

Editorial

Identifying Exact Extent and Location of Paravalvular Leakage During Mitral Valve Repair by Three Dimensional Transesophageal Echocardiographic Color Doppler Measurement of Vena Contracta can Alter Surgical Procedure

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Abstract

A 43-year-old patient with the diagnosis of paravalvular leakage one year after mechanical mitral valve (MV) replacement was scheduled for minimal invasive mitral MV repair. Intra-operatively a standard three-dimensional transesophageal echocardiography (3D TEE) and 2D TEE examination were performed.

Visual inspection and manipulation of the MV showed a good seal on the anterior side. The posterior side showed no bonding over an area of 1.5 cm located adjacent of the lateral commissure. But the 3D TEE color Doppler (CD) vena contracta (VC) image showed a much larger extent of leak than demonstrated in the surgical field. Based on the extent and location of the VC, the left atrial retractor was repositioned and re-inspection of the MV revealed an extra no bonding area of 1.5 cm on the anterior side of the lateral commissure.

We conclude that 3D-TEE CD VC can alter surgical management and preserved our patient from an extra episode on extracorporeal circulation.

INTRODUCTION

A 43-year-old patient was admitted to our hospital (Amphia, Breda, the Netherlands) for MV repair. The patient had SLE (systemic lupus erythematosus) with aortic and mitral valve replacement (mechanic prosthesis) one year ago in consequence of Libman Sacks endocarditis.

She presented with progressive dyspnoea and haemolytic anaemia. Transthoracic echocardiography showed paravalvular leakage of the MV prosthesis. 2D TEE revealed severe paravalvular leakage, but difficult to estimate the exact extent of the leakage due to the shadow of the mechanical MV prosthesis. The patient was scheduled for reoperation by heart-port procedure.

After induction of general anaesthesia 2D and 3D TEE were made, with the EPIQ7 ultrasound system (Philips, Andover, MA, USA), equipped with an x7-2t MATRIX array-transducer. On 2D TEE CD the paravalvular MV leakage was identified at the posterior side. Due to drop out and shadow of the detached mechanical MV prosthesis morphologic assessment (Figure 1) of the leak-size was not possible.

Extracorporeal circulation (ECC) was started, an anterolateral mini-thoracotomy was made. An Intra Cludedevice (Edwards Scientific, Irvine, CA, USA) was used for aortic clamping and cardioplegia. Left atriotomy and left atrial retractor allowed visualization of the MV. Inspection of the MV showed good seal on the anterior side. The posterior side showed no bonding over

an area of 1.5 cm adjacent of the lateral commissure. But the 3D TEE CD VC image showed a much larger length of leak then surgically investigated. Analysis of 3D images was performed online in QLAB, the 3D dataset was manually cropped using an image plane perpendicularly to the jet direction at the narrowest cross-sectional area [1]. Based on the clear demonstration of the VC (Figure 2), the left atrial retractor was repositioned and re-inspection of the valve revealed an extra no bonding area of 1.5 cm on the anterior side of the lateral commissure.

A total of 6 Ethibond sutures were placed to reattach the prosthesis. After 6 days of hospitalisation, the patient was successfully discharged.

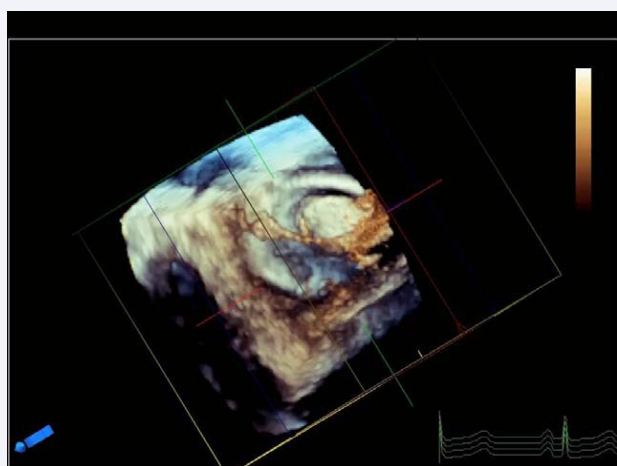


Figure 1 Detach mitral valve prosthesis with drop out due to shadow of the prosthesis.

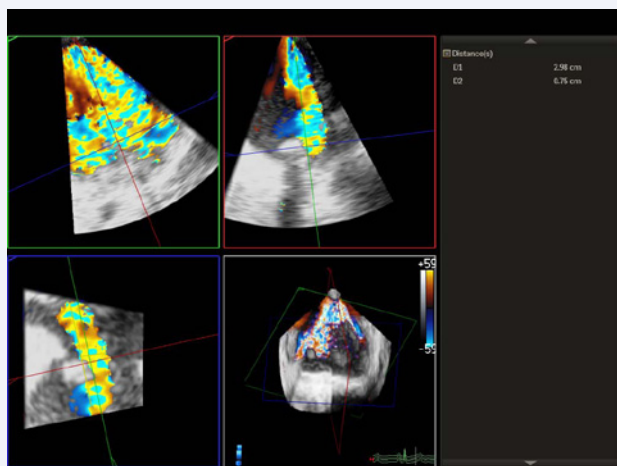


Figure 2 Left and right upper quadrant shows the orientation of the left lower quadrant: vena contracta length: 2.98 cm.

DISCUSSION

We know since 2009 that direct measurement of VC area using 3D TEE, accurately depict orifice shape and provide a simple parameter that accurately reflects mitral regurgitation severity [2]. But most often the 3D CD quality was insufficient for clinical use. Firstly, during acquisition 3D TEE CD has to be ECG gated and acquired during breath hold or by stopping mechanical ventilation during 4 heartbeats to avoid motion (stitching) artefacts [3]. These 4 regular heartbeats needed for acquisition of a useful 3D CD discards patients with irregular heart rhythm [4]. Secondly, the iE33 ultrasound system (Philips, Andover, MA, USA) has limited spatial resolution to capture the entire MV regurgitation orifice in the 3D TEE CD [5]. This problem has yet been solved in the next generation 3D ultrasound system EPIQ7 (Philips, Andover, MA, USA), which allows to capture the whole MV in the 3D CD dataset "after" surgical repair. Pre-operatively regurgitating MV are often dilated and different 3D TEE color Doppler data sets are needed to overcome the spatial resolution.

CONCLUSION

Analysing 3D TEE CD VC can alter surgical management and provide valuable information of MV leakage location and extent. We recommend intra-operative 3D TEE CD, pre- and post- MV repair in all cases.

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