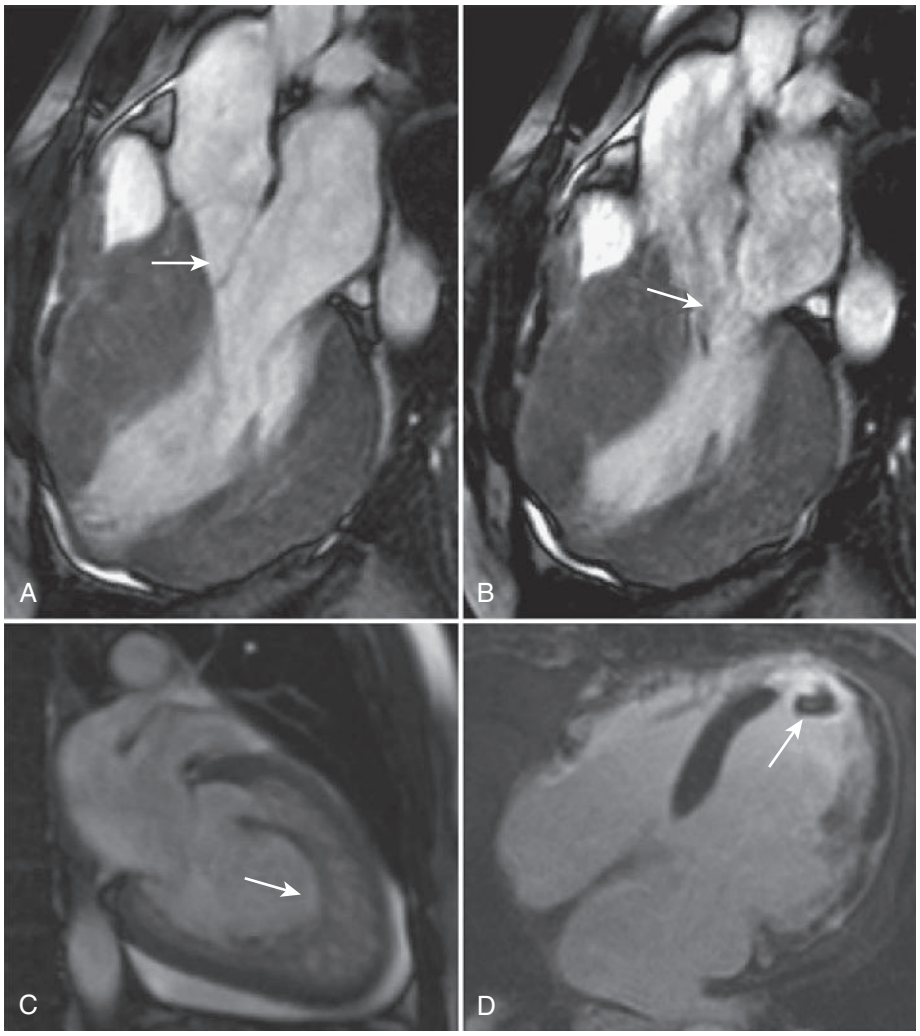

FIGURE 4-18 Cardiac magnetic resonance imaging (MRI) is used in the evaluation of cardiomyopathies. **A,** Severe left ventricular hypertrophy in a patient with hypertrophic cardiomyopathy. Diastolic frame shows open mitral valve *(arrow)*. **B,** Systolic frame shows systolic anterior motion of the mitral valve with flow disturbance in the left ventricular outflow tract *(arrow)*. **C,** Patient has left ventricular noncompaction as evidenced by deep trabeculations in the left ventricular apex *(arrow)*. **D,** Patient with ischemic cardiomyopathy has transmural apical infarction and adjacent mural thrombus *(arrow)*. Video 4-6 shows a dynamic cardiac MRI image. (Images courtesy Sheldon E. Litwin, MD, Division of Cardiology, University of Utah, Salt Lake City, Utah.)

noninvasively. The development of fast gantry rotation speeds and the addition of multiple rows of detectors (i.e., multidetector CT) have allowed unprecedented visualization of the great vessels, heart, and coronary arteries with images acquired during a single breath-hold lasting 10 to 15 seconds. CT is used to diagnose aortic aneurysm, acute aortic dissection, pulmonary embolism, and it is useful for defining congenital abnormalities and detecting pericardial thickening or calcification associated with constrictive pericarditis. ECG-gated dynamic CT images have been used to quantify ventricular size, function, and regional wall motion (Video 4-7), and in contrast to echocardiography, CT is not limited by lung disease or chest wall deformity. However, obesity and implanted prosthetic materials (i.e., mechanical valves or pacing wires) may affect image quality.

The greatest excitement and controversy about cardiac CT relates to the evaluation of coronary atherosclerosis. Electron beam and multidetector CT scans can be used to quickly and reliably visualize and quantitate the extent of coronary artery calcification (Fig. 4-19). The presence of coronary calcium is pathognomonic of atherosclerosis, and the extent of coronary calcium (usually reported as an Agatston score) is a powerful marker of future cardiac events. The coronary calcium score adds substantial, independent improvement in risk prediction to the commonly employed clinical risk scores (e.g., Framingham risk score). Although the extent of coronary artery calcification does not reliably predict the severity of stenoses, the calcium score is a good marker of the overall atherosclerotic burden.

Contrast-enhanced coronary computed tomography angiography (CTA) has improved dramatically in recent years. Coronary CTA has a sensitivity of more than 95% in diagnosing significant coronary artery obstruction. This is superior to the sensitivity of stress echo or nuclear myocardial perfusion scanning. Given the speed and accuracy of this test, it is likely to assume a major role in the evaluation of patients with acute chest pain syndromes.

Some advocates of cardiac CT have proposed the use of CTA for the *triple rule-out* in patients with acute chest pain—the ability to diagnose pulmonary embolism, aortic dissection, and CAD