ASSOCIATION OF ATRIOVENTRICULAR BLOCK WITH AND WITHOUT RIGHT VENTRICULAR INVOLVEMENT IN PATIENTS PRESENTING WITH ACUTE INFERIOR WALL MYOCARDIAL INFARCTION

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ABSTRACT:

BACKGROUND: *Patients with high degree Arioventricular Vode (AVB) had higher incidence of in hospital complications including cardiogenic shock, syncope, post MI angina, re-infarction and mortality. But data is scarce. So we conducted this study to get evidence regarding complications of RV infarction with inferior wall myocardial infarction (IWMI).*

AIMS & OBJECTIVE: *To find the association of in hospital high degree atrioventricular block with and without right ventricular involvement in patients presenting with acute inferior wall myocardial infarction.*

MATERIAL & METHODS: *This cohort study was done at Cardiology department of Punjab Institute of Cardiology, Lahore over a period of Six months from 15-06-2017 to 14-12-2017. Patients were divided in two groups i.e. group I with RV infarction and group II without RV infarction. Then patients were admitted in cardiology wards and were followed-up for 3 days.*

RESULTS: *Frequency of AVB in patients with RV infarction was significantly higher than patients without RV infraction. i.e. 16.8% vs. 3.2%. Relative risk showed that risk of AVB was 5.25 times more among patients with RV infarction. Patients who had RV infraction and AVB block (n=21) among them 71.43% had 3rd degree and 28.57% patients had 2nd degree AVB block.*

CONCLUSION: *Frequency as well as risk of high degree atrioventricular block was significantly higher in patients with RV infarction.*

KEY WORDS: *In hospital, high degree, Atrioventricular block, Right ventricular, Acute Inferior wall, Myocardial infarction.*

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INTRODUCTION

Acute myocardial infarction (AMI) is one the major cause of disability and death in the world and now evolving as major health problem in developing countries.[1] The involvement of proximal right coronary artery (RCA) in right ventricular infarction is 95% while the involvement of left anterior descending (LAD) artery is 5-10%. The important consequences on the management and outcome have occurred when inferior wall MI complicated with RV infarction.[2]

A right ventricular infarct should be considered in all those patients who present with an acute inferior wall MI with hypotension. The classic clinical trial of RV infarction includes increased jugular venous pressure, no crepitation in lungs, and hypotension.[3] Conduction abnormalities develop in about 15-20% of patients with AMI and predict adverse prognosis in these patients in terms of higher in hospital mortality, hypotension, left ventricular failure, cardiogenic shock, recurrent angina, and cardiac arrest.[4]

Heart blocks are frequent among patients with inferior wall MI and are accompanied with a variety of in hospital complications. These complications can be minimized by early recognition and timely management including interventions like temporary cardiac pacing.[5] High-degree atrioventricular block (HAVB) complicating AMI is known to be an ominous prognostic marker associated with an increased rate of mortality.[6]

One local study showed that in patients of IWMI, during hospital stay, 1.5% patients without RV infarction and 8.4% patients with RV infarction developed high degree AVB ($p<0.005$).[7] One more local study showed that frequency of high degree AVB was 39.2% in IWMI patients with RV infarction.[1]

Rationale of this study was to find the association of in hospital high degree AVB with and without RV involvement in patients presenting with acute IWMI. Literature has showed that high degree AVB is higher in patients of IWMI with RV infarction. But, not much work has been done in this regard. So we want to conduct to more evidence and be able to implement the results of this study in future. This will help use to implement the early screening of IWMI patients with RV infarction and manage patients accordingly to prevent them from developing high degree AVB which leads to in-hospital mortality.

MATERIAL & METHODS:

This cohort study was done at Cardiology department of Punjab Institute of Cardiology, Lahore over a period of Six months from 15-06-2017 to 14-12-2017. Total 250 cases were enrolled; 125 cases in each group was calculated with 80% power of test, 5% level of significance and taking expected percentage of in-hospital AVB i.e. 1.5% without RV infarction and 8.4% with RV infarction in patients presenting with IWMI. Non-probability, consecutive sampling technique was used. Patients of age 40-80 years of either gender presenting with IWMI (as per operational definition) in emergency within 12 hours of symptoms. Group I: patients with RV infarction (as per operational definition) and Group II: patients without RV infarction were included in the study. Patients with previous MI, bypass, angiography or angioplasty, or AV block in previous MI (on medical record) and patients with diabetes (BSR>186mg/dl) were excluded from the study.

Operational definition

Acute IWMI

It was defined as typical chest pain for >30 minutes, ECG changes with ≥1mm ST segment elevation in II, III & aVF, CKMB>25 and troponin>100.

Right ventricular involvement

It was defined as presence of ST-segment elevation >1mm in lead V4 R on ECG at time of presentation

High degree AVB

It was labeled if patient develop prolonged PR interval (>0.20sec) on ECG and Mobitz 2 or 3 (AV conduction ratio varies between 2:1 and 3:1, atrial rate is faster than escape rhythm, no relation between atria and ventricle, HR<40bpm) within 3 days of admission in hospital

DATA COLLECTION PROCEDURE:

Total 250patients who fulfilled the selection criteria were enrolled in the study from emergency of Department of Cardiology, Punjab Institute of Cardiology, Lahore. Informed consent was obtained from attendants. Demographic data (name, age, gender, BMI, duration of symptoms) was also noted. Then patients were divided in two groups i.e. group I with RV infarction and group II without RV infarction. Then patients were admitted in cardiology wards and were followed-up for 3 days.

DATA ANALYSIS:

The collected data was analysed statistically by using SPSS version 21. Quantitative variables like age, BMI and duration of symptomswas presented in form of mean ± SD. Qualitative variables like genderandin-hospital AVB was presented in form of frequency and percentage. Relative risk was calculated to measure association between

RV infarction and in-hospital AVB. RR>1was considered as significant. Data was stratified for age, gender, BMI and duration of symptoms. Post-stratification, adjusted RR was calculated to check significance in stratified groups. A RR>1was considered as significant.

RESULTS:

Mean age of patients in Group-A and in Group-B was 59.69±10.93 and 59.65±11.93 years. Table-1

In both Groups gender distribution of male and female patients was same i.e. 62(49.6%) male and 63(50.4%) were females. Table-2

Mean BMI of patients in Group-A and in Group-B was 26.81±4.90 and 28.12±5.75.Table-3

Mean duration of symptoms among Group-A patients 6.44±3.62 hours and among Group-B patients it was 6.38±3.62 hours respectively. Table-4

Frequency of AVB was significantly higher in Group-A patients. i.e. Group-A: 16.8% vs. Group-B: 3.2%, p-value= 0.0018. Relative risk shows that patients with RV infarction have 5.25 times more chances for AVB as compared to those patients without RV infarction. In Group-A 6(28.75%) patients had 2nd degree and 15(71.43%) patients had 3rd degree AVB while in Group-B 3(75%) patients had 2nd degree AVB and only 1(25%) patient had 3rd degree AVB. Table-5

Patients in the elderly age group with RV infarction had significant risk for AVB. i.e. 18.46, p-value=0.042. However in other age group like patients 40-50 years of age among them risk of AVB was 1.88, risk of AVB in 51-60 years age of patients was 11.64 and patients in the age group 61-70 years of age among them risk of AVB was 2.66. But among these age groups the risk for AVB for patients with RV infarction was not statistically significant.Table-6

Both male and female patients with RV infarction

Table-1: Descriptive Statistics for Age

	Group-I	Group-II
n	125	125
Mean	59.69	59.65
SD	10.93	11.93
Min	41	40
Max	80	80

Group I: Patients with RV infarction (as per operational definition)
Group II: Patients without RV infarction

Table-2: Gender of Patients

	Group-I	Group-II	Total
Male	62(49.6%)	62(49.6%)	124
Female	63(50.4%)	63(50.4%)	126
Total	125	125	250

Group I: Patients with RV infarction (as per operational definition)
Group II: Patients without RV infarction

Table-3: Descriptive Statistics for BMI of patients

	Group-I	Group-II
n	125	125
Mean	26.81	28.21
SD	4.90	5.75
Min	19.10	19.10
Max	37.09	37.09

Group I:Patients with RV infarction (as per operational definition)
Group II:Patients without RV infarction

Table-4: Descriptive Statistics for duration of symptoms (Hours)		
	Group-I	Group-II
n	125	125
Mean	6.44	6.38
SD	3.62	3.62
Min	1	1
Max	12	12
Group I: Patients with RV infarction (as per operational definition) Group II: Patients without RV infarction		

Table-5: In Hospital AVB			
AVB	Group-I	Group-II	Total
Yes	21(16.8%)	4(3.2%)	25
No	104(83.2%)	121(96.8%)	225
Total	125	125	250
Relative Risk= 5.25 (1.85-14.85) p-value= 0.0018			

Table-5.1: In Hospital AVB degree			
Degree of AVB	Group-I	Group-II	Total
2nd Degree	6(28.57%)	3(75%)	9
3rd Degree	15(71.43%)	1(25%)	16
Total	21	4	25
Group I:Patients with RV infarction (as per operational definition) Group II:Patients without RV infarction			

Table-6: In Hospital AVB in study groups stratifies for age of patients						
Age	AVB	Group-I	Group-II	RR	CI	p-value
40-50	Yes	5(16.1%)	3(8.6%)	1.881	0.48-7.23	0.357
	No	26(83.9%)	32(91.4%)			
51-60	Yes	5(15.2%)	0(0%)	11.64	0.66-202.74	0.092
	No	28(84.8%)	35(100%)			
61-70	Yes	4(11.1%)	1(4.2%)	2.66	0.31-22.43	0.366
	No	32(88.9%)	23(95.8%)			
71-80	Yes	7(28%)	0(0%)	18.46	1.10-303.36	0.042
	No	18(72%)	31(100%)			
Group I:Patients with RV infarction (as per operational definition) Group II:Patients without RV infarction						

Table-7: In Hospital AVB in study groups stratifies for gender of patients						
Gender	**AVB**	**Group-I**	**Group-II**	**RR**	**CI**	**p-value**
Male	Yes	10(16.1%)	3(4.8%)	3.33	0.963-11.53	0.057
	No	52(83.9%)	59(95.2%)			
Female	Yes	11(17.5%)	1(1.6%)	11.00	1.463-82.68	0.019
	No	52(82.5%)	62(98.4%)			
Group I:Patients with RV infarction (as per operational definition) Group II:Patients without RV infarction						

Table-8: In Hospital AVB in study groups stratifies for BMI of patients						
BMI	**AVB**	**Group-I**	**Group-II**	**RR**	**CI**	**p-value**
Normal	Yes	21(42%)	0(0%)	40.47	2.52-649-78	0.009
	No	29(58%)	47(100%)			
Over-weight	Yes	0(0%)	0(0%)	0.51	0.01-24.92	0.735
	No	42(100%)	21(100%)			
Obese	Yes	0(0%)	4(7%)	0.189	0.01-3.41	0.259
	No	33(100%)	53(93%)			
Group I:Patients with RV infarction (as per operational definition) Group II:Patients without RV infarction						

Table-9: In Hospital AVB in study groups stratifies for duration of symptoms						
Symptoms	**AVB**	**Group-I**	**Group-II**	**RR**	**CI**	**p-value**
1-4	Yes	6(12.8%)	2(4.3%)	3.00	0.637-14.11	0.164
	No	41(87.2%)	45(95.7%)			
5-8	Yes	6(18.2%)	0(0%)	14.52	0.849-248.44	0.064
	No	27(81.8%)	37(100%)			
9-12	Yes	9(20%)	2(4.9%)	4.10	0.94-17.87	0.060
	No	36(80%)	39(95.1%)			

posses significantly higher relative risk for AVB. i.e. Male: 3.33 & Female: 11.00 respectively. Table-7

Patients with RV infarction whose BMI was normal among them relative risk for AVB was 40.47 times higher as that of those patients with RV infarction. However AVB risk among overweight and obese patients was not significant. i.e. BMI (Overweight): 0.51, p-value=0.735 & BMI (Obese):0.189, p-value=0.259 Table-8

Patients with duration of symptoms 1-4 among them relative risk for AVB block was 3.00 times higher with RV infarction, patients with duration of symptoms as 5-8 among them relative risk increases to 14.52 times and patients with symptoms duration in between 9-12 among them relative risk for AVB in patients RV infarction was 4.10 times higher. Although an increasing trend was seen in relative risk value with increases in duration of symptoms but it was not statistically significant.Table-9

DISCUSSION:

Pirzada et al[7] in his study showed that in patients of IWMI, during hospital stay, 1.5% patients without RV infarction and 8.4% patients with RV infarction developed high degree AVB ($p<0.005$). Prior studies have reported the incidence of HAVB in ACS between 3 and 14% with an associated three-to five-fold increased risk of in-hospital death.[6, 8-10] These reports have been limited by the small numbers of patients studied, typically in STEMI patients, and predominantly in patients receiving care in, or prior to, the 1990s.[6, 8-10] Furthermore, the associations between clinical factors including in-hospital therapies received, and the risk of death within this group of patients is not well described.

In this study frequency of AVB in patients with RV infarction was significantly higher than patients without RV infraction. i.e. 16.8% vs. 3.2%. Relative risk showed that risk of AVB was 5.25 times more

among patients with RV infarction. Patients who had RV infraction and AVB block (n=21) among them 71.43% had 3rd degree and 28.57% patients had 2nd degree AVB block.

A number of studies have determined the incidence of CAVB and its effects on prognostic implications in inferior wall MI, but little is known about their pattern and impact in our population. Incidence of AVB is about 12% in western studies.[11] However reported incidence of AVB is 30%, and incidence of CAVB IS 21% in our population.[12] Incidence of high degree AVB is reported to be 23.6%7 and 29.4% in other studies.[13] Recently in 2016 a local study reported the frequency of AVB as 28% inpatients with inferior wall MI.[14] Another local study from Peshawar showed that among 174 patients of RVMI AVB were present in 25(14.3%) patients.[15] Siddique M in his study showed that frequency of high degree AVB was 39.2% in IWMI patients with RV infarction.[1]

In this study frequency of high degree atrioventricular block in patients with RV infarction lies in the range reported in the local study. However only two studies one by Pirzada AM and the other study by Mehreen[5] reported frequency for atrioventricular block in patients with RV infarction was quite higher as compared to this study. This difference can be explained on the basis of difference in sample size difference, patients selection criteria and other relevant methodological considerations. The important aspect of this study was the calculation of relative risk for AVB in patients with and without RV infarction presenting with acute inferior wall myocardial infarction. Previous studies have not calculated the risk for AVB in patients with and without RV infarction presenting with acute inferior wall myocardial infarction.

When acute inferior wall MI combine with RV infarction, the mortality is increased but not fully explained mechanical reasons. Patients with RV infarction in whom medical management was delayed were more prone to develop high degree AVB and mortality rate was also found to be significantly high in these patients. Right Ventricular infarction developed in one third of patients and hemodynamic compromise occurred in 10 % cases. [13]The overall experience shows that that very early origin of AVB respond to atropine quickly and dramatically but those appear late are not Atropine responsive in most of the cases.[16]

The two most common explanations that have been offered to explain the etiology of AVB are an interruption of blood flow to the AV node and a high vagal tone resulting from the Bezold-Jarisch reaction. Inferior infarctions are caused by the occlusion of the dominant artery in more than 70% of cases.[17] Because, the AV nodal artery is derived from the dominant artery, it is believed that necrosis of the AV node leads to AVB. An alternate hypothesis invokes increased vagal tone resulting from the stimulation of afferent nerves adjacent to the AV node induced by ischemia. The resultant para-sympathetic stimulation via vagus nerve produces sinus bradycardia, hypotension, and in some patients AVB. This has been named as Bezold Jarisch reflex.[18]

CONCLUSION:

Results of this study showed that frequency as well as risk of high degree atrioventricular blockwas significantly higher in patients with RV infarction. Early recognition of RV infarction in inferior MI is clinically important to ensure not only that appropriate treatment is instituted but also that one can anticipate that nodal ischemia might complicate the case by developing high degree AVB.

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