Low Recurrence of Angina Pectoris After Coronary Artery Bypass Graft Surgery With Bilateral Internal Thoracic and Right Gastroepiploic Arteries

T. Margot Bergsma, MD; Jan G. Grandjean, MD, PhD; Adriaan A. Voors, MD, PhD; Piet W. Boonstra, MD, PhD; Peter den Heyer, MD, PhD; Tjark Ebels, MD, PhD

Background—In the past 10 years, there has been a trend to use more arterial grafts instead of vein grafts for coronary artery bypass graft surgery. Although there are many reports on the short- and mid-term follow-up of patients who underwent arterial revascularization with 1 or 2 arteries, little has been reported on the follow-up of patients with 3-vessel disease who received 3 arteries.

Methods and Results—We reviewed a group of 256 patients with 3-vessel disease who received the right gastroepiploic artery together with both internal thoracic arteries (ITAs). Vein grafts were not used in these patients. The patients were monitored for up to 7 years (mean, 51 ± 15 months). Seven-year actuarial survival was 91.1%. The cumulative probability of event-free survival for myocardial infarction, reintervention, and angina pectoris at 7 years was 97.3%, 95.4%, and 85.4%, respectively.

Conclusions—We conclude that concomitant use of the gastroepiploic artery with both ITAs results in low mortality and a low incidence of myocardial infarction and reintervention at follow-up. Most interestingly, we found 85.4% freedom from angina pectoris after 7 years, which is considerably lower than the results of studies in which vein grafts, single ITA grafts, or double ITA grafts are used. These results strongly support the use of both ITAs and the right gastroepiploic artery for bypass grafting in patients with 3-vessel disease. (Circulation. 1998;97:2402-2405.)

Key Words: angina • arteries • bypass • follow-up studies • revascularization
infarction after the left anterior descending branch was not found, and 1 of cardiac failure. The other 8 patients died 25, 26, 28, 38, 44, 52, 63, and 68 months, respectively, after the operation. Four patients died of noncardiovascular causes (2 of lung carcinoma, 1 of colon carcinoma, 1 of a temporal subdural hematoma). Four patients died of a cardiovascular cause (2 of cardiac failure, 1 of ventricular fibrillation, 1 of endocarditis). Seven-year actuarial survival (including in-hospital death and death from a noncardiovascular cause) for this group of patients was 91.1% (Figure, panel A).

**Morbidity**

In-hospital infarction occurred in 5 patients. After discharge from hospital, 2 patients suffered a myocardial infarction (1 anteroseptal and 1 inferior), at 8 and 20 months, respectively, after the operation. Seven-year infarct-free cardiac survival for this group of patients (including 5 in-hospital infarctions) was 97.3% (Figure, panel B).

Eleven patients underwent a reintervention procedure. Two patients had to undergo a repeat CABG (a few hours after their operation), and 9 had to undergo PTCA. The actuarial freedom from reintervention at 7 years after the operation was 95.4% (Figure, panel C).

After leaving the hospital, 28 patients experienced a return of angina pectoris. Eighteen were in NYHA class II, and 10 in NYHA class III. Seven-year angina-free cardiac survival was 85.4% (Figure, panel D).

**Discussion**

Arterial grafts are preferred to venous grafts for CABG, because long-term patency of venous grafts is poor, with consequent frequent angina pectoris and subsequent cardiac events. In contrast, excellent long-term patency and better patient outcomes have been demonstrated for ITA grafts in several series. The improved survival with ITA grafts is due to improved patency rates of these grafts, which, if they are patent immediately after surgery, usually remain patent, whereas vein grafts exhibit progressive atherosclerosis.

However, venous grafts (in combination with 1 or 2 ITA grafts) are still used in the majority of patients. A reasonable alternative for the saphenous vein graft in conjunction with both ITAs is the GEA. With the GEA, myocardial revascularization can be achieved with the use of arterial grafts only, even in patients with 3-vessel disease.

We restudied a group of 256 patients suffering 3-vessel disease who underwent CABG with arterial grafts only (both ITAs and the GEA). Mean postoperative follow-up was 51 ± 15 months (up to 84 months), which at present is the longest follow-up of the use of the GEA graft in combination with 2 ITA grafts as yet reported. We compared our results with those of clinical studies in which patients were operated on with vein grafts and/or ITA grafts and in which the actuarial survival was calculated.

**Mortality**

Actuarial 7-year survival in our study group was 91.1%. This is a satisfactory outcome compared with studies in which vein

---

**Selected Abbreviations and Acronyms**

CABG = coronary artery bypass graft surgery
GEA = gastroepiploic artery
ITA = internal thoracic artery
PTCA = percutaneous transluminal coronary angioplasty
grafts, single ITA grafts, or double ITA grafts are used, especially considering that we studied only patients with 3-vessel disease and we included in-hospital mortality in the calculation of the actuarial 7-year survival (Table 2).

Morbidity

**Myocardial Infarction**

Seven-year actuarial freedom from myocardial infarction in our study group was 97.3%. Despite the inclusion of 5 in-hospital infarctions in our calculation of the actuarial freedom from myocardial infarction, the percentage of patients in our study group remaining free from myocardial infarction during follow-up is higher than in the comparable studies (Table 2).

**Reintervention**

The 7-year actuarial probability of remaining free from reintervention after coronary bypass in our study (95.4%) is comparable to that in other studies (Table 2). However, again it should be noted that, in contrast to the other studies, we included 2 in-hospital reoperations.

**Angina Pectoris**

Actuarial freedom from angina pectoris after 7 years was 85.4%, which is considerably lower than in the studies in which vein grafts, single ITA grafts, and double ITA grafts were used (Table 2). Because all patients in our study group were explicitly asked about anginal complaints, we firmly believe that we have not underreported the incidence of angina.

Data published on results in patients with coronary revascularization with vein grafts, single ITA grafts, and double ITA grafts are in most instances difficult to compare because of differences in inclusion and exclusion criteria. A limitation of the study is that we compared our group of patients with historical control subjects. Furthermore, follow-up is still too short to draw definitive conclusions. Nevertheless, if we allow comparisons in this early stage, we demonstrated that mortality, myocardial infarction, and reintervention rates in our patients with 3-vessel disease were at least comparable to the results of other studies. Moreover, our results indicate a lower recurrence of angina pectoris after 7 years of follow-up.

**Acknowledgments**

We thank the Jan Kornelis de Cock Stichting for financial support that made this study possible and Reinoud Brouwer, Leonie de Noo, Carsten Mellema, Robbert Mollema, and Bas Wallis de Vries for helping to take the yearly patient interviews.

**References**


Low Recurrence of Angina Pectoris After Coronary Artery Bypass Graft Surgery With Bilateral Internal Thoracic and Right Gastroepiploic Arteries
T. Margot Bergsma, Jan G. Grandjean, Adriaan A. Voors, Piet W. Boonstra, Peter den Heyer and Tjark Ebels

Circulation. 1998;97:2402-2405
doi: 10.1161/01.CIR.97.24.2402

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 1998 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/97/24/2402

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation is online at:
http://circ.ahajournals.org//subscriptions/