Basic Ultrasound Views

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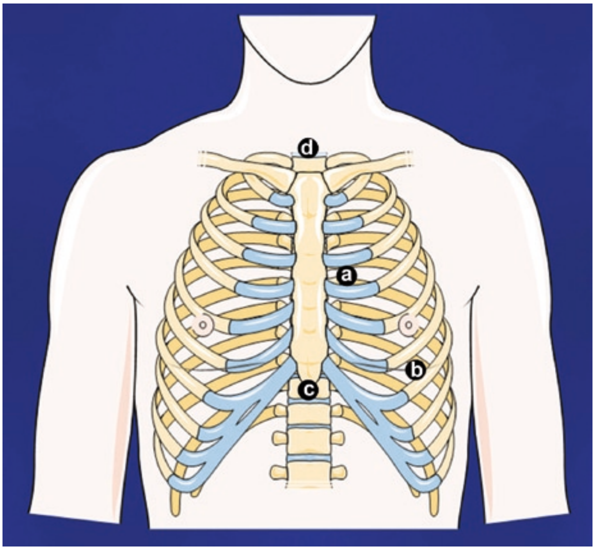

Fig. 2.1 Echocardiographic windows. When performing an echocardiogram, the transducer is placed in multiple areas of the chest. These areas are commonly referred to as "windows." The most common echo windows are: (**a**) the left parasternal window, (**b**) the apical window, (**c**) the subcostal window, and (**d**) the suprasternal notch. In certain circumstances, imaging from nonstandard windows is required. Some of the nonstandard windows include the right parasternal window and the mid-clavicular window. In some cases, imaging may need to be performed from any area of the chest from where an image can be obtained (Adapted from Servier Medical Art, www.servier.com, with permission)

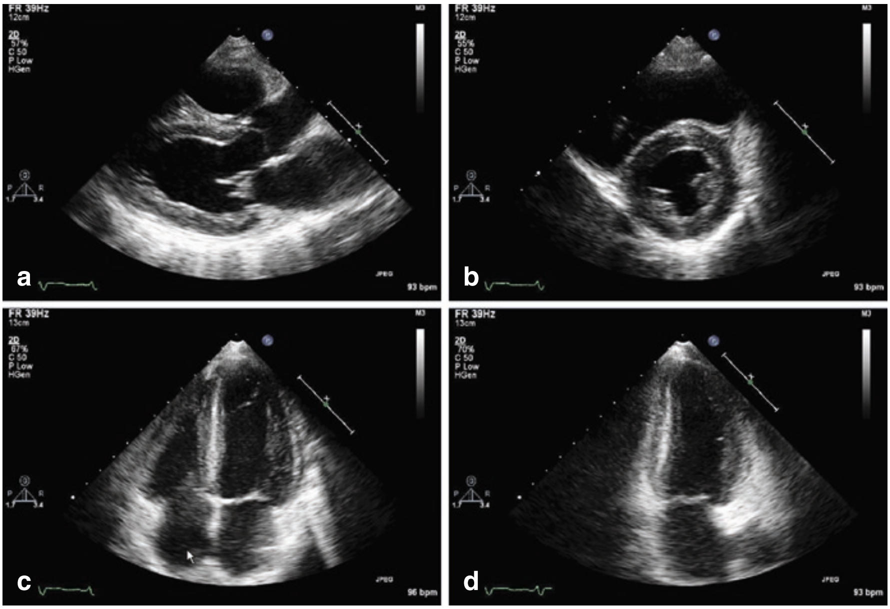

Fig. 2.2 Echocardiographic views. From each window, the transducer is manipulated to obtain multiple views of the heart. The different views are obtained by rotating and/or tilting the transducer without actually moving it to a new window

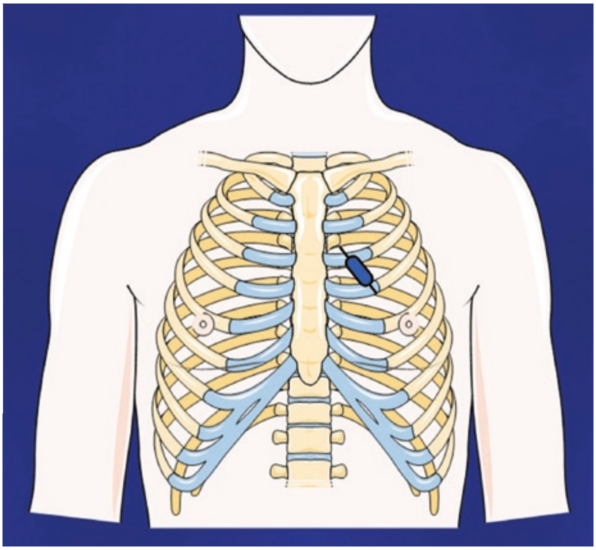

Fig. 2.3 The parasternal window. The parasternal long axis (PLAX) view is obtained by placing the transducer in the three to four left intercostal spaces close to the sternum with the bean oriented toward the patient's right shoulder. This orientation slices through the heart on a long axis from base to apex (Adapted from Servier Medical Art, www.servier.com, with permission)

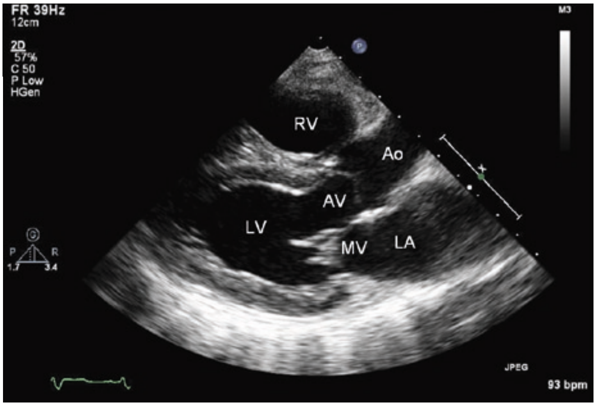

Fig. 2.4 The parasternal window. The parasternal long axis (PLAX) view is obtained by placing the transducer in the third to fourth left intercostal space close to the sternum with the bean oriented toward the patient's right shoulder. This orientation slices through the heart on a long axis from base to apex

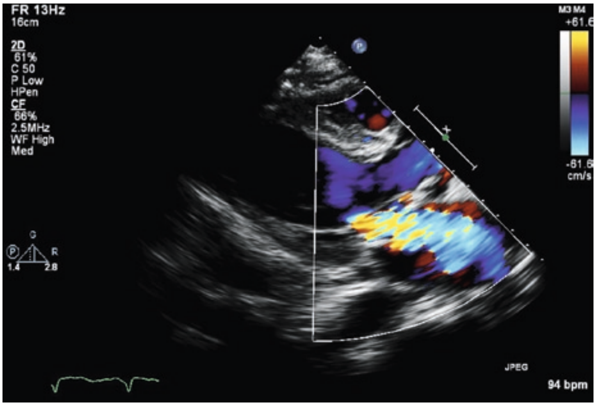

Fig. 2.5 Parasternal long axis – color flow image. Color flow Doppler imaging is used to assess the valves for regurgitation. Pictured here is a systolic still frame demonstrating regurgitation of blood flow back through the mitral valve into the left atrium

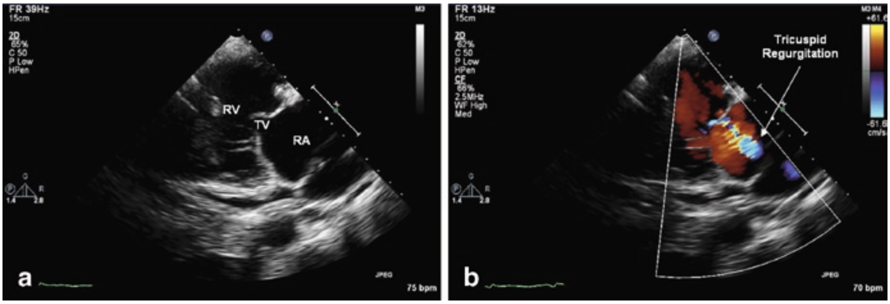

Fig. 2.6 Right ventricular inflow (RVIF) view. The RVIF view is obtained by tilting the transducer toward the left shoulder so the ultrasound beam moves anterior in the chest slicing through the right heart. (**a**) This view is used to assess the right ventricle, tricuspid valve, and right atrium. (**b**) Color flow and spectral Doppler are used to assess the valve for tricuspid regurgitation

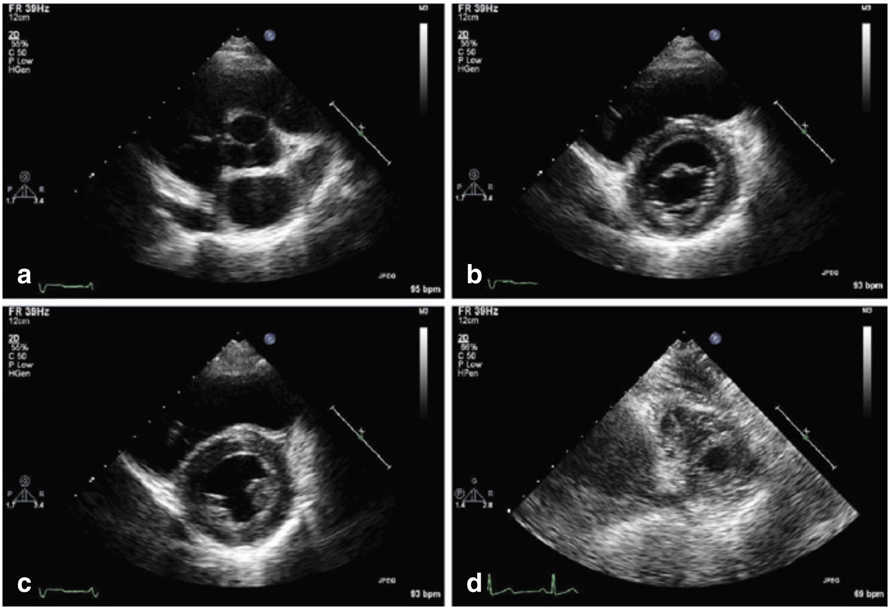

Fig. 2.7 Parasternal short axis (PSAX) view. The PSAX view is obtained by remaining in the parasternal window and rotating the transducer clockwise approximately 90°. Sweeping the transducer from base to apex results in: (**a**) the basal level view, (**b**) the mitral level view, (**c**) the papillary level view, and (**d**) the apical level view. In the basal and mitral level view, color flow Doppler can be used to assess the valves for regurgitation

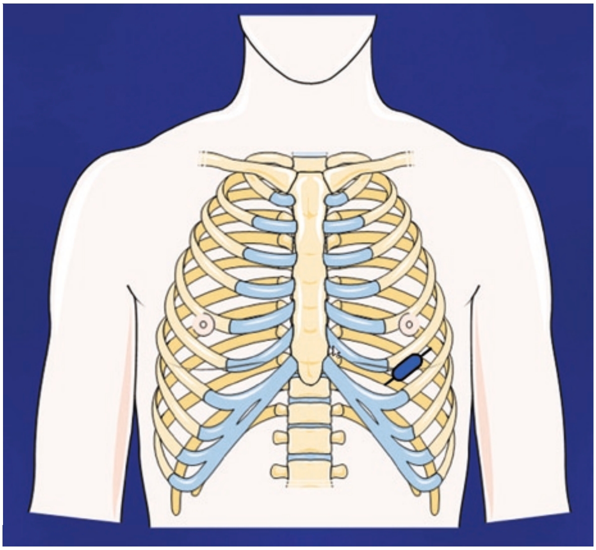

Fig. 2.8 Apical views. The apical window is usually found in the left lateral portion of the chest at the apex of the heart. This can sometimes be located by placing your hand lightly in the area of the apex and feeling for the point of maximal intensity (PMI). The PMI will serve as your starting point; however, small adjustments will need to be made to the transducer location to maximally optimize your image (Adapted from Servier Medical Art, www.servier.com, with permission)

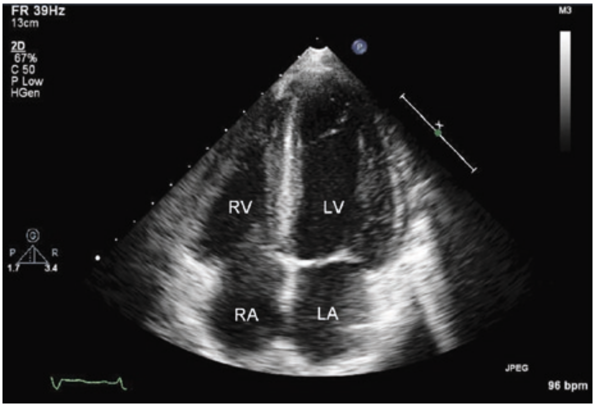

Fig. 2.9 Apical 4 Chamber (4C) view. All four cardiac chambers are visualized in the 4C view along with the mitral and tricuspid valves. Ventricular and atrial size can be assessed using 2D echo. Color flow and spectral Doppler can be used to assess for valvular regurgitation and stenosis. Left ventricular diastolic function can be assessed using pulsed wave Doppler of the mitral valve and pulmonary veins. In this view, the right ventricular freewall, interventricular septum, and left lateral wall can be assessed for systolic motion

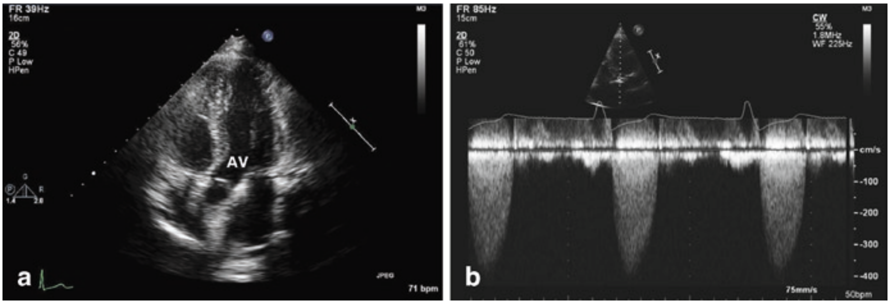

Fig. 2.10 Apical 5 Chamber (5C) view. (**a**) The 5C view is obtained by tilting the transducer slightly so the beam moves anterior in the chest slicing through the left ventricular outflow track (LVOT) and aortic valve. (**b**) Utilizing spectral Doppler, the outflow velocity can be measured. In this example, the high-velocity flow pattern indicates aortic stenosis. The aortic valve area can be calculated by integrating data from the 2D images and Doppler tracings

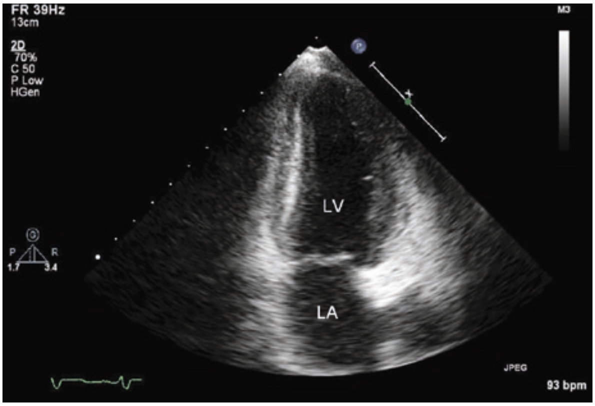

Fig. 2.11 Apical 2 Chamber (2C) view. The 2C view is obtained by starting at the 4C view and rotating the transducer clockwise approximately 90°. In the 2C view, the left ventricle, mitral valve, and left atrium can be seen. The inferior and anterior walls of the left ventricle can be assessed for systolic function. Using color flow and spectral Doppler, the mitral valve can be assessed for regurgitation and stenosis

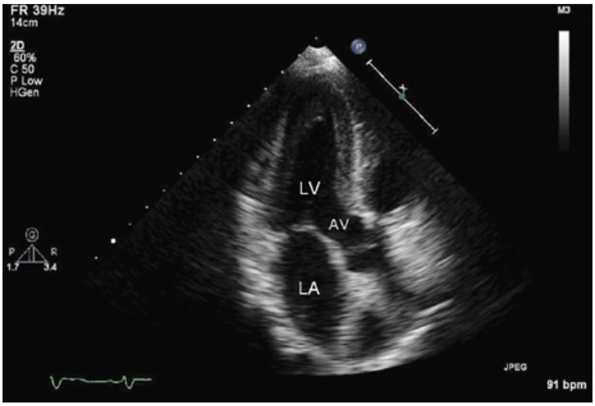

Fig. 2.12 Apical 3 Chamber (3C) or long axis view. The apical 3C view is also known as the apical long axis view. Structures seen in the 3C view are the same as the parasternal long axis view. The 3C view is utilized to assess chamber size and function as well as aortic and mitral valve function

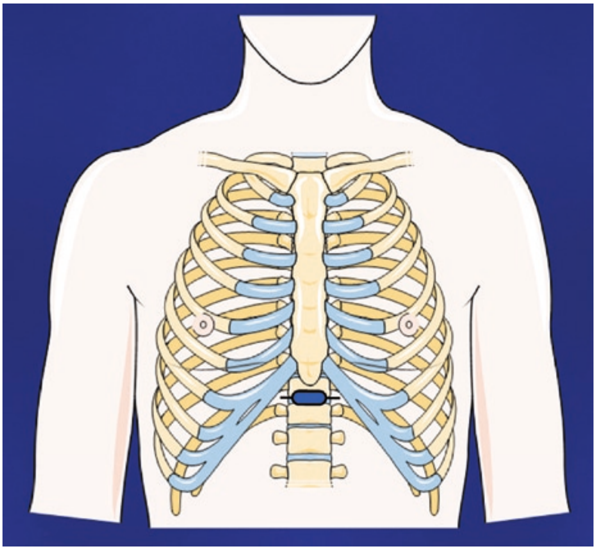

Fig. 2.13 The subcostal window. Subcostal views are obtained by positioning the patient flat on their back and placing the transducer just below the xiphoid process. Asking the patient to bend their knees may help relax the stomach muscles. Having the patient take a deep breath often moves the lungs out of the way and results in better images (Adapted from Servier Medical Art, www.servier.com, with permission)

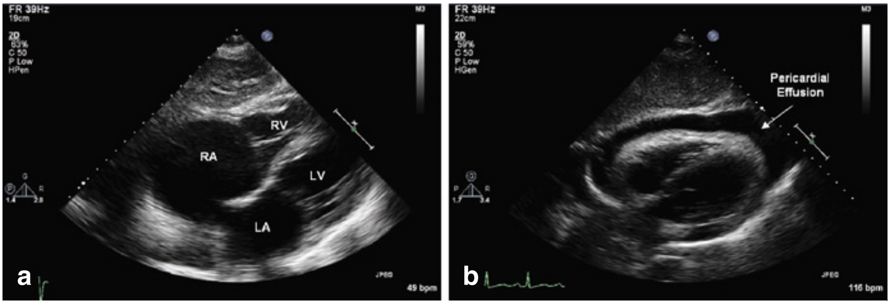

Fig. 2.14 Subcostal 4 Chamber view. (**a**) The subcostal 4C view can be used to assess chamber size and function. Color flow and spectral Doppler imaging can be used to assess valvular function. This is also a good view for assessing for atrial or ventricular septal defects. (**b**) The subcostal view is a good view for assessing the presence and size of a pericardial effusion

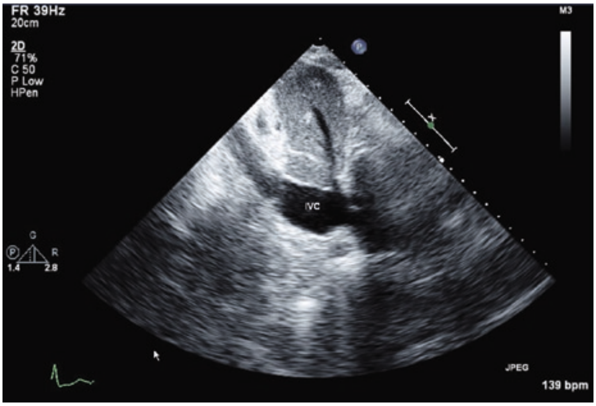

Fig. 2.15 Inferior Vena Cava (IVC) view. Beginning in the subcostal 4C view and rotating the transducer counterclockwise 90° and angling toward the liver, the IVC can be seen in long axis. The IVC can be assessed for diameter and collapsibility during respiration. The size and collapsibility of the IVC are used to estimate right atrial pressure

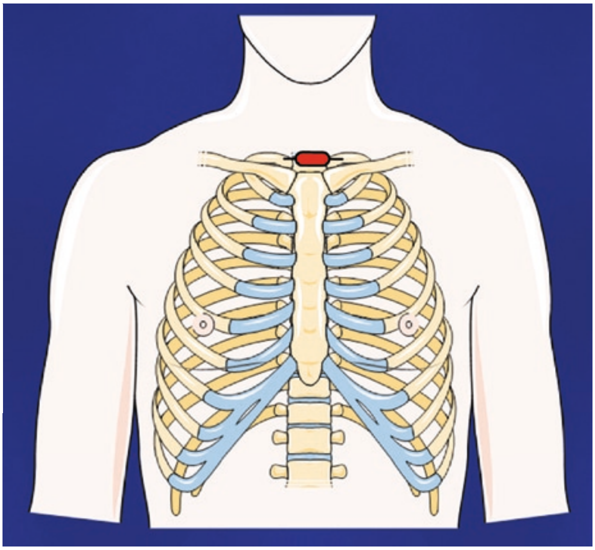

Fig. 2.16 Suprasternal window. The suprasternal window is obtained by placing the transducer in the "notch" at the top of the sternum (the manubrium). This window is used for 2D imaging and also for assessment of aortic flows with a dedicated continuous wave Doppler transducer (Pedoff probe) (Adapted from Servier Medical Art, www.servier.com, with permission)

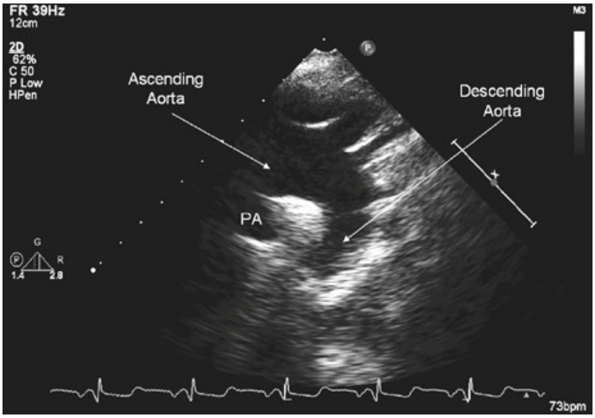

Fig. 2.17 Suprasternal window. The suprasternal 2D image is used to assess the ascending, transverse, and descending aorta and its branches. The inominate, left carotid, and left subclavian arteries can be seen branching off the aorta. The right pulmonary artery can also be seen in short axis

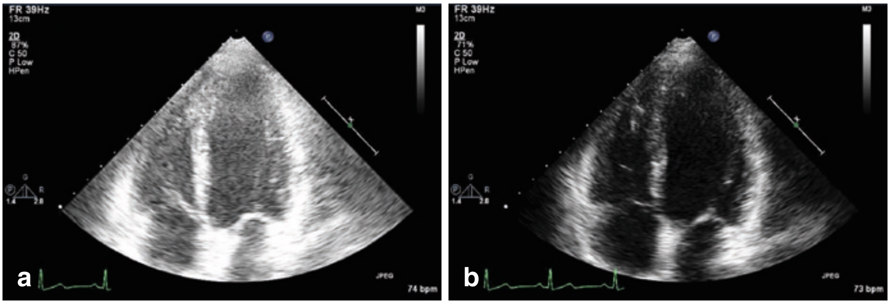

Fig. 2.18 Image optimization – overall gain. The gain controls the brightness of your image. Optimizing the gain will result in better detection of structures and endocardial borders. (**a**) Using excessive gain will result in images that are too bright and may make normal structures appearing calcified. (**b**) Gains should be set at a point that a balance between image brightness and darkness are reached

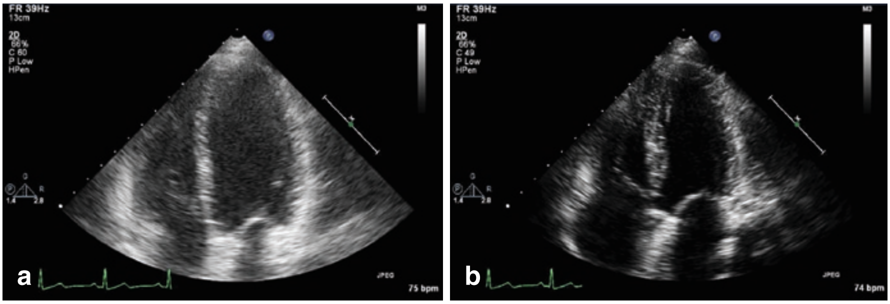

Fig. 2.19 Image optimization – compression or dynamic range. Compression or dynamic range are controls that affect the number of shades of gray that are displayed in the image. (**a**) If these are set too high, the image appears washed out and it may be difficult to visualize endocardial borders. (**b**) The compression or dynamic range should be set so the blood pool is dark and the tissue is bright. This will result in better endocardial border definition

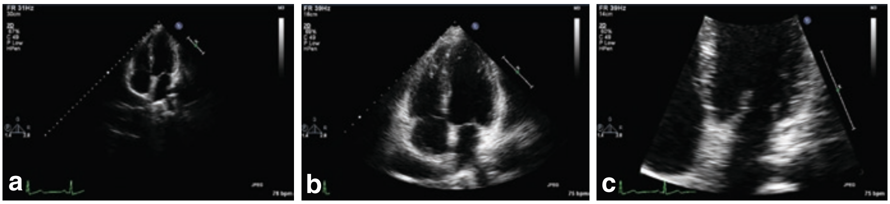

Fig. 2.20 Image optimization – depth and zoom controls. The image depth and zoom controls can be used to optimize the area of interest. In these examples (**a**) the depth is set too deep resulting in a small image that will be difficult to assess, (**b**) the depth is set at the correct level so that all structures can be seen in the apical 4C view, and (**c**) the use of the "zoom" control for better assessment of the mitral valve

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