Case report - Pulmonary

Three-dimensional transesophageal echocardiography: diagnosing intraoperative pulmonary artery thrombus

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Abstract

A 61-year-old patient with the diagnosis of acute heart failure based on severe mitral valve insufficiency due to chordae rupture was transferred to the Thoraxcenter Rotterdam with the diagnosis of acute heart failure on the basis of severe mitral valve insufficiency due to chordae rupture. The patient had no medical history, was short of breath and coughing. The electrocardiogram (ECG) on admission in the referring hospital showed sinus rhythm at 90 beats/min, partial signs of left ventricular hypertrophy, but no further pathological signs. Chest X-rays showed a cardiothoracic ratio of 14/29 and perihilar lung edema.

In the referring hospital a transthoracic echocardiogram (TTE) was performed revealing a slightly dilated left atrium, no left ventricular dilatation, good left ventricular function; severe mitral valve regurgitation due to a posterior mitral valve leaflet prolaps with chordae rupture; normal tricuspid valve, minor pulmonary valve regurgitation and normal-sized right atrium and ventricle. Right atrial and right ventricular pressure were normal.

C-reactive protein (CRP) was above normal limits with a maximum peak of 216 mg/l, therefore endocarditis was suspected. No vegetations were observed on TTE.

After uneventful induction of anesthesia according to our standard procedures the attending anesthesiologist performed a standard two-dimensional transesophageal echocardiogram (2D-TEE) examination which revealed severe mitral valve regurgitation due to a prolaps with chordal rupture and an echo dense structure in the pulmonary artery (PA). Because it was not possible to visualize this echo dense structure fully with 2D-TEE we performed a three-dimensional transesophageal echocardiogram (3D-TEE). On the basis of the clear demonstration on 3D-TEE of an at least 6-cm thrombus in the PA we decided to remove the thrombus prior to proceeding with the mitral valve repair. We conclude that 3D-TEE can alter surgical management and provide more valuable information on PA thrombus than that obtained by 2D-TEE.

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Keywords: Pulmonary artery thrombus; 3D-TEE

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spontaneous pulmonary embolisation coagulopathy examinations were advised for a later period after discharge from the hospital. On the fifth postoperative day (POD) the patient was transferred to the medium care unit. Over the next days the opacities on the chest X-ray diminished. On the 11th POD the patient was discharged from hospital.

2. Discussion

Real-time 3D-TTE has been reported to be more accurate in the measurement of the size of intracardiac masses and PA thrombus than 2D-TEE [1–4].

The real-time 3D zoom mode gave direct images of the elongated mass in the PA. A full volume data set has to be ECG gated and acquired during breath hold or by stopping the mechanical ventilation during seven heartbeats to avoid motion (stitching) artefacts during acquisition. In the multiplanar review (MPR)-mode, three orthogonal cutting planes can be moved independently of each other through the data set. This ability to ‘walk through’ the 3D data set in any 2D image plane and during any time in the cardiac cycle provides an unlimited number of cutting planes in all directions through the full volume data set [5]. Images were analyzed on the online workstation Philips Qlab 3D quantification and took no more than a few minutes.

The 3D-TEE gave additional valuable information of actual size, consistency and mobility of the thrombus. This may be explained by the inadequate visualisation of the thrombus by 2D-TEE. 3D-TEE was able to show thrombus attachment to the PA bifurcation. The limited size of the sector prevented us from seeing the entire length of the overriding mass.

With this report, we show that 3D-TEE can alter surgical management and provides more valuable information on PA thrombus than that obtained by 2D-TEE.

References

It is possible that this large PE caused subtotal obstruction with minimal secondary RVD or developed rather acutely with little time for the RV to decompensate. This unexpected intraoperative finding mandated surgical removal.

References


eComment: Re: Three-dimensional transesophageal echocardiography: diagnosing intraoperative pulmonary artery thrombus

Authors: Leo Bockeria, Bakoulev Scientific Centre for Cardiovascular Surgery, Moscow, Russian Federation; Vladimir Makarenko, Irina Baryshnikova

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The presented case report is of interest in the accumulation of clinical experience and emphasizes the importance of careful identification of the causes of cardio-pulmonary failure [1]. Acute pulmonary artery thrombus is the third most common reason for hospital mortality in patients with acquired heart defects [2]. Symptoms of pulmonary thromboembolism are non-specific and typical of many other cardiac and pulmonary diseases. Pulmonary artery embolism is the most frequently misdiagnosed disease. Deterioration of the patient’s condition with pulmonary embolism occurs quickly. Therefore, it is very important to have the opportunity and the method to detect this complication rapidly and accurately. We have experience in treating patients with pulmonary embolism as the underlying disease and as a complication. The primary diagnosis is made on the clinical status of the patient and two-dimensional transthoracic echocardiography. In adult patients it is not always possible to visualize the pulmonary artery clearly. Non-specific two-dimensional echocardiographic signs of pulmonary artery thrombus, such as echo dense, circular or linear mass in more than one view of the pulmonary artery, may be just artifacts. That is why transesophageal echocardiography is necessary to confirm pulmonary artery thrombus. Three-dimensional transesophageal echocardiography significantly increases the ability to diagnose this disease. Three-dimensional transesophageal echocardiography determines thrombus in the trunk and main branches of the pulmonary artery, but visualization of the distal pulmonary bed is impossible. Computed tomography and magnetic resonance (MR) imaging provide greater diagnostic ability to identify massive or non-massive pulmonary embolism, allowing identification of not only the blood clots and the involvement in the pathological process of the lung tissue, but also in making a differential diagnosis of other lung diseases [3]. Despite the advantages of computed tomography and MR imaging, intraoperative three-dimensional transesophageal echocardiography actually should be used in adult patients with a poor transthoracic ultrasonic window and/or controversial two-dimensional echocardiographic data.

References

