LEFT SUBCLAVIAN ARTERY FOR GRAFT INFLOW IN OFF-PUMP BYPASS

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ABSTRACT

In coronary artery bypass grafting without cardiopulmonary bypass, a suitable alternative source of inflow to the free graft is required when the internal thoracic artery has already been used or the ascending aorta is severely atheromatous. Left subclavian artery was used for proximal inflow to a free radial artery graft in 1 patient and to saphenous vein grafts in 3. The free graft was anastomosed to the left subclavian artery through a small subclavian skin incision and the new pedicled graft was introduced into the pleural cavity. Through a left anterior small thoracotomy, the graft was anastomosed to the left anterior descending artery in 3 cases and to the circumflex artery in 1, without cardiopulmonary bypass. The postoperative course was uneventful and all grafts were patent. This technique may extend off-pump coronary artery bypass grafting to patients requiring reoperation and those with a diseased ascending aorta.

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INTRODUCTION

Recently, coronary artery bypass grafting (CABG) without extracorporeal circulation (off-pump CABG) has been used more extensively to minimize operative mortality and morbidity.[1,2] Although the internal thoracic artery (ITA) is the first choice of graft, it is frequently unavailable at reoperation because of prior use. For a free graft, an alternative inflow is necessary when the ascending aorta is severely atheromatous. We recently used the left subclavian artery for proximal inflow to free radial artery or saphenous vein grafts through a small subclavian incision in patients who underwent off-pump CABG.

PATIENTS AND METHODS

There were 2 men and 2 women, aged 62 to 75 years. Three had previous CABG using the left internal thoracic artery; these grafts had become occluded. The other patient had a porcelain ascending aorta (Table 1). The left subclavian artery was exposed through a small subclavian incision parallel to the left clavicle. After mild heparinization (with 50 to 100 $U \cdot kg^{-1}$ and an activated coagulation time between 250 and 300 sec), the graft was divided obliquely and the toe side of the free graft was positioned distally toward the left subclavian artery to avoid kinking. The graft was anastomosed to the inferior wall of the left subclavian artery with 6/0 polypropylene suture. The pectoralis major muscle and the intercostal muscle were divided by electrocautery above the first rib to make a small tunnel. The distal end of the graft was introduced into the left pleural cavity through this tunnel and the graft was carefully checked for kinking. The graft was placed anteriorly along the left lung and the length of the

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graft was carefully checked by inflating the lung. Exposure of the target coronary artery (Table 1) was obtained through a left anterior small thoracotomy in 3 patients and via a median sternotomy in the other. The coronary artery was temporarily occluded with elastic snare (Matuda Ika Kogyo Co., Tokyo, Japan). The new pedicled graft was anastomosed to the coronary artery with the aid of a mechanical stabilizer (Matuda Ika Kogyo Co., Tokyo, Japan or CardioThoracic System, Cupertino, CA, USA) using the double-parachute technique (Figure 1) with a beating heart in all patients.[3]

RESULTS

The patients were weaned from mechanical ventilation at 3 to 5 hours after the operation. Intensive care unit stay was within one day in all patients. There were no postoperative complications such as myocardial infarction, stroke, distal coronary arterial thrombosis, or brachial plexus injury. Postoperative coronary angiography was performed in all patients and all grafts were patent without stenosis in either the proximal or distal anastomotic sites. A postoperative stress test was performed in each case and no ischemic changes were detected. All patients were discharged from hospital uneventfully.

DISCUSSION

Recent advances in the surgical technique of CABG allow an effective procedure without cardiopulmonary bypass.[1,2] In off-pump CABG, pedicled left ITA is the first choice of graft to revascularize the left anterior descending artery and a left thoracotomy is applied for off-pump single-vessel CABG of left ITA to the left anterior descending artery. On reoperation for CABG, a left thoracotomy is also applied to minimize dissection of adhesions. However, when the ITA has already been used and this graft has become occluded, a pedicled gastroepiploic artery graft is useful as an alternative to the ITA.[4] For a free graft, the most common source of inflow is the ascending aorta via

Table 1. **Operative Setting and Surgical Procedures**

Age (years)	Sex	Operative Setting	Revascularization
69	F	Redo CABG: LITA–LAD occluded; SVG–OM patent	ScA–SVG–LAD
62	M	Redo CABG: RITA–LAD occluded; LITA–PL & RGEA–PD patent	ScA–RA–LAD
75	F	Redo CABG: LITA–LAD occluded; SVG–RCA patent	ScA–SVG–LAD, TMLR in CX
69	M	Porcelain aorta	LITA–LAD, ScA–SVG–CX, RGEA–PD

CABG = coronary artery bypass grafting, CX = circumflex artery, LAD = left anterior descending artery, LITA = left internal thoracic artery, OM = obtuse marginal, PD = posterior descending artery, PL = posterolateral branch, RA = radial artery, RCA = right coronary artery, RGEA = right gastroepiploic artery, RITA = right internal thoracic artery, ScA = subclavian artery, SVG = saphenous vein graft, TMLR = transmyocardial laser revascularization.

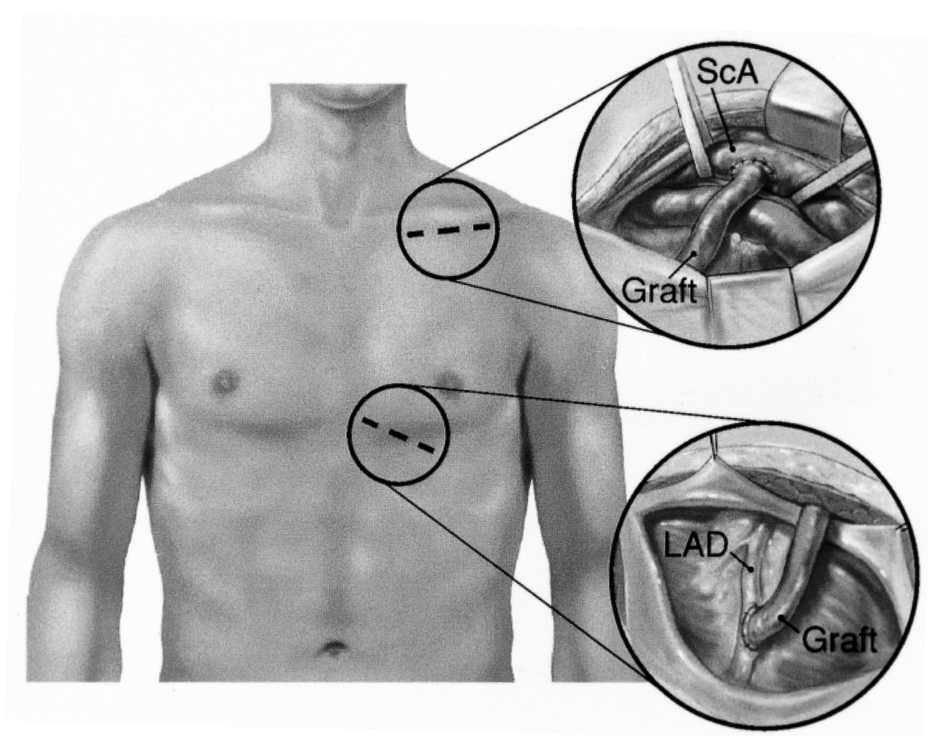

Figure 1. Schema of graft anastomosis to the left subclavian artery (ScA) and the left anterior descending artery (LAD).

a median sternotomy or the descending thoracic aorta via a left thoracotomy. Unfortunately, severe atheromatous lesions are often present at these potential inflow sites.

In this series, a free graft was used with the left subclavian artery for proximal inflow, via a small subclavian incision. The left subclavian artery showed no atheromatous changes in any of the patients and similar findings in the right axillary artery have been reported previously.[5,6] A left thoracotomy is particularly useful for reoperation, although careful attention should be paid to the length and location of the new pedicled graft. We believe that this technique may extend the use of off-pump CABG to patients with previous ITA grafts who require reoperation and to those needing multi-coronary revascularization in the presence of a diseased ascending aorta.

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