Case report

Surgical one-stage approach for coronary artery disease and occlusive disease of all aortic arch branches

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Abstract

A 52-year-old man, who presented with two-vessel coronary artery disease and severe arterial occlusive disease with occlusions and/or stenoses of all aortic arch branches, underwent simultaneously coronary artery bypass grafting and bilateral aortic-subclavian as well as left-sided aortic-carotid bypass grafting.

Keywords: Coronary artery bypass surgery; Vascular disease; Aortic arch arteries; Carotid arteries

1. Introduction

The combination of a coronary artery disease and severe arterial occlusive disease of brachiocephalic arteries is a challenge in the surgical strategy even in neurologic asymptomatic patients. This report describes a surgical one stage approach in one patient with coronary artery disease and occlusion of all aortic arch branches.

2. Case report

The 52-year-old patient suffered from angina pectoris (Canadian Classification Score III). He had a history of hypertension, one myocardial infarction at age 22 and severe arterial occlusive disease for which a percutaneous trans-luminal angioplasty of the left iliac artery was previously done. No neurologic events were reported.

On physical examination the patient showed an absent brachial and radial pulse in the left and a reduced pulse in the right upper limb, and an absence of peripheral pulses in both lower limbs.

Coronary artery angiography showed severe stenoses of the right coronary artery and the left anterior descending artery.

Magnetic resonance angiography demonstrated occlusions of the innominate artery, the left subclavian artery and the right common carotid artery, as well as severe stenosis of the left common carotid artery (Fig. 1).

A bilateral transverse anterior (clam shell) thoracotomy was made in the third intercostal space extending bilaterally to the anterior axillary line. Both mammary arteries were ligated and divided, and the sternum was divided transversely. Chest retractors were placed bilaterally for good exposure of the operative site.

Both subclavian arteries were prepared distally after incising the parietal pleura. After application of heparin one of the branches of the collagen-sealed bifurcated polyester vascular prosthesis (Hemashield Gold 14 × 7 mm; Boston Scientific Medi-tech, Wayne, NJ) was anastomosed end-to-side to the right subclavian artery and directed to the ascending aorta underneath the phrenic nerve. The left subclavian artery was somewhat smaller than the right so that a saphenous vein graft with a diameter of 5 mm was used for bypass construction.

After completion of the distal anastomoses with both side subclavian arteries cardiopulmonary bypass was established through cannulation of the aortic arch and the right atrium. After cross-clamping of the proximal...
aorta a circular fenestration with a diameter of about 2 cm was made in the ascending aorta, which showed an arteriosclerotic aortic wall with partially ulcerated plaques. The common branch of the bifurcated vascular prosthesis was then anastomosed end-to-side to the ascending aorta. After de-airing the cross-clamp was released.

Another branch of the bifurcated graft was directed underneath the innominate vein towards the left common carotid artery and anastomosed laterally with the saphenous vein graft to the left subclavian artery. After completion of this anastomosis, arterial flow to both subclavian arteries was established before the left common carotid artery was clamped. The branch of the bifurcated prosthesis was then anastomosed to the left common carotid artery end-to-side, thus completing the revascularisation of all supraaortic vessels.

After cross-clamping the aorta a second time the right coronary artery and the left anterior descending coronary artery were revascularised with saphenous vein grafts.

Since the ascending aorta was heavily calcified, the proximal anastomoses of the vein grafts were inserted into the right aorto-subclavian prosthesis and the aorto-subclavian vein graft, respectively.

The operation was performed in moderate hypothermia (28°C) with a cardio-pulmonary bypass time of 189 min. Overall aortic cross-clamping time was 25 min (10 and 15 min). Brain perfusion was monitored with somatosensory evoked potentials showing no depression of the amplitude during the whole operation.

A postoperative angiograms showed all grafts patent (Figs. 1 and 2).

The postoperative course was uneventful and the patient was discharged on the ninth postoperative day. Nine months after the operation the patient is integrated in social life and back to work.

3. Discussion

Occlusive disease of supraaortic arteries is relatively uncommon. Even though a few studies have dealt with operative strategies in occlusive brachicephalic lesions [1–3], we did not find data regarding the surgical management of this disease in combination with coronary artery revascularisation.

The combination of coronary artery disease and multiple occlusions of supraaortic brain supplying arteries is
challenging not only in terms of the operative technique but also in the thoracotomy approach. To our knowledge this is a unique case of coronary artery bypass grafting and reconstruction of all supraaortic vessels in a one stage approach.

Even though this patient had no neurologic symptoms, we decided to operate simultaneously because of a potential risk of a cerebral injury due to reduced cerebral flow beyond the multiple stenoses. For this reason the principal aims of the operation for the complex coronary and cerebrovascular pathology should be in our opinion satisfactory revascularisation with freedom from any perioperative neurological injuries. The sequence of operative steps taken reduced the risk of neurologic events from cross-clamping the common carotid artery, because flow was established previously via the vertebral arteries.

To facilitate the access to the supraaortic vessels on the one hand and to the coronary vessels on the other, an anterior transverse thoracotomy extending bilateral to the anterior axillary line gave an excellent exposure. The disadvantage of the approach described, however, is the transsection of both internal thoracic arteries.

We did not consider the use of the left internal thoracic artery because its patency would have been dependent on the bypass to the subclavian artery. Furthermore at least two separate incisions would have been necessary in addition to the median sternotomy. We also abandoned the use of the internal thoracic artery as a free graft since there is no proof of its superior long-term patency compared to vein grafts.

The case described above demonstrates that coronary revascularisation and multiple bypass grafting of aortic arch branches can be performed trans-thoracically and simultaneously with satisfactory results.

References