How to do it

Radial artery graft inflow from the undetached, unharvested RIMA: a method to avoid proximal anastomosis to the aorta in CABG surgery

Erkki Pehkonena,*, Seppo Seppänenb, Kari Niemeläc, Silja Majahalme c

aDivision of Cardio-thoracic Surgery, Tampere University Hospital, 33521 Tampere, Finland
bDepartment of Radiology, Tampere University Hospital, 33521 Tampere, Finland
cDivision of Cardiology, Tampere University Hospital, 33521 Tampere, Finland

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Abstract

Performing the proximal anastomosis of a free arterial graft to the ascending aorta is problematic, especially if the wall of the aorta is calcified or thickened. We describe a method, which makes it possible to avoid this procedure. © 2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

Developing atherosclerosis in vein grafts has led to the increasing use of arterial grafts in coronary artery bypass grafting (CABG) surgery. However, proximal anastomosis of a free arterial graft to the ascending aorta is rendered problematic by the size mismatch of the tiny graft and aorta, a problem asseverated if the ascending aorta is thickened or calcified. Further, anastomosing a peripheral artery to a central position has been thought by reason of the altered pressure environment to cause intimal hyperplasia and consequent graft stenosis and occlusion [1]. For these reasons many surgeons avoid anastomosing an arterial graft to the aorta. Although the goal can be achieved by pedicled grafts, the right internal mammary artery (RIMA) cannot always reach the desired target vessel, and there may also be contra-indications to the use of both IMAs or use of the gastroepiploic artery. These drawbacks are avoidable by the so-called T or Y graft, where an arterial free graft is anastomosed to the side of a pedicled IMA graft. By this means most if not all regions can be grafted. However, many surgeons shun this approach because of the technical skill required and the possible catastrophic outcome in case of technical error, all inflow being from one source.

To avoid aortic anastomosis, grafts have occasionally been joined to the subclavian, innominate or auxiliary arteries, or end-to-end to pedicled arterial grafts [2]. Our solution is to make the proximal anastomosis to the undetached, unharvested distal RIMA.

2. Surgical technique

When after harvesting the radial artery (RA) and left internal mammary artery (LIMA), the pericardium is opened and the ascending aorta found unsuitable for proximal anastomosis, the process is continued as follows: the right side of the sternum is elevated with the mammary retractor and the pleura bluntly removed from the distal RIMA. The endothoracic fascia is opened by a 5 cm incision over the RIMA and the artery palpated. If normal size is observed and a strong pulse felt, the patient is given 1 ml heparin and two bulldog clamps are placed on RIMA, which is then opened between them by a 6–10 mm longitudinal arteriotomy about 3–5 cm from its distal bifurcation (Fig. 1). The bulldog clamps are momentarily released to estimate the flow of blood. If it proves adequate, the proximal part of RA is anastomosed end-to-side to RIMA with 7–0 thread. The graft free flow is then measured and if it is adequate, diluted papaverine is injected into the graft, which is now ready for use. With this graft the posterior and lateral heart regions can be reached. It should be noted that RIMA is not harvested, and no side branches are ligated. When closing the sternum at the end of the operation care should be taken not to damage the RIMA or RA graft. Wire needles should be placed in direct vision under the right sternal side.

We have operated on three patients using this method. In
the 9–11 months follow-up, they are well and show no signs of ischemia (Fig. 2).

3. Discussion

The method presented offers an alternative to the surgeon who wants to avoid proximal anastomosis of an arterial graft to the aorta and who is reluctant to use a composite graft. Although composite grafting yields excellent results in experienced hands [3], it has proved less successful in early surgical experience [4].

Our approach is not in fact new, merely a modification of the so-called ‘H-grafting’ where inferior epigastric artery graft inflow is taken from unharvested LIMA and the distal anastomosis made to LAD in MIDCAB setting [5]. Our concept is used in conventional CABG.

Considering the possibility of stealing of flow by RIMA side-branches and the distal RIMA, ligation of the distal RIMA distally to the RIMA-RA anastomosis might seem advisable; however, recent studies suggest that ‘steal’ does not occur via unligated IMA branches [6]. In MIDCAB surgery, several proximal side-branches of LIMA are normally left unligated. Further, ‘reversed LIMA grafts’ the pedicle being cut proximally and inflow coming from the distal IMA, have been used with reasonable results [7]. Moreover, the flow to the chest wall arteries occurs in systole, that to the heart muscle mainly in diastole, thus speaking against the ‘steal’ possibility. In our view ligating RIMA distal to the RIMA-RA anastomosis would have adverse effects on the flow in the graft. However, this issue needs further study.

One theoretical advantage in our approach is that RA is anastomosed to a peripheral artery, the pressure circumstances thus presumably simulating its normal position in the upper extremity. This will hopefully prevent the development of intimal hyperplasia.

One disadvantage, again, is that a redo operation entails the danger of the RA graft being easily damaged as it lies near the midline beneath the sternum.

Our method of attaching RA to the unharvested RIMA may constitute an increment to the arsenal of cardiac surgeons. However, this concept warrants further study before more widespread clinical application.

References