INTRODUCTION

The surgical treatment of aortic disease remains a formidable challenge. Only since the advent of cardiopulmonary bypass in the early 1950s has the complex repair of aortic aneurysms and dissections become feasible. Today, advances in perfusion methods and surgical techniques have allowed for the treatment of complex aortic disease with ever-improving morbidity and mortality.

DeBakey and Cooley described the first repair of an ascending aortic aneurysm using an aortic allograft in 1956 (1,2). Soon thereafter, the pioneering work of Borst, Barnard, and Shrire led to methods of cerebral protection utilizing hypothermic circulatory arrest (HCA),
allowing for the treatment of complex aortic arch disease (3,4). In 1975, Griepp and coworkers described a series of patients who underwent repair of aortic arch aneurysms utilizing HCA, leading to widespread interest in modes of cerebral protection during complex aortic surgery (5).

Fundamental to the surgical treatment of aortic disease is the maintenance of end organ perfusion while continuity of the arterial tree is disrupted during the period of repair. Neuroprotective strategies are of particular importance when addressing pathology of the aortic arch. This chapter will discuss different cannulation and perfusion approaches for the treatment of aortic aneurysmal disease in the context of anatomic location. Aortic dissection will be considered in a separate section.

**GENERAL CONSIDERATIONS**

Cannulation strategies for aortic surgery can broadly be divided as central or peripheral, depending upon the specific anatomy. With central cannulation, the ascending transverse arch, or descending aorta can be cannulated directly. The most common sites for peripheral arterial cannulation include the right axillary and common femoral arteries. Venous drainage is commonly achieved by right atrial cannulation or femoral venous cannulation utilizing a long multiport catheter advanced into the right atrium.

Aortic plaque and mobile atheroma can be a source of systemic embolization during direct cannulation of the aorta. Assessment of the aorta is critical in identifying safe areas for cannulation and for the prevention of embolic stroke and systemic embolization. Traditionally, the modalities most commonly employed include direct inspection and manual palpation, intraoperative transesophageal echocardiography, and epiaortic ultrasonography. Several studies have identified epiaortic ultrasonography as the test of choice (6,7). Direct inspection and palpation has been shown to have a sensitivity of as low as 55% atherosclerotic disease (8). Although TEE has improved sensitivity, it is limited by its difficulty in visualization of the distal portion of the ascending aorta.

**ANEURYSMAL DISEASE OF THE AORTIC ROOT AND ASCENDING AORTA**

A variety of pathologic entities can lead to aneurysms of the ascending aorta including cystic medial degeneration, connective tissue disorders such as Marfans syndrome and Ehlers-Danlos syndrome,