

The use of three-dimensional echocardiography in the visualization of pseudoaneurysm of the mitral-aortic intervalvular fibrosa

Mitral-aortik intervalvüler fibroza yalancı anevrizmasının görüntülenmesinde üçboyutlu ekokardiyografinin kullanımı

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Pseudoaneurysm of the mitral-aortic intervalvular fibrosa (MAIF) is an uncommon but serious complication of aortic valve endocarditis. A 23-year-old woman was referred to our institution with the diagnosis of aortic valve endocarditis thought to be complicated by an aortic root abscess. Two-dimensional transthoracic echocardiography revealed a vegetation attached to the left coronary cusp of the aortic valve and a false aneurysm-like structure in the MAIF at the left ventricular outflow tract. The diagnosis of MAIF pseudoaneurysm was confirmed by three-dimensional echocardiography. The patient died a few hours after admission because of worsening of her neurological status. An abscess-like structure detected in a patient with aortic valve endocarditis should be differentiated from a pseudoaneurysm of the MAIF.

Key words: Aneurysm, false/diagnosis; echocardiography, three-dimensional/methods; endocarditis, bacterial/complications; heart aneurysm/etiology; heart valve diseases/ultrasonography.

Pseudoaneurysm of the mitral-aortic intervalvular fibrosa (MAIF) is a rare but potentially life-threatening complication of aortic valve endocarditis, aortic valve surgery, or chest trauma.^[1] Aortic valve endocarditis is usually the main reason that predisposes the MAIF to perforate and form a pseudoaneurysm. Both direct extension of the infection from the aortic wall and the aortic jet striking the subaortic structures and anterior mitral leaflet may infect the MAIF.^[2] The relatively avascular tissue of this region contributes to the extension of the infection.

Early recognition and diagnosis are of great value in preventing catastrophic complications related with

Mitral-aortik intervalvüler fibrosa (MAİF) yalancı anevrizması, aort kapak endokarditine bağlı gelişebilen, nadir fakat çok ciddi sonuçları olan bir komplikasyondur. Yirmi üç yaşında kadın hasta, aort kökü apsisi ile komplike olduğu düşünülen aort kapak endokarditi öntanısıyla kliniğimize sevk edildi. İkiboyutlu transtorasik ekokardiyografi ile, aort kapağının sol koroner kuspisine tutunmuş vejetasyon ve sol ventrikül çıkış yolunda yalancı anevrizma benzeri oluşum saptandı. Mitral-aortik intervalvüler fibrosaya ait yalancı anevrizma tanısı üçboyutlu ekokardiyografi ile doğrulandı. Ancak, hasta nörolojik durumunun kötüleşmesi nedeniyle yatışından birkaç saat sonra öldü. Aort kapak endokarditli bir hastada apse benzeri yapılar MAİF yalancı anevrizmasından ayırt edilmelidir.

Anahtar sözcükler: Anevrizma, yalancı/tanı; ekokardiyografi, üçboyutlu/yöntem; endokardit, bakteriyel/komplikasyon; kalp anevrizması/etyoloji; kalp kapağı hastalığı/ultrasonografi.

the rupture of the pseudoaneurysm of the MAIF. Diagnostic modalities currently available for this purpose include echocardiography,^[2] cardiac catheterization,^[3] ultrafast computed tomography,^[4] and magnetic resonance imaging.^[1] Despite numerous reports on the use of real-time three-dimensional (3-D) echocardiography in various pathological conditions, there are limited data on the role of this imaging method in the evaluation of endocarditis and its complications.^[5,6]

We present a case of MAIF pseudoaneurysm that occurred as a complication of aortic valve endocarditis which was diagnosed by the use of transt-

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horacic echocardiography (TTE) and real-time 3-D echocardiography with volume-rendering mode (four-dimensional). To our knowledge, this is the first case reporting the use of 3-D transthoracic echocardiography in the evaluation of an MAIF pseudoaneurysm secondary to endocarditis.

CASE REPORT

A 23-year-old woman was transferred to our institution with the diagnosis of aortic valve endocarditis presumed to be complicated by an aortic root abscess. While the patient had been medically treated for a culture-negative aortic valve endocarditis at a local hospital, she developed right hemiparesis and a progressive loss of consciousness. Brain computed tomography demonstrated an infarct in the left temporo-occipital region. Transthoracic echocardiography raised the suspicion of an aortic root abscess, and she was transferred to our institution. On admission, she had a slurred speech and right hemiparesis. She was febrile (38.5 °C) with a blood pressure of 90/60 mmHg and a pulse rate of 110/min. Cardiac examination revealed a grade 2/6 systolic murmur at the apex and a grade 3/6 decrescendo aortic regurgitation murmur at the left sternal border. Electrocardiography showed first-degree atrioventricular block. Laboratory tests showed a white blood cell count of 17,800/mm³, anemia with a hemoglobin level of 9.8 g/dl, and an elevated erythrocyte sedimentation rate (80 mm/1 hr). Two-dimensional TTE demonstrated a 1.3 x 0.8-cm vegetation attached to the left coronary cusp of the aortic valve and a false aneurysm-like structure in the MAIF at the left ventricular outflow tract (Fig. 1). Color Doppler examination showed a communication between the echo-free space and left ventricular outflow tract and a turbulent flow inside the cavity. Cardiac systolic functions were normal with normal chamber dimensions. Transesophageal echocardiog-

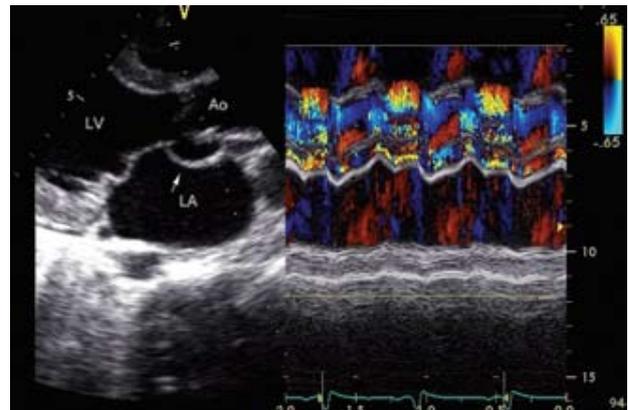


Figure 1. Transthoracic parasternal long-axis view showing an abnormal echo-free space resembling a pseudoaneurysm (left side). Color flow Doppler and color M-mode examination showing flow into the pseudoaneurysm (right side). Ao: Aorta; LA: Left atrium; LV: Left ventricle.

raphy (TEE) could not be performed because of the neurologic status of the patient.

The diagnosis of a pseudoaneurysm of the MAIF was confirmed using real-time 3-D transthoracic echocardiography (Vivid 7 Dimension, GE Medical Systems, Horten, Norway) with the volume-rendering technique using a 1.5 to 3.6 MHz 3V full matrix-array probe (Fig. 2). She was consulted by the cardiovascular surgery department for urgent surgery, but a few hours after admission she died following worsening of her neurologic status.

DISCUSSION

The junctional tissue between the half of the noncoronary cusp and the adjacent third of the left coronary cusp of the aortic valve and the anterior mitral leaflet is termed as MAIF.^[7] Perforation of the MAIF following aortic valve endocarditis, aortic valve surgery, or trauma leads to pseudoaneurysm formation that may result in a fatal outcome. Rupture of an MAIF

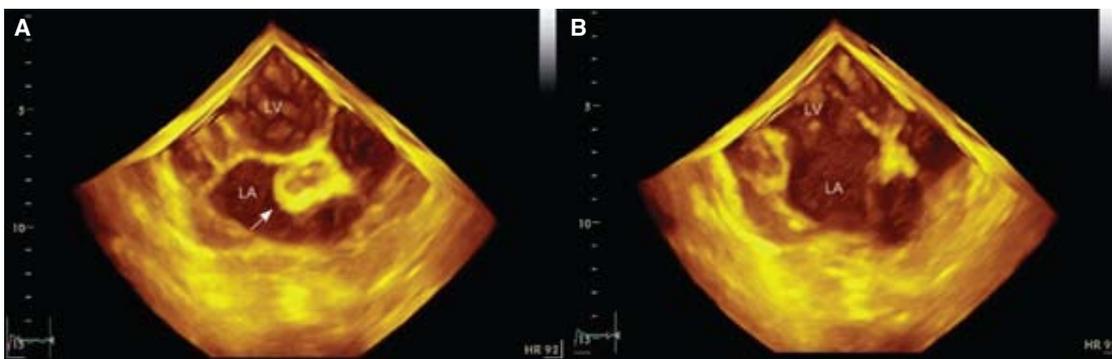


Figure 2. Four-dimensional transthoracic echocardiography showing the dynamic character of the pseudoaneurysm (A) expanding in systole and (B) collapsing in diastole. LA: Left atrium; LV: Left ventricle.

pseudoaneurysm may give rise either to a pericardial tamponade, an eccentric jet of mitral regurgitation, or a direct communication between the left ventricular outflow tract and the left atrium.^[2] In some instances, the pseudoaneurysm remains intact and may compress the coronary arteries causing symptomatic coronary obstruction.^[8]

Echocardiographic examination should be considered first in the evaluation of suspected endocarditis and its related complications. Both TTE and TEE can detect a pseudoaneurysm of the MAIF with sensitivity rates of 43% and 90%, respectively.^[9] Echocardiographic findings should be differentiated from those observed in an abscess. A false lumen at the MAIF that expands in systole and collapses in diastole is the characteristic echocardiographic feature of an MAIF pseudoaneurysm, allowing the differentiation and prompt diagnosis. Color Doppler imaging may show a turbulent flow inside the pseudoaneurysm, as in this case.^[9]

Real-time volume-rendering 3-D echocardiography has the potential for a better understanding of anatomic structures.^[10] It is also capable of displaying dynamic morphology depicting the depth of the structures. It allows the reconstructed 3-D image to be animated and moved in space, providing visualization from different perspectives.^[5,6,11] It can display deep structures that cannot be visualized using TEE and TTE by acquiring full-volume data, slicing, and cropping.^[12] Additionally, this technique is beneficial in obtaining realistic views of the cardiac valves and demonstration of numerous pathologies in a unique, noninvasive manner.^[13] Recently, the role of 3-D echocardiography as an imaging modality in the visualization of an MAIF aneurysm was demonstrated in a case report by Penugonda et al.^[14] The present case differs from this report by the illustration of the systolic expansion and diastolic collapse of the pseudoaneurysm by 3-D echocardiography, which are the diagnostic findings of a pseudoaneurysm distinguishing it from an abscess. In our patient, TTE views were highly suspicious for an MAIF pseudoaneurysm. The characteristic dynamic nature of the pseudoaneurysm displayed by the 3-D, volume-rendering mode echocardiography enabled the diagnosis. Three-dimensional echocardiography may be more useful, especially when the two-dimensional views are not sufficient to identify the pathoanatomic structures and recognize the complications of an endocarditis.

Given the risk of potentially life-threatening consequences of a rupture, an abscess-like structure

detected in a patient with aortic valve endocarditis should be differentiated from a pseudoaneurysm of the MAIF. Further evaluation by the use of other imaging techniques is necessary to exclude this catastrophic possibility.

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