

Postoperative coronary arteriography

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Postoperative coronary arteriography involves saphenous vein grafting and internal mammary artery opacification as well as coronary arteriography. In our institution, these examinations have been carried out prospectively in two series of near-consecutive patients at three separate times after surgery (*Table 1*). The first series represents patients operated on at the onset, whereas patients of the second series were operated on after 2 years of experience and improvement in surgical techniques.

Saphenous vein graft patency

The cumulative graft patency is detailed in *Table 2*. A significant improvement is observed in patients of the second series at 6 to 18 months and between 54 and 88 months. Graft closure was rarely observed after the first year particularly in the second series, its average yearly rate being recorded at 0.7%.

Graft changes

These were first noted at the 6- to 18-month evaluation and consisted of diffuse and localized narrowing, which at pathologic examination were found to be caused primarily by fibrous intimal proliferation. Moderate to marked narrowing (>40%) was observed less frequently in the second series (*Table 3*). Diffuse narrowing did not progress

Table 1. Clinical material

Time of study after surgery	First 300 cases		301 to 600 cases		Total
	Consecutive series No. 1	All cases	Consecutive series No. 2	All cases	
Within 1 mo					
Number of patients	124	200	83	202	402
Number of grafts	182	304	184	417	721
Between 6 and 18 mo					
Number of patients	105	111	67	91	202
Number of grafts*	133	151	143	175	326
Between 54 and 88 mo					
Number of patients	45	59	37	41	100
Number of grafts*	59	78	75	81	159

* Patent at previous study.

Table 2. Cumulative graft patency in percentage (see *Table 1* for number of grafts studied in each subgroup)

	Within 1 mo	6-18 mo (1 yr)	54-88 mo
Consecutive series No. 1	86.3	66.8	57.7
Consecutive series No. 2	91.9	85.5	83.2
All grafts	86.6	75.9	67.8

after the first year and it did not appear to lead to late graft occlusion. Grafts with localized stenoses, however, became occluded in 21.6% of cases (8 of 37), as compared to 8.1% (9 of 102) without this alteration ($p < 0.02$)

Other obstructive changes were noted in 8.8% of the grafts at the 5- to 7-year examination and appeared to be of atherosclerotic origin (histologic proof in three patients). Its occurrence (mean yearly rate of 1.8%) was similar to that found in unbypassed arteries without significant disease (2%), as described be-

low.

Changes in grafted coronary arteries

Changes that appeared related to surgery may have involved coronary artery segments proximal to, at, or distal to the graft-coronary artery anastomosis (*Table 4*). Total obstruction of the proximal segment at the site of a preexisting narrowing was observed in 64.4% of cases at 5 to 7 years after surgery. Increased narrowing by at least 25% or new stenosis $>50\%$ was observed in 5.1% at or distal to the graft-artery anastomosis of arteries, which were partially obstructed before surgery.

Changes in ungrafted coronary arteries

Arteries without narrowing $>25\%$ before surgery developed significant stenosis ($>50\%$) during the first 5 to 7 years following surgery in only 11.9% (7 of 59) or at an average yearly rate of 2%. Arteries with narrowing between 25% and

Table 3. Graft narrowing $>40\%$ noted between 6 and 18 months after surgery

	Number of patent grafts studied	Grafts with localized narrowing	Grafts with diffuse narrowing
Consecutive series No. 1	103	No. 17 16.5%*	No. 32 31%*
Consecutive series No. 2	133	No. 8 6%*	No. 17 12.8%*
All grafts	278	No. 30 10.8%	No. 58 20.9%

* $p < 0.025$.

Table 4. Progression of obstructive disease (increased narrowing by at least 25% or new stenosis of at least 50%)

	Number studied	Progression	
		No.	%
Grafted arteries (partially obstructed preoperatively)			
Proximal segment	146	94	64.4
At or distal to anastomosis	146	22	15.5
Ungrafted arteries (with narrowing >50%)	62	27	43.6

50% showed progression in 23% (9 of 39), whereas 44% of those with stenoses >50% became worse (27 of 62). Significant progression (increased narrowing by at least 25% or new stenosis >50%) occurred at an average yearly rate of 7.3% in these later patients with significant obstructive disease before surgery.

Changes in grafted arteries as compared to ungraftable vessels

A greater progression in grafted arteries is noted (*Table 4*). It is primarily due to total occlusion at the site of the preexisting stenosis. This complication is of little consequence as long as the graft remains patent.