Alternative Surgical Strategy for the Treatment of a Mycotic Aortic Arch Aneurysm

We report the case of a 69-year-old man who presented with a symptomatic mycotic aneurysm of the aortic arch. Diagnosis was confirmed by positron emission tomography and by blood cultures positive for Salmonella species. A complete resection of the aortic arch process was performed via left thoracotomy using a cryopreserved aortic homograft and normothermic left heart bypass. The left-sided cerebral vessels were clamped, and adequacy of collateral left brain flow and oxygenation was confirmed by neurophysiologic monitoring. Using this less-invasive operative strategy, we avoided the risks inherent to deep hypothermic circulatory arrest and the use of prosthetic materials. (Tex Heart Inst J 2006;33:356-8)

Mycotic aneurysms of the aorta are rare and life-threatening. When localized in the aortic arch, they are invariably fatal if not treated. The operative strategy most commonly reported is aneurysm resection with regional débridement and in situ prosthetic reconstruction,1 which usually requires deep hypothermic circulatory arrest (DHCA), with its associated risks. Herein, we describe an alternative surgical strategy that safely avoids the use of DHCA, and that—through use of an in situ, cryopreserved aortic homograft—might decrease the risk of graft infection and the need for lifelong antibiotic therapy.

Case Report

In January 2004, a 69-year-old man presented at Jewish Hospital in Louisville with hoarseness, hematuria, and weight loss. Results of urine and blood cultures were positive for Salmonella species. The patient reported a recent trip to the Caribbean and the onset of diarrhea a few weeks later. Results of his physical examination were unexceptional. He was initially treated with ciprofloxacin; however, pyrexia recurred. Chest radiography showed a widened upper mediastinum, and computed tomography of the chest revealed a saccular mid-aortic-arch aneurysm (Fig. 1). Positron emission tomography showed increased uptake in the aortic arch area consistent with infection.

Surgical exposure was achieved through a left posterolateral thoracotomy at the 3rd intercostal space. The aortic arch was mobilized en bloc with the periaortic phlegmon and a wedge of lung tissue. Standard neurologic monitoring was instituted using a 2-MHz transcranial Doppler probe on the temporal bone to continuously isonate the left middle cerebral artery. Bihemispheric electroencephalographic (EEG) tracings of the frontal, temporal, central, and occipital regions were recorded. Regional oxygen saturation was monitored bilaterally within the cerebral cortex (CrSO₂). The left carotid and left subclavian arteries were test-clamped individually and simultaneously without effect on the EEG, CrSO₂, or transcranial Doppler readings.

When normothermic bypass was begun and the left common carotid and subclavian arteries were clamped, the left CrSO₂ declined 20% from the baseline brain-oxygen values obtained when the patient was conscious; the right CrSO₂ increased 16%. These changes were accompanied by a 50% drop in left middle cerebral artery mean velocity; however, the EEG and CrSO₂ remained unchanged, which indicated an adequate oxygen supply.
After partial heparinization, a left atrium-to-descending thoracic aorta bypass was instituted. Bypass flow was maintained at approximately 2 L/min. Right radial and right femoral arterial lines were used for pressure monitoring; the mean arterial pressures were maintained at 75 mmHg proximal and 60 mmHg distal to the aneurysm. The aortic arch was clamped tangentially, allowing flow to the brachiocephalic artery. The aneurysm was then entered, and 50 cc of grayish, purulent material was drained. En bloc resection of the aneurysm, phlegmon, wedge of lung, and proximal left subclavian artery was performed. A chloramphenicol solution was used for irrigation. A reversed, cryopreserved, 23-mm ascending-aorta homograft was sutured in situ and tailored to complete the replacement of the arch segment between the left carotid artery takeoff and the proximal descending thoracic aorta (Fig. 2). The clamps were then removed, and bypass was discontinued. After vascular clamp removal, left CrSO₂, and the middle cerebral artery velocity transiently increased above the baseline values measured before anesthesia. We packed the surgical area with pedicled pericardial tissue.

The postoperative course was uneventful. The patient was discharged from the hospital on the 10th postoperative day and was prescribed oral antibiotic agents for 4 weeks. At his 2-year follow-up, he remained asymptomatic.

Discussion

Mycotic aneurysms of the thoracic aorta are rare, and they are invariably fatal without intervention. Optimal surgical and infection-control therapies are not well established, and little in the literature focuses specifically on aortic arch infections.

Resection with local débridement and placement of an in situ prosthetic vascular graft, followed by lifelong antibiotic therapy, is the treatment typically reported for mycotic aneurysms of the aortic arch. This conventional surgical strategy requires extracorporeal circulation, DHCA, and aortic replacement with prosthetic material, which can lead to perioperative morbidity and death. This conventional approach has recently been improved by the use of cryopreserved aortic homografts. Another approach, local débridement of the aortic arch and the descending thoracic aorta, has led to rapid healing, a low anastomotic dehiscence rate, and a shorter course of antibiotic treatment (only 4–6 weeks). With few exceptions, DHCA is required to complete the aortic arch repair and to protect the brain. This approach exposes the patient to substantial postoperative neurologic risk.

A central operative approach—median sternotomy—has been commonly described, even for arch lesions that are comparatively distal. However, other data point to the usefulness of the left thoracotomy for aortic arch aneurysms; Westaby and Katsumata described the use of DHCA, central cannulation, and various techniques of brain protection.

Elsewhere, we have described the use of comprehensive neurologic monitoring in cases that require DHCA. Although this monitoring has not led to substantial improvement in overall clinical outcomes, it has clearly helped to detect cerebral malperfusion and to guide cerebral-protection strategies.
Noninvasive, near-infrared spectroscopic measurements of regional cerebral oxygen saturation can reveal changes within the adult cerebral cortex. Desaturation detected by this technique indicates a failure of increased cerebral oxygen extraction to keep up with a decreasing delivery of oxygen or an increasing metabolic demand for oxygen. Clinical applicability of cerebral oximetry, therefore, has relied on relative changes expressed as a percentage of decrease from baseline values. Transcranial Doppler ultrasonography is necessary to detect flow; combined with oximetry, it indicates the effectiveness of a given flow in maintaining oxygenation.

To avoid the potential morbidity associated with DHCA and to control and minimize recurrent infection, we used this alternative surgical strategy. It avoided the need for DHCA, and the left posterolateral thoracotomy enabled a more complete resection. Furthermore, our use of a cryopreserved aortic homograft with viable tissue coverage decreased the risk of reinfection and limited the course of postoperative antibiotic therapy.

References