Recent advances in coronary arterial surgery

Nicholas T. Kouchoukos, M.D.

Birmingham, Alabama

Risk of operation

Perhaps the most significant development in the surgery of coronary arterial disease in the past several years has been the demonstration of a progressively declining risk of operation, both in terms of hospital mortality and cardiac-related morbidity. An analysis of our experience with isolated coronary bypass grafting procedures during an 8-year interval ending in December 1977 has demonstrated a statistically significant reduction in the subgroups of patients with left main and three-vessel disease (*Table 1*). As *Table 1* indicates, selection of more favorable patients for operation has not been a factor contributing to the improved early results. The reduction in mortality has occurred despite an increase in the complexity of the procedures, as evidenced by an increase in the number of grafts inserted per patient. There has also been a substantial decline in the incidence of perioperative myocardial infarction. From our analysis, it has not been possible to isolate a single factor responsible for the improved early results. Factors considered important include (1) better anesthetic management; (2) increasing surgical experience and improved techniques; (3) more complete revascularization, and (4) perhaps most important, improved methods of intraoperative myocardial protection.

We observed reductions in hospital mortality and especially in the incidence of perioperative infarction when profound myocardial cooling replaced intermittent ischemic arrest and more recently, when hypothermic cardioplegic techniques were implemented. These improved methods of myocardial protection have allowed more extensive revascularization and the addition of revascularization to other procedures such as valve replacement, ventricular aneurysmectomy, and repair of rupture of the ventricular septum with improved early results. Analysis of the long-term results of bypass grafting indicates enhanced survival among the patients operated on in the more recent time interval, demonstrating the important effect of low hospital mortality on late survival.

Table 1. Coronary artery bypass grafting; University of Alabama Medical Center, 1970–1977

	1970–73 N = 590	1974–77 N = 2467	p value
Age	53	53	NS
Males	89%	88%	NS
Unstable angina	46%	49%	NS
Previous infarction	65%	74%	0.03
Congestive failure	30%	32%	NS
Extent of disease			
Left main artery	14%	15%	NS
Three vessel	42%	54%	<0.001
Left ventricle dysfunction*			
Ejection fraction <50%	61%	58%	NS
30-day mortality			
Overall	2.7%	1.2%	<0.01
Left main artery	6.1%	1.7%	<0.02
Three vessel	3.6%	1.4%	<0.01
Perioperative infarction*	11.4%	2.3%	<0.001
No. of grafts per patient	1.9	2.9	. . .

* Data not available for all patients.
NS = Not significant.

High and low risk patients

The improved early results now being obtained in most experienced surgical centers have led to a reappraisal of the role of myocardial revascularization in patients with substantial impairment of left ventricular function, and those with persistent myocardial ischemia early after myocardial infarction.

Asymptomatic or minimally symptomatic patients with multiple-vessel disease and little or no impairment of ventricular contractility are also being considered for elective revascularization in view of the very low (approximately 1%) risk of operation, and the demonstration of 5-year survival rates well above 90%.

Unstable angina pectoris

The results of several randomized trials comparing medical and surgical therapy for patients with rigidly defined unstable angina pectoris have demonstrated no distinct advantage for urgent myocardial revascularization. Aggressive medical management followed by semielective operation, particularly in patients with multiple-vessel disease, has produced early results that equal those for elective revascularization in patients with stable angina.

Table 2. Hospital costs of medical and surgical treatment of unstable angina pectoris for the first 2 years after randomization

Mode of therapy	Mean ± SD	No. of patients
Medical	$ 4,728 ± $1,590	22
Surgical	$ 9,528 ± $2,942	34
Late surgical (Crossover)	$20,218 ± $9,727	18
	F = 44.9; p < 0.01	

Cost effectiveness

The cost effectiveness of coronary bypass grafting has not been clearly established. However, it appears that in certain subsets of patients, i.e., those with unstable angina, substantial savings in hospital costs within the first 2 years after diagnosis will be achieved if those patients who are likely to fail medical therapy can be identified and operated upon promptly (*Table 2*).