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How I Do It

A New Method of Myocardial Revascularization with Use of the Radial Loop Technique

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ABSTRACT

We report a technique that allows total arterial myocardial revascularization of the left ventricle by the use of the radial artery as a composite graft. The technique includes anastomosis of the distal end of the radial artery to its more proximal part after division of the conduit from the brachial artery. In this way we create an adjustable loop that can be divided and used as a Y-fashioned conduit according to the needs of revascularization. The main advantages of this technique are that it saves time and facilitates complex arterial revascularization of the lateral and posterior parts of the left ventricle, especially during off-pump revascularization. At least 2 coronary targets can be revascularized with the radial artery in a flexible and safe manner. The radial artery also has important potential opportunities for multiple grafting through minimal-access incisions or endoscopic coronary artery bypass grafting when a critical Y anastomosis is needed inside the chest.

INTRODUCTION

Use of arterial conduits has been emphasized in conventional coronary artery bypass grafting (CABG) and more recently in beating-heart surgery [Wendler 2001]. The general condition of patients who need surgical revascularization has changed toward increased comorbidity and poorer quality of coronary targets. Several authors have highlighted the superior performance of arterial conduits over vein grafts in smaller coronary arteries [Nishida 1996].

Use of the radial artery (RA) is associated with low early mortality, a low complication rate, and a potential cost-saving effect due to the lower morbidity of RA harvesting than of saphenous vein harvesting [Buxton 1996].

TECHNIQUE

The patient is prepared for CABG in a routine manner. The RA is harvested simultaneously with the left internal mammary artery (LIMA) and prepared as a pedicle with the satellite veins, perivascular fat, and areolar tissue and fascia.

Preparation of the loop (Figure 1) includes end-to-side anastomosis of the distal end to the proximal RA with 8-0 polypropylene (Prolene) suture. Preparation of the arteriotomy at the proximal and ventral part of the RA is performed after division of the thin fascia and minimal skeletonization of the vessel at the arteriotomy site. After preparation, the RA is kept moist in vasodilating solution (heparinized blood with verapamil and glyceryl trinitrate).

The radial loop is divided at a desirable point at the time of grafting. Division creates an adjustable composite graft with a long and a short leg. This graft can enable 2 end-to-side distal anastomoses on a beating heart (Figure 1).

We decide where to divide the loop by measuring 2 distances with a silk stitch as a guide. First we calculate the length of the long leg by measuring the distance between the more distal target vessel and the proximal site (aorta or LIMA). The rest of the radial length is the short leg of the radial loop, which is anastomosed end to side to the proximal coronary target in a Y fashion.

Crude intraoperative patency is shown with evaluation of satisfactory backflow through the proximal part after occlusion of each leg separately with a vascular bulldog clamp.

We have developed 2 types of radial loops on the basis of diameter. The small-diameter loop can be used as alternative to sequential anastomosis for targets close to each other, such as obtuse marginal artery 1 (OM1) and OM2 or OM2 and the distal circumflex (Cx) artery. The large-diameter loop (Figure 2) is used for grafting of diagonal and intermediate or diagonal and distal Cx arteries.

DISCUSSION

The RA has been proven a reliable conduit in terms of early and midterm patency [Tatoulis 2002]. Several reports have described extended use of the RA in complex multivessel arterial revascularization [Aguero 1999, Yilmaz 2001]. We have previously reported the use of RA as a conduit of choice in a significant proportion of patients needing multivessel arterial revascularization on the beating heart [Roy 2000].

The radial loop technique offers several advantages. With harvesting of 1 conduit, 2 distal anastomoses can be

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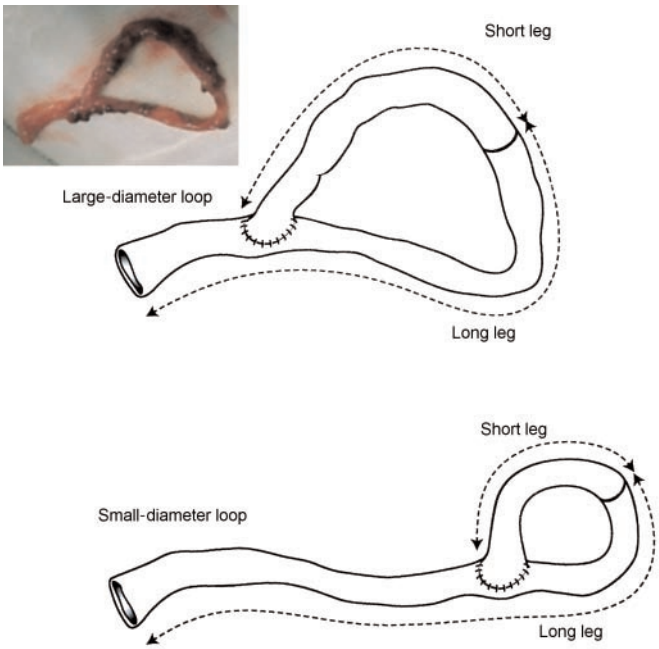

Figure 1. Types of radial artery loops.

performed, and in conjunction with the use of LIMA, total arterial revascularization of the left ventricle can be achieved.

The adjustable length of the loop offers flexibility and extends use of the RA as a composite conduit. The fact that one anastomosis is performed outside the operative field saves time and facilitates off-pump coronary revascularization.

We believe that this technique offers advantages over use of sequential grafts, especially between coronary targets close to each other that may require higher levels of surgical skill, to avoid a pursestring effect. The technique also allows trainees to improve their skills in performing smaller arterial anastomoses.

This technique can offer important opportunities for multiple grafting through minimal-access incisions such as small lateral thoracotomies [Athanasiou 2002] or robotic-assisted CABG in which intrathoracic creation of the anastomosis is quite complex.

We have used the radial loop technique in 20 patients without any evidence of perioperative or postoperative ischemia, arrhythmia, or low cardiac output. The efficacy of the method needs to be investigated in a larger sample of patients. Follow-up of the patients and midterm angiographic studies will provide more reliable evidence of early and midterm patency.

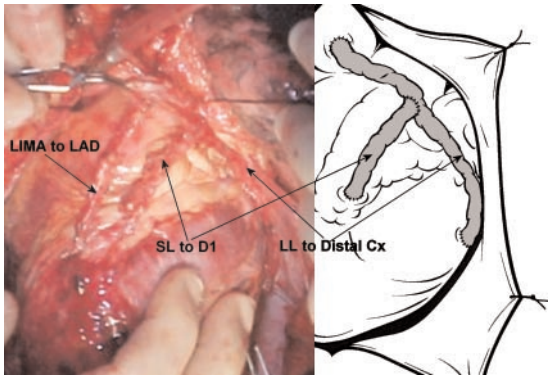

Figure 2. Total arterial revascularization of the left ventricular wall on a beating heart with the radial loop technique. LIMA indicates left internal mammary artery; LAD, left anterior descending artery; SL, short leg; D1, diagonal artery; LL, long leg; Cx, circumflex artery.

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