ECHO-
CARDIOGRAPHY
QUIZ

Image in cardiology

A. van Rensburg and P.G. Herbst

Division of Cardiology, Department of Medicine, University of Stellenbosch and Tygerberg Academic Hospital, South Africa

Address for correspondence:
Dr Annari van Rensburg
Division of Cardiology
Department of Medicine
University of Stellenbosch and Tygerberg Academic Hospital
PO Box 19063
Tygerberg
7505
South Africa

Email:
annarivanrensburg@gmail.com

A 31-year-old male, admitted with a minor burn wound, was referred for cardiology assessment following an incidental finding of a ¾ diastolic murmur in the aortic area. He was asymptomatic and had no medical history of note apart from a prior stab wound to the chest requiring a sternotomy 2 years previously. Echocardiography was done and a continuous wave (CW) Doppler trace recorded in a low parasternal long axis position as shown in Figure 1. The Doppler flow pattern is reminiscent of AR, however, 2D imaging and colour Doppler revealed a normal aortic and pulmonary valve. How do we reconcile these apparent inconsistencies? Considering the haemodynamics at work here is perhaps a good starting point.

Which 2 cardiovascular chambers or vessels could produce such a Doppler tracing if they were connected?

a.	LV to RV	d.	Artery to LV
b.	LA to RA	e.	Artery to vein
c.	Artery to RV	f.	Systemic artery to pulmonary artery

LV: left ventricle, RV: right ventricle, LA: left atrium, RA: right atrium.

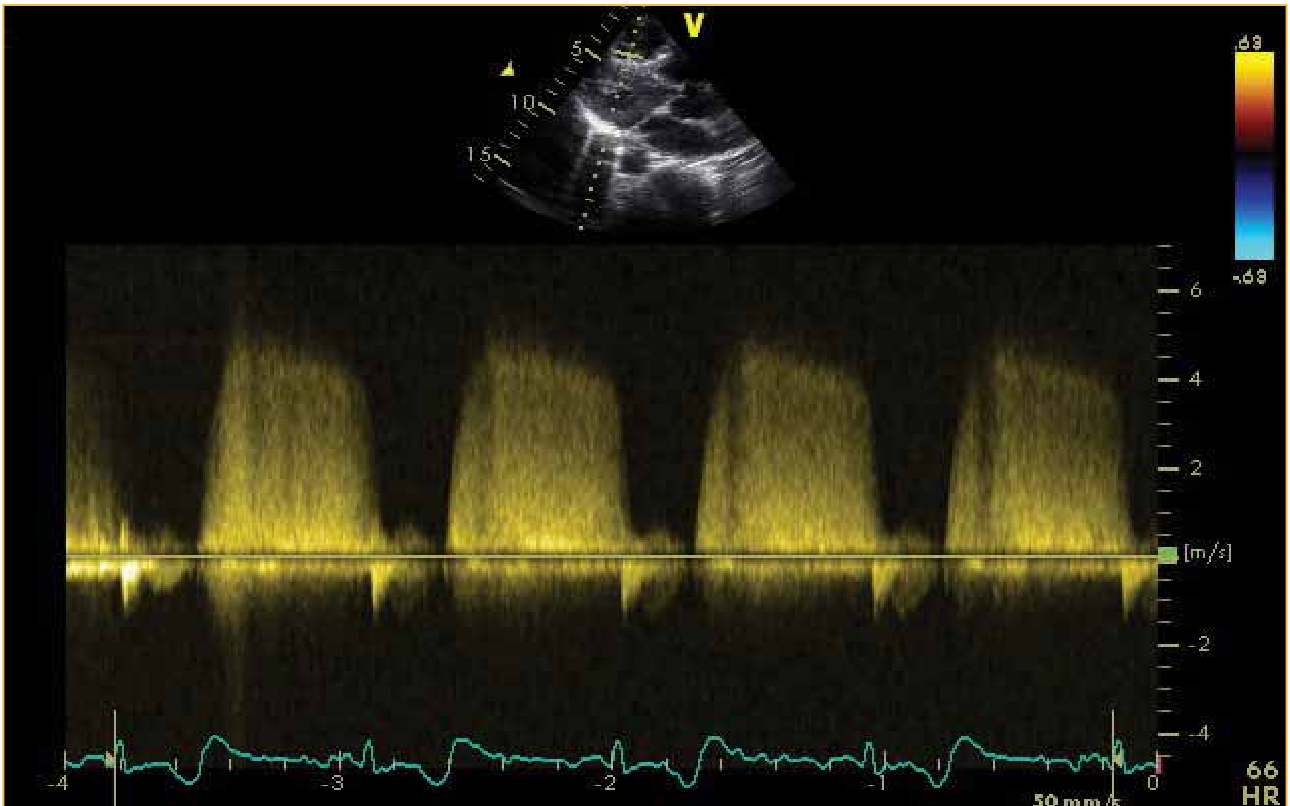

FIGURE 1: CW trace with a Vmax of 4.86m/s and a PHT of 569ms.

OVERVIEW OF THE CW TRACE

This CW trace shows a diastolic gradient of 94mmHg.

INTERPRETATION

At first glance the trace looks like the typical trace you would expect in aortic regurgitation. However, we know that the aortic valve in this patient is normal. The Vmax is 4.86m/s indicating that there is a 94mmHg pressure difference between the two chambers. We therefore know that the shunt has to be from a high pressure chamber to a low pressure chamber with the pressure gradient between these two chambers existing only in diastole.

If we regard the options one by one:

a. **LV to RV:** the pressure gradient of 94mmHg would be in keeping with the gradient that normally exists between these two chambers, but the gradient would exist during systole, not diastole.

b. **LA to RA:** the atria are low pressure chambers and the gradient clearly originates from a high pressure chamber.

c. **Artery to RV:** unless the right ventricle has systemic pressures, the flow between a systemic artery and the right ventricle would take place continuously.

d. **Artery to LV:** the pressure in the systemic artery and the left ventricle would be similar during systole while in diastole the pressure in the artery would remain high while the pressure in the left ventricle would be very low to allow for ventricular filling from the low pressure atrium. This would therefore explain the gradient as well as the part of the cardiac cycle the gradient exists in.

e. **Artery to vein:** with a connection between an artery and a vein you would expect the flow to be continuous since a gradient would exist throughout the cardiac cycle. Also, you would expect the gradient to be maximal during systole and not diastole.

f. **Systemic artery to pulmonary artery:** once again you would expect continuous flow since the gradient would exist throughout the cardiac cycle.

The best answer is therefore d.) Artery to left ventricle.

The 2D image with colour Doppler shown in Figure 2 is the modified parasternal long axis view from which the CW trace shown in Figure 1 was taken. The color Doppler in this image appears to show a jet crossing the anterior inter ventricular septum from LV to RV. However, the Doppler trace described before argues against this for the reasons given. Based on these arguments we expect the flow to originate in a systemic artery. The LAD courses close to this position as it supplies the anterior septum with blood and becomes our prime suspect for the origin of the color jet. This jet then appears to be flowing from LAD (in the anterior septum) into the RV, however again we have argued for the reasons given above (and since the PA systolic pressures were calculated to be normal) that the receiving chamber is unlikely to be the RV and that rather flow must be going into the LV. What portion of the LV however could be lying so out of position as to appear to be in the position of the RVOT? The apical segments of the inferior septum, anterior septum and anterolateral walls (LAD territory) in this patient were thin and akinetic. Since he was young with no cardiovascular risk factors, this led us to believe that there was likely an LAD injury related to the previous stab wound rather than coronary artery disease responsible for this. We therefore considered the possibility of a LV pseudoaneurysm with flow to the pseudoaneurysm taking place during diastole and draining at the same time to the LV via a large, non-restrictive opening. This would be compatible with the CW trace and also explains the abnormal chamber next to the LV that the flow could be seen draining into on this 2D image. This was then confirmed on a parasternal short axis view on which we could visualise the flow into the false aneurysm and draining into the LV during diastole. The patient was subsequently referred for surgical treatment of the pseudoaneurysm.

FIGURE 2: 2D image with colour Doppler of a modified parasternal long axis view showing flow from the LAD to the pseudoaneurysm.

Conflict of interest: none declared.