BRIEF COMMUNICATIONS

INFERIOR MESENTERIC ARTERY AS A FREE ARTERIAL CONDUIT FOR MYOCARDIAL REVASCULARIZATION

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Superiority of internal thoracic artery (ITA) grafts over venous grafts in terms of long-term patency and longevity after coronary artery bypass grafting (CABG)¹ has led to the search for and use of additional arterial conduits including the right gastroepiploic artery, inferior epigastric artery, radial artery, and splenic artery.

From our vascular surgical experience we were impressed by the caliber and length of the inferior mesenteric artery with its left colic and rather long superior hemorrhoidal branches. We repeatedly observed, as did Mikkelsen,² that atherosclerotic lesions that produced inferior mesenteric artery occlusion were frequently confined to its origin whereas the major portion of its main segment along with the primary branches remained fully patent. In addition, collateral circulation in the form of marginal artery itself or through the secondary arcade between the middle colic branch of the superior mesenteric artery and the left colic and sigmoidal branches of the inferior mesenteric artery ensured blood supply to the entire left colon and the rectosigmoid even when the inferior mesenteric artery was blocked. These facts prompted us to consider the inferior mesenteric artery as a free graft for coronary revascularization. It was, however, not until November 1994 that we came across a case that satisfied all the ethical considerations for using the free inferior mesenteric artery graft in addition to pedicled right and left ITA grafts. Since then we have used, in addition to a free right ITA graft, a free inferior mesenteric artery graft, with the two branches of this artery, in one other case to bypass two coronary vessels. We describe these two cases in this article.

CASE 1. A 42-year-old male patient with triple-vessel disease was referred to us in November 1994 for CABG. In view of his young age it was decided to use arterial grafts to bypass all three vessels. Selective mesenteric angiography, done to evaluate the feasibility of harvesting the inferior mesenteric artery, revealed a well-developed

marginal artery between the middle colic, left colic, and sigmoidal arteries (Fig. 1), which allowed for removal of the inferior mesenteric artery without fear of producing colonic ischemia. At operation, through a midline lower abdominal incision, the inferior mesenteric artery with its superior hemorrhoidal continuation was harvested. The diameter of the inferior mesenteric artery was 4 mm at its origin and 2.5 mm at the distal end of the superior

Fig. 1. Selective inferior mesenteric arteriogram showing inferior mesenteric artery (arrowhead), left colic branch (large white arrow), superior hemorrhoidal continuation (black arrow), and marginal artery (small white arrow).

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Fig. 2. Postoperative coronary angiogram showing patent free inferior mesenteric artery graft (black arrow) to left anterior descending artery.

hemorrhoidal artery. The inferior mesenteric artery so harvested was hydrostatically dilated with papaverine solution and wrapped in gauze soaked in papaverine. The abdominal incision was closed. Through a simultaneously performed median sternotomy, the right and left ITAs were harvested. CABG was done in routine fashion with pedicled right ITA to mid-right coronary artery, pedicled left ITA to large obtuse marginal artery, and free inferior mesenteric artery to mid-left anterior descending artery. The patient recovered well without any evidence of low cardiac output or myocardial infarction and regained bowel movement within 48 hours. Symptoms of angina disappeared completely and administration of antianginal medication was discontinued. Coronary angiography done 5 months after the operation showed all the arterial grafts, including the inferior mesenteric artery (Fig. 2), to be patent.

CASE 2. The second patient, a 38-year-old man, had significant lesions involving the first diagonal and the first obtuse marginal arteries, both large branches, in addition to the distal right coronary artery. Selective injection of contrast at the time of coronary angiography had shown a minuscule left ITA. It was therefore decided to use free inferior mesenteric artery graft with its two branches, the left colic and superior hemorrhoidal, for bypass of the first diagonal and first obtuse marginal arteries, respectively, and free right ITA for bypass of the right coronary artery. After selective mesenteric angiography, the inferior mesenteric artery with both its left colic and superior hemorrhoidal branches was harvested as described earlier. CABG was then done as planned. The postoperative period was uneventful. The patient had relief from angina even without medication and was in functional class I at the time of the most recent follow-up visit, 13 months after the operation.

Since 1987 use of right gastroepiploic artery as both pedicled and free grafts has been reported.³ Dissection of

right gastroepiploic artery is complicated by omental fat and numerous tiny branches. Routing of in situ right gastroepiploic artery to reach the heart can often be cumbersome. With inferior epigastric artery graft, there is always a risk, although small, of ischemic fibrosis of the rectus abdominis muscle and subsequent development of desmoid tumor, particularly if ipsilateral ITA is also used. Radial artery free graft without restoration of continuity could be risky for the donor hand. Donor artery spasm has also been observed in all these alternate arterial grafts. The frequency of atherosclerosis and calcification in the splenic artery, the difficulty in harvesting it because of multiple tiny pancreatic branches, and the need for sacrificing the spleen dissuades its use.

From a purely surgical point of view, the inferior mesenteric artery represents an excellent arterial conduit for CABG because of the following reasons: (1) being a direct branch of the aorta, much like the coronary arteries, it is used to the aortic pressure with higher and more rapid systolic upstroke (rate of pressure rise) and thus is likely to be less prone to early intimal disruption and resultant migration of smooth muscle cells leading to graft failure in comparison with the other alternative free graft arterial conduits,⁴ (2) it shows infrequent atherosclerotic involvement beyond its proximal 1 cm or so,² (3) it has a large caliber with virtual absence of branches until the primary arcade, (4) the combined length of the left colic and superior hemorrhoidal branches and the large obtuse angle between them allow the graft to reach any of the target vessels on the surface of the heart, and (5) proximal anastomosis to the aorta can be done with ease.

The main concern with use of the inferior mesenteric artery is the possible deleterious effect on the blood supply of the descending colon and the rectosigmoid. This can be overcome by looking out for the integrity of the marginal arterial arcade on selective mesenteric arteriography, which thus becomes a prerequisite for the use of this graft for CABG. A lower abdominal midline incision provides excellent exposure and it takes not more than 45 minutes to harvest the vessel. We are thus inclined to believe that the inferior mesenteric artery will turn out to be a most popular arterial graft for CABG, second to the ITA. To the best of our knowledge this is the first report of the use of inferior mesenteric artery as a free graft conduit for myocardial revascularization.

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