General Considerations

Echocardiography is a valuable noninvasive technique for the evaluation of congenital and acquired heart disease. Its practical value as a diagnostic procedure depends entirely on the technical skill of the examiner and the expertise of the physician who interprets the echocardiogram. Significant improvements have been achieved in ultrasound recording equipment since Elder and Hertz (16) first employed reflected ultrasound to examine the heart. Only the conventional, single-crystal transducer echocardiography will be covered in this chapter, other echocardiographic systems, including two-dimensional sector scanning and the multiple-crystal system, will not be discussed.

Echocardiographic records have been markedly enhanced by employing a continuous recording technique instead of Polaroid exposures. The 2.25 mHz transducer, focused at 5.0 or 7.5 cm, is most often used to examine adults. However, better quality studies can usually be obtained in obese individuals and in patients with increased anterior-posterior diameter of the chest by using a 1.6 mHz transducer focused at 10 cm. A 3.5-mHz transducer is often preferable for small children and a 5.0 or 7.5 mHz nonfocused transducer is necessary for newborn infants. Despite technologic improvements in available hardware, significant difficulty may still be encountered in performing an examination. Considerable skill is essential to conduct a complete echocardiographic study, much more than is normally required for any other type of medical machine technician. The technician or physician performing the examination should not only be familiar with cardiac anatomy, physiology, pathology, and congenital malformations, but he must possess knowledge of the working diagnosis in each patient studied. The position of the patient and location of the transducer will vary in each patient, depending on the difficulties encountered. Although the conventional position of the transducer is the second to fifth intercostal space along the left sternal border other more unusual locations may be necessary, such as further lateral over the left precordium, over the left ventricular apex, in the suprasternal notch, along the right sternal border, or in the epigastrium pointing superior and leftward through the diaphragm. In contrast to adults, the transducer beam can be directed through the ribs or sternum in newborn infants since these structures have not yet calcified. The usual position of the patient is supine or turned to the left side. Sometimes the study is easier to perform by elevating the head of the bed 20° to 30°. On rare occasions, some patients with thick chests or hyperinflated lungs can be studied better if they are sitting up, leaning forward, and breathing out, in held expiration, which brings the heart closer to the anterior chest wall. However, care should be taken to avoid initiating a Valsalva maneuver, which usually creates more artifacts and interferences in the echocar-
Fig. 19-1. A. Diagram of the heart in sagittal cross-section. B. Continuous echocardiographic recording of a normal adult heart scanning from the left ventricle at the level of the chordae tendineae (position 2) through the mitral valve to the base (position 5) where the aortic valve and left atrium are seen. As the transducer beam is directed medial and inferior from the aortic valve, the tricuspid valve can be identified. ARV = anterior right ventricular wall, RS = right side of septum, LS = left side of septum, AAR = anterior aortic root, AV = aortic valve, PAR = posterior aortic root, AL or AML = anterior mitral leaflet, PL or PML = posterior mitral leaflet, ac = anterior chordae tendineae, pc = posterior chordae tendineae, ppm = posterior papillary muscle, END = endocardium, P-E = pericardium-epicardium, EPI = epicardium, C = chordae, LA = left atrium, TV = tricuspid valve.