

# Survival following myocardial revascularization

## *An analysis at 8 years*

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Since direct revascularization surgery was first begun at St. Luke's Hospital, we have closely followed our patients through ongoing research projects or yearly questionnaires or both. A high degree of follow-up has been maintained yearly (97.5% to June 1976). This review includes 4603 patients who had direct revascularization surgery at St. Luke's Hospital from 1968 through June 1, 1976.

These 4603 patients had an operative mortality of 4% (*Fig. 1*). At 4 years, there was 88% survival, and at 8 years, 75% survival which is 3.06% annual attrition rate. The term annual attrition rate is used to describe average annual death rate, and will in all cases include operative mortality.

A total of 1256 patients who had revascularization from 1968–1971 had an average operative mortality of 9%. This includes operative mortality of 16% in 1968 and 19.5% in 1969, with subsequent yearly improvement to the present time. At 8 years, 69.5% survived, resulting in a 3.83% annual attrition rate.

A great deal of difference is noted in the experience of the last 4 years, in which 3347 patients had revascularization operation, with an average 2.1% operative mortality and an

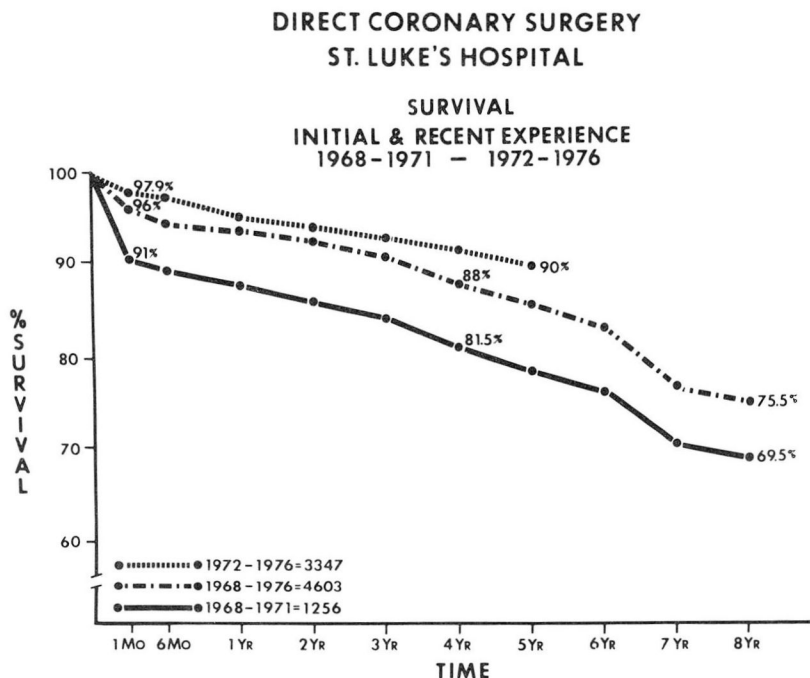


Fig. 1

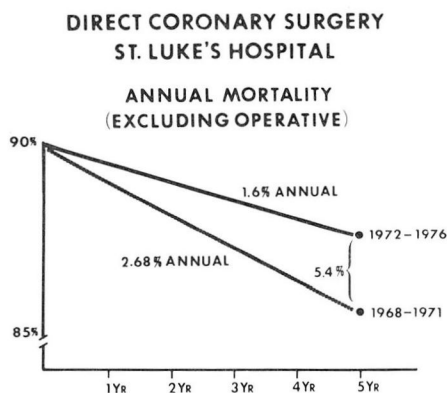


Fig. 2

**DIRECT CORONARY SURGERY  
ST. LUKE'S HOSPITAL**

**SURVIVAL ACCORDING TO AGE  
1972 - 1976**

AGE	NUMBER	OP. MORT	ANNUAL ATT. RATE
20-29	4	0	0
30-39	113	0	0.8%
40-49	766	1.53%	1.72%
50-59	1444	1.55%	2.0%
60-69	635	3.8%	2.26%
70-89	53	10.9%	2.9%
	<b>3015</b>		

Fig. 3

annual attrition rate of 2% (90% survival at 5 years).

The long-term differences are not explained by the gross differences in operative mortality (*Fig. 2*). Even excluding the operative mortality, our earlier group had a 2.67% annual mortality compared to 1.6% annual mortality of our more recent group ( $p > 0.001$ ). In addition to better

operative skills, pump perfusion, anesthesia skills, cardiology support, and intensive care nursing techniques, more complete revascularization has also played its part. In 1968-1971, there was an average of 1.98 grafts per patient compared to 2.94 grafts per patient in the more recent group. In addition, perioperative in-

farction has dropped from 8% to an average of 4% currently.

Figure 3 shows the effect of age on operative mortality and annual attrition rate, as well as the incidence of surgery in the various age groups.

Figure 4 compares operative mortality and long-term survival in one-, two-, and three-vessel disease. Operative mortality is 1.4%, 2.0%, and 2.4% in one-, two-, and three-vessel disease respectively, and 5-year survival using the Life Table Method is 96%, 92.7%, and 90.7%, yielding an annual attrition rate of 0.8%, 1.46%, and 1.86% in their respective categories.

We have found that the quality of

left ventricular function is a major determinant of operative mortality and long-term survival. Figure 5 shows the very low operative mortality and annual attrition rate in patients with normal left ventricular function compared to the somewhat higher figures for those with discrete inferior and anterior scar, and the greatly increased operative and late mortality of patients with severe left ventricular dysfunction and left ventricular aneurysm.

Summary

(1) Long-term survival in 97.5% of 4603 patients who had revascularization at St. Luke's Hospital in Milwaukee, Wisconsin is presented. (2) Recent results (1972-1976) are much better than the results in 1968-1971. Operative mortality average is 9% early and 2.1% in the more recent group; annual attrition rate is 3.83% and 2% in the early versus late groups. (3) Prognosis is somewhat worse in multivessel disease, that is, operative mortality 1.4% and annual attrition rate 0.8% for one-vessel disease; three-vessel disease has operative mortality of 2.4% and an annual attrition rate of 1.86%. The differences are much less divergent than any medical series reported and suggests to us that two- and three-vessel disease and possibly even one-vessel disease have better prognosis when treated surgically. (4) Another major determinant of ultimate prognosis is quality of left ventricular function. Operative mortality and annual attrition rate increase progressively with increasing left ventricular scar.

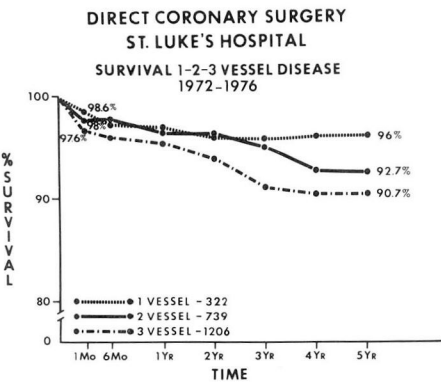


Fig. 4

DIRECT CORONARY SURGERY  
ST. LUKE'S HOSPITAL  
SURVIVAL RELATED TO LV. FUNCTION  
1972-1976

	NUMBER	OP.MORT	%SURVIVAL 5 YRS.	ANNUAL ATT.RATE
NORMAL	835	1.0%	96%	0.8%
INFERIOR SCAR	260	2.4%	90.8%	1.8%
ANTERIOR SCAR	166	2.5%	88.4%	2.3%
SEVERE	76	11.3%	77%	4.6%
ANEURYSM	107	8.8%	71%	5.8%

Fig. 5