

IMAGES

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Normal adult echocardiography - parasternal views

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Abstract

Children with congenital heart disease will grow into adults who may also develop adult heart disease. This article attempts to familiarise practitioners that usually deal with congenital heart disease with the conventional views that are obtained during adult echocardiography.

MeSH: Echocardiography, Echocardiography, Doppler

Paper

Echocardiography started fifty years ago and has developed in tandem with information technology.¹ It has become the most important non-invasive cardiac imaging modality and is independent of x-radiation, utilising only ultrasound beams. From delineation of structure, the speciality has moved on to detailed assessment of function, including flow across valves, study of cardiac wall motion, myocardial strain quantification and 4-dimensional reconstruction of cardiac anatomy.

As children with congenital heart disease grow older, they will inevitably develop cardiac problems associated with adulthood. Paediatric cardiologists will therefore have to develop a degree of familiarity with views and concepts that are employed by adult cardiologists.

During echocardiography, the heart is viewed in a variety of projections, each of which is a two-dimensional representation of a three-dimensional structure. One must acquire the skill of reconstituting the three-dimensional anatomy of the heart from a series of different, two-dimensional views. An understanding of cross-sectional anatomy is of paramount importance in the interpretation of all of the images obtained.

Ultrasound energy propagates poorly through a gas and for this reason, the air-filled lungs act as a barrier. Figure 1 shows the surface projections of the heart in red, of the pleurae in light blue and of the lungs in violet. It is clear that a large part of the heart is covered by lung hence specific echocardiographic 'windows' need to be used to avoid this air barrier. In this paper, we will outline the standard and conventional parasternal long and short axis views.

The study commences with the parasternal long axis view (PLAX - figure 2).

Several M-mode projections will now be shown at different levels of the parasternal long axis view.

Figure 1 Surface projections of the heart (red), pleurae (light blue) and lungs (violet)

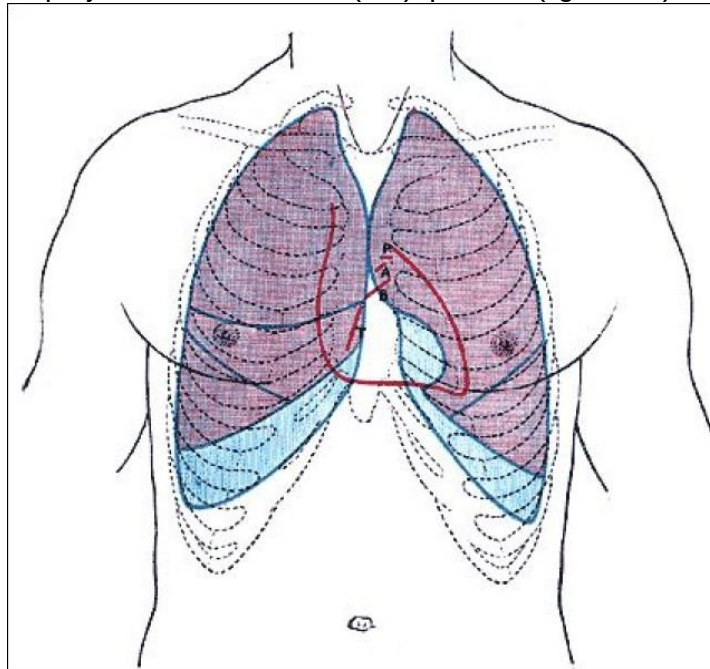


Figure 2 Schematic view of parasternal long axis ultrasound beam

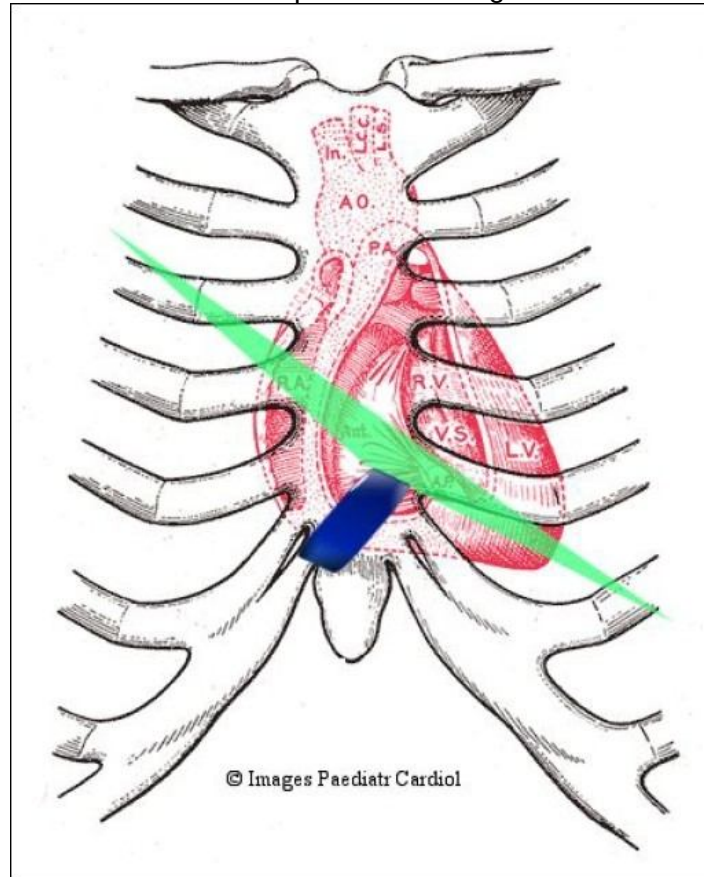


Figure 3 PLAX view: LV=left ventricle, RV=right ventricle, IVS=interventricular septum, Ao=aorta, LA=left atrium, MV=mitral valve, LVPW=left ventricular posterior wall

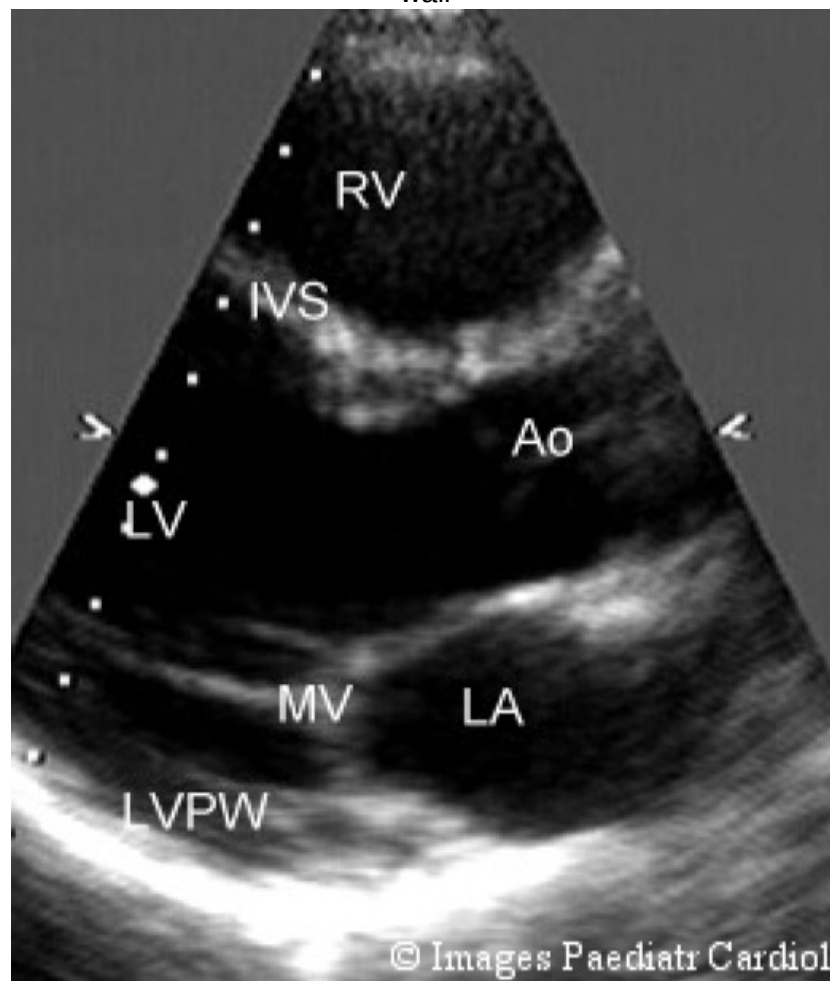


Figure 4 Video clip as per figure 3

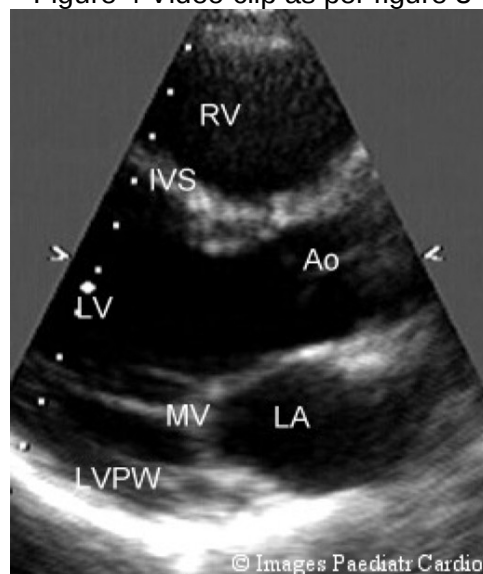


Figure 5 Reference frame showing the caliper at the level of the mitral valve tips.

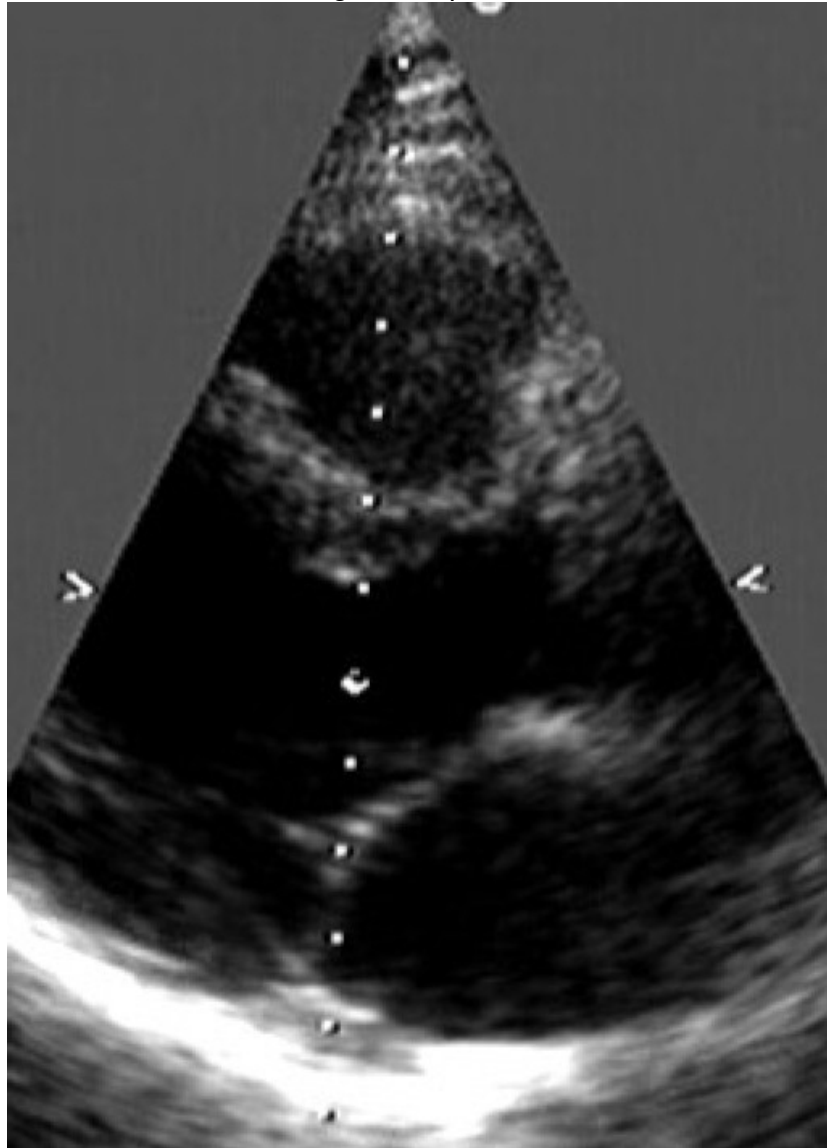


Figure 6 Video clip of M-mode at the level shown in figure 5.



Figure 7 E-septal distance i.e. the distance between the E point (maximum anterior excursion of the anterior mitral valve leaflet) and the IVS at the E point. It is an index of myocardial function and the normal value is less than 10mm.

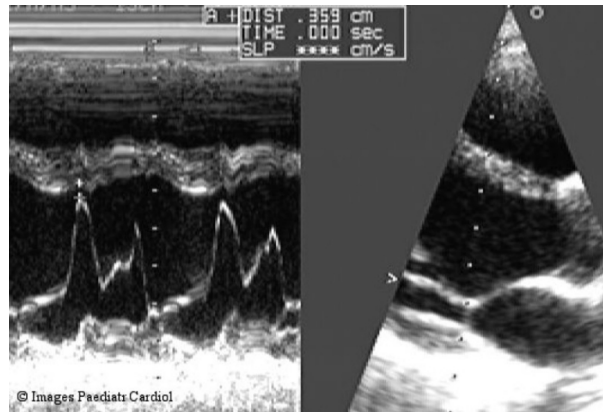


Figure 8 Reference frame showing the caliper at the level of the middle of the left ventricle.

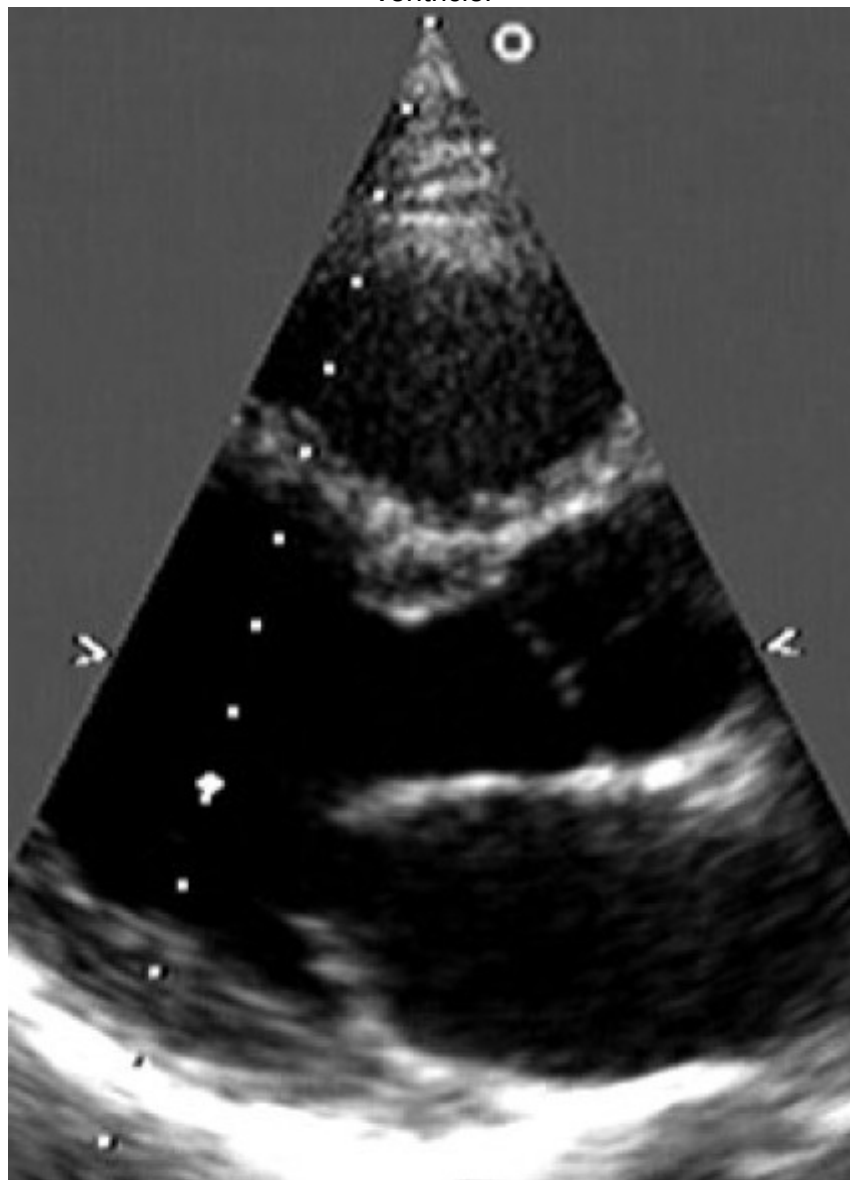


Figure 9 Video clip of M-mode at the level shown in figure 8.

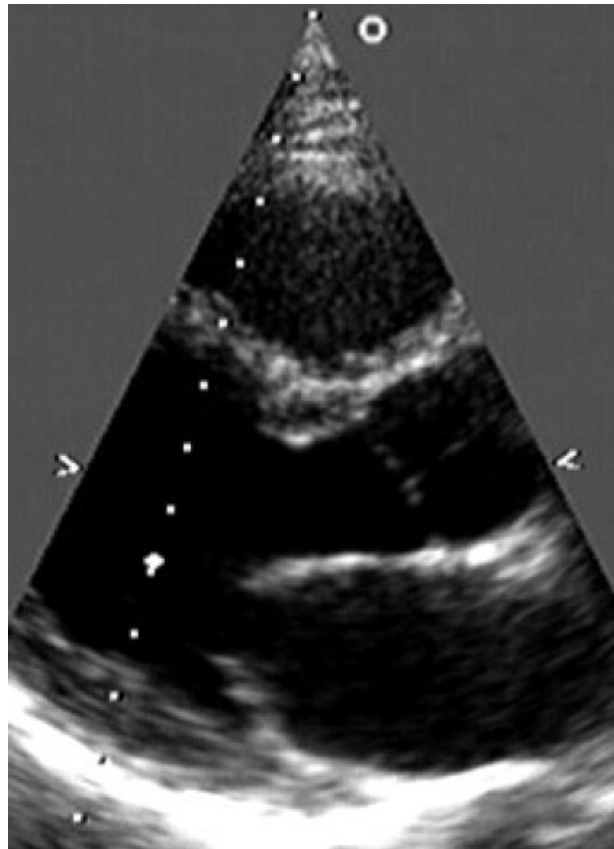


Figure 10 M-mode measurements of the left ventricle. A=LV internal diameter in systole. B=IVS. C=LV internal diameter in diastole. D=LVPW

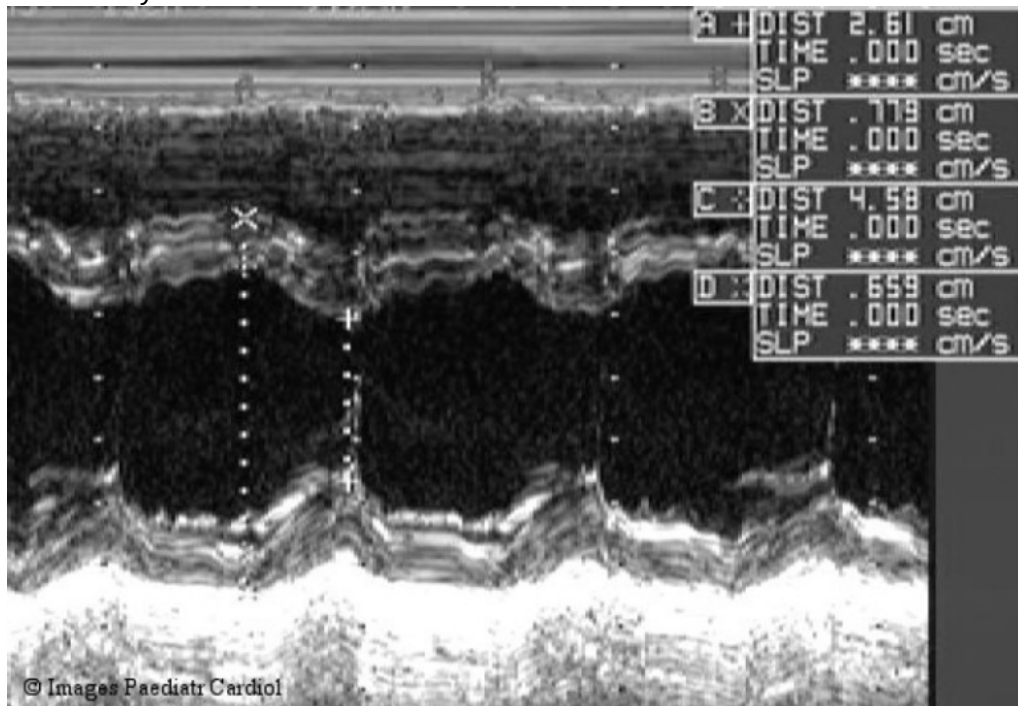


Figure 11 Reference frame showing the caliper at the level of the aortic valve.

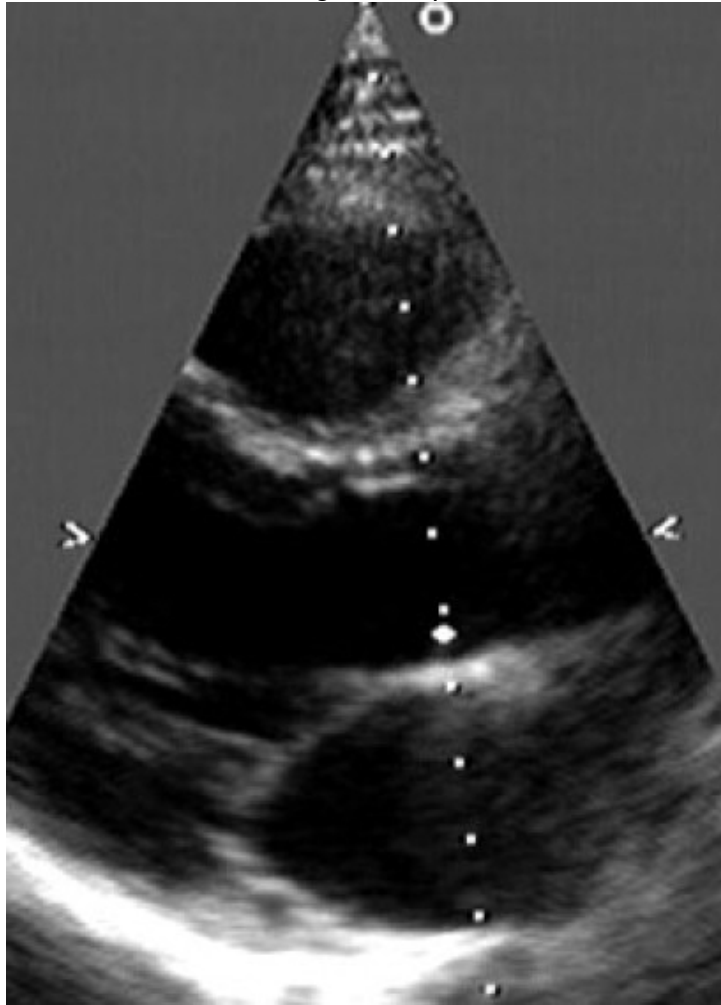


Figure 12 Video clip of M-mode at the level shown in figure 11.

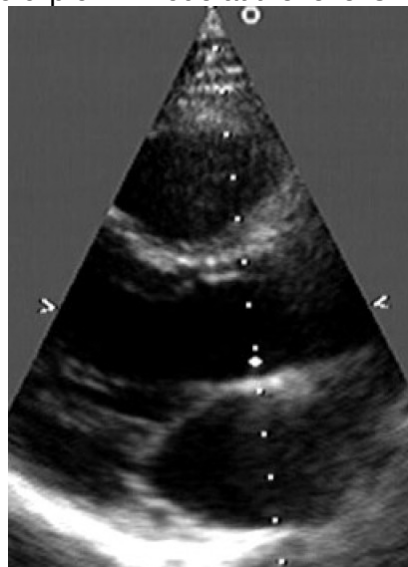


Figure 13 M-mode measurements of Ao (A) and LA (B).

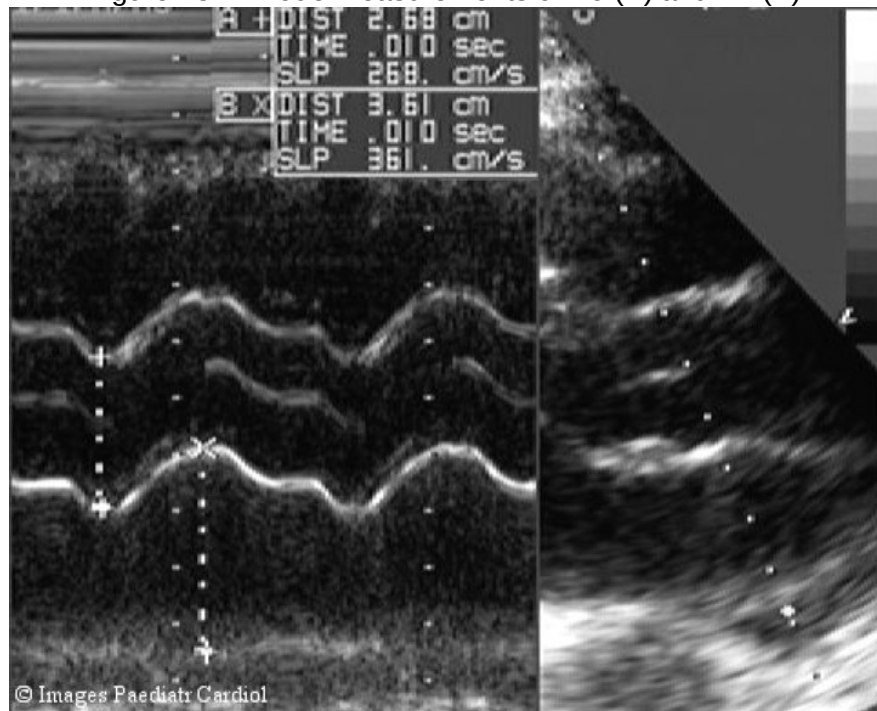


Figure 14 PLAX with the probe angled medially to show the RV inlet

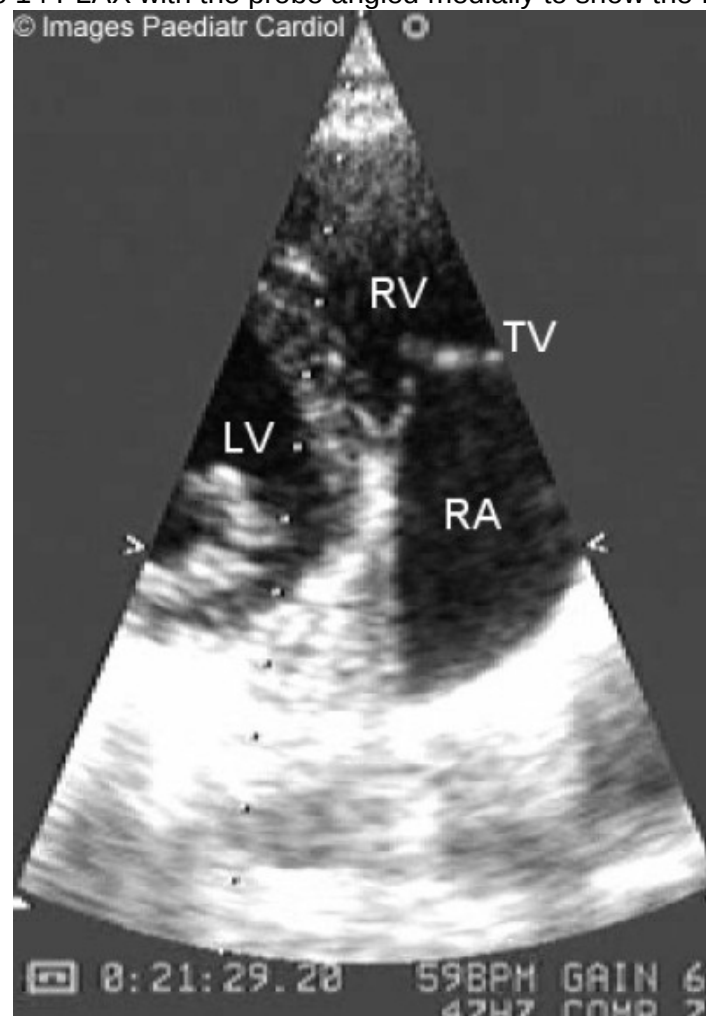


Figure 15 Video clip of figure 14.

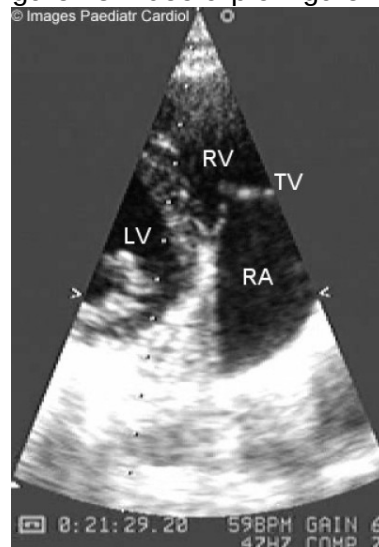


Figure 16 Video clip as per figure 14.

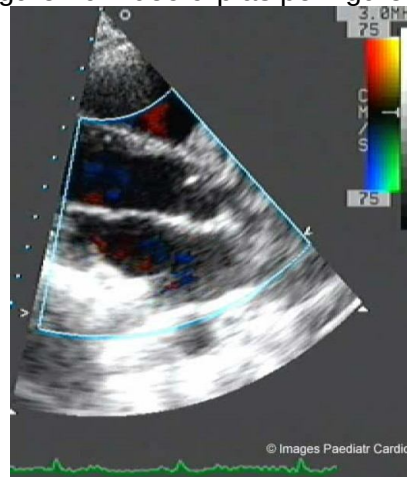
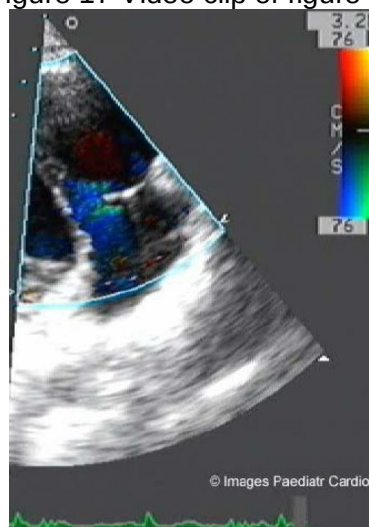


Figure 17 Video clip of figure 15



PLAX colour Doppler views are now shown.

The probe is rotated through 90° and parasternal short axis (PSAX) views are obtained (figure 18).

The probe is swung from base to apex and several SAX views are obtained.

Figure 18 Schematic view of parasternal long axis ultrasound beam

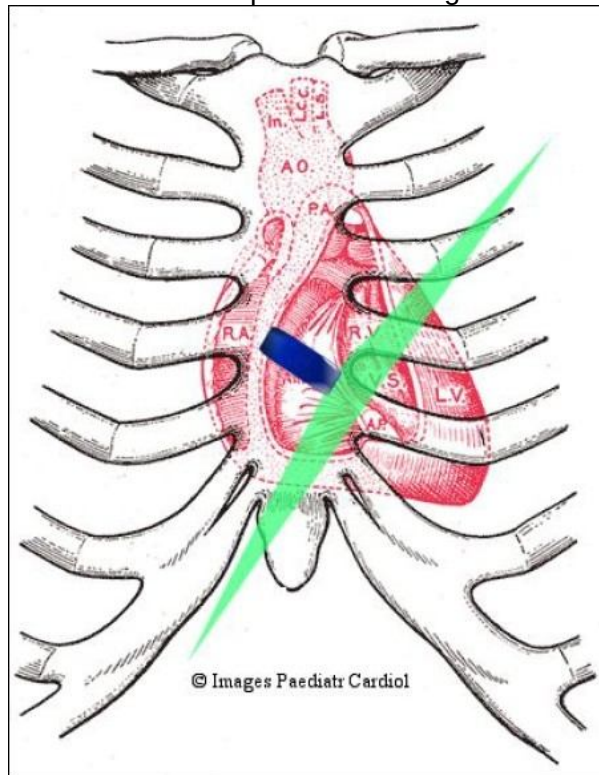


Figure 19 PSAX at the level of the aortic valve: RV=right ventricle, RVOT=RV outflow tract, TV=tricuspid valve, PV=pulmonary valve, AoV=aortic valve, RA=right atrium, IAS=interatrial septum, LA=left atrium

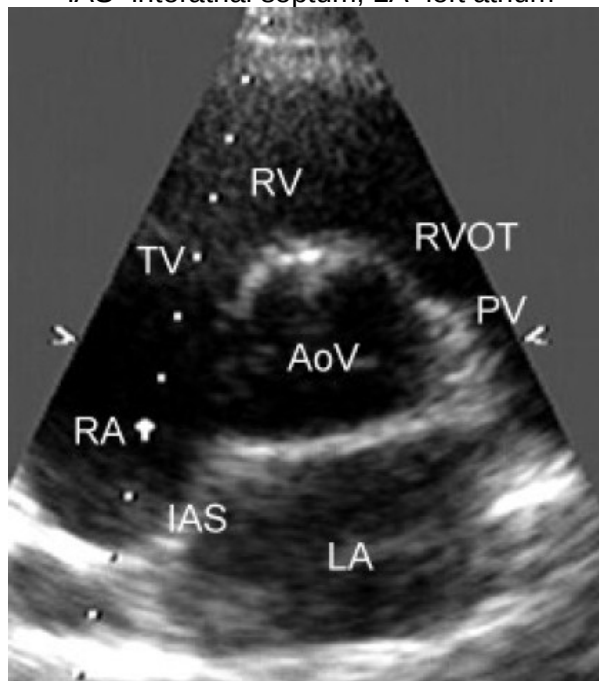


Figure 20 Video clip of figure 19

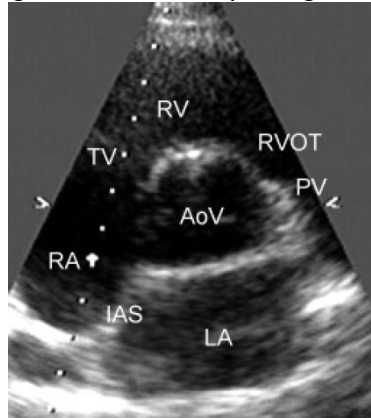


Figure 21 Slight manipulation of the probe at this level reveals the MPA (main pulmonary artery) and may also show the proximal segments of both coronary arteries arising from the aorta (RCA=right coronary artery, LCA=left coronary artery)

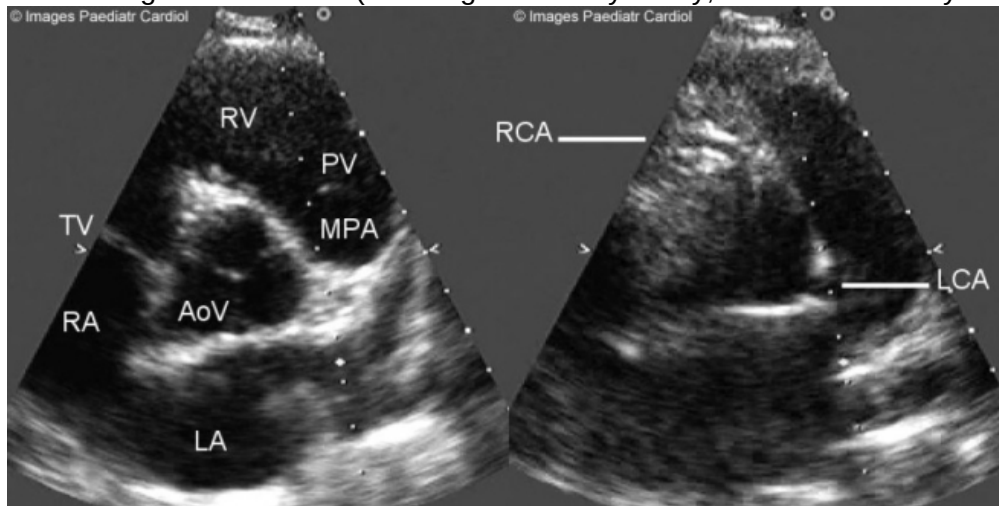


Figure 22 Video clip of figure 20 showing the right ventricular inflow with colour Doppler. Note the presence of minimal tricuspid regurgitation which is a very common finding even in normal hearts.

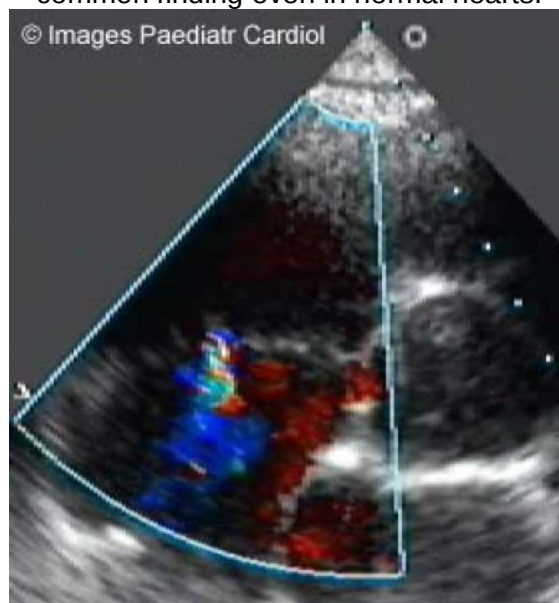


Figure 23 PSAX at the level of the mitral valve (MV)

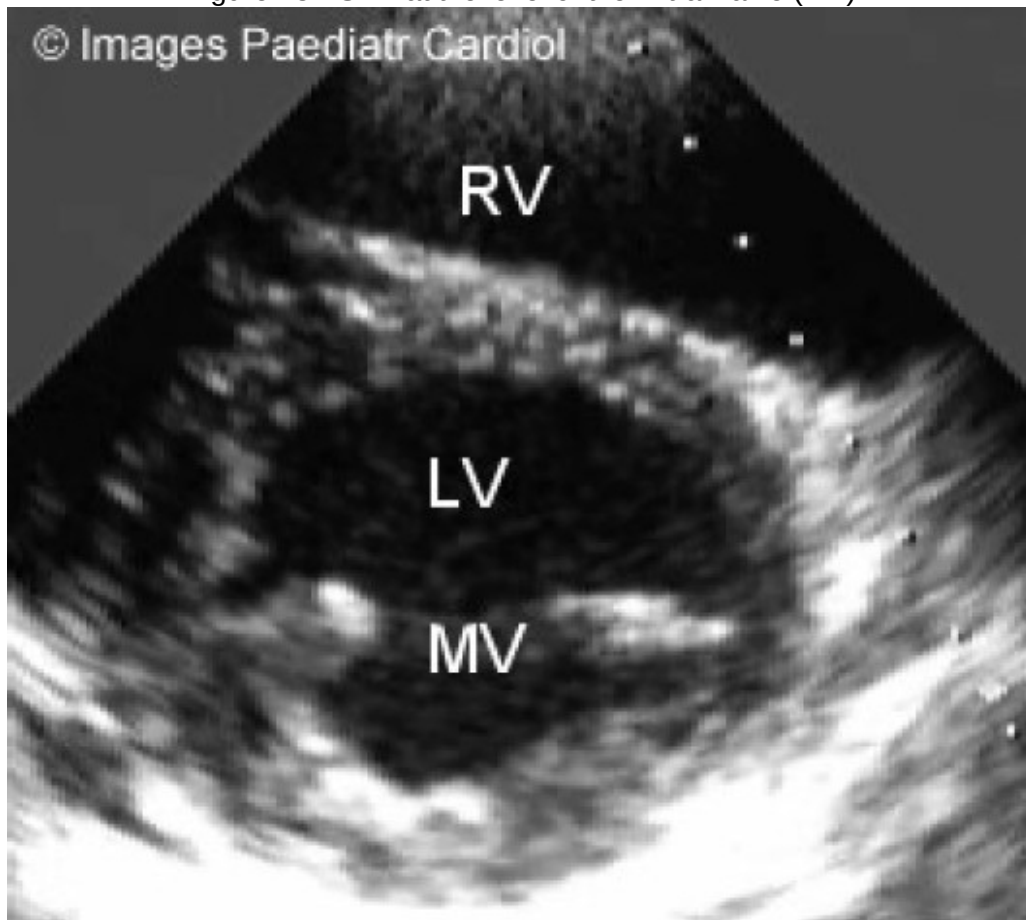


Figure 24 Video clip of figure 23

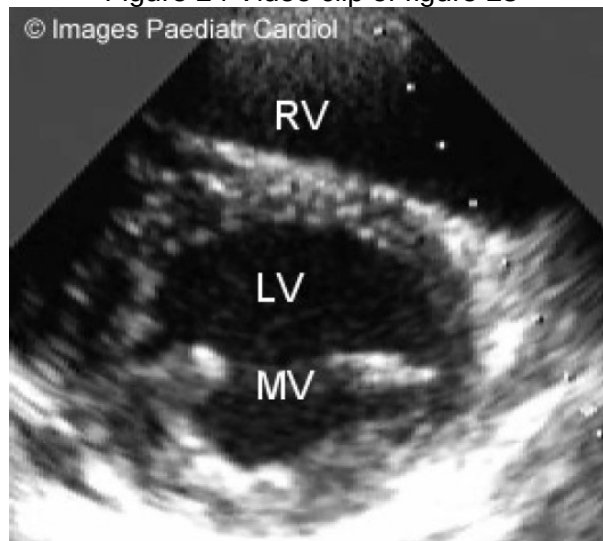


Figure 25 PSAX at the level of the papillary muscles (PM)

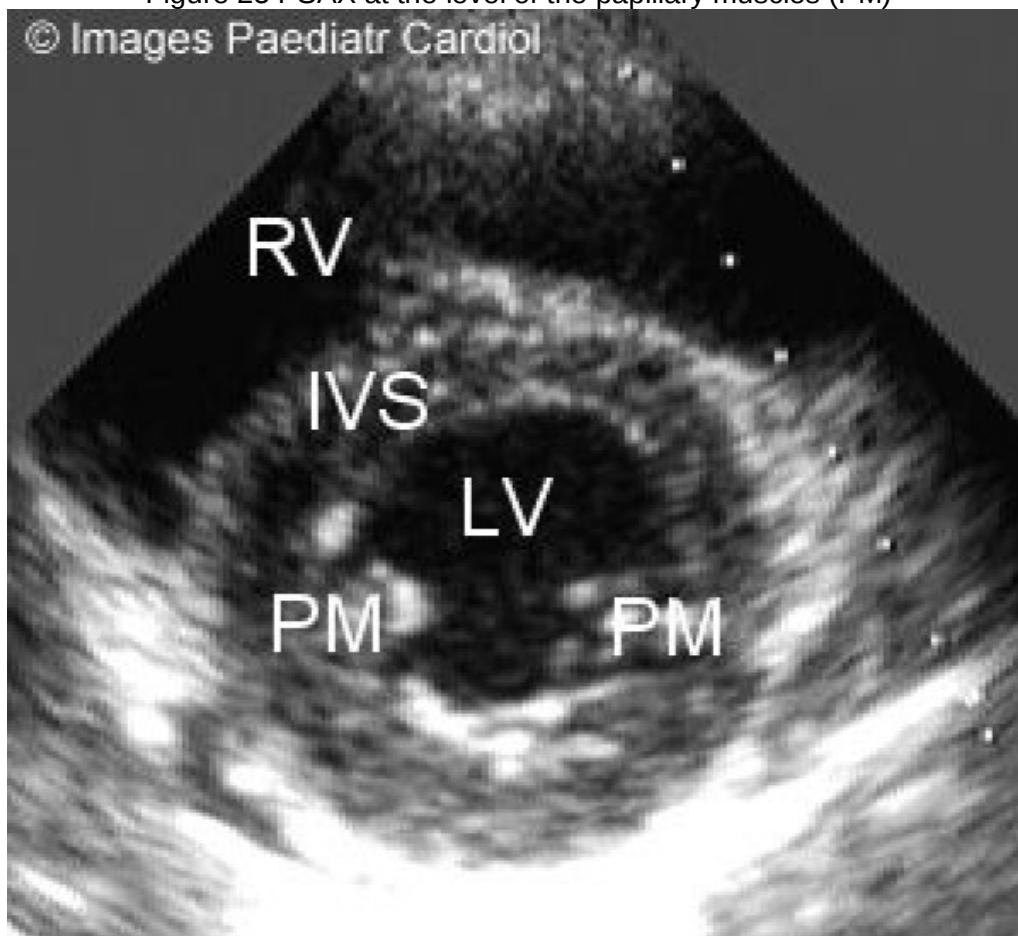


Figure 26 Video clip of figure 25

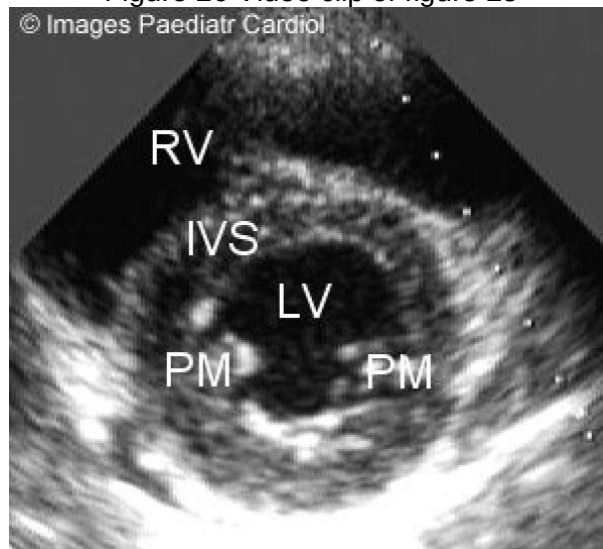
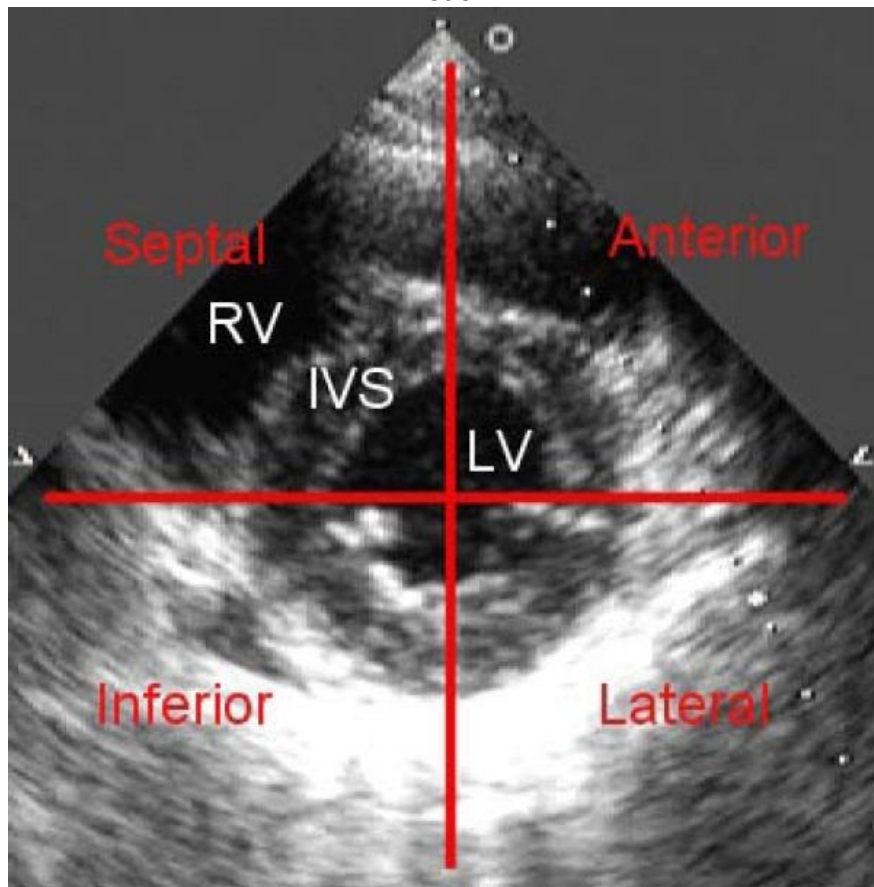


Figure 27 PSAX at the level of the papillary muscles showing how the respective LV segments are identified, usually for the purposes of describing abnormal LV wall motion



References

1. Feigenbaum H. 6th ed. Philadelphia: Lippincott Williams and Wilkins; 2004. Echocardiography.

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