Right Ventricular Infarction
A study carried out by

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Abberivations

RVMI : Right ventricular myocardial infarction.
RV : Right ventricle.
CCU : Coronary care unit.
AMI : Acute myocardial infarction.
T.R : Tricuspid regurgitation.
V.S.D. : Ventricular septal defect.
V. Ectopic : Ventricular ectopic.
V. Tachycardia : Venticular tachycardia.
A.F : Atrial fibrillation.
A. Flutter : Atrial flutter.
RBBB : Right bundle branch block.
IV.S. : Inter ventricular septum.

Abstract

70 patients (40 patients with acute anterior MI and 30 patients with acute inferior MI) were included in this study. Those patients were admiitted under my care in the ccu of MARJAN teaching hospital in the period between 1-6-1994 and 15-1-1996. Those patients were followed closely for the first week from admission to the hospital by history, physical examination, ECG and echocardiography to detect RVI and any complications of RVI during this period.

The study showed that RVI occurred in 40% of patients with inferior wall MI and 10% of patients with anterior wall MI.

The study showed that V4R lead is the most reliable right precordial lead in detecting RVI followed by V3R.

Echocardiography had been found to be an important tool in diagnosis of RVI as showed by RV dilation and pardoxical or abnormal movment of interventricular septum.

RVI has various complications ranged from simp;e one such as ventricular ectopic to life threatning one such as CHB or shock.

The mortality rate of anterior wall RVI was 25% in the first week. While that of inferior wall MI and RVI was 16%.

Introduction

The right ventricular myocacdial infarction (RVMI) become a subject of great interest while previousily it was not considered an important clinical entity[1].

The incidence of (RVMI) is

lower than left ventricular infarction. This is attributted to the following causes [1]

1- The RV has smaller muscle mass.

2- The RV has a more favorable oxygen supply - demand ratio than the LV.

3- RV has better oxygen delivery due to biphasic nature of coronary blood fiow during both systole and diastole.

4- RV recives more extensive collateral from the rich left - to right collateral system.

RVI occurs when there is an occlusion of right coronory artery proximal to the acute marginl branches, but it may also occur with an occlusion of the left circumflex artery in patient who have left dominant coronary circulation[2,3].

RVI is now recognized to occur (50%) of all inferior myocardial infarction[1,4]. In early studies RVI occurred exlusively in patient with inferior myocardial infarction but subsquenty, cabin and colleague found (12%) incidence of RVI in patient with anterior MI[5].

Isolated RVI account for less than (3%) of all cases of infarction[6,7].

Those patients with RVI often present with signs of sever RV failure (jugular venous distention, hepatomegaly with or without hypotension). These symptoms and signs if present in patient with inferior MI considered pathognomonic of RVI.

Diagnosis of RVI is important because managment is differ from successful in treating. Volume expantion by normal saline is often successful in treating low cardiace output and hypotension associated with extensive RVI.

Patients and Methods

30 patient with acute inferior MI and 40 patients with acute anterior MI were admitted to the CCU of Marjan teaching hospital in the period between 1-6-1994 and 15-1-1996 (20 months). Those patients were followed closely for the first week from admission by history, phsical examination, ECG and echocardiophy (only for those patients with RVI) to detect any complications during this period.

The following criteria were used in the diagnosis of RVI :-

I- Physical examination:-

The clinical traid of Hypotension, clear lung field and elevated jugular venous pressure in patients with acute inferior MI were considered diagnostic of RVI.

II- Electrocadiography:-

1- 1 mm ST segment elevation in V3R, V4R, V5R. (one lead is enough)

2- presence of Q wave in any or all of the above leads.

III- Echocardiography

1- RV dilation.

2- Abnormal interventricular septal motion.

3- Tricuspid regurgitation.

4- Ventricular septal defect.

Aim of the study

1- To identify the incidence of RVI in inferior and anterior AMI.

2- To identify the complications of RVI.

Results

Table I

Showed that RVI occured in 40% (12 : 30) of patients with acute inferior MI. This result is inconsistent with the result of cohn and coworkers and also inconsistent to what is written in Harrison's Principle of internal Medicine (which showed 20-30% of acute inferior MI had RVI).

The recent study showed that RVI complicate up to 50% of inferior left ventricular infaction.

RVI occurred in 10% (4:40) of patients with left acute anterior wall MI. This is something new because in early studies RVI occurred exclusively in patients with concurrent transmural inferior wall MI. This result is consistent with the study done by Cabin and colleagues who found (13:97) of RVI in anterior wall MI.

Table II

Showed ECG change in RVI, which were 16 (4 in anterior AMI and 12 in inferior AMI) ST elevation > 1mm and or Q wave occurred in (100%) of V4R followed by V3R (62.5%).

These ECG changes also occurred in other right precodial leads but to less extent.

This give us clue that ST segment elevation and or Q wave in V4R is the most reliable lead in diagnosis of RVI. This result is consistent with the study done by Robalino BD in 1989 (who showed that lead V4R is the most predictive electrocardiographic finding of RVI. A 1-mm segment elevation in this lead was 70% sensitive and 100% specific for RVI[9].

Table III

Showed the echocardiographic finding:-

I did echocardiography only for those patients with acute MI and RV involvement [16 patients (12 RVI in inferior wall MI and 4 RVI in anterior wall MI)].

75% (12 : 16) had RV dilation ranged from mild to moderate dilation. (Normal RV dimension up to 28 mm)[13].

Another interesting echocardiographic finding had been observed, this was abnormal or paradoxical movement of inter ventricular septum which was presenet in 56%[9,16].

This can be explained by reversal of the transseptal pressure gradient due to the increased RV end diastolic pressure [11,12].

V.S.D. was recorded in one patient. This recorded by 2.D echocardiography.

Tricuspid Regurgitation was not recorded in any patient.

From this I conclude echocardiography play an important role in diagnosis of RVI.

Table IV

Showed the complications of acute MI with RVI. The complications ranged from simple one such as ventricular ectopics to life threatening one such as CHB, shock and ventricular tachycardia.

CHB. occurred in = (19%) (3: 16). Two of them was due to acute inferior MI and the third one was due to anterior MI. Two patients died (Pacemaker was not available in our hosiptal).

The third one was improved by medical treatment (isoprenaline drip), and one patient developed Mobitiz type II which progressed to CHB and died on the third day of admission to the hosiptal.

The incidence of atrioventricular nodal conduction distrubances (first degree A.V. block 4, Wenekebach phenomena 2; mobitiz II and CHB 3) was (10:16) = (62.5%) so it is higher than the incidence of A.V. block in a study done by Braatsh etall 1984 who showed that 48% of patients with acute RVI had atrioventricular nodal disturbances.

AF occurred in 31% (5:16) of patient. All of them were cardioverted either pharmacologically or by DC.

The highest complication was ventricular ectopic beat followed by AF.

The least was V.S.D. (1:16) 6.25%.

Table V

Showed the mortality rate of patients with RVI.

The mortality rate of patient with anterior MI without RVI was 16% (6:36). This increased to 25% (1 :4) in those patients who had anterior MI + RVI.

Also the patients with inferior wall MI without RVI had a mortality rate of 6% (1:18) this increased to (16%) (2:12) in those who had RVI. This indicate that the mortality increased among patient who also have RVI.

Conclusion

This study was conducted to give the physician an idea about RVI which became a subject of great interest recently :

1- The study emphasized the fact that the RVI occurred in anterior wall MI as well as in inferior wall MI on the contrary of previous concept that RVI occurred only in inferior wall MI.

2- The incidence of RVI highest in inferior wall MI than in anterior wall MI. This can be explaind on the base of blood supply of RV which come mainly from right cornary artery in which its block cause inferior wall MI. RV also receive blood supply to less extent from left circumflex artery and left anterior descending artery and blockage cause anterior wall MI and RVI.

3- **A.** ECG play a great role in diagnosis of RVI. ST elevation > 1mm and or Q wave in right precordial leads is diagnostic of RVI.

B. V4R, V3R are most reliable right precordial leads used in the diagnosis of RVI in this study.

C. Leads V4R, V3R are enough to diagnose RVI and there is no need to do other right precordial leads like V1R, V2R, V5R and V6R.

4- The study showed that echocardiography plays an important role in the diagnosis of RVI manifested by:

A- RV dilation.

B- Paradoxical or abnormal interventricular septal movement. These finding when pressent in patient with inferior wall MI or patient with anterior wall MI raise the possibility of RVI.

C- Echocardiography is also importan in detecting complication of RVI such as V.S.D. or Tricuspid regurgitation.

5- The study showed that the presence of RVI in patient with inferior or anterior wall MI increase the morbidity and mortality of the patient.

References

1- R. Jack W. Kinch, Right Ventricular infarction Current Concept Volume 330 No. 17.

2- Weinshel A. J. Isner J. M., Salem D.N., Konstam M. A. The cornary anatomy of RVI : relationship between the site of RCA oclusion and orgin of RV free wall irculation 1983; 68 : suppl III : II - 351. abstract.

3- Andersen H.R, Falk E. Nielsen RVI. frequency, size and topography in coronory heart disease

J. Am. Coll. Cardiology 1987 ; 10 : 1223 - 32.

4- Harrison i : Principles of internal medicine 1. Eleventh edition. chapter 190 page 992.

5- Cabin HS-Clubb KS. Wackers E. J T. RVI with anterior wall left ventricle infarction. AM Heart J. 1987; 113 : 16-23.

6- Moreyra A.E Wajnberg A. *et al.* Nondominant right coronory artery occlusion presnting with isolated RVI and V.F. Am. J. Med 1986; 81 : 146-8.

7- Roberts N. Harrison D.C. *et al* RVI with Shock but without significant L.V. infarction a new clinical syndrome Am. Heart J. 1985; 110 : 1047-53.

8- Cohn J.N., Guiho N.H. Broder MI Limas C.J. RVI clinical and haemodynmic features Am. J. Cardiolgy, 1974 ; 33; 209-14.

9- Erhardt L.R; Sjogren A. single right - sided precordial lead in diagnosis of RV involvement in inf. MI. A.M Heart J. 1976; 91 : 571-6.

10- Braat S.H., de Zwaan C; RV. involvment with acute of MI. identifies high risk of developing AV. nodal conduction disturbances. A.M Heart J. 1984; 107 : 1183-7.

11- D. Arcy B; Nada N.C. Two-dimensional echocardiographic features of right ventricular infarction. Circulation 1982; 65 : 167-73.

12- Jugdutt B.I.; Sussex B.A. Sivaram .A., Rossall R.E., Right ventricular infarction; two-dimensional echocardiographic evaluation A.M. Hreat J. 1984; 107 :505-18.

13- Harvey Feigenbaum Echocardiography 5th Edition Volume II. 1994. p-658.

Table I : Incidence of Right ventricular infarction

Site of MI	No.	No. of RVI	%
Anterior	40	4	10
Inferior	30	12	40

Table II : ECG changes in right ventriculr Infarction

ST Elevation and or Q wave	No. of Patients	%
V1R	2 : 16	12.5
V2R	3 : 16	18.75
V3R	10 : 16	62.5
V4R	16 : 16	100
V5R	8 : 16	50
V6R	6 : 16	37.5

Table III : Echocardiography in right ventricular Infarction

Echo Finding	No. of Patients	%
RV dilation	12 : 16	75
Paradoxical Motion of I.V.S	9 : 16	56
Tricuspid regurgitation	ZERO	ZERO
V.S.D	1 : 16	6.25

I . V . S = Inter Ventricular Septum

Table IV : Complications of patients with right ventricular infarction

Type of Complications	No.	%
Vent. ectopic	10 : 16	62.5
Vent. tachy cardia	2 : 16	12.5
Atrial fibrillation	5 : 16	31.25
Atrial flutter	ZERO	ZERO
First degree heart block	4 : 16	25
Wenekebach phenomena	2 : 16	12.5
Mobitiz type II	1 : 16	6.25
RBBB	1 : 16	6.25
CHB.	3 : 16	18.75
V. S . D .	1 : 16	6.25
Shock	2 : 16	12.5

Table V : Mortality of right ventricular infarction

Type of MI	No.	No. of death	%
Anterior Without RVI	36	6	16
Anterior With RVI	4	1	25
Inferior Without RVI	18	1	6
Inferior With RVI	12	2	16