

## Multiple Atherosclerotic Aneurysms of the Bilateral Subclavian Artery, Aortic Arch and Abdominal Aorta

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**Subclavian artery aneurysms are relatively rare in comparison with other peripheral aneurysms. We report a 65-year-old woman with multiple atherosclerotic aneurysms of the subclavian artery, aortic arch saccular aneurysm and abdominal aortic aneurysm. Two-staged operations by which the infrarenal abdominal aorta was replaced first and median sternotomy extending to the supraclavicular space for the concomitant resection of bilateral subclavian as well as aortic arch aneurysm resulted in good results. (Ann Thorac Cardiovasc Surg 2004; 10: 126–9)**

**Key words:** subclavian artery aneurysm, aortic aneurysm

### Introduction

Multiple aneurysms including thoracic, abdominal and subclavian artery are relatively rare. Surgical treatment for them should be considered to avoid the risk of rupture or embolus formation. Here we report successful surgical management for bilateral intrathoracic subclavian artery aneurysms occurring concomitantly with aortic arch and abdominal aortic aneurysm.

### Case Report

A 65-year-old hypertensive non-Marfan woman (body weight 69.8 kg, height 150 cm) was referred to our hospital, because of general fatigue. She had no history of trauma. On physical examination, her blood pressure was 118/74 mmHg in both arms. A slightly pulsatile, nontender mass, 8 cm in diameter, was palpated in the mid-abdomen. Blood analysis, including white blood cell count and level of C-reactive protein, gave normal results. A chest x-ray film showed a significant enlargement in the mediastinal shadow. Computed tomography revealed sac-

cular aneurysms of the bilateral subclavian arteries without any thrombus, a saccular aneurysm of the aortic arch with a thick mural thrombus, 68 mm in diameter (Fig. 1), and a fusiform aneurysm of the infrarenal abdominal aorta, 75 mm in diameter. Magnetic resonance angiography (Fig. 2) revealed that the right subclavian artery aneurysm, 26 mm in diameter, was located at the proximal portion of the right subclavian artery near the origin of the right vertebral artery, whereas the left subclavian artery aneurysm, 22 mm in diameter, was located at the proximal portion of the left subclavian artery close to its origin. Coronary angiography showed no significant stenosis. Considering the large size of the abdominal aortic aneurysm (Fig. 3), it was decided to perform two-staged operations.

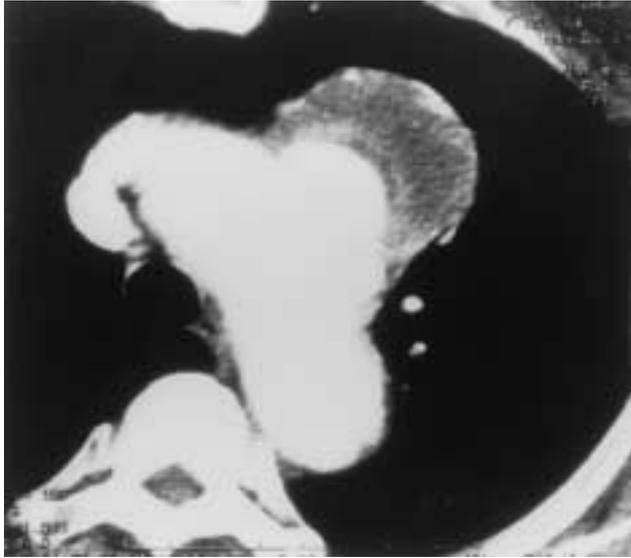
At the first operation, the patient underwent Y-grafting with a 16×8 mm Gelseal knitted Dacron graft (Vascutek Ltd., Renfrewshire, Scotland, UK) for the infrarenal abdominal aortic aneurysm through a median laparotomy, and the subsequent clinical course was uneventful.

In the second surgery six months after the initial operation, the patient underwent a median sternotomy with extension to the bilateral supraclavicular spaces. The aortic arch and its branches, including the bilateral subclavian artery aneurysms, could be exposed adequately without a lateral thoracotomy. Although the right vagal nerve ran over the right subclavian artery aneurysm and a dense adhesion was noted around the aneurysm, the nerve was

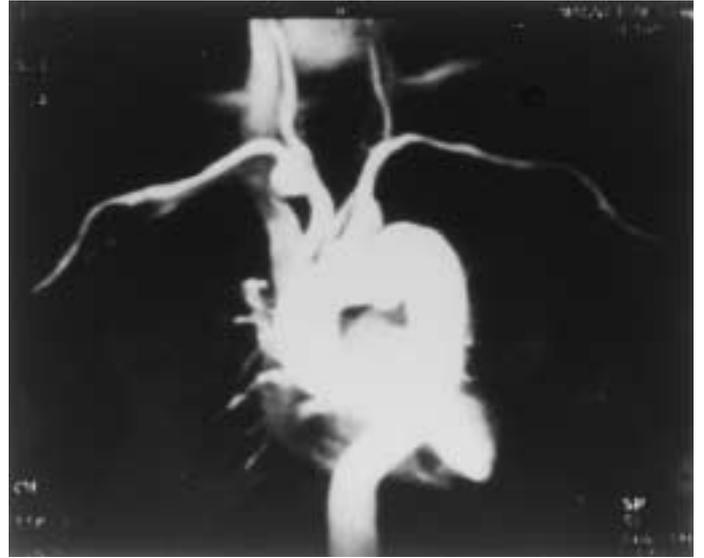
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**Fig. 1.** Computed tomography of the chest. Saccular aneurysm of the aortic arch with a thick mural thrombus, 68 mm in diameter.



**Fig. 2.** Magnetic resonance angiography (see text for details).

secured safely by mobilizing it at the distal portion in advance. It was also possible to expose the left subclavian artery aneurysm, in spite of some difficulties with its location behind the left common carotid artery. After the cannulation to the right femoral artery and both caval veins, a cardiopulmonary bypass was started. Because careful examination of the bilateral subclavian artery aneurysms by echocardiography revealed no mural thrombi, selective cerebral perfusion (cannulated into the arch three vessels from inside the aortic arch) was applied for cerebral protection during surgery. First, the distal anastomosis using a 25 mm UBE woven Dacron tube graft (Ube Industries, Ltd., Yamaguchi, Japan) was performed under moderate hypothermia (rectal temperature of 25°C), maintaining the retrograde perfusion of the lower half of the body using the balloon occlusion technique. Thereafter, a 27.5 mm UBE woven Dacron tube graft with five prefabricated branches was sutured to the graft. Secondly, the proximal anastomosis was completed after starting antegrade lower-body perfusion from one of the branches of the tube graft. Then the aorta was unclamped, and heart beating was spontaneously obtained. Finally, the four arch vessels, the right common carotid artery, the right subclavian artery, the left subclavian artery, and the left common carotid artery, were reconstructed individually, while rewarming the body (Fig. 4). The patient easily came off the cardiopulmonary bypass. Surgical hemostasis was easily achieved. With 1,600 ml of autologous blood, no homologous blood transfusion was needed. The patient



**Fig. 3.** Digital subtraction angiography. Fusiform aneurysm of the infrarenal abdominal aorta, 75 mm in diameter.

was extubated on the following day, and no neurological deficit was observed. She was discharged in good condition.

All four aneurysms were classified as true aneurysms. Histological studies of the specimens obtained from the thoracic, the abdominal and the right subclavian artery

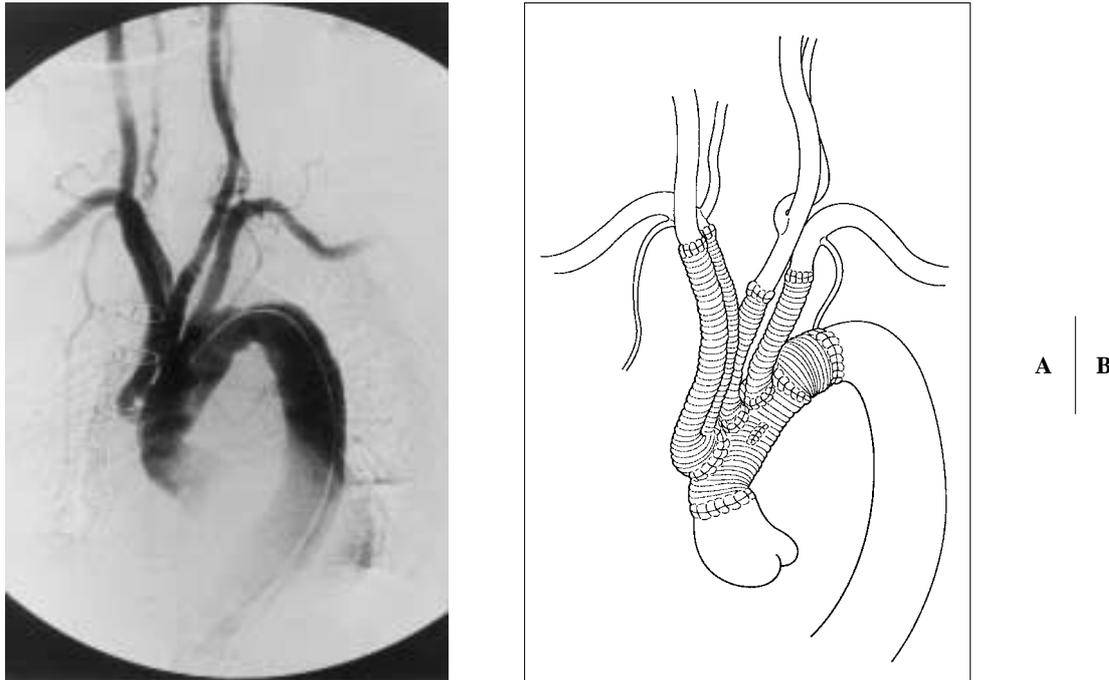


Fig. 4. Postoperative angiography (A) and schema (B) of the second operation.

aneurysm walls showed marked arteriosclerosis with calcification. The presence of chronic inflammatory cells and the loss of elastic fibers were not severely observed. The cause of the four aneurysms was thought to be atherosclerosis.

## Discussion

Aneurysms of the subclavian artery are uncommon in comparison with other peripheral aneurysms.<sup>1)</sup> The usual etiological factors associated with aneurysm formation in the subclavian arteries are atherosclerosis,<sup>2)</sup> trauma,<sup>3)</sup> and thoracic outlet syndrome.<sup>4)</sup> On the other hand, cystic medial necrosis,<sup>5)</sup> pulmonary tuberculosis,<sup>6)</sup> syphilitic arteritis,<sup>7)</sup> Marfan syndrome,<sup>8)</sup> Turner's disease,<sup>9)</sup> Behçet's disease,<sup>10)</sup> aortitis syndrome,<sup>11)</sup> and congenital arterial disease<sup>12)</sup> are rare causes of aneurysm. The reported symptoms of the patients with subclavian artery aneurysm are localized pain, paresthesia of the arm, Horner's syndrome, hoarseness, and ischemia of the upper extremity. Because of the significant risk to life and the extremity, from rupture, thrombosis and peripheral embolization, surgical treatment is recommended,<sup>8)</sup> even if the patient is asymptomatic as in the present case.

Patients with subclavian artery aneurysm should be thoroughly investigated for other associated aneurysms,

especially in cases of atherosclerosis. In a review of the literature related to subclavian artery aneurysm, Dougherty and colleagues<sup>13)</sup> emphasized that multiple aneurysms, apparent both at the time of diagnosis and in the subsequent follow-up, have been reported in a number of cases. According to them, 33-47% of patients with subclavian artery aneurysms also have aortic, visceral, or peripheral aneurysms. However, the present case of bilateral atherosclerotic subclavian artery aneurysm occurring concomitantly with an aortic arch and abdominal aortic aneurysm is a rare case to have been reported.

Concerning the treatment, some authors<sup>14,15)</sup> recently reported endovascular repair of the subclavian artery as an option. Indeed this technique obviates the need for thoracotomy, supraclavicular incision, or median sternotomy. However, a large-size and non-diseased artery into which a sheath can be introduced is necessary for the method. Moreover, it seems to be difficult to preserve the internal thoracic and vertebral arteries. And long-term patency of the small-sized stent-graft remains unknown.

In open surgery for the subclavian artery, care must be taken not to damage the phrenic and recurrent laryngeal nerves. In this point of view, median sternotomy extending to the supraclavicular space is safe and feasible for surgical treatment of proximal subclavian artery aneurysm. Although a high lateral thoracotomy is preferred

for an intrathoracic subclavian artery aneurysm on the left,<sup>13)</sup> this approach is thought to be unsuitable and insufficient for manipulating the bilateral subclavian artery and the aortic arch simultaneously, as in the present case.

Two-staged operations by which the infrarenal abdominal aorta was replaced first were successfully performed in our patient. The size of the abdominal aortic aneurysm was so large that the risk of rupture seemed to be higher than that of aortic arch aneurysm. Furthermore, if the treatment for bilateral subclavian artery aneurysms and aortic arch aneurysm had been preceded, there existed the possibility of embolism due to mural thrombus of the abdominal aortic aneurysm during retrograde perfusion from the femoral artery.

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