

Early and long-term results of combined endarterectomy and bypass grafting

Magdi H. Yacoub, M.D.

London, England

Early and long-term results of coronary artery bypass grafting depend on an adequate lumen beyond the area of obstruction in the affected coronary artery. It has been our policy not to regard the presence of diffuse peripheral coronary arterial disease or nonvisualization of the distal segment at operation as contraindications to operation. In these patients the artery is explored at operation and, if necessary, additional gas endarterectomy is performed. For this purpose a special set of cannulae designed to deliver CO₂ under pressure to the different coronary arteries was used. To evaluate the results of this policy, all patients receiving coronary artery bypass grafts between October 1969 and October 1976 were reviewed. A total of 640 patients received 1345 grafts. In all, 292 arteries were endarterectomized in 212 patients. This represents 33% of the patients and 22% of all grafted vessels. The incidence of risk factors was slightly higher in patients requiring endarterectomy compared to those who did not (*Table I*).

The 212 patients received 247 additional grafts to nonendarterectomized arteries, bringing the total number of grafts to 539 or 2.5 grafts per patient. Endarterectomy of the ante-

rior descending artery was performed on 120 occasions and accounted for 41% of all endarterectomies in this series, compared to 160 (55%) for the right coronary artery and 12 (4%) for the circumflex artery. Additional procedures were performed in 18 patients (9%) and included excision of left ventricular aneurysm or scar in 11, mitral valve repair or replacement in 3, and aortic valve replacement in 3.

The indication for operation was angina alone in 143 patients, angina and failure in 52, and failure alone in 17. The early and late deaths for the different groups are shown in Table 2. Analysis of survival, using the actuarial method and including hospital mortality showed a 6-year survival of 95% for patients operated on for angina alone and 84% for all patients including those operated on for failure, cardiogenic shock, and

Table 1. Comparison of risk factors; coronary bypass grafting (Harefield Hospital, October 1969 to October 1976), 640 patients

Risk factor	Endarterectomy (212 patients)		No endarterectomy (428 patients)	
	No.	%	No.	%
Family history	89	42	167	39
Smoker	124	59	200	47
Hypertension	31	15	47	11
Hyperlipidemia	47	22	68	16
Diabetes mellitus	10	5	16	4

Table 2. Hospital and late mortality; combined gas endarterectomy and CABG (Harefield Hospital, October 1969 to October 1976)

Group	Early		Late		Total	
	No.	%	No.	%	No.	%
Angina (143)	1	0.7	5	3.5	6	4.2
Angina and failure (52)	4	7.7	5	9.6	9	17.3
Failure (17)	4	24.0	9	53.0	13	77.0
Total (212)	9	4.2	19	9.0	28	13.2

COMBINED GAS ENDARTERECTOMY AND C.A.B.G.
Actuarial Survival Analysis No. of patients 212
(Mean Follow Up) 31.3 Months

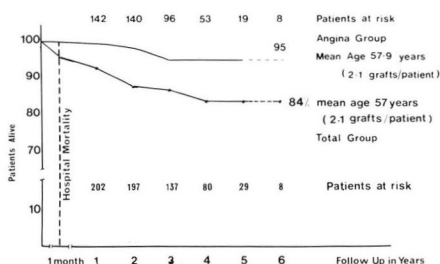


Fig. 1. Actuarial survival analysis.

those requiring combined procedures (Fig. 1). These figures are similar for all patients operated on during the same period. Symptomatic evaluation of 183 patients who were followed up for periods varying from 6 months to 6 years (mean of 31 months) showed that 66% of patients operated on for angina alone were asymptomatic and 31% were improved (Table 3).

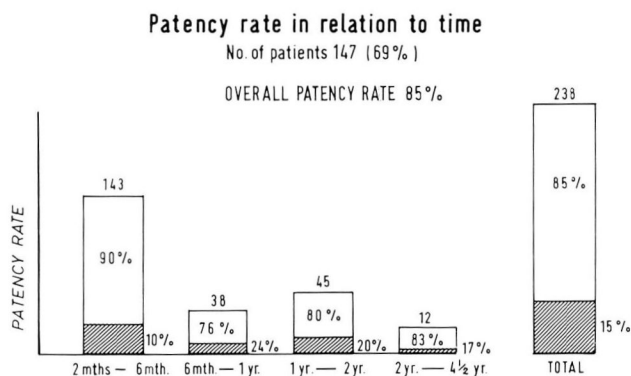
Perioperative myocardial infarction was evaluated by a set of electrocardiographic criteria which included (1) appearance of new Q waves; (2) failure of progression of R waves across the chest; (3) development of intraventricular conduction defects. Thirteen patients (6.1%) showed evidence of new anterior infarcts and 16 (7.5%) showed posterior infarcts, which represent an incidence of 13.6%. The infarcts were in the area of an endarterectomized artery on

Table 3. Postoperative symptoms; combined gas endarterectomy and CABG (mean follow-up 31.3 months)

	Asymptomatic		Improved		Unchanged	
	No.	%	No.	%	No.	%
Angina alone (138)	92	66	42	31	4	3
Angina and failure (41)	21	51	18	44	2	5
Failure alone (4)	1	25	1	25	2	50
Total (183)	114	62	61	34	8	4

COMBINED GAS-ENDARTERECTOMY AND C.A.B.G.

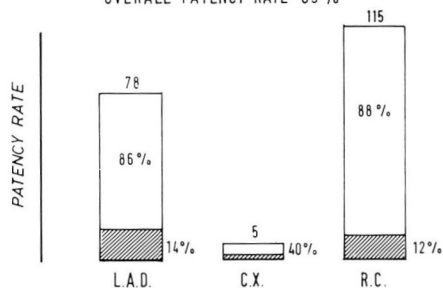
HAREFIELD HOSPITAL Oct.'69 - Oct.'76

**Fig. 2.** Patency rate in relation to time.**COMBINED GAS-ENDARTERECTOMY AND C.A.B.G.****Patency rate of grafts to endarterectomized vessels**

Total No. of grafts 198 (68% of all endarterectomized vessels)

2 weeks - 4 1/2 years (mean 5.3 months)

OVERALL PATENCY RATE 85%

**Fig. 3.** Patency rate of grafts to endarterectomized vessels.

24 occasions, representing an incidence of 8.2% of all endarterectomized arteries. Late myocardial infarction was encountered in 10 patients

(4.8%) during a follow-up as of 6 years (mean 31 months).

Reinvestigation by repeat angiography was performed at periods

varying from 2 weeks to 4.5 years. The overall patency rate of grafts to endarterectomized vessels was 85% (171 of 198 grafts). There was no apparent deterioration in patency rate with time (*Fig. 2*), and no difference in patency rate between grafts

to the right and left coronary systems (*Fig. 3*).

From this study it is concluded that endarterectomy is a valuable additional procedure in patients with diffuse coronary disease.