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Case Report

Surgical treatment of extensive atherosclerosis of supraaortic arterial branches: Two case reports

Supraaortik arteriyel dalların yaygın aterosklerozunun cerrahi tedavisi: İki olgu sunumu

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ABSTRACT

Herein, we report two cases with symptomatic stenosis of the great vessels successfully treated surgically with aorto-bi-carotid artery bypass and aorto-innominate common carotid artery bypass. Both operations were performed via standard median sternotomy. In the second patient, concomitant coronary revascularization was performed. Postoperative courses of both patients were uneventful.

Keywords: Aorta; brachiocephalic trunk; coronary artery bypass.

ÖZ

Bu yazıda, aortokarotis aorto-innominate ana karotis arter ve aorto-bi-karotis arter baypas yapılarak cerrahi olarak başarılı bir şekilde tedavi edilen semptomatik büyük damar darlıkları olan iki olgu sunuldu. Her iki ameliyat da, standart median sternotomi ile yapıldı. İkinci olguda eş zamanlı olarak koroner revaskülarizasyon yapıldı. Her iki hastanın da ameliyat sonrası seyirleri normaldi.

Anahtar sözcükler: Aort; brakiosefalik trunkus; koroner arter baypas.

Arteriosclerosis less frequently involves the arteries of upper extremities, compared to the lower extremities. Although supraaortic vessel disease (SVD) is usually asymptomatic, severe and extensive arterial stenosis may cause cerebral or limb ischemia.[1] Herein, we report extensive arteriosclerosis of the supraaortic branches and their surgical treatment in two adult women.

CASE REPORT

Case 1- A 53-year-old woman was referred to our clinic due to frequent episodes of dizziness. She had aorto-bifemoral bypass, right femoro-popliteal bypass, femoro-femoral crossover bypass, and percutaneous coronary interventions in the previous two years. Her physical examination and laboratory findings were completely normal, except for diminished left brachial pulse and high serum creatinine level. Transthoracic echocardiography revealed an ejection fraction of 40% with normal valve functions. She had arteriosclerotic risk factors, including smoking, hypertension (HT), diabetes mellitus (DM), and hyperlipidemia (HL). Carotid Doppler ultrasonography (USG) showed increased velocity in both carotid arteries due to proximal arterial stenosis. Computed tomography angiography (CTA) revealed a critical stenosis in both ostia of brachiocephalic trunk (70% stenosis) and left common carotid artery (CCA) (80% stenosis). Computed tomography angiography also showed that

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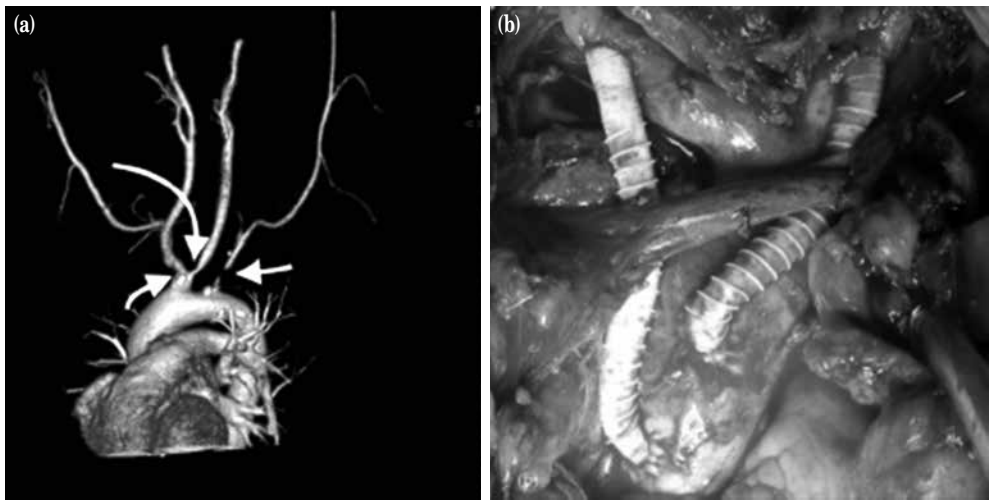

Figure 1. Arrows (inset) showing stenotic areas of the arteries. **(a)** Computed tomography angiography showing stenosis of supraaortic branches. **(b)** An intraoperative view of the aorto-bi-carotid bypass graft (Case 1).

left common carotid artery was emerging from the brachiocephalic trunk. The proximal segment of left subclavian artery was occluded (Figure 1a, Case 1).

Under general anesthesia, a median sternotomy was performed. Two separate 6 mm polytetrafluoroethylene (PTFE) grafts were anastomosed proximally to the lateral wall of the ascending aorta, using a partial occlusion clamp. The grafts were anastomosed to CCA distally. Figure 1b shows aorto-innominate artery and aorto-CCA bypasses. Histopathological samples were consistent with arteriosclerosis. Postoperative course of the patient was uneventful. She was put on oral anticoagulants and acetylsalicylic acid. The patient was asymptomatic in her daily activities after 12 months.

Case 2- A 49-year-old woman had unstable angina pectoris and headache. She had the same arteriosclerotic risk factors with Case 1 including smoking, HT, DM, and HL. The patient's physical examination was consistent with chronic obstructive pulmonary disease, and her laboratory parameters were completely normal except high serum creatinine level. Temporal artery biopsy had been performed with the suspicion of vasculitis in another center. The biopsy report indicated that the findings were not compatible with temporal arteritis or Takayasu's disease. The patient's coronary angiograms revealed severe coronary artery disease. Transthoracic echocardiography showed an ejection fraction of 30% with mild-moderate mitral valve insufficiency. Carotid Doppler USG revealed critical stenosis in both carotid arteries. A CTA examination was performed. It showed diffuse, severe stenosis (90% stenosis) in both carotid arteries extending to the origin of the internal carotid arteries (ICA) (Figure 2a, Case 2). Coronary and carotid artery bypasses were planned to be performed in the same session. Under general anesthesia, right and left ICA were prepared by using oblique neck incisions, and then median sternotomy was performed. Proximal

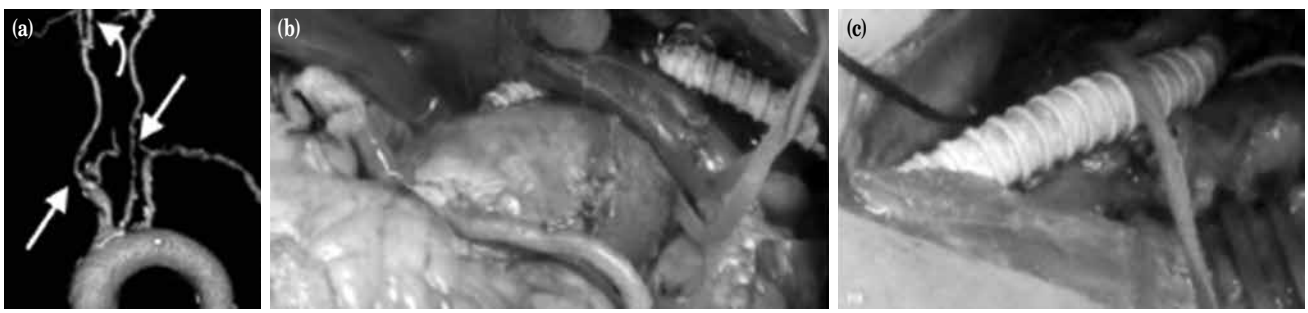

Figure 2. Arrows (inset) showing stenotic areas of the arteries. **(a)** Computed tomography angiography showing long-segment stenosis of the carotid arteries. **(b, c)** Intraoperative views of proximal and distal sites of aorto-internal carotid artery bypass graft (Case 2).

anastomoses of two separate 6 mm PTFE graft were performed to the lateral wall of the ascending aorta by using a partial occlusion clamp. Grafts were tunneled under the innominate vein through neck incision. End-to-side distal anastomoses were performed to internal carotid arteries. This was followed by triple coronary artery bypass grafting. All stages of aorta-bi-ICA bypass are shown in Figure 2b and 2c. Postoperative course was uneventful, except for transient elevation of serum creatinine level.

Both patients were monitored for brain perfusion with near infrared spectroscopy. Informed consents of the patients were obtained prior to surgery. Operation decisions of the patients depended on their symptoms.

DISCUSSION

Atherosclerotic disease of the carotid artery occurs most frequently in the region of carotid bulb and proximal ICAs. Concomitant occlusive disease of the brachiocephalic trunk and CCAs is rare.[2] In addition, the differential diagnosis of extensive atherosclerotic supraaortic arteries and Takayasu disease should be made.[3] The surgical treatment strategies of SVD are controversial.[3] There are a number of options for revascularization of supraaortic branches. Carotid endarterectomy is one of revascularization techniques. However, we preferred to perform the bypass of stenotic arterial segments because there were long atherosclerotic segments in both cases. In the literature, endarterectomy was performed rarely due to technical difficulties and anatomic factors.[4] In addition, carotid angioplasty is not recommended in the majority of patients with long segment carotid artery stenosis.[5] Besides, Modarai et al.[6] reported better patency and lower complication rates thanks to extra-anatomic bypass for supraaortic trunk disease. As aorto-supraaortic bypass is an extra-anatomic procedure, surgery was performed via trans-sternal route in order not to experience intraoperative graft kinking in our patients. In our cases, ascending aorta bypass was performed to both carotid arteries, inserting PTFE graft. The ICAs were isolated through two lateral small neck incisions. The distal anastomoses of PTFE grafts were performed terminolaterally to both carotid arteries in the first case. The first case had neurological symptoms before her surgery. Therefore, a staged operation was not preferred in this patient. Additionally, endovascular therapy was planned for the subclavian artery in order not to make surgery more challenging in the first case. In this case, brachiocephalic trunk stenosis seemed to be suitable for endarterectomy. However, brachiocephalic trunk may require temporary clamping during endarterectomy, and interruption of the flow to the both ICA or an embolic event due to use of shunt can cause severe ischemic consequences. Considering all these factors, common trunk revascularization was performed using the bypass technique.

Surgical management of patients with coexisting severe disease of supraaortic branches and heart vessels is still debated. In the second case, combined one-stage surgery of the supraaortic branches and the coronary arteries was performed to avoid resternotomy later. However, simultaneous coronary artery surgery and supraaortic bypass may cause neurological disturbances. Therefore, proximal and distal anastomotic sites were selected carefully in both patients, since our patients had diffuse and extensive atherosclerotic disease. Anastomosis was not performed on the atherosclerotic site of artery to improve graft patency. Anastomoses were not performed in cardiopulmonary bypass due to probability of hyperperfusion syndrome after carotid bypass. Bifurcated graft was not preferred to avoid this problem. This is a new technical consideration for this entity. Therefore, we did not perform bypass for the left subclavian artery. Intravenous antihypertensives were used to control the blood pressure of the patients. The second case was discharged on the postoperative day 20; however, she died of pulmonary infection nine months after the operation.

In conclusion, transthoracic surgery intervention was performed through median sternotomy in patients with supraaortic vascular disease to prevent compression by the sternum, and pads were positioned and oriented anatomically to provide an opportunity to perform distal anastomosis. In case of simultaneous supraaortic vascular disease and coronary artery stenosis, concomitant surgery can be performed, if there are no contraindications.

Declaration of conflicting interests

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