Case report

Internal thoracic artery as a collateral source to the ischemic lower extremity

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Received 16 May 2000; received in revised form 18 July 2000; accepted 15 August 2000

Abstract

Based on the superior long-term results, internal thoracic artery is widely used for coronary artery bypass grafting. However, the vessel can play an important role as a collateral source to the chronically ischemic lower limbs. We reported two cases who underwent simultaneous revascularization to the myocardium and lower limbs because this particular condition was anticipated. Selective angiography of internal thoracic artery was useful to determine its role before harvesting in our cases. Careful preoperative examinations and choice of surgical approach are required for such patients to avoid serious vascular complications. © 2000 Elsevier Science B.V. All rights reserved.

Keywords: Coronary artery bypass grafting; Internal thoracic artery; Aortoiliac occlusive disease; Collateral source

1. Introduction

The use of internal thoracic artery (ITA) as a conduit for coronary artery bypass grafting (CABG) has been reported to provide superior long-term results compared with the use of saphenous vein grafts alone [1]. However, because ITA can play an important role as a collateral source to the chronically ischemic lower extremity, the use of the vessel for myocardial revascularization may cause severe leg ischemia [2–4]. We report two patients who underwent simultaneous revascularization to the coronary arteries and peripheral arteries because this particular condition was anticipated preoperatively.

2. Patient 1

A 69-year-old man with old myocardial infarction and intermittent claudication was referred to our institute for CABG. The patient had undergone a replacement of abdominal aorta and bilateral iliac arteries using a bifurcated graft because of abdominal aortic aneurysm 6 years before the admission to this institute. At this original procedure, the inferior mesenteric artery and the lumbar arteries were ligated. Coronary angiography demonstrated triple vessel disease with good left ventricular function. Aortography showed complete obstruction of the left external iliac artery distal to the anastomosis of the former bifurcated graft (Fig. 1). Selective angiography and digital subtraction angiography (DSA) showed well developed left ITA and inferior epigastric artery (IEA) which supplied collateral blood flow to the left lower limb (Fig. 1). Femoro-femoral crossover bypass grafting using a polytetrafluoroethylene (PTFE) graft was performed prior to the left ITA dissection. A triple coronary artery bypass graft was performed using the left ITA and vein grafts. The patient was weaned off cardiopulmonary bypass without difficulty and his postoperative course was uneventful.

3. Patient 2

A 56-year-old male had stable angina pectoris, hypertension in the upper extremities and severe intermittent claudication involving both lower extremities. DSA showed severe stenoses in the thoraco-abdominal aorta (internal diameter of 7 mm) due to atypical coarctation and well developed bilateral ITAs, superior epigastric arteries (SEA) and IEAs as major collaterals to the lower extremities (Fig. 2). Coronary angiography demonstrated double vessel disease with moderate left ventricular function (ejection fraction of 56%). Prior to the dissection of the left ITA and the inferior epigastric artery (IEA), a bifurcated PTFE graft was anastomosed to the bilateral external iliac artery. The bifurcated graft and the right axillary artery were used as arterial line during cardiopulmonary bypass. A double coronary artery bypass graft was performed using the left
ITA and IEA. After aortic declamping, the bifurcated PTFE graft was passed through the preperitoneal abdominal tunnel and was anastomosed to the ascending aorta. Although the patient was once weaned from cardiopulmonary bypass, an extracorporeal membrane oxygenator (ECMO) and an intraaortic balloon pump (IABP) were required to maintain his hemodynamics due to the occurrence of intraoperative myocardial infarction. The patient was weaned off the ECMO and IABP without difficulty on the third and fifth postoperative days, respectively. The patient recovered uneventfully afterward without development of peripheral ischemia.

4. Comment

Although major vascular complications associated with the use of ITA or IEA as a conduit for CABG are uncommon, several reports have shown that acute limb-threatening ischemia occurred after their harvest when the vessels form major collateral pathways to the lower limbs in patients with aortoiliac occlusive disease [2–4]. In such patients, exceptionally large (>3 mm) and tortuous ITAs, SEAs and IEAs, which eventually feed into the external iliac arteries, were observed in selective angiography of the ITA [5–7]. Besides the particular condition, anomalies of ITA, such as common origin of another large artery, large side branches, tortuosity, and atypical course or origin, have also been reported to influence the surgical strategy and results [8]. Thus, we believe that selective ITA angiography should be performed routinely to determine its functional and anatomical status before harvesting, particularly in patients with aortoiliac occlusive disease.

Numerous collateral circulation, that comprises the visceral collaterals and the parietal collaterals, have been documented to circumvent the aortoiliac occlusive disease [2]. In our first patient, the inferior mesenteric artery and lumbar arteries were ligated at the previous operation for abdominal aortic aneurysm. In the second patient, severe stenoses were found in thoraco-abdominal aorta. In these particular cases, it seems unlikely that the visceral circulation, such as inferior mesenteric artery and hemorrhoidal branches of the hypogastric artery, and some of the parietal circulation, such as lumbar arteries and intercostal arteries, furnished critical collateral flow to the lower limbs. Moreover, exceptionally large ITAs, SEAs and IEAs, and retrograde flow in the IEA found in the angiography suggest that the vessels had adopted the important role of collateral to the lower limbs.

The treatment of a such patient poses a challenging problem. Dietzek and colleagues [2] have recommended to avoid the use of ITA and to perform a sequential or staged revascularization of coronary and peripheral arteries for such patients. In contrast, because of the incidence of the acute limb-threatening and sometimes lethal event, simultaneous approach has been recommended by some surgeons.
on the basis of satisfactory clinical results [3–5,9]. The decision will depend on the severity of myocardial and lower limb ischemia, the age, and general condition of the patient. Simultaneous coronary artery bypass grafting using arterial conduits and lower limb revascularization would be indicated in a young patient or a patient with atherosclerotic change in the ascending aorta to avoid serious vascular complications and to obtain optimum myocardial revascularization. To date, however, reported number of patients undergoing CABG with this particular vascular condition is small [2–7,10]. Moreover, in some cases the condition was noticed after the occurrence of limbs-threatening ischemia [2–4]. Thus, the management strategy for such patient is still conflicting. To avoid serious vascular complications after ITA harvesting, heightened awareness of this possibility and careful choice of surgical approach are required for patients undergoing CABG in the presence of chronically occlusive aorta.

Acknowledgements

This work was supported by the Grant-in-Aid for Encouragement of Young Scientists, Japan Society for the Promotion of Science (Grant A-11770751, Grant A-11770753, Grant A-12770738).

References

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