CAUSES OF DEATH FROM MYOCARDIAL INFARCTION BEFORE AND AFTER THROMBOLYSIS ERA: A PATHOLOGIC STUDY

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ABSTRACT

One hundred and sixty-eight out of 296 patients who died of acute myocardial infarction (AMI) in the Coronary Care Unit were studied to assess the cause of death. Twenty-two of them had received thrombolytic therapy. The mean age of these patients was 64.3±18.2 years. One hundred and eight subjects were male and 60 were female. One hundred and nine cases (64.8%) showed, at postmortem examination, histopathologic alterations due to acute myocardial infarction (AMI). Death was due to heart failure in 35.8%, cardiogenic shock in 20% and ventricular arrhythmia in 44%. The other 59 patients died from complications superimposed upon AMI: reinfarction (23.7%), heart rupture (40.7%), myocardial fibrosis and reinfarction (18.6%), and cerebral infarction (17%). Two of these patients also showed massive pneumonia. In those subjects who had received thrombolytic therapy, a broad spectrum of arrhythmic and haemorrhagic complications were seen (68%).

Four causes of death were seen in the subjects studied: AMI, superimposed cardiac complications, side-effects of thrombolytic treatment, and non-cardiac causes. Patients who did not receive thrombolysis mechanical events eg heart failure, characterized their deaths. In subjects who had received thrombolytic therapy, arrhythmic and haemorrhagic were widely observed.

Keywords: *thrombolysis, myocardial infarction, death*

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INTRODUCTION

There is no doubt that the use of thrombolytic agents improves the chances of survival in patients with acute myocardial infarction (AMI). But the benefits of thrombolytic therapy seem to be greatest when the drug used is administered as early as possible, ie within 4 to 6 hours from the onset of chest pain[1-3].

Thrombolytic intervention seems to modify the cause of death usually observed in those patients who died from AMI. A spectrum of deaths related to side-effects of the thrombolytic agents have been reported[4,5].

The purpose of the study was to assess the cause of in-hospital death from AMI before and after thrombolytic era.

MATERIALS AND METHODS

One hundred and sixty-eight (56.7%) out of 296 patients who died from AMI in the Coronary Care Unit were included in this study. The cases were collected from 1976 to 1992 from the City Hospital of La Spezia and City Hospital of Pontremoli in Italy. Their sex and age distributions are shown in Table I. Table II shows the number of patients who had either received or did not receive thrombolytic therapy.

The post-mortem examinations of the heart was conducted according to the method described by Leone[6]. The heart was removed by severing the pulmonary artery and aorta about 5 cm from the free margin of the semilunar valves. After observing the external aspect of the heart to identify the areas of myocardial lesions, a rubber plug was placed through the aorta into the aortic orifice of the coronary vessels. The coronary arteries were then injected, via an aortic cannula at a pressure of 130mmHg, with a barium-iodine gelatin radiopaque contrast medium. When a good degree of contrast was obtained, post-mortem coronary angiography was carried out (Fig 1). Each heart was then soaked in formalin and subsequently cut into transverse slices of 1 cm thick, proceeding from the apex to within 3 cm of the atrioventricular groove. Each main coronary artery and its branches were sectioned transversely at 3 mm intervals along their entire course. The slices of the heart and coronary arteries were then photographed (Fig 2). Every visible gross alteration in morphology was recorded. Histological study of every segment of the myocardium and arteries was carried out after haematoxylin-eosin and Weigert staining.

Post-mortem examination of the remaining viscera was also performed[7]. The changes observed were analysed and recorded. The causes of death, whether related or not related to AMI, were documented.

Table I - Sex and age frequency of cases studied

Sex	Age range (years)					
	38-50	51-60	61-70	71-80	>80	Total
Males	8	26	37	25	12	108
Females	2	7	34	12	5	60
Total	10	33	71	37	17	168

Table II – Studied cases treated with and without thrombolytic agents

Patients who received thrombolysis	22 (13%)
Patients who did not receive thrombolysis	146 (87%)
Total	168 (100%)

RESULTS

In 109 cases (64.8%), the cause of death was due to AMI (Table III). Thirteen of these patients (12%) had received thrombolytic therapy. Clinically, death was due to heart failure in 39 patients

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Fig 1 – Illustration of the technique for the postmortem coronary angiography. A rubber plug was placed through the aorta into the aortic orifice and the coronary tree is injected with a radiopaque mass.

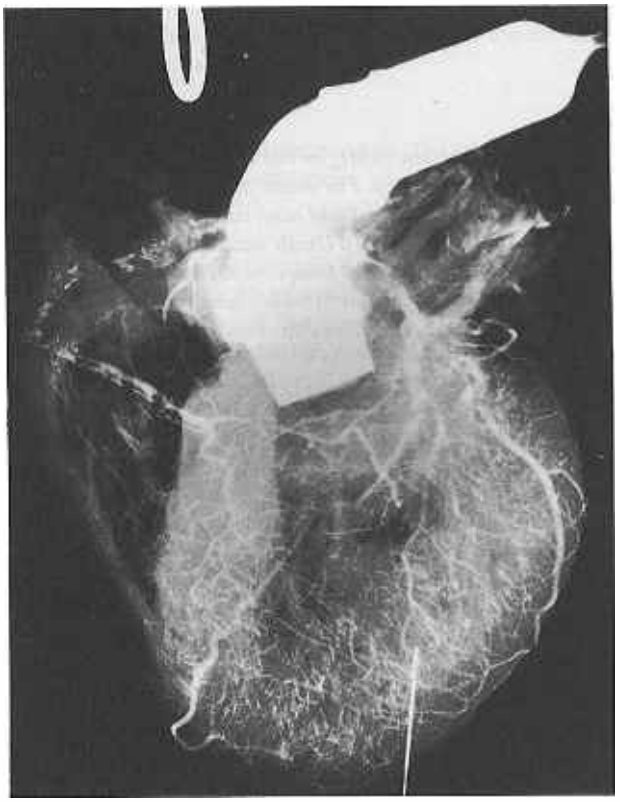

Fig 2 - Method of examination of the heart.

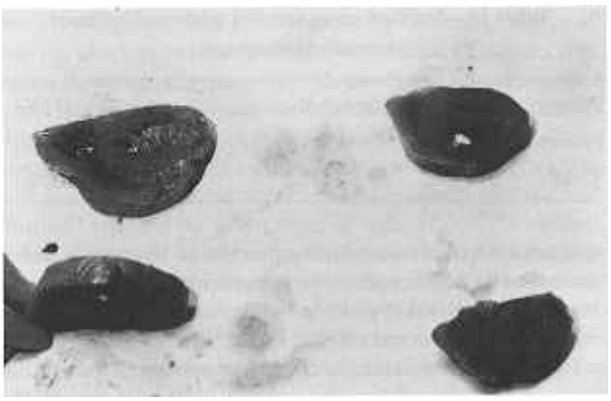

Table III – Cases studied who died from acute myocardial infarction (AMI)

Number	109/168 (64.8%)
Location of infarction	
Anterior	64 (59%)
Inferior	23 (21%)
Combined	22 (20%)
Infarct size	25% to 65%
Causes of death	
Heart failure	39 (35.8%)
Ventricular arrhythmia	48 (44.2%)
Cardiogenic shock	22 (20%)

(35.8%), ventricular arrhythmias in 48 patients (44%), and cardiogenic shock in the remaining 22 subjects (20%). Anterior infarction was seen in 64 subjects (59%), inferior infarction in 23 (21%), and combined anterior and inferior infarctions in 22 (20%). The size of the infarct ranged from 25% to 65% of the total myocardial mass.

The remaining 59 subjects (35.2%) had died from complications of AMI (Table IV). Nine of them (15.2%) had received intravenous thrombolytic agents. The causes of death in this group of subjects were reinfarction in 13 subjects (23.7%); heart rupture in 24 subjects (40.7%); myocardial fibrosis with reinfarction (old fibrosis combined histologically with recent fibrosis) in 11 subjects (18.6%). Two of these subjects also showed massive pneumonia and cerebral infarction, one of whom also showed gastric haemorrhage. The infarct was anterior in 22 subjects (37.3%), inferior in 26 (44%), and combined anterior and inferior in 11 (18.7%). The size of the infarct ranged from 35% to 60% of the total myocardial mass.

In the 22 patients who had received thrombolytic therapy (Table II), 8 died of haemorrhagic complications (36.3%) (Table V), and 7 of ventricular arrhythmias (31.8%) (Table VI).

Table IV - Cases studied who died from complications

Number	59/168 (35.2%)
Location of Infarction	
Anterior	22 (37.3%)
Inferior	26 (44%)
Combined	11 (18.7%)
Infarct size	35% to 60%
Causes of death	
Reinfarction	13 (23.7%)
Heart rupture	24 (40.7%)
Myocardial fibrosis + reinfarction*	11 (18.6%)
Cerebral infarction**	11 (17%)

* Associated massive pneumonia: 2 cases
** Associated gastric haemorrhage: 1 case

Table V - Causes of death from complications in patients who had undergone thrombolytic therapy.

Haemorrhagic reinfarction	3/22 (13.6%)
Cerebral haemorrhage	4/22 (18.2%)
Gastric haemorrhage	1/22 (4.5%)
Pneumonia	1/22 (4.5%)
Total	9/22

Table VI - Causes of death from AMI in patients who had undergone thrombolytic therapy.

Heart failure	3/22 (13.6%)
Cardiogenic shock	3/22 (13.6%)
Ventricular arrhythmia	7/22 (31.8%)
Total	13/22

Table VII – Classification of in-hospital cause of death from AMI

1. Death due to AMI
2. Death due to cardiac complications
3. Death due to side-effects of drugs (especially haemorrhagic side-effects of thrombolytic agents)
4. Death due to noncardiac causes

DISCUSSION

The in-hospital prognosis of myocardial infarction is usually related to the extent of the infarct and superimposed complications. Several variables such as the presence of previous myocardial ischaemia, hypertension, associated diseases and lifestyle may also influence the outcome.

Common causes of in-hospital deaths such as ventricular arrhythmias and pump failure[8,9] have been described. In the past, embolism in the arteries of the brain, lung, mesentery or extremities and recurrent myocardial infarction had also been described as possible causes of death in patients with AMI[10]. Some studies[11,12] have shown that deaths resulted whenever a sufficiently large area of myocardium underwent acute ischaemia, with or without necrosis, or when the ischaemia caused asystole, ventricular fibrillation, or congestive cardiac failure.

Recent therapeutic approaches, especially the treatment of AMI patients with thrombolytic agents, seem to decrease both acute and long-term mortality from AMI[1-3]. In contrast, a large series of newer complications, which may also be life-threatening in the course of AMI have been reported[13]. The majority of these complications are of the haemorrhagic type, and are mainly due to the side-effects of the thrombolytic agents which have been administered. Our observations seem to show clearly the two main causes of death in patients who had undergone thrombolytic treatment are haemorrhage and ventricular arrhythmia. Both causes accounted for more than 65% of the total in-hospital mortality for the group of subjects treated. In contrast, mechanical complications due to heart failure, cardiogenic shock, or heart rupture were the cause of death in AMI patients who had not received thrombolytic treatment.

The results of the present study thus suggest that the in-hospital cause of death due to AMI can be classified into four groups as shown in Table VII.

In addition, a wide spectrum of deaths, due to different causes, have influenced the in-hospital prognosis of myocardial infarction. However, the total mortality from such an occurrence is decreasing under diagnostic and therapeutic progresses.

Thrombolytic therapy increases haemorrhagic and arrhythmic deaths, although it increases the chances of survival in AMI patients.

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