis. In the literature, metastasis to contralateral breast, bones, lung, and liver have been reported previously (5, 6). Angiosarcomas disseminates hematogenously, so axillary dissection is not commonly necessary.

As a result, on US and elastography, our case of angiosarcoma had imaging features suggestive of benign pathology, while the MRI findings were highly suggestive of malignancy.

Footnotes

Conflict of Interests: The authors have no conflicts of interests to declare.

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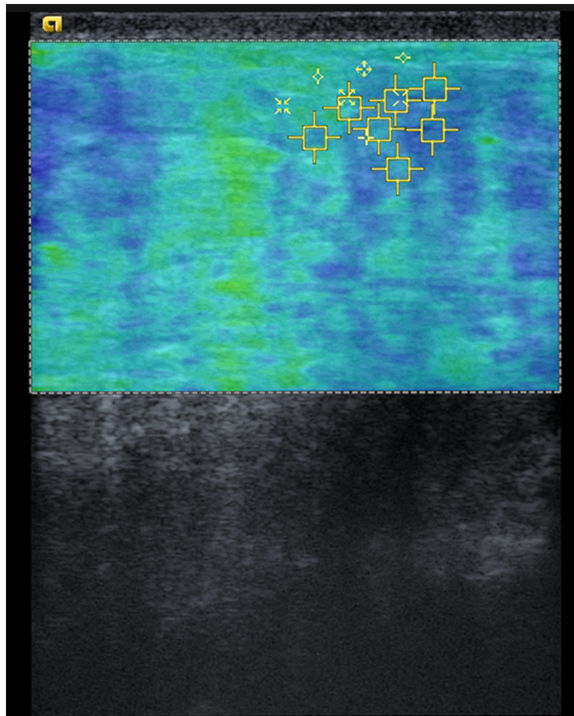
Figure 2. Elasticity Map Obtaining by Using Shear Waves



The shear wave speed is coded on a color scale ranging from 0.5 to 6.5 m/s. Soft lesions were coded as blue and hard lesions were coded as red in this scale. The lesion was coded as blue and green without any red areas. Shear wave velocities range between 1.89 - 2.43 m/s suggesting a benign pathology.

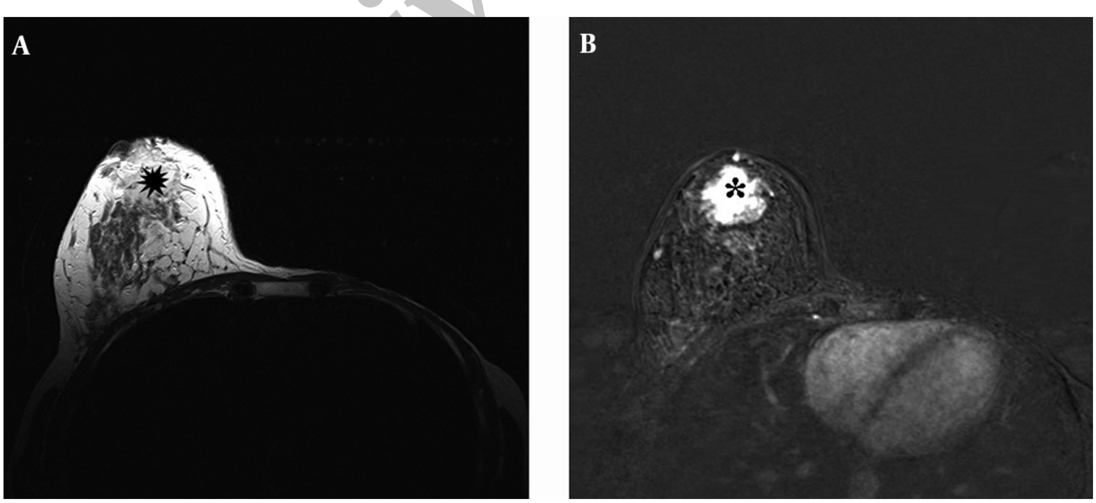


Figure 3. A, T2 weighted MRI showing hyperintense signal intensity of the lesion (black star) with irregular margins; B, Dynamic contrast-enhanced MRI shows early intense enhancement of the lesion (black star).

from any funding agency in the public, commercial, or not-for-profit sectors.

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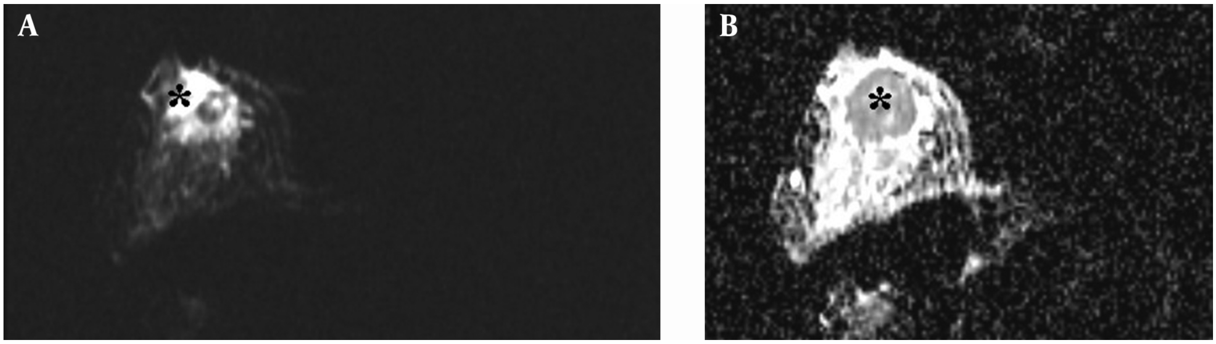

Figure 4. A, Diffusion-weighted MRI at b value of 800 sec/mm2 showed hyperintense signal intensity of the mass (black star); B, The lesion was hypointense on ADC map and consistent with restricted diffusion (black star).

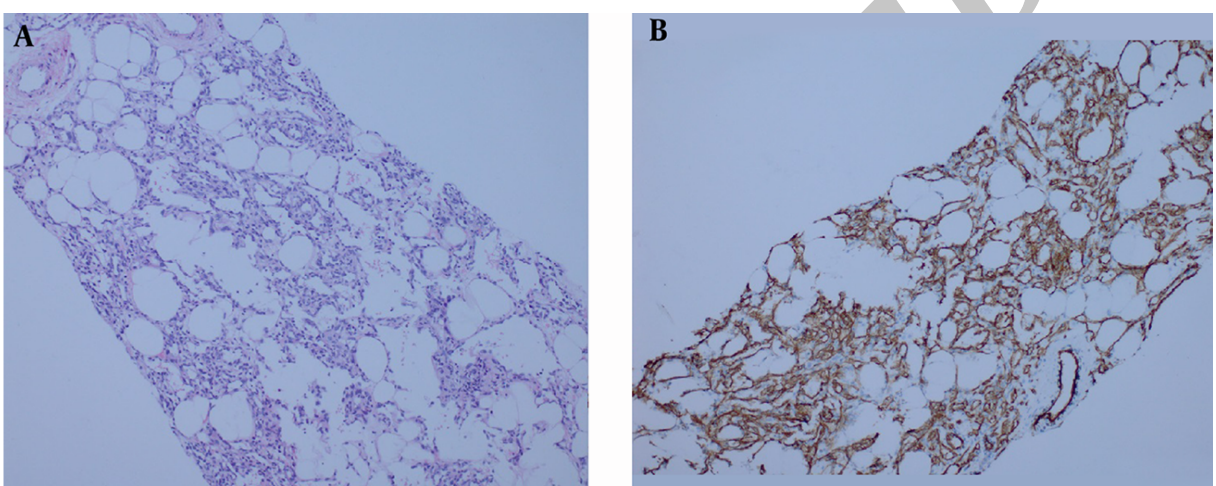

Figure 5. A, Histopathology examination of the specimen revealed a low grade angiosarcoma of the breast. There was an increased mytotic activity within the vascular endothelial cells (Hematoxylin-eosin stain; × 100 original magnification); B, The tumor cells were positive for CD31 (Immunohistochemistry × 100 original magnification)

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