

Coexistence of the Congenital Arteriovenous Fistula of the Left Breast with a True Aneurysm of the Right Internal Mammary Artery

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Running Title: Coexistence of the congenital AVF with a true aneurysm

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Abstract

Arteriovenous fistulas (AVF)s and true aneurysms seen uncommon arterial vascular disorders of the breast. The etiology can be either acquired or congenital. Coexistence of the congenital AVF and true aneurysm of the internal mammary artery (IMA) branches are very rare condition. We present a case of congenital AVF and true aneurysm of the IMA in a 56 -year- old woman. The radiologic findings of these rare entities had been reviewed according to the literature.

Keywords: Arteriovenous fistula; aneurysm; breast; Magnetic Resonance Imaging, Doppler ultrasonography,

Introduction

Vascular abnormalities of the breast include a wide spectrum of arterial and venous disorders, as well as benign and malignant vascular masses. Multimodality imaging is often necessary to accurately diagnose several of these uncommon conditions, and pathologic correlation can be important for accurate diagnosis of vascular masses. The arterial supply to the breast is primarily derived from branches of the internal mammary (thoracic) artery (IMA), intercostals arteries, and the lateral thoracic artery. The IMA is the dominant artery supplying the breast, and its mammarian branches supply the medial and central breast parenchyma. The lateral thoracic artery supplies the superolateral breast parenchyma (1). The arterial vascular diseases of the breast include atherosclerosis, true and pseudo aneurysms, congenital and acquired arteriovenous fistula (AVF), benign and malignant vascular neoplasia (hemangioma, angioliipoma, angiosarcoma, hemangiopericytoma etc.). Atherosclerotic vascular disease of the breast is the most commonly seen in daily basis in screening mammography. Coexistence of the congenital AVF and true aneurysm of the IMA are very rare condition.

Multiple radiologic modalities is often used to pre-diagnose several of these uncommon conditions, and pathologic correlation can be important for accurate diagnosis of vascular masses. Radiologic modalities include mammography, color Doppler Sonographic and dynamic contrast enhanced MRI examination.

A case of congenital AVF of the left internal thoracic artery and true aneurysm of the right internal thoracic artery are described in a 56 -year- old woman. An AVF was seen in the left breast that communication occurring between the second medial mammary branch of the left

IMA and a superficial venous structure of left breast. True aneurysm was occurring from the first anterior perforating branch of the right IMA. Clinical features, mammographic, Sonographic evaluation and MRI findings of this rare entity have been reviewed according to the literature.

Case Report

A 56-year-old woman, **gravida** 3, para 3, was admitted to the Gynecology and Obstetrics Clinic of Universal Malatya Hospital with **non specific intermittent bilateral breast pain** especially in the **upper quadrants** when the patient lying down, especially in the prone position within two years.

The patient had no history of chest trauma or surgery and didn't use hormone replacement therapy. In the patient history, there was no chronic disease such as hypertension, diabetes mellitus and heart failure. On physical breast examination, dilated venous structures were seen **on the upper quadrants** of the left breast and **systolic thrill** was palpated on the upper medial **quadrant** of the left breast Vaginal examination revealed a normal vulva and vagina, and cervical erosion measuring 2x2 cm , endometrial thickness was 4 mm in the middle parts of the endometrium. Pap smear test was performed and normal.

The patient was no risk factors (positive family history, BRCA gene mutation, previous chest radiation, hormone therapy, tobacco smoke) for breast cancer. In consequence of the patient symptoms, age and positive physical breast examination, mammography was performed.

Mammography (Figure 1 A, 1B) demonstrated dilated venous structures in the retroareolar and axillary region of the left breast.

A breast US was performed with LOGIQ 9 ultrasound system (GE Healthcare Technologies, Ultrasound, Milwaukee, USA) by using linear (12- 14 MHz) transducer. At the US examination, a 7 mm diameter dilated superficial venous structure located in the subcutaneous tissue was seen in the upper medial quadrant and crossing to the lateral quadrant of the left breast which draining towards the axillary vein. On color Doppler examination, AVF was diagnosed when arterialized venous waveform (RI 0.41 and PI 0.52) was seen and communication occurring between an artery and a vein was demonstrated in the upper medial quadrant of the left breast. In the upper medial quadrant of the right breast, a fusiform shaped aneurysm which size measured 16x6 mm was observed (Figure 2A, 2B). According to the Doppler sonographic findings of the breast, MRI examination was planned for confirming the diagnosis of the AVF and aneurysm.

Dynamic contrast enhanced breast MRI was performed on a 1.5-Tesla clinical MR system (General Electric Signa Excita, GE Health care system Milwaukee, USA). Patient was placed in prone position. A dedicated phased-array bilateral 4-channel breast coil (General Electric MRI devices, WI, USA) was used for imaging the breasts. The scan protocol was include axial T1-weighted fast spin echo (TR/TE, 560/7 m.sec) and axial T1-weighted three-dimensional fast spoiled gradient-echo fat-suppressed sequence (TR/TE 3,3/1 m.sec; flip angle 13°; bandwidth, 62,5), axial and Sagittal T2-weighted fat suppressed fast spin echo series (TR/TE, 5000/85

m.sec; Finally, dynamic contrast-enhanced fat-suppressed T1-weighted gradient echo images (TE/TR 3,3/1 m.sec; flip angle 13, dynamic scan duration 60 sec) was acquired before and immediately after administration 0.1 m.mol/kg gadolinium based contrast agent to study the contrast enhancement of the lesions.

MRI examination showed dilated venous structures in the upper quadrant of the left breast and dilated fusiform shaped arterial structure in the upper medial quadrant of the right breast. **MIP MR Images** illustrated an AVF in the left breast communication occurring between the second medial mammary branch of the left IMA and left superficial mammarian venous structure drainages towards the axillary vein (Figure 3A, 3B, 3C). In the upper medial quadrant of the right breast, a fusiform aneurysm was seen which measured 16x10 mm in diameter and originated from anterior perforating branch of the right IMA (Figure 4A, 4B, 4C, 4D).

The patient was referred to another hospital for catheter angiography wherefore the catheter angiography unit is not established in our hospital yet. The patient did not agree to go to another hospital for catheter angiography.

AVF was corrected surgically under general anesthesia and aneurysm was managed conservatively by thrombin injection.

Discussion

Vascular pathologies of the breast represent as uncommon conditions except atherosclerotic disease of the breast. The vascular pathologies of the breast classified into three categories; arterial, venous and mixed types AVFs and the true aneurysm of the breast seen uncommon pathologies. Coexistence of the congenital AVF and true aneurysm of the breast are very rare condition.

An AVF is an abnormal communication between an artery and a vein. An AVF may be congenital (usually affecting smaller vessels) or acquired as a result of trauma or erosion of an arterial aneurysm into an adjacent vein. Aneurysms are divided into two categories included true and pseudo aneurysms. True aneurysms of the breast are thought to be due to prior trauma. Pseudo aneurysms are most often associated with trauma and are recognized a complication of diagnostic interventional techniques (2).

In this case report, we describe a non-traumatic, presumably congenital AFV and true aneurysm of the breast originated from the internal thoracic artery in the same patient. These vascular pathologies should be considered in the differential diagnosis of mastodynia. In our case, the patient presented with **non specific intermittent bilateral breast pain** especially in the upper **quadrants**.

On physical breast examination, dilated venous structures were seen and **systolic thrill** was palpated in the left breast when the patient lying down, especially in the prone position. Vlahos et al. presented a case of congenital AVF in a young woman; the chief complaint was murmur

when lying down, especially in the prone position, a palpated lump and the presence of varicose-like veins in the breast similar to our patient. Vascular disorders of the breast represent a broad spectrum of conditions and differential diagnosis is difficult with one imaging modality (1). Multiple imaging modalities (e.g. mammography, color Doppler US and MRI) were used for the diagnosis of the vascular breast pathologies. In our case, on color Doppler US images a fusiform shaped aneurysm in the right breast was demonstrated. In the left breast an arterialized venous wave form inside the proximal segment of the draining vein of the AVF was observed. On MRI, connection of the arterial and venous structure of the AVF and a dilated draining vein which was extended to the axillary region was demonstrated in the sagittal T2 weighted MIP images. In the right breast, the aneurysm appearing as a saccular form on MRI in fact that the Doppler US examination confirmed the fusiform aneurysm which showed the arterialized venous wave form in the distal segment of the aneurysm. Localization of the pathologies and also the connections of the AVF were illustrated very clearly by these imaging modalities for effective surgical treatment. In our best knowledge, coexistence of the congenital AVF and true aneurysm of the breast is the first case in the literature.

Previously, two congenital breasts AVF has been reported (3, 4). Cox et al. described multiple true aneurysms in the female breast in a patient with a history of chronic amphetamine abuse. They are postulate that amphetamine abuse may have been a factor in the development of multiple breast aneurysms. The aneurysm was demonstrated on Doppler ultrasonography in this patient (5). Dehn and Lee report an arteriovenous fistula between the right second anterior intercostals artery and vein, which was occurred after an episode of hypertension crisis (6). The AVF was demonstrated on conventional angiography and treated by ligation of the artery and vein. Our patient did not agree to perform catheter angiography for diagnosis and the treatment of

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these vascular pathologies. The pseudo aneurysms of the breast relatively frequent than the true aneurysms. There are several reports in the literature of pseudo aneurysm and AVF formation in the female breast after invasive procedures such as biopsy (7, 8). Distinction between the true and pseudo aneurysm made by hystopathologically. Surgically extracted pathological specimen from the presented case revealed true aneurysm of the breast vessels.

On dynamic contrast enhanced breast MRI, and obtained MIP images have become a standard imaging method for evaluation breast disorders [9]. Vessels are recurrently encountered in predictable locations; venous collateral connections may be demonstrated on maximum intensity projection (MIP) images. Increased asymmetry vascularity of breast has also been found to be a potentially important marker for breast cancer (9). Knowledge of breasts vascular anatomy important to surgeons performing excisions and breast reconstructive surgery (1).

In conclusion, breast MRI is superior to other conventional breast imaging methods detection vascular disorders of the breast. Color Doppler US correlations may be required to confirm the diagnosis. Non invasive imaging modality MRI can be applied in the diagnosis of breast vascular disease especially in the patient who does not agree to perform catheter angiography.

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Figure 1: (A) Mediolateral oblique (MLO) and (B) craniocaudal (CC) views of both breasts mammography images demonstrating dilated vascular structure in the retroareolar region and axillary localization of the left breast (open arrows).

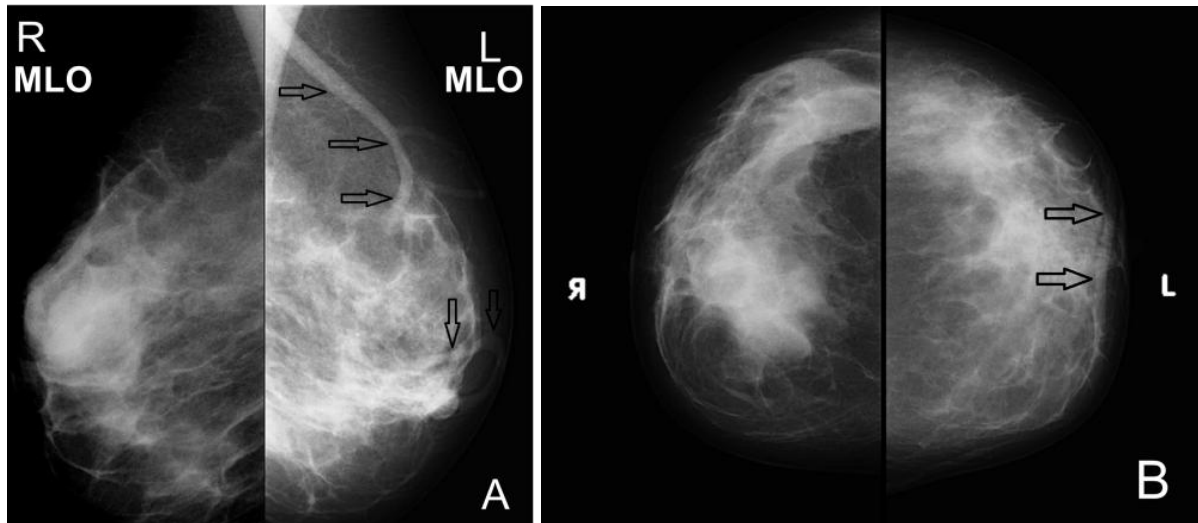


Figure 2: Color Doppler US images demonstrating a fusiform shaped 16x 6 mm diameter aneurysm in the right breast (A), an arterialized venous wave form (RI 0,41) inside the proximal segment of the draining vein of the AVF in the left breast (B).

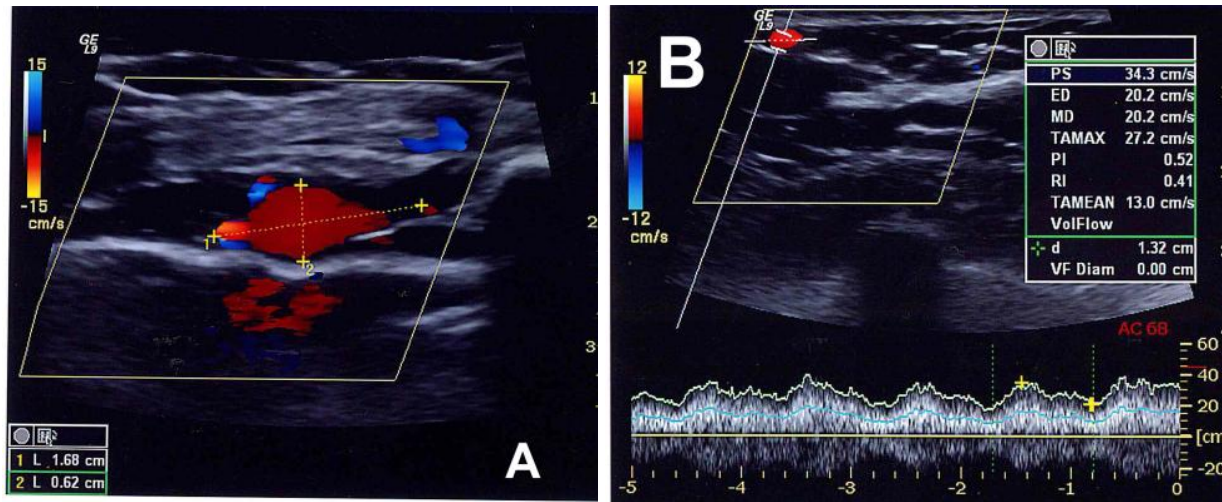


Figure 3: (A, B) Sagittal fat suppressed T2 weighted images and (C) maximum intensity projection (MIP) images which were obtained from sagittal T2 weighted images of the left breast shows the connection of arterial and venous structure (AVF) and dilated draining vein which was extended axillary region (open arrows).

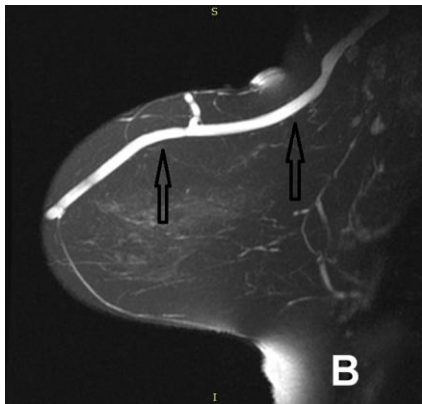
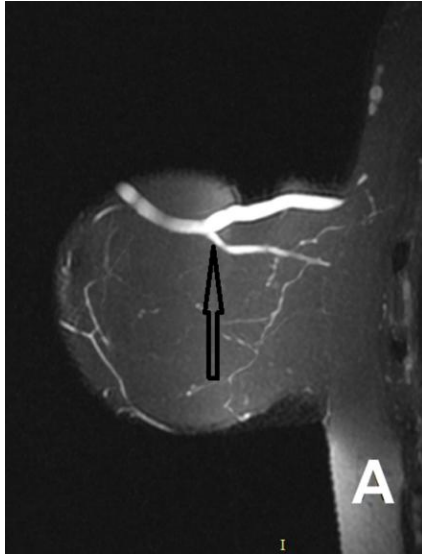


Figure 4: (A) MIP images which were obtained contrast enhanced Axial T1-weighted fat-suppressed fast spoiled gradient-echo sequence shows an AVF in left breast and an aneurysm near the right breast (Arrows). (B) Sagittal fat suppressed T2 weighted images. (C) Sagittal fat suppressed T2 weighted maximum intensity projection (MIP) image of the left breast shows an aneurysm (open arrows) on the first internal thoracic artery branch. (D) Axial STIR image show a 16x7 mm diameter fusiform dilated vascular structure near the right breast.

