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Pulmonary vein Doppler flow in a patient with fatigue and dyspnoea

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IMAGE CHALLENGE

Pulmonary vein Doppler flow in a patient with fatigue and dyspnoea

CLINICAL INTRODUCTION

A woman in her 80s with a medical history of uncontrolled hypertension, hyperlipidaemia and diet-controlled pre-diabetes presented to a primary care physician's office with fatigue and dyspnoea on exertion of 2–3 months' duration. The patient reported no chest pain, paroxysmal dyspnoea or orthopnoea. Medications included atenolol 50mg once a day. Blood pressure in the clinic was 158/75 mm Hg. An echocardiogram was performed.

QUESTION

Which of the following explains the pulmonary vein pulsed wave Doppler flow signal, as shown in [figure 1](#)?

- A. Blunting of systolic flow due to severe mitral regurgitation
- B. Atrioventricular conduction block

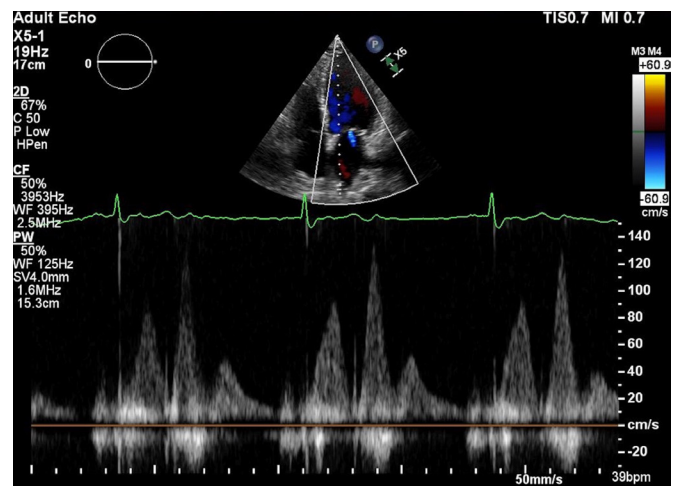


Figure 1 Pulsed wave Doppler of the pulmonary vein on transthoracic echocardiogram.

- C. Normal Doppler flow pattern
- D. Restrictive diastolic filling of the left ventricle

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ANSWER: B

The correct answer is B, atrioventricular conduction block.

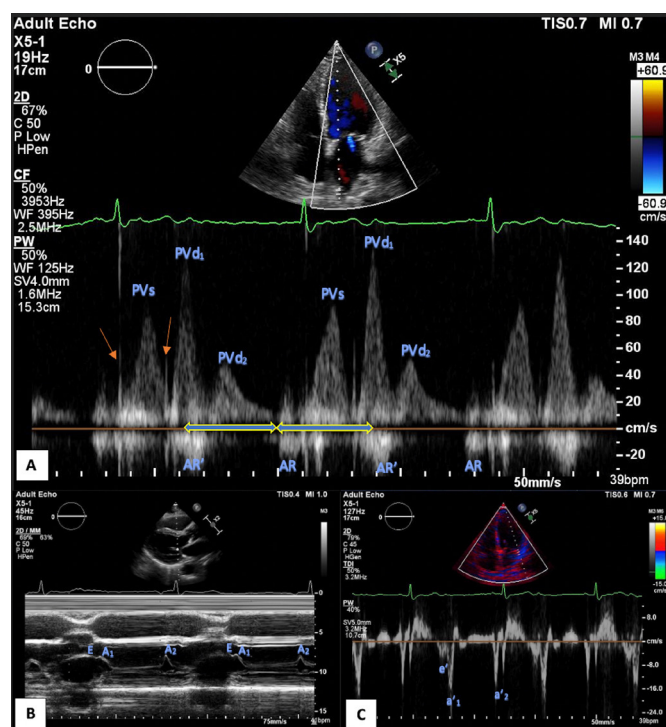



Figure 2 (A) Pulmonary vein pulsed wave Doppler pattern showing normal PVs and AR waves with an abnormal biphasic diastolic wave (PVd₁ and PVd₂). PVd₁ corresponds to a non-conducted P wave on the electrogram. The cycle length between P waves is about 730 ms. Mitral and aortic valve closure clicks are shown (orange arrows). (B) Mitral valve M-mode showing the opening of the mitral valve with both the non-conducted P wave (A₁) as well as the conducted P wave (A₂). (C) Lateral mitral annular tissue Doppler annular motion due to the extra atrial contraction (a'₁) in early diastole and normal atrial contraction (a'₂). AR, atrial systolic reversal wave; AR', atrial systolic reversal wave from extra atrial contraction; PVd, pulmonary vein diastolic wave; PVs, pulmonary vein systolic wave.

Normal filling of the left atrium from the pulmonary veins (PV) is comprised of a biphasic systolic wave (PVs₁ and PVs₂) and a single diastolic wave (PVd). In this patient, the pattern is reversed with a single systolic wave (PVs) and a biphasic diastolic wave (PVd₁ and PVd₂) (figure 2A). This paradoxical appearance is caused by an interruption of normal diastolic PV forward flow from a second atrial contraction related to 2:1 atrioventricular block. The blocked P wave is seen on ECG as well as on M-mode imaging (A₁) and tissue Doppler imaging (a'₁) (figure 2B,C).

A biphasic PVd wave is not present under normal conditions as there is typically no interruption in PV flow in diastole. Therefore, C is incorrect.

In severe mitral regurgitation, the PVs wave can be blunted or reversed, which is not present here. Therefore, A is incorrect.

In restrictive diastolic filling, the left atrium is non-compliant from high filling pressures with poor systolic passive filling, leading to blunted PVs waves. This PVs wave is not blunted or reversed and this does not explain the diastolic notch. Therefore, D is incorrect.

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