

Mechanical Discordance between Left Atrium and Left Atrial Appendage

Abstract

During standard transesophageal echocardiographic examinations in sinus rhythm (SR) patients, the left atrial appendage (LAA) is not routinely assessed with Doppler. Despite having a SR, it is still possible to have irregular activity in the LAA. This situation is even more important for SR patients where assessment of the left atrium is often foregone. We describe a case where we encountered this situation and briefly review how to assess the left atrium and its appendage in such a case scenario.

Keywords: *Left atrial appendage, mechanical discordance, transesophageal echocardiography*

Introduction

Mechanical discordance between the left atrium and left atrial appendage (LAA) is an uncommon clinical finding. This discordance is even more unusual in the presence of sinus rhythm (SR). Standard perioperative echocardiography assessment needs to address the left atrium in depth to identify the risk of mechanical discordance. This case report demonstrates that a possible risk assessment of the LAA would be beneficial, especially if the patient had a history of embolism.

Case Report

A 68-year-old male was admitted for transeptal transcatheter mitral valve replacement for mitral stenosis and regurgitation. His comorbidities included paroxysmal atrial fibrillation (AF), coronary artery disease, congestive heart failure, and ischemic cerebral vascular accident. At the time of surgery, the patient was in SR with distinct “P” waves on the electrocardiogram (EKG). During intraoperative transesophageal echocardiography (TEE) examination, the LA contractility was demonstrated with distinct mitral inflow E and A waves, and atrial systolic reversal waves of pulmonary venous inflow [Figure 1]. Simultaneous interrogation of the LAA with pulse wave Doppler (PWD) demonstrated characteristic dyssynchronous contraction and relaxation waves suggesting a non-SR [Figure 2 and Video 1]. There was no

spontaneous echo contrast (SEC) or thrombus in the LAA and ejection velocity was >20 cm/s [Video 2]. The patient underwent a successful transeptal mitral valve replacement procedure with a 26 mm Sapien 3 valve (Edwards Lifesciences Corporation, Irvine, California, USA). The postoperative course was uneventful and patient remained in SR and was discharged after 1 day of oral aspirin and clopidogrel therapy. He was noncompliant with medications and suffered a massive embolic stroke a week after discharge and died a week after the procedure.

Discussion

In adults, AF is the most common cardiac arrhythmia.^[1,2] More than 30% of all ischemic strokes occur in patients with AF (either paroxysmal, persistent, or permanent).^[3] In patients with AF, the LAA is considered the source of cardiac thrombi due to its stasis prone geometry and location. In patients with AF, strokes can happen during sustained periods of SR and have been attributed to clinically silent AF. Mechanical discordance between the LA and LAA has been suggested as a possible mechanism of thromboembolism during periods of sustained SR.^[4] Either the surface EKG displays normal SR with distinct P waves while LAA demonstrates dyssynchronous contraction or there is normal LAA contractility despite evidence of AF on EKG. It is estimated that 3.5-4% of patients undergoing TEE demonstrate LA-LAA discordance. Furthermore, it is

**Arash Khamooshian^{1,2},
Jelliffe Jeganthan¹,
Yannis Amador¹,
Roger J Laham³,
Feroze Mahmood¹,
Robina Matyal¹**

¹Department of Anesthesia, Critical Care and Pain Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Harvard Medical School, ²Department of Medicine, Division of Cardiology, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, USA, ³Department of Cardio-Thoracic Surgery, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands

Address for correspondence:
Dr. Feroze Mahmood,
Department of Anesthesia,
Critical Care and Pain
Medicine, Beth Israel Deaconess
Medical Center, CC-454, 1
Deaconess Road, Boston, MA,
USA.
E-mail: fmahmood@bidmc.harvard.edu

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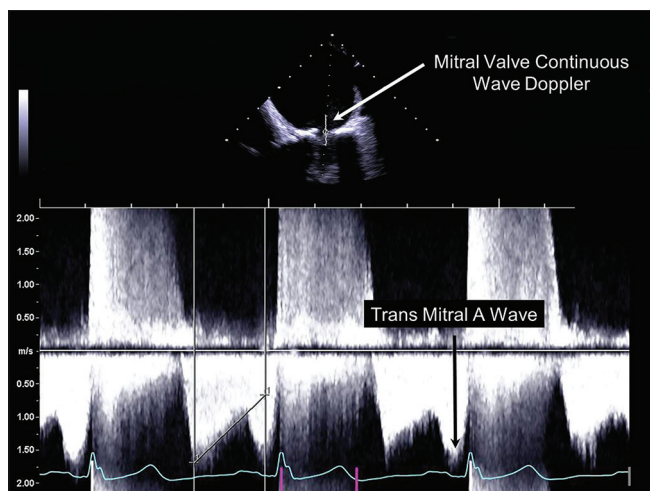


Figure 1: Continuous wave Doppler of the mitral inflow demonstrating distinct E and A waves implying the left atrial contraction in the midesophageal four chamber view

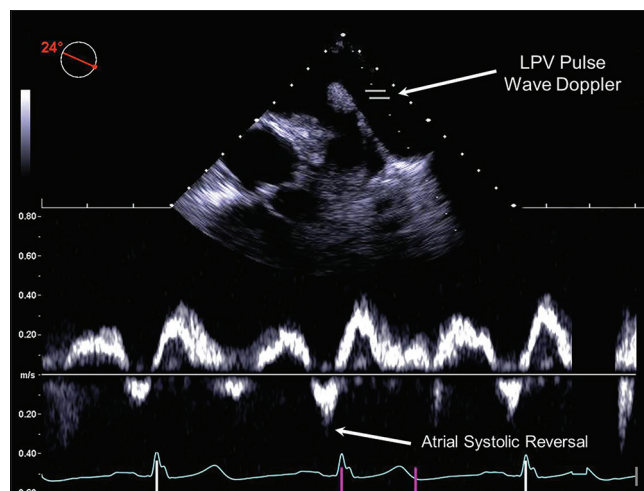


Figure 2: Midesophageal four chamber view; pulse wave Doppler of the left pulmonary vein demonstrating atrial systolic reversal waves implying left atrial emptying in the midesophageal four chamber view. LPV: Left pulmonary vein

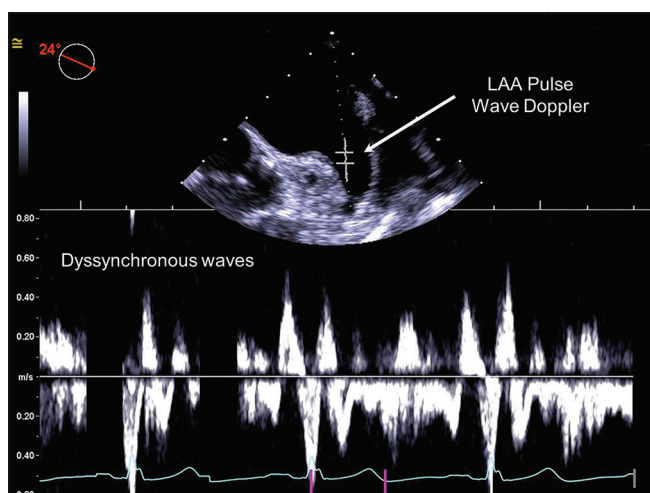


Figure 3: Midesophageal four chamber view; pulse wave Doppler of the left atrial appendage demonstrating characteristic dyssynchronous contraction and relaxation waves suggesting a rhythm that is not sinus in the midesophageal four chamber view. LAA: Left atrial appendage

demonstrated that almost 25% of patients with a history of AF demonstrate mechanical discordance between LA and LAA while in SR.^[4] Isolated LAA dysfunction with an AF phenotype is a plausible mechanism to explain the occurrence of strokes in patients with AF during periods of sustained SR.

Exclusion of LAA thrombi in cases of AF can be reliably performed with TEE examination. Due to its anterolateral position, with two-dimensional (2D) imaging, the LAA is structurally best interrogated with TEE probe in the midesophageal position.^[5] A structural examination is initiated with identifying LAA as the region of interest (ROI) at 0°. The scan plane is incrementally rotated in 3°–5° increments to 180°. Minor positional adjustments of the TEE probe have to be made to maintain the LAA as the ROI. Barring any anatomical peculiarities,

the LAA is best visualized at a scan plane rotation between 5° and 90° with slight antelexion of the TEE probe. Simultaneous orthogonal 2D imaging when using three-dimensional (3D) TEE probes can also be used for LAA interrogation. Functionally, the LAA is interrogated with PWD at 0° or 90° to obtain an optimal Doppler alignment. The sample volume should be placed in the proximal portion of the LAA to obtain the characteristic flow pattern [Figure 3]. Functional data regarding LAA should be integrated with the LA size, the presence of SEC, left ventricular function, and Doppler-derived mitral and pulmonary vein inflow patterns for a complete examination.

In the presented case, although there was no SEC and the ejection velocities were >20 cm/s, the LAA demonstrated a contraction/relaxation pattern that was discordant with normal LA function [Figure 3]. In general, flow velocities of the LAA during AF are lower than those during SR.^[6] However, velocities during AF can vary to higher than normal, normal or minimal or absent flow.^[7] This represents the wide continuum of LAA dysfunction, from preserved contraction (although irregular in rhythm) to complete absence of flow due to paralysis of the appendage.^[8] In conclusion, LAA-LA mechanical discordance is uncommon, and its identification may help us identify patients at risk for thromboembolism despite being in SR.

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Conflicts of interest

There are no conflicts of interest.

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