The development of magnetic resonance imaging and computed tomography (CT) of the heart has provided significant advances in the diagnosis and management of patients with acquired and congenital heart disease. Certainly, the dramatic improvement in temporal resolution obtained using electrocardiogram (ECG)-gated multidetector CT scanning has set the stage for the implementation of this mature technology into the daily practice of cardiac medicine. A particular characteristic of cardiac CT scanning is acquisition of image data in the axial body plane. That is, conventional cardiac imaging has been in radiographic projection (plain films, cineangiography) and, subsequently, in tomographic section (echocardiography and nuclear imaging). However, image data was never presented to the cardiac imager in axial body section. Although the heart lies obliquely in the chest, and the axial body section therefore displays cardiac structure oblique to the intrinsic cardiac axes, image data obtained in this format provides a wealth of anatomic information. Since most cardiologists are not familiar with image data displayed in this view, the cardiac imager utilizing this exciting modality should become familiar with the appearance of the heart in axial section. Furthermore, acquisition of isotropic image voxels on higher resolution (namely, 64-detector) CT scanners provides a robust data set for the reconstruction of the heart in arbitrary or traditional cardiac-based sections. To construct these axes, one must first be able to recognize standard cardiac landmarks on the original axial data acquisition sets.

The purpose of this chapter is to describe the anatomy of the heart. We utilize thin-section axial tomographic acquisitions as obtained on a conventional 64-detector CT scanner. Our description follows the flow of blood into and out of the heart. Each particular anatomic structure is described in terms of its morphologic structure and anatomic relationships and displayed in axial section as well as in reconstruction in oblique section, normal or parallel to the intrinsic cardiac axes. The chapter is designed to serve two purposes. It is a tutorial in cardiac anatomy, as depicted in axial section on contrast-enhanced ECG-gated CT examination. It is also an atlas or reference for novice and experienced cardiac imagers to help recognize normal cardiac structures when viewed in tomographic section.

**Right Atrium**

The superior vena cava passes through the mediastinum to the right of the ascending aorta (Figures 7.1 and 7.2) and drains into the right atrium just posterior to the orifice of the right atrial appendage (Figures 7.3–7.6). The posterior wall of the superior vena cava
**FIGURE 7.1.** Surface-rendered, three-dimensional reconstruction of the heart and great arteries of a 34-year-old woman displayed in mild right anterior oblique view. The left innominate vein (LIV) drains from left to right anterior to the great arteries of the aorta, joining the unopacified right innominate vein (contrast injection was from the left upper extremity) to form the superior vena cava (arrowheads). The right atrial appendage (RAA) curves around the AoA to the anterior atrioventricular ring. The right ventricle (RV) lies anteriorly, bounded superiorly by the pulmonary valve sinuses of Valsalva (1), on the right by the atrioventricular ring, and on the left by the (moderately atherosclerotic) anterior descending coronary artery (3) and first diagonal branch (2).

**FIGURE 7.2.** Tomogram from examination of patient in Figure 7.1, reconstructed in right anterior oblique (RAO) section through the origin of the innominate artery (5). The highly opacified superior vena cava (SVC) descends into the right atrium (RA) to the right of the ascending aorta (AoA). The right hilar vessels, namely the right upper-lobe pulmonary vein (2), right pulmonary artery (3), and right upper-lobe pulmonary artery (4), are labeled. Embedded in the fat of the anterior atrioventricular ring, the right coronary artery (1) is viewed in cross section. Extending from the ring, and viewed as a filling defect within the right ventricle (RV), is a tricuspid valve leaflet (7). Notice how the anterior atrioventricular ring, containing the tricuspid valve, is separated from the pulmonary valve (6). The right ventricular outflow (RVO) tract is labeled.

**FIGURE 7.3.** The proximal right pulmonary artery (RP) is seen extending from the medial aspect of the main pulmonary artery (MP), passing behind the ascending aorta (AoA) and superior vena cava (SVC) toward the right hilum. The right upper-lobe pulmonary vein (2) lies lateral to the SVC and anterior to the RP; the left upper-lobe pulmonary vein (5), similarly, lies anterior to the left pulmonary artery (LP). Both right (3) and left (4) internal mammary arteries lie to the right and left of the sternum (S), respectively. As the right main bronchus (RB) separates from the left main bronchus (LB), the soft tissue of the subcarinal space develops. The air-filled esophagus (1) lies behind the LB. AoD, descending aorta.