intrinsic involvement of the right pulmonary artery itself, with only about 15% of normal artery circumference remaining, that was responsible for the stenosis.

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Circulatory Arrest in a Reoperation for Brachiocephalic Arterial Occlusive Disease

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We report a patient with multiple brachiocephalic arterial occlusive disease who suffered failure of a bifurcated aorto–carotid artery graft. Profound hypothermic circulatory arrest provided adequate cerebral protection during redo aorto–brachiocephalic arterial grafting.

(Ann Thorac Surg 1996;61:1259–61)

Reoperation for recurrent multiple brachiocephalic arterial occlusions and stenoses has been considered a rare condition. It is generally recognized that such redo procedures are technically more difficult and are associated with a higher risk of embolism than operation for primary disease. Hypothermic circulatory arrest may offer significant surgical advantages in these cases, but there has been limited experience of its use in patients with severely compromised cerebral blood flow. This article reports the application of profound hypothermic circulatory arrest in a complex reoperation in a patient with recurrent multiple brachiocephalic arterial occlusive disease.

A 66-year-old woman was admitted due to frequent episodes of dizzy spells (8 to 12 per day) associated with numbness of left arm and face for the last 6 months. Eleven years before admission, a bifurcated bypass graft from the ascending aorta to both common carotid arteries had been placed, due to severe atherosclerotic disease of the innominate and both common carotid arteries. That procedure was carried out via a median sternotomy. She was a heavy smoker with a positive family history of atherosclerotic disease. Physical examination revealed bruits in both carotid arteries.

Aortography showed graft failure with occlusion of the right limb and 90% stenosis of the left limb. The innominate, the right subclavian, and both common carotid arteries were occluded. There was also a 75% stenosis in the origin of the left subclavian artery, 95% stenosis of the right coronary artery, and diffuse aortoiliac disease.

The operation was performed through a median sternotomy. The femoral artery was exposed in the right groin and cannulated with an 18F arterial perfusion cannula (Research Medical, Inc, Midvale, UT). After dissection of the adhesions around the right atrium, cardiopulmonary bypass was established between a 34F two-stage venous cannula (DLP, Inc, Grand Rapids, MI) in the right atrium and arterial return to the right femoral artery. Systemic cooling was initiated immediately. During the period of cooling, the heart was freed from the pericardial adhesions. After 35 minutes of cooling and when the temperature reached 23°C, the heart went into ventricular fibrillation. When the nasopharyngeal temperature reached 15°C, circulatory arrest was established and the brachiocephalic vessels with the old grafts were identified and carefully dissected free. The old graft was excised and the brachiocephalic vessels were divided at their takeoff from the aorta. After debris and atherosclerotic material were removed from the lumen of the vessels, an aorto–innominate artery side-to-end Gore-Tex (W. L. Gore & Associates, Flagstaff, AZ) No. 8 graft and an aorto–left subclavian/left carotid side-to-end bifurcated Gore-Tex No. 16 graft were placed. The proximal stump of the old graft was used for the proximal anastomosis of the latter. The left brachiocephalic vein was reconstructed with a Gore-Tex No. 10 interposition graft (Fig 1). Aortocoronary bypass grafting to the right coronary artery with reversed saphenous vein graft was performed during rewarming. The cooling lasted 43 minutes, the circulatory arrest lasted 70 minutes, and the cardiopulmonary bypass time was 120 minutes. The mean aortic pressure ranged from 50 to 85 mm Hg throughout the procedure.

The patient was extubated 24 hours after operation and, after an uncomplicated recovery, she was discharged from the hospital on the 8th postoperative day.

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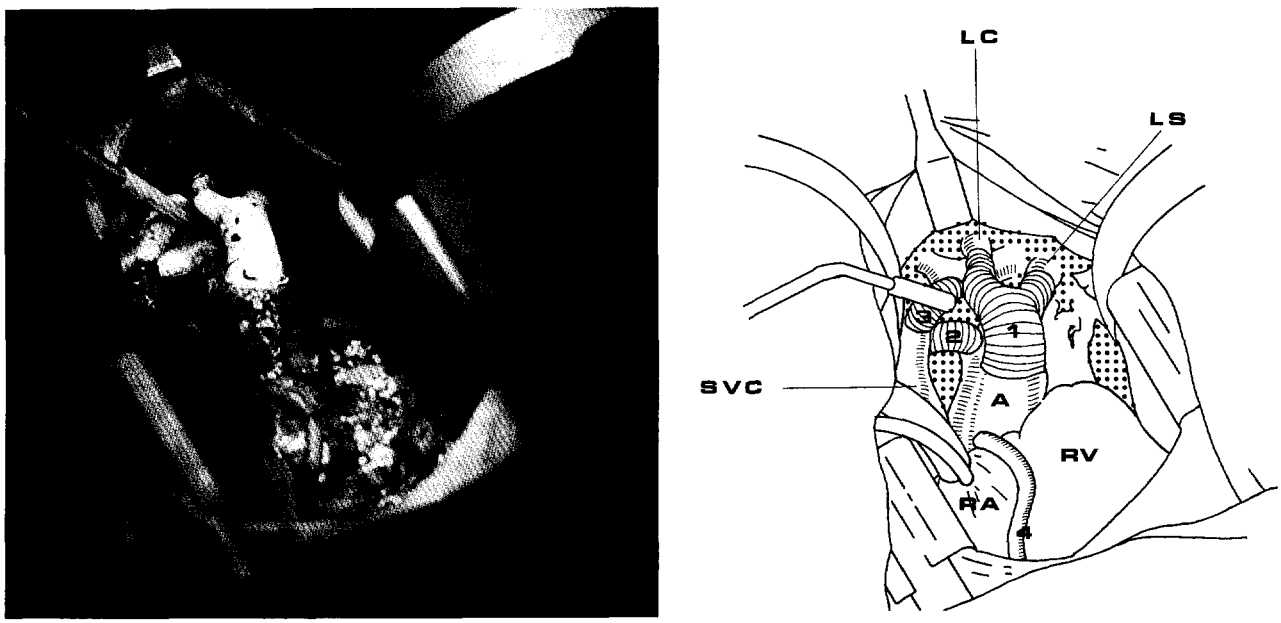

A B

Fig 1. Photograph and drawing illustrating the operation. There are four grafts: (1) bifurcated aorto–left subclavian/left carotid artery graft, (2) aorto–innominate artery graft, (3) left brachiocephalic vein interposition graft, and (4) aorto–right coronary artery saphenous vein graft. (A = aorta; LC = left common carotid artery; LS = left subclavian artery; RA = right atrium; RV = right ventricle; SVC = superior vena cava.)

Triplex studies carried out 8 months after the operation showed patent grafts.

Comment

Although more than a thousand cases of primary operation for brachiocephalic arterial stenoses and occlusions have been reported in the last 20 years [1–5], there are few data regarding management and outcome in redo cases. In this patient we thought that reconstruction was the treatment of choice because concomitant aorto-iliac disease precluded extraanatomic reconstruction with femoro-carotid or femoro-subclavian bypass.

Because of the risk of inadvertent damage to the previous graft lying immediately posterior to the sternum, the femoral artery was cannulated despite the known presence of diffuse aortoiliac disease. The femoral vein was exposed, but venous return was secured from the right atrium after uneventful resternotomy. The rationale for hypothermic circulatory arrest was to provide cerebral protection during an obligatory period of interruption of cerebral blood flow. Particular attention was paid to gentle handling of both the diseased native vessels and the previous graft to minimize the risk of cerebral embolism.

To ensure adequate cerebral perfusion during the cooling period, the mean arterial blood pressure was maintained between 50 and 85 mm Hg. In our patient it took 43 minutes of cooling to reach a nasopharyngeal temperature of 15°C, comparable with the 30 to 90 minutes of cooling reported in the literature [6]. The use of profound hypothermic circulatory arrest to produce uniform brain cooling even in the presence of unilateral and bilateral carotid artery stenoses is well documented [7] and may be explained on the basis of collateral blood flow and cerebral autoregulation. Indeed, the successful outcome in our patient supports the hypothesis that collateral flow and cerebral autoregulation remain intact even in the presence of severe occlusive disease of all the major cerebral blood vessels.

This case report illustrates that the presence of severe occlusive disease of the native brachiocephalic vessels and previous graft is not a contraindication to further attempts at reconstruction and that the use of profound hypothermic circulatory arrest provides satisfactory cerebral protection.

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Pulmonary Venous Aneurysm Presenting as a Middle Mediastinal Mass

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A large mediastinal mass in a 43-year-old man was proven at thoracotomy to comprise a right superior pulmonary vein aneurysm. Intraoperative transesophageal echocardiography was useful in defining the abnormality. Pulmonary venous aneurysm appears to represent an extremely rare but surgically correctable addition to the differential diagnosis of middle mediastinal masses.

(Ann Thorac Surg 1996;61:1261–2)

Although almost 10% of mediastinal masses in adults are of vascular origin, the majority of these are aneurysms of the aorta and its branches [1]. Abnormalities of the pulmonary venous system that give rise to a middle or superior mediastinal density are distinctly unusual, but include partial or total anomalous venous connections, pulmonary venous varicies, and a prominent venous confluence [1, 2]. We report a highly unusual case in which a large middle mediastinal mass resulted from an aneurysm of the right superior pulmonary vein, emphasizing the importance of intraoperative transesophageal echocardiography (TEE) in delineating the abnormality.

In May 1991 routine chest roentgenography disclosed a mediastinal mass in a 43-year-old man. Computed tomography demonstrated a large right-sided mass with equivocal contrast enhancement. The patient was asymptomatic and refused further investigation.

In July 1994, paroxysmal nocturnal dyspnea, palpitations, and orthopnea developed. The patient denied dyspnea on exertion or hemoptysis. There was no history of congenital heart disease, systemic vasculitis, tuberculosis, syphilis, or chest wall trauma. On physical examination, the lungs were clear and there were no cardiac murmurs. No clubbing, cyanosis, or edema was detected.

The chest radiograph demonstrated a large density enveloping the right hilum along the border of the proximal thoracic aorta (Fig 1). A repeat computed tomographic scan of the chest revealed a large homogeneous mass adjacent to the ascending aorta and superior vena cava, anterior to the right main bronchus. A contrast injection was again inconclusive. The computed tomographic findings were unchanged from the previous study. Pulmonary arteriography was not performed. Pulmonary function tests were within normal limits.

The patient underwent right video thoracoscopy with attempted biopsy of the mediastinal mass. Upon inspection, the mass appeared pulsatile, and fine needle aspiration retrieved frank blood. At this point thoracoscopy was terminated and reoperation planned with cardiopulmonary bypass capabilities available.

Two days later, the patient underwent an exploratory posterolateral thoracotomy with intraoperative TEE. The TEE demonstrated a 6 × 5-cm aneurysmal dilatation of the right superior pulmonary vein with flow into the left atrium (Fig 2). The aneurysm was adjacent to, but distinct from, the right main pulmonary artery bifurcation. When the right hemithorax was entered, a large pulsatile mass appeared to arise from the right superior pulmonary vein or left atrium. Proximal control of the right main pulmonary artery was assured, with ensuing dissection and control of the superior and inferior pulmonary veins. A clamp was applied to the right main pulmonary artery. The aneurysm failed to decompress, excluding a pulmonary artery aneurysm or significant arteriovenous connection. A very proximal left atrial clamp was then added, and pulsation of the aneurysm ceased. Segmental pulmonary veins from the right upper lobe entered the aneurysm separately and were adherent to underlying parenchyma; hence a right upper lobectomy was performed along with excision of the superior pulmonary venous system. Recovery was uneventful, and the patient

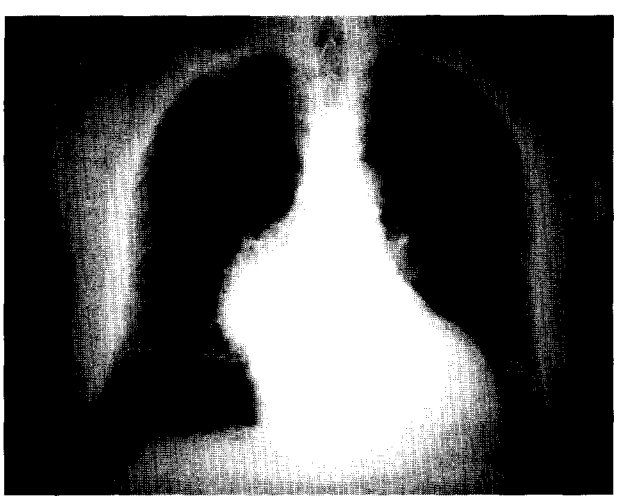

Fig 1. Posteroanterior chest roentgenogram showing right hilar mass.

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