

Factors influencing patency of coronary bypass grafts

William C. Sheldon, M.D.
Cleveland, Ohio

The immediate relief of angina pectoris was striking in the earliest patients treated with bypass graft surgery in the late 1960s. Early optimism was tempered, however, by the uncertainties of long-term graft patency, particularly in view of the experiences reported with autogenous venous femoropopliteal bypass grafts with which patency ranged from 20% to 90%, depending upon the site of the distal anastomosis, adequacy of runoff, and time. Early postoperative arteriograms of coronary bypass grafts in 48 patients operated upon from May 1967 through September 1968 demonstrated patency in 87.5% of grafts. Encouraged by these results, the indications for surgical treatment were cautiously expanded to include larger numbers of patients.

Patients are selected for bypass graft surgery on the basis of angiographic assessment of their coronary arteries and left ventricle. In many instances, the arteriographic assessment of an artery is supplanted by that of the surgeon at the time of operation, and the various factors influencing graft patency are preempted by these preselection criteria. It is recognized that the greater likelihood of symptomatic patients with graft failure to return for postoperative

study introduces a negative bias into postoperative arteriographic results. This can be overcome only by 100% arteriographic follow-up of survivors or by strict randomization of patients for postoperative arteriography, neither of which has been achieved. Although a large number of patients have returned for routine postoperative studies 1 year or more after surgery, an increasing caseload in the Cardiac Catheterization Laboratory

has precluded the routine 1 year postoperative study, and currently these studies are carried out only when specifically indicated.

In our computerized Cardiovascular Information Registry, the results of 4590 postoperative arteriographic studies are available for analysis and a number of parameters of possible importance in graft patency have been studied:

Patency of IMA vs. vein grafts to anterior descending artery*

	IMA	Vein	Total
No. grafts	845	1268	2113
No. occluded	19	171	190
No. patent	826	1097	1923
Percent patent	97.8	86.5	91.0

* Postoperative angiograms 1974 through 1976.

Patency vs. postoperative interval

Postoperative interval	IMA		Vein		Both	
	No.	%	No.	%	No.	%
<7 months	153	94.1	706	76.6	859	79.7
7-12 months	454	96.9	1956	84.4	2410	86.8
13-24 months	492	95.1	2510	84.7	3002	86.4
25-36 months	51	94.1	350	89.4	401	90.0
37-48 months	28	92.9	171	78.9	199	80.9
>48 months	9	100.0	192	81.8	201	82.6
Total	1187	95.6	5885	83.7	7072	85.7

Patency vs. sex

	IMA		Vein		Both	
	Male	Female	Male	Female	Male	Female
Number	1088	99	5355	530	6443	629
Percent	95.9	92.9	84.4	76.6	86.3	79.2

Patency vs. other risk factors (vein and IMA grafts)

	Hypertension		Diabetes		Smoking	
	≥150/100	<150/90	+	-	+	-
Number	1786	5227	681	4960	3203	2728
Percent	87.0	85.2	84.4	86.8	84.5	87.9

Patency vs. hyperlipidemia (vein and IMA grafts)

	Cholesterol		Triglycerides	
	≥260 mg/dl	<260 mg/dl	≥160 mg/dl	<160 mg/dl
Number	2164	4682	3599	2390
Percent	85.9	85.8	85.4	86.5

Patency vs. severity of preoperative lesion (vein and IMA grafts)

	<50%	50%-75%	76%-99%	100%
Number	454	876	4060	1682
Percent	86.8	84.1	86.1	85.0

Patency vs. preoperative LV function

	Focal akinesia	Generalized hypokinesia
Number	1865	205
Percent	88.2	87.8

Patency vs. emergency or repeat operation

	Emergency operation		+1	Repeat operation	
	+	-		+2	-
Number	43	7029	30	77	7042
Percent	93.0	85.6	70.0	84.0	85.7

+1 Reoperation for same artery (CVIR)

+2 Reoperation for any artery (Irrarrazaval)

Patency vs. perioperative MI in area of grafted artery

	IMA		Vein		Both	
	No.	%	No.	%	No.	%
MI	35	94.3	82	65.9	117	74.4
No MI	1152	95.7	5803	83.9	6955	85.9

Intraoperative electromagnetic flow measurements were of little value in predicting the late patency of grafts except at flow rates of 20 cc per minute or less. Histologic abnormalities identified in vein graft samples at the time of surgery (phlebosclerosis) did not predict graft occlusion.

Insufficient material for late histologic analyses of graft (from reoperations or autopsy) precludes any conclusion regarding the incidence of intimal fibroplasia or atherosclerotic

involvement. Both have rarely been observed.

Despite an initial attrition of grafts, which is probably related to factors of selection as well as to surgical technique, long-term graft patency, up to 106 months postoperatively, has been demonstrated. For the anterior descending artery, patency is better for the IMA graft than for the venous graft. Explanation for reduced graft patency in women remains to be determined.