Right Ventricular Infarction Incidence And Outcome

*MUHAMMAD AZHAR**
*SARMAD SALIM***
*SHAHID KARIM****
*MUHAMMAD ZUBAIR*****

Summary

To determine the incidence and outcome of right ventricular infarction we looked prospectively at 346 consecutive patients admitted with acute myocardial infarction. Right ventricular infarction was diagnosed by combination of electrocardiographic and echocardiographic criteria.

There were 48 patients with right ventricular infarction. The incidence of right ventricular infarction in patients with inferior myocardial infarction was 30%. There were 39 males and 9 females. In hospital mortality of patients with right ventricular infarction was significantly more than the mortality of the patients with acute myocardial infarction who did not have right ventricular involvement (23% vs 13%, p<0.001). Six patients presented with cardiogenic shock all of which died. Most patients had good resting left ventricular ejection fraction (mean 54%, range 39% to 74%).

We conclude that all patients with acute inferior myocardial infarction should be evaluated for right ventricular involvement so that specific haemodynamic and pharmacological management can be started.

Introduction

Right ventricular infarction (RVMI) is a complication of myocardial infarction involving posterior (inferior) wall of the left ventricle. Incidence at necropsy has been found to be 14% of all infarctions and 24% of the posterior wall infarctions[1]. It is usually caused by proximal right coronary artery occlusion before the right ventricular branch[2]. Diagnosis is usually made by clinical presentation, electrocardiogram and haemodynamic findings. ST segment elevation of more than 1 mm in V_{4R} has a high sensitivity and specificity for RVMI[3]. Although electrocardiogram is reliable in diagnosing RVMI it does not reveal the severity of right ventricular dysfunction and the ST segment elevation may not continue long enough for the diagnosis[4]. In first 2-3 days after infarction right ventricular necrosis can be diagnosed by uptake of technetium 99-m pyrophosphate resulting in scintigraphic hot spot[5]. 2-D echocardiography is also very sensitive for diagnosing right ventricular dysfunction[6]. We looked at the incidence, clinical presentation and outcome of right ventricular infarction in 346 consecutive patients with acute myocardial infarction admitted to Mayo Hospital, Cardiology Department.

Patients and Methods

346 consecutive patients admitted with acute myocardial infarction in Cardiology Department Mayo Hospital from July 1992 to June 1993 were analyzed for type of infarction, patient characteristics and subsequent clinical course.

* Assistant Professor, Cardiology Department, King Edward Medical College, Lahore.
** Medical Officer, Cardiology Department, Mayo Hospital, Lahore.
*** Registrar, Cardiology Department, Mayo Hospital, Lahore.
**** Professor, Cardiology Department, King Edward Medical College, Lahore.

Patients were monitored and serial cardiac enzymes were done. All patients were treated with intravenous heparin except for those in whom anticoagulants were contraindicated. Intravenous streptokinase was administered if the patient presented within 6 hours of onset of symptoms. One patient had a post mortem examination, which confirmed clinical diagnosis.

Two dimensional and Doppler echocardiography was performed on SIMS 9000 Biomedica echocardiographic equipment within 48 hours of admission and standard views were recorded. Right ventricular dimensions and any regional wall motion abnormalities were noted. Left ventricular ejection fraction was calculated in all patients. All the events were recorded and analyzed till discharge from hospital.

Right ventricular infarction was diagnosed by following criteria. Symptoms consistent with prolonged ischaemic chest pain, ST segment elevation followed by appearance of pathological Q waves of $\geq$ 0.04 sec in duration in leads II, III, aVF and V_{4R}, echocardiographic evidence of right ventricular dilatation, regional wall motion abnormality and reduced right ventricular ejection fraction. Chi-square test was used to determine the statistical difference in mortality.

Table I.
Patient characteristics of 48 patients with right ventricular infarction

Characteristic	
Sex (M/F)	39/9
Mean age	52
Previous infarction	2 (4%)
Thrombolytic therapy	20 (41%)
Shock at time of admission	6 (12%)
In hospital mortality	11 (23%)
ST segment elevation $\geq$ 0.1 mV in V	42 (87%)
Serious ventricular arrhythmias	10 (20%)

Results

346 consecutive acute myocardial infarction patients admitted to Cardiology Department Mayo Hospital were analyzed. There were 189 patients with anterior myocardial infarction and 157 patients with inferior myocardial infarction. Right ventricular infarction was diagnosed in 48 (14%) of total number of patients with myocardial infarction and 30% of inferior myocardial infarctions. The age range of the patients with right ventricular infarction was 37 to 70 with a mean age of 54, out of 48 patients with right ventricular infarction there were 39 (81%) males and 9 (19%) females. 45 (93%) had right ventricular infarction as first myocardial infarction and, 2 (6%) had history of previous myocardial infarction. Preinfarct angina was present in 3 (8%), diabetes mellitus 8 (20%), smoker 19 (49%), and hypertension 4 (10%). ST segment elevation of more than 1 mm in V_{4R} was present in 42 (87%) but echocardiogram showed right ventricular dilatation and reduced ejection fraction in all patients. We found right ventricular dilatation and reduced ejection fraction in 2 patients with anterior myocardial infarction. 6 patients were in cardiogenic shock at the time of admission (systolic blood pressure below 90 mmHg, signs of impaired peripheral circulation and lack of response to volume loading). All of these patients died.

Intravenous streptokinase was administered to 20 (41%) patients within 6 hours of onset of symptoms. Mean resting left ventricular ejection fraction as measured by two dimensional echocardiography was 54% (range 39-74%). 11 patients out of 48 with right ventricular myocardial infarction died during hospital stay (23%) as compared to 7 out of 96 (8%) with inferior wall myocardial infarction and no right ventricular involvement. The patients who died had a mean age of 52. Preinfarct angina and female sex were bad prognostic factors for increased mortality.

Serious ventricular arrhythmias (sustained ventricular tachycardia or fibrillation) occurred in 10 patients (Table I).

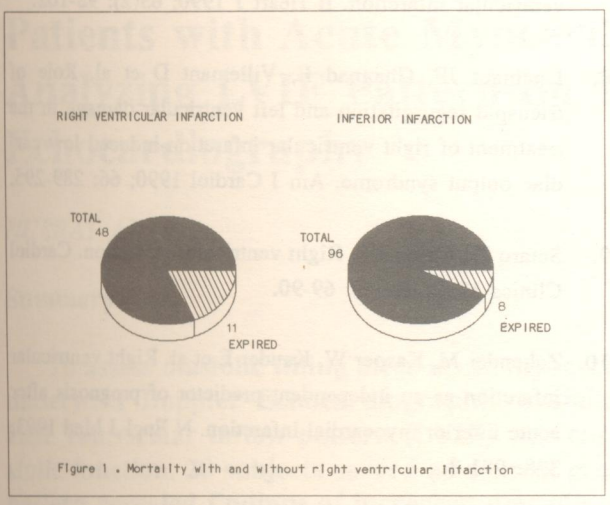

Figure 1.
Mortality with and without right ventricular infarction.

Discussion

Incidence of myocardial infarction has risen sharply in Pakistan over the last two decades although official statistics are lacking. To our knowledge this is the first study in our country to look at the incidence and outcome of right ventricular infarction. We found the incidence of right ventricular infarction in patients presenting with acute myocardial infarction very similar to previously reported series in developed countries.[1] Right ventricular infarction remained unrecognized in past due to lack of diagnostic methods and the belief that right ventricular function may not be important to maintain haemodynamic status. Right ventricular infarction may be suspected on grounds of clinical suspicion, physical examination and is confirmed using well defined electrocardiographic, radionuclide, echocardiographic and haemodynamic criteria.

Significant haemodynamic alterations may be present in upto 10% of patients[1]. Maintaining right ventricular filling pressures is considered to be the major therapeutic approach in right ventricular infarction and optimal level has been suggested as 10 to 14 mmHg[7]. However recent evidence suggests that volume loading helps only modestly in right ventricular infarction induced low output state and dobutamine was found to be more effective[8]. We found that the diagnosis of right ventricular infarction and extent of right ventricular dysfunction can be made reliably by keeping a high index of suspicion and with the help of echocardiogram. Patients with right ventricular infarction had a significantly high hospital mortality as compared to patients who did not have right ventricular involvement (Fig 1).

It has been said in the past that the prognosis of patients with right ventricular infarction is favourable[9], however our study did not find this and is in agreement with the recent evidence that in hospital mortality of patients with right ventricular infarction is alarmingly high[10].

Limitation to our study could be that we used echocardiographic and electrocardiographic criteria for diagnosis of right ventricular infarction which although is highly sensitive and specific may have missed some cases of right ventricular infarction.

As the mortality of right ventricular infarction is high we recommend that all patients admitted with acute inferior myocardial infarction should be evaluated for right ventricular involvement so that specific haemodynamic management can be instituted.

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