CLINICAL INVESTIGATIONS

Favorable early and long-term prognosis following coronary bypass surgery therapy for myocardial infarction: Results of a multicenter trial

Coronary bypass surgery was performed before hospital discharge on 82 (21%) of 386 consecutive patients enrolled in the Thrombolysis and Angioplasty in Myocardial Infarction (TAMI) multicenter trial of intravenous tissue plasminogen activator and coronary angioplasty for acute myocardial infarction. Time from infarct symptom onset to coronary bypass surgery was 7.3 ± 1.9 hours for 24 patients operated upon on an emergency basis and 9.3 ± 5.2 days for 58 patients having late in-hospital surgery. There were no operative deaths and five in-hospital deaths in the surgical group, all of which occurred in patients with preoperative cardiogenic shock. Although patients in the surgical group were older (59.7 ± 10.4 years versus 54.9 ± 10.2 years; $p = 0.03$), had more extensive coronary artery disease (42% three-vessel disease versus 11%; $p = 0.001$), and had a higher incidence of anterior wall myocardial infarction (48% versus 39%; $p = 0.02$), in-hospital mortality for the surgical group (6%) was similar to that in 301 patients not undergoing surgery (7%) in this trial. For patients discharged from the hospital, mortality at 1 year was 2.5% in the surgical group and 1.8% in patients not having coronary bypass surgery before hospital discharge. At a 1 year follow-up, there were no significant differences in the frequency of cardiac or noncardiac-related hospitalizations or in event-free survival between surgical and nonsurgical groups. The majority of patients in both groups considered themselves to be in excellent or good condition. Coronary bypass surgery can be performed with low morbidity and mortality rates in close temporal association to acute myocardial infarction. Despite the presence of high-risk clinical descriptors (age, extent of coronary disease, and anterior myocardial infarction) in surgical patients, a similar hospital and 1-year mortality, event-free survival, angina status, and general health status was observed in both groups of patients. (AM HEART J 1989;118:199.)

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Surgical coronary revascularization has played both primary and adjunctive roles in interventional strategies for myocardial reperfusion during acute myo-

cardial infarction. Although emergency coronary bypass surgery has been advocated as primary reperfusion therapy for evolving acute myocardial infarction,[1-3] logistic and financial considerations have limited this approach. Coronary bypass surgery may also be valuable when employed as part of a sequential reprfusion strategy following thrombolytic therapy or coronary angioplasty for myocardial infarction.[4-9] With the use of this approach, myocardial reperfusion can be initiated following intravenous thrombolysis or coronary angioplasty in the vast majority of patients and coronary bypass surgery can be used only if needed because of threatened coro-
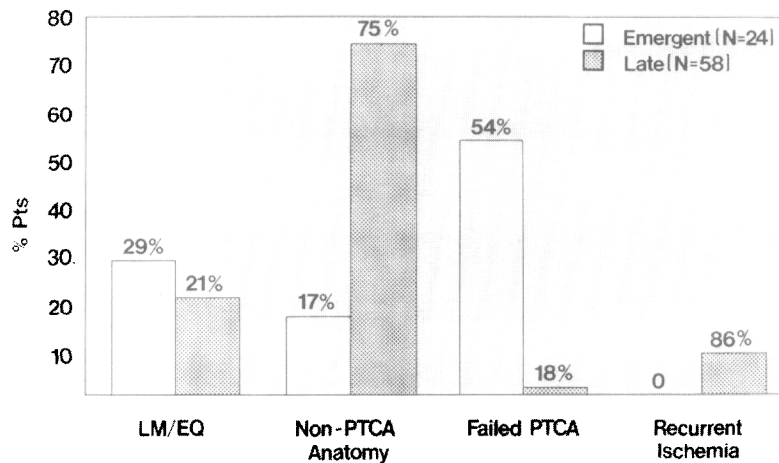
Fig. 1. Relative indications for coronary bypass surgery in emergency *(emergent)* and late coronary bypass surgical groups.

nary reocclusion or high-risk coronary anatomy. Rather than establishing myocardial reperfusion, surgery assures the maintenance of reperfusion established by pharmacologic or percutaneous catheter techniques and is associated with significant preservation of global and regional (infarct zone) left ventricular function.[9]

Many patients with myocardial infarction who receive intravenous thrombolytic therapy with or without percutaneous transluminal coronary angioplasty without subsequent emergency surgical coronary revascularization will, however, require coronary bypass surgery later during their initial hospitalization. The long-term outlook for patients undergoing surgery as part of a sequential reperfusion strategy is poorly defined.[9, 10] The purpose of the present study was to determine the relative need for emergency versus delayed (in-hospital) coronary bypass surgery in a large group of patients treated sequentially with intravenous tissue plasminogen activator and coronary angioplasty therapy for acute myocardial infarction, and to examine the possible influence of coronary bypass surgery on in-hospital and long-term (1 year) mortality, functional status, and quality of life.

METHODS

Patient selection. From January through October 1986, coronary bypass surgery was performed before hospital discharge on 82 (21%) of 386 consecutive patients enrolled in the Thrombolysis and Angioplasty in Myocardial infarction (TAMI) trial of intravenous tissue plasminogen activator and coronary angioplasty therapy for acute myocardial infarction. The details of the study design have been reported previously.[11] Enrollment criteria included chest pain.of less than 6 hours' duration and ≥1 mm ST segment elevation in two or more contiguous electrocardiographic (ECG) leads. Exclusion criteria included age

>75 years; history of recent stroke, surgery, or trauma; previous history of hemorrhage; prior coronary bypass surgery; prior Q wave infarction in the acutely ischemic region; and cardiogenic shock (blood pressure less than 85 mm Hg unresponsive to volume infusion).

Interventional protocol. Informed consent was obtained from the patient before treatment with intravenous tissue plasminogen activator. For the first 178 patients enrolled in the TAMI trial, the dose was 60 mg over 1 hour, 20 mg over the next 2 hours, and 10 mg for each of the last 5 hours of infusion. In the remaining 208 patients, the dose was 1.0 mg per kilogram of body weight to a maximum of 90 mg over 1 hour, with the remaining amount of tissue plasminogen activator (or a 150 mg total) being equally divided over a 5-hour maintenance infusion. For both intravenous regimens, 10% of the initial 1-hour dose was administered as a bolus. In the patients operated on during the continuous infusion stage, t he tissue plasminogen activator infusion was maintained until the start of the surgical procedure. Selective coronary angiography and left ventriculography were performed 90 minutes after initiation of tissue plasminogen activator therapy. In patients with persistent total occlusion in the infarct-related artery (Thrombolysis In Myocardial Infarction [TIMI] grade 0 to 1 flow), immediate percutaneous transluminal coronary angioplasty was attempted if the coronary anatomy was suitable for angioplasty. Patients having greater than 50% residual stenosis with TIMI grade 2 or 3 flow in the coronary anatomy suitable for angioplasty were randomized to receive either immediate or elective (pre-discharge) coronary angioplasty. Specific criteria for exclusion from randomization to immediate or elective angioplasty were (1) >50% left main coronary stenosis with a left anterior descending or circumflex infarct-related vessel; (2) ≥75% of left main coronary stenosis with a right coronary infarct-related vessel; (30 severe diffuse coronary atherosclerosis unsuitable for coronary angioplasty; (4) patients in whom the infarct vessel could not be determined; (5) cardiogenic shock developing after initiation of thrombolytic therapy. Patients

who developed cardiogenic shock after enrollment underwent emergency coronary angioplasty without randomization if the coronary anatomy was suitable.

Coronary angioplasty was attempted using a steerable dilatation system. In the event that coronary angioplasty was unsuccessful in maintaining vessel patency, a coronary perfusion catheter (Advanced Cardiovascular Systems Inc., Mountain View, Calif.) was placed. This 4.3F catheter has 36 side holes arranged in a spiral fashion along its distal 10 cm that allow pulsatile blood flow to enter proximally and exit distally when the catheter is positioned appropriately across the coronary occlusion.[12, 13] The catheter is advanced into the coronary artery over an exchange guide wire and is intermittently flushed with heparinized solution.

Not all patients with unsuccessful immediate percutaneous transluminal coronary angioplasty in the TAMI trial had emergency coronary bypass surgery. Patients were assessed on an individual basis for clinical data suggesting a large, viable, jeopardized myocardial bed or severe multivessel coronary artery disease. The decision to perform emergency coronary bypass surgery was at the discretion of the principal investigator. Patients having complex or severe multivessel coronary artery disease who were felt to be poor candidates for coronary angioplasty were considered for late (in-hospital) coronary bypass surgery. These patients were maintained on heparin and antiplatelet therapy until coronary bypass surgery was performed. The clinical characteristics of both emergency and delayed surgical groups are reviewed below.

Data collection and management. Findings in the trial were collected by the study nurses and were reviewed by the principal investigator at each clinical site. Data entry was performed at each clinical site and the coordinator center. Any discrepancies in data entry were resolved by primary review of patients' records. All survivors of hospital discharge were followed for at least 1 year or until death. These patients were contacted by phone and were asked to fill out standardized questionnaires regarding general health status, angina status, and return to work.

Statistical analysis. Values for continuous variables are recorded as mean ± standard deviation and for discrete variables values are recorded as percentages. Comparisons between groups were made by the chi square test for discrete variables and by the Wilcoxon signed-rank test for continuous variables.

RESULTS

Emergency coronary bypass surgery. Emergency coronary bypass surgery was performed on 24 (6.2%) of 386 patients enrolled in the TAMI 1 trial. The clinical demographics and left ventricular function analysis in this group have been reviewed in detail previously.[9] These 24 patients (17 men and 7 women) had a mean age of 56.5 years, received intravenous tissue plasminogen activator therapy at 2.7 ± 0.8 hours after myocardial infarction symptom onset, and underwent emergency coronary bypass surgery

Table I. Clinical characteristics of patients having emergency or late (in-hospital) coronary bypass surgery in the TAMI 1 trial

	Emergency	Late
No. patients	24	58
Age (yr)	56.5 ± 12.8	61.1 ± 6.8
Male	71%	81%
Anterior MI	67%	40%
Time to TPA*	2.7 ± 0.8hr	2.8 ± 0.9 hr
Time to surgery*	7.3 ± 1.9hr	9.3 + 5.2days
Infarct artery patent†	88%	84%
Preop shock	33% (8 pts)	7% (4 pts)

MI, Myocardial infarction; TPA, tissue plasminogen activator; TAMI, Thrombolysis and Angioplasty in Myocardial Infarction; pts, patients.
*From infarct symptom onset.
†At acute cardiac catheterization.

at 7.3 ± 1.9 hours after the onset of chest pain. Hemodynamics consistent with preoperative cardiogenic shock had developed following the initiation of intravenous tissue plasminogen activator (t-PA) therapy in eight patients (33%). The indication for emergency surgery was left main or equivalent coronary disease in seven patients, coronary anatomy unsuitable for angioplasty in four patients, and unsuccessful emergency coronary angioplasty in 13 patients (Fig. 1). Infarct-related artery patency was achieved preoperatively by pharmacologic or mechanical means in 21 of 24 (88%) patients. There were no operative deaths and three hospital deaths (12.5%), all occurring in patients who had manifested preoperative cardiogenic shock. The clinical characteristics of patients who had emergency coronary bypass surgery are compared to the characteristics of those patients who had delayed (in-hospital) bypass surgery in Table I.

Late (in-hospital) surgery. Coronary bypass surgery was performed late in the hospital following intravenous t-PA therapy and/or coronary angioplasty in 58 (15%) patients. These 58 patients (47 men and 11 women), with a mean age of 61 years, received intravenous t-PA therapy 2.8 ± 0.9 hours after the onset of myocardial infarction and had coronary bypass surgery an average of 9.3 ± 5.2 days after symptoms onset. The indication for coronary bypass surgery was left main or equivalent coronary disease in 12 patients, coronary anatomy unsuitable for angioplasty in 43 patients, and failed angioplasty (late elective) in three patients (Fig. 1). Infarct artery patency was achieved at the time of acute catheterization in 49 of 58 (84%) patients. There were no operative deaths and two (3.4%) in-hospital deaths. Both deaths occurred in patients with preoperative cardiogenic shock hemodynamics that developed pre-

Table II. Comparison of patients with and without coronary bypass surgery in the TAMI-1 trial

	Surgery	*No surgery*
No. patients	82 (21%)	301 (79%)
Age*	59.7 ± 10.4	54.9 ± 10.2
Male	77%	79%
Diabetes	21%	12%
No. vessels diseased		
1	28%	53%
2	24%	29%
3†	42%	11%
Anterior MI‡	48%	39%
LVEF (%) (acute catheterization)	50.4 ± 10.7	52.4 ± 11.3
Death in hospital	6%	7%

LVEF, Left ventricular ejection fraction; other abbreviations as in Table I.
*p = 0.03.
†p = 0.0001.
‡p = 0.02.

Table III. Hemorrhage and transfusion requirements following surgery

	Emergency (n = 24)	*Late* (n = 58)
Nadir hemoglobin (gm)	9.0 ± 1.0	9.1 ± 0.8
Chest tube drainage (ml)*	1685 ± 1353	991 ± 488
Transfusion*	Mean (range)	Mean (range)
PRBC (units)	5.6 (0-15)	5.6 (0-12)
FFP (units)	3.9 (0-14)	1.3 (0-6)
Cryo (units)	3.9 (0-18)	1.7 (0-20)
Plate (packs)	3.0 (0-20)	1.3 (0-12)
Excessive hemorrhage	4/24	1/58
Surgical reexploration	3/24	0/58

Cryo, Cryoprecipitate; FFP, fresh frozen plasma; plate, platelets; PRBC, packed red blood cells.
*Over 24 hours postoperatively.

cipitously following episodes of recurrent chest pain and ECG abnormalities consistent with acute coronary reocclusion. Preoperative cardiogenic shock hemodynamics were also noted following papillary muscle rupture in one patient and following suspected silent coronary reocclusion in one patient, respectively. Bypass surgery was performed on an emergency basis in all four patients who developed preoperative cardiogenic shock in the late surgical group.

Overall surgical experience. Coronary bypass surgery was performed in 82 (21%) of 386 consecutive patients treated with intravenous t-PA and coronary angioplasty for acute myocardial infarction (emergency, 24 patients; late, 58 patients). The clinical characteristics of the 82 patients undergoing bypass surgery during their initial hospitalization are compared to those of the remaining patients in the trial who did not undergo bypass surgery in Table II. Patients in the surgical group were older (59.7 ± 10.4 years versus 54.9 ± 10.2 years; p = 0.05), had more extensive coronary artery disease (42% three-vessel disease versus 11%; p = 0.0001), and had a higher incidence of anterior wall myocardial infarction (48% versus 39%; p = 0.02). Patients in the surgical group more often had diabetes mellitus and a lower resting left ventricular ejection fraction on acute left ventriculography, although these differences were not statistically significant.

In spite of the presence of high-risk clinical descripters (age, extent of coronary disease, and anterior myocardial infarction), in-hospital mortality was similar in surgical (6%) and nonsurgical (7%) groups. There were no operative deaths and five in-hospital deaths in the surgical group, all of which occurred in patients with preoperative cardiogenic shock (mor-

tality in shock of 42%). Preoperative shock was present in 8 of 24 (33%) emergency surgical patients and in 4 of 58 (7%) late surgical patients. Shock appeared to be precipitated by coronary reocclusion (three patients) or papillary muscle rupture (one patient) in the late surgical group. Patients undergoing late in-hospital surgery were more likely to have internal mammary artery grafts utilized as bypass conduits (34.8%) than were patients who had emergency surgical revascularization (16.6%). The average perioperative (24-hour) transfusion requirements for packed red blood cells was similar for both emergency and late surgical groups, although total blood product requirements appeared greater in the emergency group (Table III).

Long-term follow-up. All patients in the surgical and nonsurgical groups were followed for at least 1 year after hospital discharge or until death during follow-up. A low incidence of death, recurrent myocardial infarction, death, and/or infarction, coronary bypass surgery, and coronary angioplasty was noted for both groups of patients (Fig. 2). There were no significant differences between groups with respect to these clinical end points. For patients discharged from the hospital, mortality at 1 year was 2.5% in the surgical group and 1.8% in patients not having coronary bypass surgery. At 1-year follow up, there were no significant differences in the frequency of cardiac and/or noncardiac-related hospitalizations or in event-free survival between surgical and nonsurgical groups (Fig. 3). Event-free survival (excluding noncardiac hospitalization) was 77.2% in the surgical group and 72.6% in the nonsurgical group.

Angina status (Canadian Heart Association classification) was evaluated at follow-up in all surviving patients. Angina was present in 31% of surgical patients (class 1 or 2 in 80%; class 3 or 4 in 20%) and

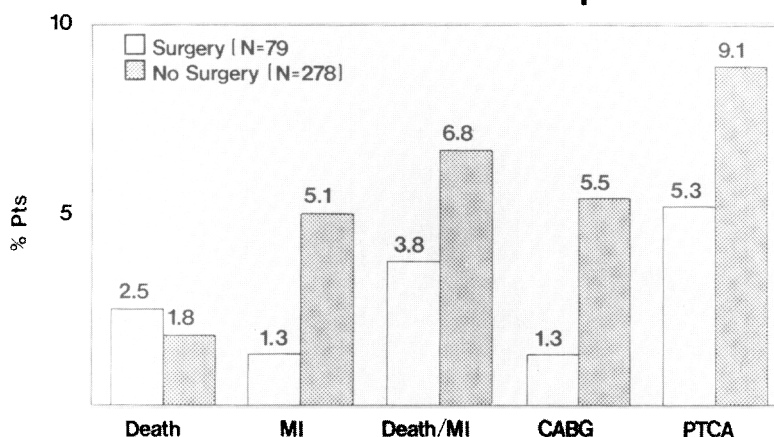## Coronary Bypass Surgery In The TAMI 1 Trial

One Year Follow-up

Fig. 2. Relative percentage of patients at 1-year follow-up who experienced death and/or myocardial infarction, coronary bypass surgery, or follow-up coronary angioplasty. *CABG,* Coronary artery bypass grafting; *MI,* myocardial infarction; *PTCA,* percutaneous transluminal coronary angioplasty.

in 44% of nonsurgical patients (class 1 or 2 in 85%; class 3 or 4 in 15%). Angina was thus slightly more frequent in patients who had not undergone surgical coronary revascularization but was confined to Canadian Heart Association class 1 or 2 in the majority of patients in both groups.

All surviving patients were asked to assess their general health status at 1-year follow-up, as illustrated in Table IV. The majority of patients in both groups (74% surgical; 80% nonsurgical) considered themselves to be in excellent or good condition. Work status at 1 year is shown in Table V. A similar percentage of patients in both groups were either unemployed or disabled. More patients in the surgical group were retired, consistent with a significantly greater mean age of patients in this group.

DISCUSSION

This study evaluates the practice of coronary bypass surgery in a large group of patients enrolled in a multicenter trial of intravenous tissue plasminogen activator and percutaneous transluminal coronary angioplasty therapy for acute myocardial infarction. Survivors at hospital discharge were followed for at least 1 year after infarction with respect to survival, functional status, and quality of life. An important finding of this study is the observation that there were no operative or hospital deaths in patients with stable preoperative hemodynamics despite the fact that surgery was performed in close temporal association to acute myocardial infarction. Twelve patients (15%) of the entire surgical series had cardiogenic

Table IV. General health status at 1 year*

	Surgery	*No surgery*
Excellent	21/74 (28%)	52/238 (22%)
Good	34/74 (46%)	138/238 (58%)
Fair	14/74 (19%)	39/238 (16%)
Poor	5/74 (7%)	9/238 (4%)

*Data from 312 of 359 (87%) survivors discharged from hospital.

shock hemodynamics prior to surgery, and the hospital mortality in this subset was 42%. These data suggest that coronary bypass surgery for the indications noted can be performed safely in close temporal association with acute myocardial infarction in the majority of patients.

Although all patients in the trial received intravenous thrombolytic therapy with tissue plasminogen activator followed by intravenous heparin and antiplatelet therapy, clinically significant hemorrhage occurred in only 5 of 82 (6.1%) surgical patients. Surgical reexploration for postoperative hemorrhage was performed in three patients (3.7%), all from the emergency surgical group. Hemorrhage was felt to be secondary to a generalized coagulopathy in two of these patients and due to a discrete, surgically correctable cause of bleeding (vein graft branch) in one patient. The nadir of postoperative hemoglobin in perioperative (24 hours) packed red cell transfusion requirements were similar for both early and late surgical groups. The overall blood product replacement (fresh frozen plasma, cryoprecipitate, platelets)

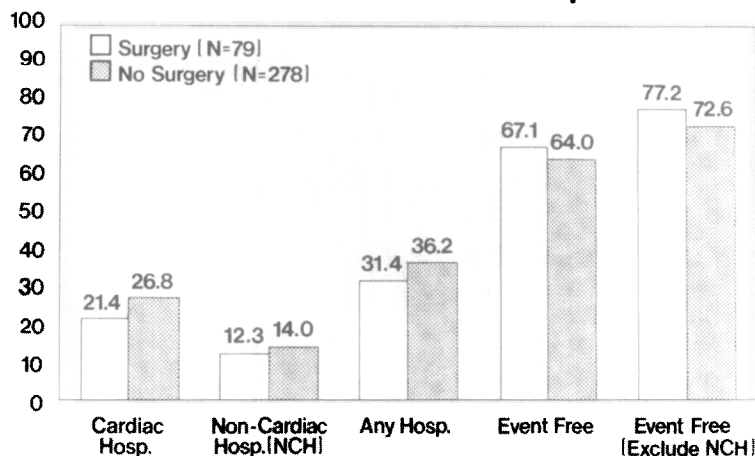## Coronary Bypass Surgery In The TAMI 1 Trial

One Year Follow-up

Fig. 3. Relative percentage of patients requiring cardiac-related hospitalization, noncardiac-related hospitalization, any hospitalization, having event-free survival with or without excluding noncardiac hospitalization. *NCH*, Noncardiac hospitalization.

Table V. Work status at 1 year

Work status	Surgery	No surgery
Full time	28%	48%
Part time	10%	6%
Homemaker	2%	4%
Retired	46%	30%
Disabled	10%	8%
Unemployed	3%	1%
Temporarily laid off	0%	2%
Other	2%	1%

appeared greater in patients having emergency surgery, although factor replacement was frequently administered prophylactically in anticipation of a hemorrhagic diathesis that did not subsequently occur. The present series of tissue plasminogen activator-treated patients compares favorably with other reported series of patients having coronary bypass surgery following streptokinase-mediated coronary thrombolysis with respect to overall transfusion requirements.[4, 14]

Although fibrin specificity with relative preservation of circulating coagulation factors and increased efficacy of coronary recanalization has made recombinant t-PA an attractive intravenous agent for coronary thrombolysis,[16-18] no randomized comparison of coronary bypass surgery following coronary thrombolysis with streptokinase versus t-PA is available. The relative fibrinogen sparing following the use of t-PA may be of importance in patients undergoing a major surgical procedure.[19] Relatively high and similar incidences of periaccess hematoma and overall transfusion requirements have been noted in patients having emergency coronary angiography and/or angioplasty following either streptokinase or t-PA therapy.[20]

It is important to note that infarct artery patency was achieved by pharmacologic and/or balloon catheter intervention during the initial catheterization procedure in 88% of the emergency and 84% of patients in the late surgical groups. Unlike prior studies of the use of emergency coronary bypass surgery in the treatment of acute myocardial infarction, in the present series surgery was not used to achieve myocardial reperfusion but rather to maintain reperfusion that already been established by other means. This fact probably underlies the observation that the relative timing of emergency coronary bypass surgery (less than versus greater than 6 hours after infarct symptoms onset) did not influence the degree of preservation in left ventricular function noted when comparing preoperative and late (pre-discharge) contrast left ventriculograms, as we have shown previously.[9] Likewise, timely myocardial reperfusion with subsequent muscle salvage may have made patients in the late surgical group more suitable candidates for surgery and thus may have favorably influenced their selection for surgical therapy.

The possible role of early surgery in preventing catastrophic outcomes in patients with severe multivessel disease is raised by this trial's results. Both

deaths in the late surgical group occurred in patients who manifested clinical evidence for coronary reocclusion with subsequent development of cardiogenic shock before bypass surgery could be performed. One of these patients had a suboptimal result of coronary angioplasty (coronary dissection) in the infarct-related artery, and the other patient had critical multivessel disease following successful pharmacologic recanalization of the infarct-related artery. If these patients had been directed to earlier coronary bypass surgery from the cardiac catheterization laboratory at a time when the infarct-related artery was patent, myocardial perfusion might have been maintained and late coronary reocclusion might have been prevented.

The present study allows a comparison of survival and relative morbidity in patients who underwent coronary bypass surgery as part of the sequential reperfusion strategy for the treatment of myocardial infarction compared with patients treated solely with intravenous thrombolysis with or without coronary angioplasty. Although patients who had coronary bypass surgery during their initial hospitalization were older, had more extensive coronary artery disease, and had a higher incidence of anterior wall myocardial infarction, hospital (6% versus 7%) and 1-year (2.5% versus 1.8%) mortality were similar in surgical and nonsurgical groups, respectively. No differences were noted with respect to the occurrence of nonfatal myocardial infarction, subsequent coronary bypass surgery or angioplasty, or cardiac or noncardiac-related hospitalizations. One-year event-free survival (excluding noncardiac-related hospitalization) was remarkably high (72.2% surgical; 72.6% nonsurgical) in both groups of patients. This observation suggests that coronary bypass surgery had a positive influence when performed in-hospital in view of the significantly greater occurrence of "high-risk" clinical predictors in patients undergoing surgery.

The aggressive sequential reperfusion strategy employed in this trial allowed for the early detection and treatment (coronary bypass surgery) of patients with extensive multivessel coronary disease prior to hospital discharge. In addition, these patients may have achieved some benefit from early infarct-related artery recanalization and myocardial reperfusion by pharmacologic or angioplasty intervention. The present series compares favorably with historical series noting a 5% to 15% 1-year mortality for victims of myocardial infarction who survive to hospital discharge.[21-24] These 1-year mortality results with an aggressive reperfusion strategy employing coronary bypass surgery compare favorably with 1-year mor-

tality results in patients treated conservatively after intravenous thrombolytic therapy administration. Out-of-hospital mortality at 1 year following infarction in the GISSI (Gruppo Italiano pen lo Studio della Streptochinase nel 'Infarcto miocardioco) trial was 7.1%.[25] Although direct comparisons are not valid, the striking difference in 1-year mortality (2.5% in surgical and 1.8% in nonsurgical patients) noted in the present series suggests that further evaluation of the use of more "complete" revascularization is needed with regard to long-term outcome.

Patients who undergo coronary bypass surgery during their first hospitalization for the diagnosis of acute myocardial infarction appear to have a low death rate in the first year following infarction, and to enjoy a status of good general health. Seventy-four percent of patients who had surgery and 80% of patients not having surgery rated their general health status as excellent or good at 1 year following hospital discharge. Angina pectoris was slightly less common in the surgical group (31% versus 44%) in the year following infarction, although the majority of patients in both groups rated their angina as mild (Canadian Heart Association class 1 to 2).

Comparison of work status at 1 year following hospital discharge may be skewed by the significantly older age of surgical patients as well as by other psychological and socioeconomic factors. Although return to full time work capacity was less frequent in the surgical group, the percentage of patients who considered themselves disabled was similar in both groups (10% surgical; 8% nonsurgical). A relatively low percentage of return to full time employment has also been noted following elective coronary bypass surgery and may be significantly influenced by socioeconomic considerations.[26, 27]

Conclusions. The present study examines the use of coronary bypass surgery as part of a sequential myocardial reperfusion strategy for patients enrolled into a multicenter collaborative trial of intravenous t-PA and/or coronary angioplasty therapy for acute myocardial infarction. One of five patients (21%) who were enrolled into this trial underwent coronary bypass surgery during their first hospitalization. Despite the more frequent occurrence of high-risk clinical predictors (older age, more extensive coronary disease, and more frequent anterior myocardial infarction) in patients having surgery, hospital and 1-year mortality was surprisingly low in this group of patients and was not different from that observed in patients who did undergo surgery. At 1-year follow-up, cardiac and noncardiac morbidity, quality of life, and angina status appear similar in patients who have undergone coronary bypass surgery following

thrombolysis and angioplasty therapy for myocardial infarction when compared with those patients who have only received pharmacologic and/or catheter intervention.

These data suggest an important and possibly beneficial role of coronary bypass surgery as part of a sequential reperfusion treatment strategy for patients with acute myocardial infarction. A favorable long-term outlook with respect to survival and quality of life appears to follow coronary bypass surgery when it is used in this fashion. Although this study demonstrates that patients treated with coronary bypass surgery do well, a true comparison group treated conservatively is not available. Now that early intervention with surgrey has been shown to be associated with an acceptable complication rate, future trials should evaluate the indications for surgical therapy with greater precision.

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