



FIGURE 11-5 Total artificial hearts approved by the U.S. Food and Drug Administration: **A**, CardioWest total artificial heart. **B**, AbioCor total artificial heart. See text for details. TET, Transcutaneous energy transfer device. (Modified from National Heart, Lung, and Blood Institute, U.S. Department of Health and Human Services: What is a total artificial heart? Available at <http://www.nhlbi.nih.gov/health/health-topics/topics/tah/>. Accessed August 15, 2014.)

but aggressive management of hypercholesterolemia and the use of calcium-channel blockers, specifically diltiazem, have been associated with a slowing of disease progression and a higher survival rate. Retransplantation is reserved for patients who have severe, three-vessel coronary artery disease with reduced left ventricular function and symptoms of congestive heart failure.

Noncardiac Surgery in the Patient with Cardiovascular Disease

Noncardiac surgery in patients with known cardiovascular disease may be associated with an increased risk for death or cardiac complications such as MI, congestive heart failure, and arrhythmias. To determine an individual patient's risk for a procedure, the consulting physician must have knowledge of the type and severity of the patient's cardiac disease, the comorbid risk factors, and the type and urgency of surgery. In general, the preoperative evaluation and management are the same as in the nonoperative setting; for patients who are at risk, additional non-invasive and invasive testing may be performed if the results would affect treatment or outcome.

Usually, estimation of a patient's perioperative risk can be determined by a careful clinical evaluation, including a history, physical examination, and review of the ECG. Patients at highest risk for a perioperative cardiac event are those with a recent MI (defined as occurring >7 days but <1 month earlier), unstable or

severe angina, decompensated congestive heart failure, significant arrhythmias, or severe valvular disease (Table 11-4). Predictors of moderate or intermediate cardiac risk include a history of stable angina, compensated heart failure, prior MI, or diabetes mellitus. Advanced age, an abnormal ECG, low functional capacity, and poorly controlled hypertension are associated with cardiovascular disease but are not independent predictors of a perioperative cardiac event.

In regard to the type of surgery, risks are highest in patients who are undergoing major emergency procedures, especially older adults (Table 11-5). Cardiac complications are also common after vascular surgery, considering that the prevalence of underlying coronary artery disease is high in this patient population. In addition, any surgery associated with large volume shifts or blood loss may place increased demands on an already diseased heart. Procedures associated with the lowest risk in patients with cardiac disease are cataract extraction and endoscopy. Several risk stratification calculators have been developed and validated for patients undergoing cardiac surgery. The Society for Thoracic Surgeons risk calculator (available at <http://riskcalc.sts.org/STSTWebRiskCalc273/>) and the recently updated EuroSCORE II risk calculator (available at <http://www.euroscore.org/calc.html>) are used in the United States and Europe to assess risk of in-hospital mortality and morbidity and risk of 30-day in-hospital mortality, respectively.