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Martha L. Gray

Randall S. Reimer

Michael D. Thompson

Mortality From Postoperative Myocardial Infarction in Nonthoracic Surgical Patients at a Community Hospital

Martha L. Gray, MD,* Randall S. Reimer, MD,† and Michael D. Thompson, MD‡

In a 20-month prospective study, 35 patients with postoperative myocardial infarction were identified. All patients referred to cardiologists by nonthoracic surgeons were evaluated for evidence of postoperative myocardial infarction as defined by symptoms, electrocardiographic changes, and cardiac enzyme elevation. Ten of the 35 patients (29%) subsequently died, seven (20%) from the myocardial infarction. Twenty-five of the 35 patients (71%) had preexisting coronary artery disease. Reported experience with patient mortality following postoperative myocardial infarction varies from 28% to 69%. Our patient mortality rate at 29%, though still substantial, is lower than many current reports. Despite close perioperative surveillance of patients with coronary artery disease, the morbidity and mortality remains unacceptably high. Physicians should routinely evaluate the surgical patient thoroughly for cardiac risk. (Henry Ford Hosp Med J 1986;34:117-9)

Approximately 5% of the adult population has coronary artery disease (CAD), and more than 1.3 million people suffer new myocardial infarctions (MI) each year (1). With this prevalence of CAD and the increase in our aging population, a significant number of patients who require surgery each year will experience MI. The reported incidence of postoperative MI increases from 0.15% in patients without cardiac history to 6.0% in patients with CAD or previous myocardial injury (2). The incidence of postoperative MI also relates to the interval from previous myocardial infarction, with elective surgery safest at six months or more following myocardial insult (2). In six major studies (2-7), postoperative MI mortality ranged from 28% to 69% (Table). However, none of these studies are strictly comparable due to different patient populations and varying definitions of CAD. Only two studies sorted myocardial death from other causes of death (3,6). To accrue a significant number of patients with postoperative MI, a large number of patients were included in each of the six studies. All studies reported substantial mortality rates. The goal of our study was to compare our community hospital's postoperative MI mortality with these other reports and to assess whether our cardiologic perioperative consultation helped to decrease the postoperative cardiac complication rate.

Methods

From January 1982 through August 1983, all inpatients who had either preoperative or postoperative cardiology consultations requested by nonthoracic surgeons were identified and followed prospectively. The clinical course of each patient was studied at regular intervals until either death or discharge from the hospital. All patients underwent emergency or elective surgery.

Postoperative MI was diagnosed when at least two of three criteria were fulfilled: 1) symptoms were compatible with MI, 2) electrocardiographic (EKG) changes were consistent with an acute ischemia or injury pattern, and 3) a total creatine phosphokinase (CPK) enzyme elevation occurred. All patients with CPK elevation had an MB band present. In our study, the postoperative period extended through the seventh day; all patients having an MI more than seven days postoperatively were excluded. Additional information was recorded on each patient: history of CAD, type of surgery, initiating symptoms or signs indicating myocardial compromise, time of onset of MI in relation to time of operation, and specific EKG changes. All changes were interpreted variously as ischemic or subendocardial, transmural, nonspecific ST-T wave changes, or no change.

Results

Of almost 700 cardiology consultations reviewed in this 20-month period, 35 patients suffered a postoperative MI, an incidence of nearly 5%. These 35 patients were 60 to 91 years old with a mean age of 70. The majority of these patients, 25 of 35 (71%), had a history of CAD including anginal symptoms or known ischemic heart damage. Eighteen of the 35 patients (50%) had suffered a previous MI more than six months before surgery.

Of the 35 patients, ten (29%) died postoperatively while in the hospital; seven deaths (20%) were cardiac in nature, three of which were confirmed by autopsy; and three other patients died from sepsis, respiratory failure, or stroke. Nine of ten patients who died had prior CAD history, and seven of these had had a previous MI. Twenty-three of the 35 patients with postopera-

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*Formerly Department of Internal Medicine, Henry Ford Hospital, Plymouth Center. Currently from Associates in Internal Medicine, P.C., Ann Arbor, MI.
†Department of Medicine, St Joseph Mercy Hospital, Ann Arbor, MI.
‡Silver Lake Professional Center, Everett, WA.
Address correspondence to Dr Gray, Associates in Internal Medicine, P.C., 3250 Plymouth Rd, Ann Arbor, MI 48105.

Table
Postoperative Myocardial Infarction Mortality

Study	Patient Population	MI*/Patients (%)	Deaths/MI	Total Death Rate	MI Death Rate
Arkins et al (3)	CAD†	55/1005 (5%)	38/55	69%	47%
Mauney et al (4)	CAD	30/365 (8%)	16/30	50%	not reported
Tarhan et al (2)	Previous MI	28/422 (7%)	15/28	54%	not reported
Steen et al (5)	Previous MI	36/587 (6%)	25/36	69%	not reported
Goldman et al (6)	Unselected patients‡	18/1001 (1.7%)	5/18	not reported	28%
von Knorring (7)	CAD	38/214 (17%)§	16/38	32%	not reported
Gray et al (Present study)	All patients‖	35/700 (5%)	10/35	29%	20%

*Myocardial infarction.
†Coronary artery disease.
‡Patients (27%) with CAD history.
§In patients without CAD, the incidence of postoperative MI was 0.1%.
‖Selected through cardiological consultations.

tive MI (66%) suffered an MI within 48 hours of surgery. Postoperative symptoms and signs included dyspnea, tachycardia, chest pain, hypotension, arrhythmia, and cardiac arrest. Cardiac arrest was the first sign of an MI in six patients, five of whom subsequently died of their MI. Only three of 35 patients had an asymptomatic MI.

EKG changes varied: 15 of 35 patients had ischemic changes, six patients had transmural injury patterns, yet seven patients showed only nonspecific ST-T wave changes. These seven patients were included because of significant symptoms, enzyme elevation, or autopsy-proven MI. Two other patients with left bundle branch block and one patient with a permanent pacemaker showed no EKG changes. Four patients who had a cardiac arrest and no EKG performed before death were included because of autopsy-proven new myocardial injury.

Discussion

At our institution, the total mortality rate of nonthoracic surgical patients with in-hospital postoperative MIs was 29% (10 patients), seven of whom died of their MI. Except for one study (6), our mortality was lower than the total mortality cited (2-5,7). However, our patient population included a large percentage of patients with previous CAD or MI (71%) and, therefore, is not comparable to Goldman's patient group with only 27% CAD history (6). Our total death rate of 29% is substantially lower than many comparable reports (Table).

Several reasons may account for our study's low mortality rate. Clearly, perioperative care has improved in the last decade as has preoperative screening for cardiac risk factors (8-12). Even though our patients were identified by cardiological consultations, many patients were seen for the first time postoperatively. Thus, our patients were not necessarily assessed earlier or followed more closely by cardiologists, thereby accounting for the lower total mortality. At our institution, most surgeons work closely with the cardiologists when caring for patients with known cardiac risk or for patients in an intensive care unit. We believe that the majority of postoperative MI patients were identified through our prospective study of cardiology consultations. Certainly, some patients might have been missed, such as those who died intraoperatively of an MI or those patients never seen by a cardiologist. Based on our familiarity with clinical practice at our institution, we consider this number of patients insignificant.

We excluded sudden death patients unless previous evidence existed for myocardial damage, or autopsy confirmed new myocardial injury. Only six of 35 patients presented as sudden death in our study. We chose to follow well-defined criteria to identify postoperative MI patients because of the difficulty not only in assessing the etiology of sudden death but also in interpreting postoperative CPK enzyme levels (13) and EKG changes in the critical care setting.

We believe our patient mortality rate was unrelated to less extensive surgery. In our patients, 50% of the surgical procedures were vascular in type, including arterial bypasses of the carotid, abdominal aortic, or iliac vessels. The remaining procedures varied from rhinoseptoplasty and cataract surgery to total hip arthroplasty and colon resection. Four of the seven patients who died postoperatively of their MI had undergone vascular procedures.

Our experience with 23 of 35 patients (66%) suffering an MI within 48 hours of surgery is comparable to that of other investigators (2,6). The immediate postoperative period is a hazardous time for patients with increased cardiac risk. Many of our patients' early postoperative days were spent in an intensive care unit.

Our study's death rate of 29%, though lower than other reports, represents a substantial mortality. To reduce the incidence of postoperative MI, physicians need to look for predictive risk factors including preoperative congestive heart failure, a high cardiac risk index or physical status classification (8,11,14), and major vascular surgery or history of myocardial injury in the previous six months (2). In certain individuals, preoperative exercise testing or coronary angiography may be indicated. Others may need intraoperative hemodynamic monitoring to guard against hypertension, congestive failure, and arrhythmia. With our aging population and ambitious surgical technology, certain patients may need coronary artery bypass grafting before other vascular procedures (15). Clearly, physicians should be prepared to review the necessity of surgery in the patient with increased cardiac risk. If surgery is necessary, then physicians should make every effort to preoperatively evaluate and closely follow these patients so as to negatively affect the high morbidity and mortality of the postoperative myocardial infarction patient.

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