computerized data analysis has improved the quality and reproducibility of the data from these studies. Myocardial perfusion imaging may also be combined with ECG-gated image acquisition to allow simultaneous assessment of ventricular function and perfusion. LVEF can be quantitated with this technique, and regional wall motion can be assessed to help rule out artifactual perfusion defects (Video 4-5).

Positron emission tomography (PET) is a noninvasive method of detecting myocardial viability by the use of perfusion and metabolic tracers. In patients with left ventricular dysfunction, metabolic activity in a region of myocardium supplied by a severely stenotic coronary artery suggests viable tissue that may regain more normal function after revascularization (Fig. 4-14). PET is less widely available than conventional SPECT imaging; however, PET offers improved spatial resolution because of the higher energy of the isotopes used for this type of imaging.

Cardiac Catheterization

Cardiac catheterization is an invasive technique in which fluid-filled catheters are introduced percutaneously into the arterial and venous circulation. This method allows direct measurement of intracardiac pressures and oxygen saturation and, with the injection of a contrast agent, visualization of the coronary arteries, cardiac chambers, and great vessels. Cardiac catheterization is indicated when a clinically suggested cardiac abnormality requires confirmation and its anatomic and physiologic importance needs to be quantified. Coronary angiography for the diagnosis of CAD is the most common indication for this test.

Compared with catheterization, noninvasive testing is safer, cheaper, and equally effective in the evaluation of most valvular and hemodynamic questions. Most often, catheterization precedes some type of beneficial intervention, such as coronary artery angioplasty, coronary bypass surgery, or valvular surgery. Although cardiac catheterization is usually safe (0.1% to 0.2% overall mortality rate), procedure-related complications such as vascular injury, renal failure, stroke, and MI can occur.

An important objective during cardiac catheterization is documentation of filling pressures in the heart and great vessels. This task is accomplished through use of fluid-filled catheters that transmit intracardiac pressures to a transducer that displays the

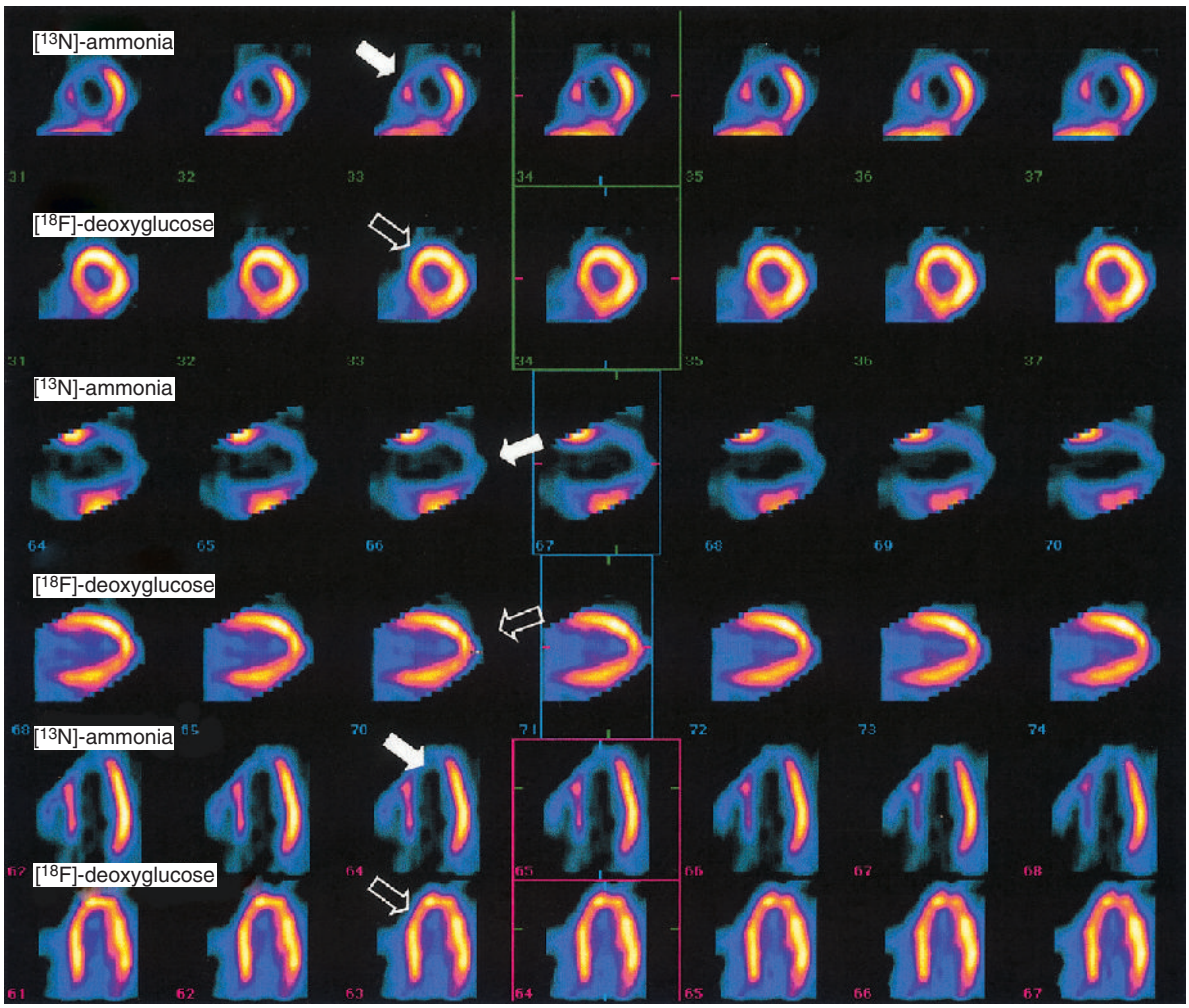

FIGURE 4-14 Resting myocardial perfusion (obtained with [^{13}N]-ammonia) and metabolism (obtained with [^{18}F]-deoxyglucose) is seen in positron emission tomography images of a patient with ischemic cardiomyopathy. The study demonstrates a perfusion-metabolic mismatch (reflecting hibernating myocardium) in which large areas of hypoperfused *(solid arrows)* but metabolically viable *(open arrows)* myocardium involve the anterior, septal, and inferior walls and the left ventricular apex. Video 4-5 shows a dynamic image obtained with cardiac single-photon emission computed tomography imaging. (Courtesy Marcelo F. Di Carli, MD, Brigham and Women's Hospital, Boston, Mass.)