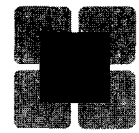

Risk factors for in-hospital mortality associated with coronary angioplasty

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■ The clinical, angiographic, and procedural findings in 40 in-hospital deaths among 5,000 consecutive percutaneous transluminal coronary angioplasties were reviewed. Compared to the total group, the mortality group had a higher proportion of women, older age, and more extensive coronary disease. Angioplasty was performed as an emergency procedure in 21 of the 40 patients who died. Eighteen presented with an evolving acute myocardial infarction and 17 with unstable angina. Most patients presented in critical condition prior to angioplasty: 18 patients were in cardiogenic shock and 5 patients were on cardiopulmonary resuscitation. Among 13 patients who died following elective angioplasty, the salient feature was acute vessel closure or dissection in 7 patients and failed dilatation of a saphenous vein graft in 4 patients.

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WITH IMPROVED technology and operator experience, percutaneous transluminal coronary angioplasty (PTCA) is being applied in a larger number of patients. Nevertheless, mortality rates have not changed, possibly reflecting the use of PTCA in higher risk patients.[1]

Variables associated with in-hospital mortality are history of congestive heart failure, age more than 65 years, triple-vessel disease, female gender, and new-onset angina.[2]

We analyzed in-hospital mortality in 5,000 consecutive patients who underwent PTCA at our institution.

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METHODS

A search of the PTCA registry and the Cardiovascular Information Registry was conducted at our institution to identify in-hospital deaths among 5,000 consecutive PTCA procedures performed between December 1980 and November 1987. Hospital records and cineangiograms were reviewed for clinical and angiographic characteristics, procedural details, cause of death, and autopsy findings.

Mortality was defined as death during the same hospitalization in which PTCA was performed, regardless of the cause of death. Acute myocardial infarction was defined by the presence of prolonged chest pain, ST-segment elevation, and creatine kinase elevation.

Angina was graded according to the Canadian Cardiovascular Society Classification. Unstable angina was considered present if there was pain at rest associated with ST-segment changes and normal cardiac enzyme levels.

TABLE 1
COMPARISON OF CLINICAL AND ANGIOGRAPHIC CHARACTERISTICS OF ALL PTCA PATIENTS AND THE MORTALITY GROUP

	All patients n = 5000 (%)	Mortality group n = 40 (%)
Mean age (years)	58	66
≥70 years old	645 (13)	15 (38)
Women	1280 (26)	20 (50)
Previous myocardial infarction	1737 (35)	13 (33)
Previous coronary artery bypass graft	670 (13)	6 (15)
Extent of disease		
1-vessel	2705 (54)	11 (27)
2-vessel	1579 (32)	13 (33)
3-vessel	641 (13)	16 (40)
Left ventricular dysfunction		
Normal to mild	4438 (89)	13 (48)
Moderate to severe	561 (11)	14 (52)

Cardiogenic shock was defined as systolic pressure of less than 90 mmHg and clinical signs of hypoperfusion despite administration of vasopressor drugs and volume replacement.

Angiographic success of PTCA was defined as reduction in stenosis diameter to less than 50%.

Extent of coronary artery disease was defined as ≥ 70% diameter stenosis of one, two, or three major epicardial coronary arteries. Left ventricular function was assessed qualitatively, based on right anterior oblique ventriculography, and graded as normal or mildly, moderately, or severely impaired.

RESULTS

Among 5,000 consecutive patients who underwent PTCA between December 1980 and November 1987, there were 40 (0.8%) in-hospital deaths. There were 20 men and 20 women; mean age was 66 years (range, 38 to 91). Fifteen (38%) patients were 70 years of age or older.

Six patients (15%) had undergone coronary artery bypass surgery, including two patients with two previous surgeries. Thirteen patients (32.5%) had previous myocardial infarction.

Significant associated conditions were hypertension, 23 patients; diabetes mellitus, 11; history of cigarette smoking, 23; and peripheral vascular disease, 12.

Stenosis of more than 70% affected one vessel in 11 patients, two vessels in 13 patients, and three vessels in 16. Left ventricular function was normal or mildly impaired in 13 patients and moderately or severely impaired in 14. Left ventriculography was not performed in 13 patients.

Table 1 compares clinical and angiographic characteristics of the mortality group with the entire PTCA group. It clearly demonstrates that, compared to the total PTCA group, the mortality group is characterized by older age, a higher percentage of women, multivessel disease, and left ventricular impairment.

Most patients in the mortality group presented with either an acute myocardial infarction (18 patients, including 8 with anterior infarctions and 10 with inferior-posterior infarctions), or unstable angina (15 patients, including 5 with post-infarction angina). Seven patients presented with stable angina.

The most common conditions preceding PTCA in the 40 patients who died were cardiogenic shock (18 patients) and intra-aortic balloon pump procedure (12 patients). Six had complete heart block, five had undergone pulmonary resuscitation, and three had had ventricular fibrillation. Twenty-two patients had evolving ST-segment changes (19 ST-elevation and 3 ST-depression) and 19 patients had elevated cardiac enzyme levels prior to angioplasty.

PTCA procedure

Dilatation of 47 lesions was attempted. Thirty-four patients had one vessel dilated, five had two vessels, and only one patient had three vessels dilated.

Twenty-one of the deaths occurred following emergency angioplasty. In 18 patients, the indication was an evolving myocardial infarction. Seven of these patients died despite an angiographically successful angioplasty (five irreversible cardiogenic shock, one ischemic bowel, and one free-wall rupture). Of the remaining three patients, one had an acute vessel closure 3 days after angioplasty, one had an unsuccessful angioplasty, and one patient with carcinoma died of pneumonia and sepsis after a successful PTCA.

Of the 19 patients who died after an elective PTCA, 6 died of unrelated causes. Four patients died of complications after elective vascular surgery (2 thoracoabdominal aneurysm, 1 abdominal aneurysm, and 1 femoropopliteal bypass) at a mean of 25 days (range, 3 to 48) after PTCA. One patient with severe left ventricular dysfunction and ventricular arrhythmia

died suddenly 24 hours after angioplasty; autopsy revealed a widely patent right coronary artery at the site of dilatation. One patient with extensive cerebrovascular disease died of anoxic brain damage following respiratory arrest complicating a gastrointestinal endoscopy 12 days after PTCA.

Of the 13 PTCA-related deaths, 4 occurred during attempted dilatation of saphenous vein grafts. Two of these attempts were complicated by closure of the graft and 2 showed evidence of distal embolization. Of the remaining 9 deaths, 4 occurred as a consequence of abrupt vessel closure, 3 from dissection of the vessel and 2 because of failure to dilate the lesion.

DISCUSSION

The overall in-hospital mortality in 5,000 consecutive PTCA procedures was 0.8%. If we exclude the six deaths that were unrelated to the initial angioplasty procedure, the mortality rate would be 0.7%. Excluding coronary angioplasty done in the setting of an acute myocardial infarction, Bredlau and associates[3] reported an in-hospital mortality rate of 0.1%. The National Heart Lung and Blood Institute (NHLBI) PTCA Registry mortality rates were 1.2% and 1% for 1977-1981 and 1985-1986 cohorts, respectively.[2]

In the present study, the 40 patients who died were characterized by an older age, high proportion of women, multivessel disease, and impaired left ventricular function compared to our general experience. In the NHLBI PTCA Registry, factors associated with increased mortality included a history of congestive heart failure, age ≥ 65 years, triple vessel disease, female gender, and new-onset angina.

More importantly, the main characteristic of this group of patients was the need for emergency PTCA, frequently during an evolving acute myocardial infarction with severe hemodynamic and electrical instability. Regardless of the therapeutic approach, these patients historically have had a very high in-hospital mortality. Recent reports suggest that PTCA may significantly lower mortality in patients with acute myocardial infarction and cardiogenic shock.[4]

Nineteen deaths occurred following elective PTCA. If we exclude the six patients who died of unrelated causes, the overall mortality in elective PTCA was 0.3% (13 patients). Four of these patients died during attempted dilatation of a saphenous vein graft. We have since learned that PTCA of a saphenous vein graft implanted longer than 36 months is associated with increased morbidity and mortality.[5] Abrupt vessel closure continues to be an important factor related to PTCA-associated mortality.[6]

In summary, mortality occurs predominantly in PTCA patients who present with an evolving acute myocardial infarction and hemodynamic compromise. Despite this phenomenon, mortality has been found to be reduced in these patients who undergo PTCA; therefore continued use of this approach is warranted. Developments such as percutaneous cardiopulmonary bypass[7] may allow stabilization of these patients before and during angioplasty. Among patients who died following elective angioplasty, the group in whom angioplasty of old saphenous vein grafts was attempted stands out as the high-risk group.

Although the indications for PTCA have expanded to include higher risk groups, the procedure can be performed with low in-hospital mortality.

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