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YEAR BOOK OF CARDIOLOGY® 1990

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The Year Book of CARDIOLOGY®

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Journals Represented

Year Book Medical Publishers subscribes to and surveys nearly 850 U.S. and foreign medical and allied health journals. From these journals, the Editors select the articles to be abstracted. Journals represented in this YEAR BOOK are listed below.

American Heart Journal
American Journal of Cardiology
American Journal of Epidemiology
American Journal of Hypertension
American Journal of Kidney Diseases
American Journal of Medicine
American Journal of Physiology
American Journal of Public Health
American Journal of Roentgenology
Anesthesiology
Annals of Internal Medicine
Annals of Plastic Surgery
Annals of Thoracic Surgery
Archives of Disease in Childhood
Archives of Internal Medicine
Archives of Surgery
British Heart Journal
British Medical Journal
Canadian Journal of Cardiology
Catheterization and Cardiovascular Diagnosis
Circulation
Circulation Research
Clinical Science
Electroencephalography and Clinical Neurophysiology
European Heart Journal
European Journal of Applied Physiology and Occupational Physiology
Hypertension
International Journal of Cardiology
Journal of Cardiac Surgery
Journal of Cardiovascular Pharmacology
Journal of Clinical Epidemiology
Journal of Clinical Investigation
Journal of Heart Transplant
Journal of Hypertension
Journal of Internal Medicine
Journal of Medical Genetics
Journal of Nuclear Medicine
Journal of Pediatrics
Journal of Thoracic and Cardiovascular Surgery
Journal of Vascular Surgery
Journal of the American College of Cardiology
Journal of the American Medical Association
Lancet
Mayo Clinic Proceedings
Nature
New England Journal of Medicine
Pace

Pediatric Cardiology
Pediatric Research
Prenatal Diagnosis
Psychosomatic Medicine
Quarterly Journal of Medicine
Radiology
Scandinavian Journal of Thoracic and Cardiovascular Surgery
Stroke
Ultrasound in Medicine and Biology
Wiener Klinische Wochenschrift

Standard Abbreviations

In many articles in this edition, at least one of the following terms is used: acquired immunodeficiency syndrome (AIDS), acute myocardial infarction (AMI), atrial ventricular (AV), coronary artery bypass graft (CABG), congestive heart disease (CHD), central nervous system (CNS), cardiopulmonary resuscitation (CPR), cerebrospinal fluid (CSF), computed tomography (CT), electrocardiogram (ECG), human immunodeficiency virus (HIV), left anterior descending (LAD), left ventricular (LV), left ventricular ejection fraction (LVEF), myocardial infarction (MI), New York Heart Association (NYHA), right ventricular (RV), ventricular tachycardia (VT). Rather than spell out these terms in full each time they appear, their abbreviations will be used.

Introduction

This 1990 YEAR BOOK OF CARDIOLOGY, the 30th in the series, continues the objectives and format of its predecessors. The editors have selected and provided comments on 295 clinically relevant articles in the broad field of cardiology. In addition, other pertinent articles and references often are provided with the comments of the section editors.

All the chapter editors again thank the staff at Year Book Medical Publishers for their assistance, patience, and understanding. In particular, we are indebted to Ms. Nancy Gorham and Ms. Sharon Tehan.

Robert C. Schlant, M.D.

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The material in this volume represents literature reviewed through November 1989.

1 Coronary Artery and Other Heart Diseases, Heart Failure

Introduction

Major advances have been achieved in our understanding of the pathogenesis of clinical instability in patients with coronary artery disease. At the same time, excellent, well-controlled clinical trials are providing practical information to help guide the individual physician treating an individual patient. I believe it is to the credit of our profession that the new therapies in thrombolysis have been subjected to such critical analysis. Furthermore, exciting new discoveries being made in molecular biology have an impact on clinical cardiology in a substantial manner (see Abstract 1–38). Cardiologists must broaden their horizons beyond imaging and technical proficiency.

The TIMI and TAMI trial results have provided outstanding controlled studies of percutaneous transluminal coronary angioplasty (PTCA) in the setting of acute myocardial infarction, trials of PTCA in other settings remain a major deficit in our fund of knowledge. Fortunately, several excellent trials are in progress, and their results are eagerly awaited.

Also selected in this section are several fascinating studies in cardiovascular epidemiology that I believe will be of real interest to all physicians. Several deal with utilization of cardiovascular resources in the United States (Abstracts 1–43 and 1–44); others report intriguing trends in cardiovascular mortality in the United States and Japan (Abstract 1–42). Of particular interest is a report on Swedish cardiovascular mortalities in relation to social class.

A number of miscellaneous topics include congestive heart failure, post-CABG active fibrillation, and effects of theophylline. The problem of mural thrombus in acute myocardial infarction is also the subject of different perspectives (Abstracts 1–8 and 1–11).

Robert L. Frye, M.D.

Myocardial Infarction, Thrombolysis, PTCA

Comparison of Invasive and Conservative Strategies After Treatment With Intravenous Tissue Plasminogen Activator in Acute Myocardial Infarction: Results of the Thrombolysis in Myocardial Infarction (TIMI) Phase II Trial
TIMI Study Group (Maryland Med Research Inst, Baltimore)
N Engl J Med 320:618–627, March 9, 1989 1–1

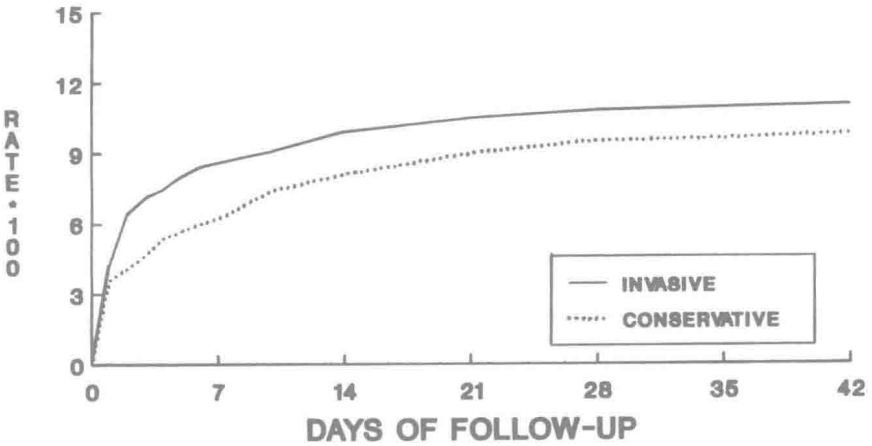

Fig 1–1.—Percentage of patients in the invasive-strategy and conservative-strategy groups who died or had confirmed nonfatal MI during the 42 days after randomization. (Courtesy of TIMI Study Group: *N Engl J Med* 320:618–627, March 9, 1989.)

Of 3,262 patients given recombinant tissue plasminogen activator (rt-PA) intravenously within 4 hours of the onset of presumed MI, 1,636 subsequently underwent coronary angiography, followed by angioplasty if suitable anatomy was demonstrated. The other 1,626 patients were managed conservatively; angiography was performed only for spontaneous or exercise-induced ischemia. Angioplasty was attempted in 57% of the former group and was anatomically successful in 93% of them. Thirteen percent of patients assigned to conservative therapy underwent angioplasty in the first 2 weeks.

The clinical outcome was comparable in the 2 groups of patients (Fig 1–1). Values of resting and exercise ejection fraction were similar at discharge and 6 weeks after randomization. In a subgroup of patients, those given intravenous β-blockade did better clinically than others given delayed oral metoprolol therapy.

Most patients appear not to require cardiac catheterization or angioplasty during the first 2 days after thrombolytic therapy for acute infarction. Instead, a policy of "watchful waiting" is appropriate after early intravenous rt-PA treatment. Angiography may be reserved for patients with specific indications.

▶ This is a crucial paper in the evolution of our knowledge regarding use of coronary angioplasty in patients with AMI. It appears "routine" angioplasty is not indicated, but it may be very useful for those patients who do become unstable with recurrent angina immediately after infarction period. Whether to use balloon angioplasty or coronary bypass surgery in such patients is part of the protocol in the Bypass Angioplasty Revascularization Investigation (BARI) trial.—R.L. Frye, M.D.

Randomised Double-Blind Trial of Recombinant Pro-Urokinase Against Streptokinase in Acute Myocardial Infarction

PRIMI Trial Study Group (Meyer J II, Med Univ Clinic, Mainz, West Germany)
Lancet 1:863–867, Apr 22, 1989 1–2

Single-chain urokinase-type plasminogen activator (scu-PA) or recombinant prourokinase (rscu-PA) has intrinsic plasminogen activating potential and has been shown to possess fibrin-specific lysis activity in patients. The therapeutic value of rscu-PA was compared with that of streptokinase when given to patients with a first MI within 4 hours of the appearance of symptoms. In a prospective, randomized, double-blind trial 198 patients who received 80 mg of rscu-PA intravenously as a 20-mg bolus followed by a 60-mg infusion for 60 minutes were compared with 203 patients who received 1.5 million IU of streptokinase infused over 60 minutes. Angiograms were taken at 60 minutes, 90 minutes, and 24–36 hours after the infusion was begun.

In the first angiographic study, significantly more patients (71.8%) who had received rscu-PA showed evidence of perfusion than patients who had received streptokinase (48.0%). At 90 minutes, the patency rate among the rscu-PA group was 71.2% and that among the streptokinase group was 63.9%. At 24–36 hours, 84.7% of the rscu-PA group showed patency, as did 88.4% of the streptokinase group. Reocclusion at this time was seen in 6 of 121 patients receiving rscu-PA and 5 of 114 patients receiving streptokinase. The clinical course was similar for the 2 patient groups. Significantly more bleeding episodes (4) occurred among the patients receiving streptokinase (24.6%) than those receiving rscu-PA (14.1%). Plasma levels of fibrin(ogen) degradation products rose after administration of both agents, to a high of 96 mg/L after rscu-PA and significantly higher, to 240 mg/L, after streptokinase.

In the patients studied, intravenously administered rscu-PA resulted in a higher patency rate, earlier reperfusion, less disturbance of hemostasis, and fewer bleeding complications than did streptokinase. Recombinant prourokinase seems to have reached the goals expected for a thrombolytic agent used to treat AMI. In addition, it was easily administered and resulted in a very low early reocclusion rate.

▶ These results are of interest and document the early advantage of single-chain urokinase-type plasminogen activator. However, at 90 minutes, the differences in patency rates were less impressive than with streptokinase, and at 24 to 30 hours, the percentage of patent infarct-related arteries was the same. How the early differences translate into clinical benefit will require further study.—R.L. Frye, M.D.

Intravenous Tissue Plasminogen Activator and Size of Infarct, Left Ventricular Function, and Survival in Acute Myocardial Infarction

Van de Werf F, Arnold AER, European Cooperative Study Group (Univ Hosp Gasthuisberg, Leuven, Belgium; Erasmus Univ, Rotterdam, The Netherlands)
Br Med J 297:1374–1379, Nov 26, 1988 1–3

A double-blind, randomized, placebo-controlled, prospective trial assessed the effect of intravenous recombinant plasminogen activator on infarct size, LV function (LVF), and survival in 721 patients with AMI at 26 hospitals in several European countries.

Patients included 304 men (83%) and 62 (17%) women aged 43–69 years who were assigned to receive placebo and 313 (88%) men and 42 (12%) women aged 41–69 years who were assigned to treatment with plasminogen activator. Patients had typical MI chest pain for at least 30 minutes' duration. All patients received 250 mg of aspirin and a bolus injection of 5,000 IU of heparin immediately before treatment was begun. Patients assigned to the treatment group received a 10-mg intravenous bolus of plasminogen activator, another 50 mg during 1 hour, and 40 mg administered by infusion during the next 2 hours. Controls received placebo by the same method. Both groups were given full anticoagulation treatment and aspirin until angiography was performed 10–22 days after admission. All patients were prescribed β-blockers at discharge.

During the first 14 days after allocation, 21 (5.7%) controls and 10 (2.8%) patients given plasminogen activator patients died. After 3 months of follow-up another 8 controls and 8 treated patients died. The reduction in mortality for treated patients was 51% at 14 days and 36% at 3 months. For those treated within 3 hours after onset of MI, mortality was reduced by 82% at 14 days and 59% at 3 months. Cardiac complications during the 2 weeks of hospitalization were less frequent for treated patients than for controls. Angioplasty or artery bypass performed during the first 3 months was more frequent for treated patients than for controls. Bleeding complications were more common in treated than in untreated patients. Treated patients also had smaller infarcts and higher LVF values than controls.

▶ Further documentation of the clinical effectiveness of thrombolytic therapy with intravenous recombinant tissue-type plasminogen activator. Not only was survival enhanced, but there were beneficial effects in terms of size of MI and LVF. These results are particularly interesting given a very low event rate in the control group of patients as compared with other trials. The 1.7% hemorrhagic stroke rate with tissue plasminogen activator is of concern.—R.L. Frye, M.D.

Effect of Intravenous Streptokinase as Compared With That of Tissue Plasminogen Activator on Left Ventricular Function After First Myocardial Infarction

White HD, Rivers JT, Maslowski AH, Ormiston JA, Takayama M, Hart HH, Sharpe DN, Whitlock RML, Norris RM (Green Lane Hosp; Middlemore Hosp; North Shore Hosp; Auckland Hosp, Auckland, New Zealand)

N Engl J Med 320:817–821, March 30, 1989 1–4

The long-term prognosis after MI is related to the size of the infarct and LV function. Previous studies have shown that recombinant tissue

plasminogen activator (rt-PA) is superior to streptokinase for obtaining patency in the infarct-related coronary artery when infused a mean of 4.8 hours after the onset of chest pain. However, both agents have similar effects on the preservation of LV function. The effects of rt-PA and streptokinase on the preservation of LV function in 270 patients with a first MI were compared. Half were randomly assigned to receive streptokinase intravenously at a dose of 1.5 million units infused over 30 minutes and half received rt-PA at a dose of 100 mg infused over 3 hours. The primary end point of the trial was LV function as assessed with cineangiography performed 3 weeks after infarction.

Ten patients (7.4%) in the streptokinase group and 5 patients (3.7%) in the rt-PA group died. The difference was not statistically significant. The effect of streptokinase and rt-PA on LV function as measured 3 weeks after myocardial infarction was similar, as both groups had identical mean ejection fractions. The mean end-systolic volume in the streptokinase group was 61 mL, and in the rt-PA group, 66 mL. The difference was not statistically significant. Patency rates at 3 weeks for the infarct-related coronary artery were also similar, as were reinfarction rates at 30 days. After a mean follow-up of 9 months, there was no significant difference in survival rates between the 2 groups.

Streptokinase and rt-PA, when given within 3 hours of onset of a first MI, have similar effects on the preservation of LV function.

▶ This direct comparison of intravenous streptokinase and t-PA in the setting of AMI is of great interest. The investigators report no advantage of 1 drug over the other in terms of preservation of LV function as assessed by cineangiography 3 weeks after myocardial infarction. Most studies seem to point to a clear advantage of t-PA in terms of clot lysis, but this is not translated into a major difference in clinical outcomes, at least in the trials reported thus far.—R.L. Frye, M.D.

Plasminogen Activator Italian Multicenter Study (PAIMS): Comparison of Intravenous Recombinant Single-Chain Human Tissue-Type Plasminogen Activator (rt-PA) With Intravenous Streptokinase in Acute Myocardial Infarction

Magnani B, PAIMS Investigators (Istituto di Malattie Cardiovascolari dell Università, Bologna, Italy)

J Am Coll Cardiol 13:19–26, January 1989 1–5

The thrombolytic efficacy of a single-chain preparation of recombinant tissue-type plasminogen activator (rt-PA) was compared with that of intravenously administered streptokinase in 171 patients seen within 3 hours of the onset of AMI. Patients were randomly assigned to receive a cumulative dose of 100 mg of rt-PA (no. = 86) or 1.5 million units of streptokinase intravenously in 1 hour (no. = 85). The groups were clinically comparable.

The reperfusion rate was 87% with rt-PA and 80% in the streptoki-

nase group, but 24% and 10% of patients, respectively, had recurrent chest pain and ST segment elevation. The reperfusion rate at 4 hours was 79% in both groups. Ejection fraction values at the outset and at discharge were similar in both groups. Two streptokinase-treated patients had definite reinfarction. Hospital mortality was 4.6% in the rt-PA group and 8.2% in the streptokinase group. One streptokinase-treated patient died of intracranial hemorrhage.

Treatment of early postinfarction patients with single-chain rt-PA often produces coronary reperfusion, and the risk of sustained reocclusion is low. The hemostatic system is spared in comparison with the effects of intravenously administered streptokinase.

▶ An interesting direct comparison of single chain rt-PA with streptokinase. The reperfusion rates (judged noninvasively) and patency of the infarct-related artery were comparable. The direct comparison of rt-PA and streptokinase on clinical outcome is eagerly awaited.—R.L. Frye, M.D.

A Randomized Controlled Trial of Intravenous Tissue Plasminogen Activator and Early Intravenous Heparin in Acute Myocardial Infarction

Topol EJ, George BS, Kereiakes DJ, Stump DC, Candela RJ, Abbottsmith CW, Aronson L, Pickel A, Boswick JM, Lee KL, Ellis SG, Califf RM, TAMI Study Group (Univ of Michigan, Ann Arbor; Duke University; Riverside Methodist Hosp, Columbus, Ohio; Christ Hosp, Cincinnati; Univ of Vermont)

Circulation 79:281–286, February 1989 1–6

Tissue plasminogen activator (t-PA) increases fibrinolytic activity when used with heparin. Monotherapy with t-PA was compared with combined t-PA and early, intravenously administered heparin in patients seen

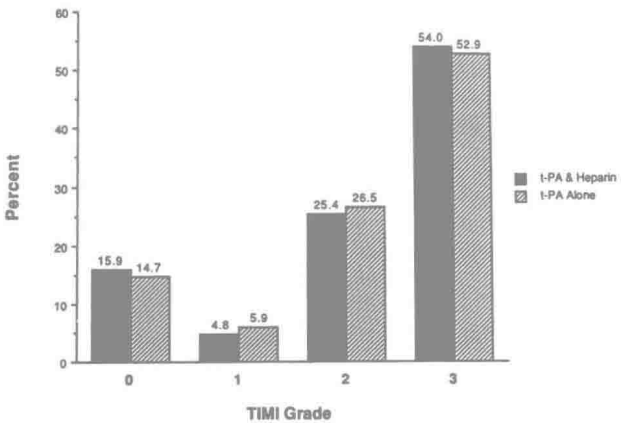

Fig 1–2.—Bar graph of infarct-related artery recanalization at 90 minutes of therapy by Thrombolysis in Myocardial Infarction (TIMI) grade for t-PA and heparin (no. = 64) vs. t-PA alone (no. = 70) patients. No differences between the groups were observed. (Courtesy of Topol EJ, George BS, Kereiakes DJ, et al: *Circulation* 79:281–286, February 1989.)

within 4 hours of the onset of MI. The dose of t-PA was 1.5 mg in 4 hours. Heparin therapy was adjusted to keep the partial thromboplastin time at 1.5 to 2 times control for at least 24 hours.

The patency rate was 79% after both combined treatment and t-PA therapy alone, and flow grades were similar in the 2 treatment groups (Fig 1–2). Immediate angioplasty had comparable success rates, and bleeding complications were similarly frequent in the 2 groups. Ejection fraction failed to improve at 1 week in either group. Measurements of coronary stenosis were similar for the patients given combined treatment and those given t-PA alone.

Added heparin therapy appears not to improve the results obtained with t-PA alone in patients with early MI. Heparin may be withheld for at least 90–120 minutes to lessen the risk of bleeding complications.

▶ This important paper from the TAMI group deserves careful reading by all those involved in treating MI patients with thrombolytic therapy. The dilemma for clinicians in using heparin in the setting of powerful thrombolytic drugs is an important practical one. This study shows no apparent greater benefit from the combined use of heparin and t-PA than from t-PA alone in terms of early clot lysis. It is important for all those who consider these data in their clinical practice to read carefully the limitations of the study the investigators point out. No predischarge angiography was performed to determine late infarct-related artery patency, but it is noteworthy that, in terms of clinical outcomes, reinfarction and recurrent ischemia rates were comparable for both therapies. Certainly, the other issue for clinicians is not only the impact of heparin combined with t-PA in clot lysis, but also maintenance of patency of the infarct-related artery.—R.L. Frye, M.D.

Early Noninvasive Detection of Successful Reperfusion in Patients With Acute Myocardial Infarction

Ellis AK, Little T, Masud ARZ, Liberman HA, Morris DC, Klocke FJ (State Univ of New York, Buffalo; Buffalo VA Med Ctr; Erie County Med Ctr, Buffalo; Emory Univ; Crawford W Long Hosp, Atlanta)

Circulation 78:1352–1357, December 1988 1–7

Myoglobin (Mb) is an intracardiac protein that is rapidly released into the blood circulation after the onset of coronary reperfusion of injured myocardium. It is also rapidly cleared from the circulation, as its half-time of disappearance is less than 10 minutes. The usefulness of determinations of blood Mb level early in the course of acute transmural MI in patients undergoing attempted reperfusion with thrombolytic therapy was investigated.

Thirty-eight men and 4 women aged 39–71 years were receiving thrombolytic therapy consisting of intravenous or intracoronary streptokinase, intravenous recombinant tissue-type plasminogen activator, or percutaneous transluminal coronary angioplasty, or some combination of these, within the first 6 hours of acute transmural MI. The time between

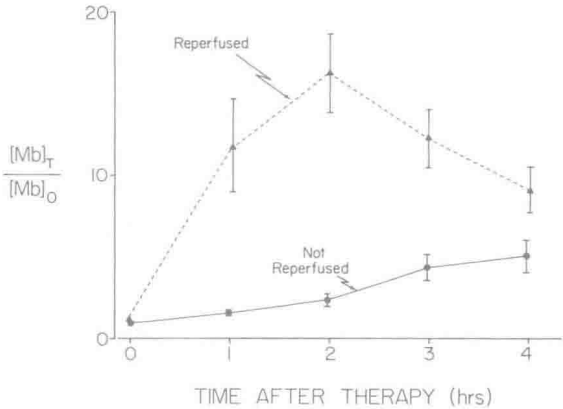

Fig 1–3.—Normalized myoglobin *(Mb)* curves for reperfused and unreperfused patients. Time 0 is the time at which therapy is applied. The actual time at which samples were drawn varied for individual patients: 0 hours (mean, −8 minutes), 1 hour (mean, 58 minutes), 2 hours (mean, 117 minutes), 3 hours (mean, 177 minutes), and 4 hours (mean, 236 minutes). $[Mb]_0$, Mb concentration at time 0; $[Mb]_T$, Mb concentration at time T. For each patient, plasma Mb levels were normalized in relation to *[Mb]* at time 0, which was taken as 1.0. (Courtesy of Ellis AK, Little T, Masud ARZ, et al: *Circulation* 78:1352–1357, December 1988.)

onset of chest pain and treatment ranged from 90 to 360 minutes, or an average of 216 minutes. A venous blood sample for Mb determinations was drawn before treatment and every 30 minutes thereafter for at least 4 hours.

Reperfusion was successful in 35 of the 42 patients. In each of the 35 patients, the plasma Mb level increased rapidly, with peak Mb levels occurring a mean of 111 minutes after application of therapy. In contrast, Mb levels increased more slowly in the 7 patients in whom reperfusion was unsuccessful, with peak Mb levels occurring a mean of 360 minutes after reperfusion was attempted (Fig 1–3). The mean time required for Mb levels to increase from 25% to 100% of peak values was 71 minutes in patients in whom reperfusion was successful, and 341 minutes in those in whom reperfusion had failed. A rapid increase in Mb levels after successful reperfusion was also evident by a more than 4.6-fold increase in Mb over the first 2 hours after reperfusion in 30 of the 35 successful cases, whereas Mb levels increased less than 4.6-fold during the first 2 hours in those in whom reperfusion was not successful.

The determination of blood Mb levels early in the course of attempted coronary reperfusion is a relatively simple test that provides a useful index of successful reperfusion after acute transmural MI.

▶ The Buffalo group has extended their long-time interest in myoglobin to the use of this enzyme as a marker of reperfusion. The clinical importance of a test that will rapidly and accurately reflect successful reperfusion early enough to still allow "rescue" efforts to open the infarct-related artery is of great clinical importance.—R.L. Frye, M.D.

Myocardial Infarction, General Topics

The Natural History of Left Ventricular Thrombus in Myocardial Infarction: A Rationale in Support of Masterly Inactivity

Nihoyannopoulos P, Smith GC, Maseri A, Foale RA (Hammersmith Hosp; St Mary's Hosp, London)

J Am Coll Cardiol 14:903–911, October 1989 1–8

The proper approach to LV thrombus, found after acute infarction, remains uncertain. The incidence of thrombus formation was prospectively determined for 105 consecutive patients with a first MI, and its significance for the functional outcome and survival was found. Eighty-seven patients had echocardiograms suitable for serial evaluation. About 60% of the group had anterior infarctions.

Left ventricular thrombus was found in 40% of the patients with anterior infarction a median of 6 days after the acute event. None of 34 patients with an inferior infarct had LV thrombus. Patients with mural thrombus had a lower hospital mortality than those without. Thrombus was present in 3 of 10 patients who had transient arm weakness or blurred vision. After 1 year, patients with LV thrombus were less symptomatic than the others. After 2 years, only 5 of 21 patients still had evidence of thrombus. No patient had embolism after hospital discharge.

Mural thrombus is frequent after acute anterior MI, but clinical embolism is not frequent and the presence of thrombus did not influence adversely the outcome in this series. It therefore should not, by itself, be an indication for full anticoagulation. Thrombus may be beneficial through aiding the healing process.

▶ This more relaxed view regarding LV thrombus in AMI must be considered in relation to the other study included in this section, from Hamilton, Ontario (Abstract 1–11).—R.L. Frye, M.D.

Short- and Long-Term Clinical Outcome After Q Wave and Non-Q Wave Myocardial Infarction in a Large Patient Population

Nicod P, Gilpin E, Dittrich H, Polikar R, Hjalmarson A, Blacky AR, Henning H, Ross J Jr (Univ of California, San Diego; VA Hosp; US Naval Hosp, San Diego; Univ of British Columbia, Vancouver)

Circulation 79:528–536, March 1989 1–9

A number of studies have suggested a poorer outlook for patients with non-Q wave MI than for those with Q wave infarction. Nearly one fourth of a series of 2,024 patients had non-Q wave infarction. They were somewhat older than those with Q wave infarction and more often had previous infarction and congestive heart failure. The patients were followed for 1 year.

Hospital mortality was 8% among patients with non-Q wave infarc-