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Frequency of new onset right bundle branch block in acute myocardial infarction and its coronary angiographic findings in patients presenting at Tertiary Care Hospital, Peshawar

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Abstract

Background: Right bundle branch block has prognostic significance in the setting of acute myocardial infarction; this research is intended to determine the incidence of new-onset right bundle branch block in acute myocardial infarction and its angiographic findings.

Methodology: This descriptive cross-sectional study was conducted in a tertiary care hospital, i.e., the Cardiology Department, Lady Reading Hospital, Peshawar, from 13/5/2016 to 13/11/2016. A total of 91 patients were included in the study. Baseline investigation, including ECG (Nihan Koden), Coronary angiography (Siemens Healthineers), on patients who qualify for early invasive therapy and angiographic findings. All the information, like age and gender, was recorded. 91 patients with acute myocardial infarction who presented within 24 hours were observed, in which male to female ratio was 1.17:1. The study enrolled the age group from 30 up to 75 years.

Results: Average age was52.6±7.71 years. New onset right bundle branch block (RBBB) was found in 13(14.29%) patients in acute myocardial infarction.

Conclusion: In conclusion, RBBB was observed in 13% of patients where angiographic findings showed triple vessel disease 38.5%, double vessel coronary artery disease 30.8%, single vessel disease 15.4%, and left main stem disease15.4% respectively, there is a high rate of severe CAD in patients presenting with RBBB in the setting of the acute coronary syndrome, so early reperfusion is recommended.

Keywords

Right Bundle Branch Block, Myocardial Infarction, Coronary Angiography.

Introduction

Left bundle branch block (LBBB) and right bundle branch block (RBBB) in acute myocardial infarction (AMI) patients are associated with very high mortality risk[1,2]. Moreover, European Society of Cardiology (ESC) guidelines consider LBBB as an indication for urgent reperfusion therapy[3]. The American Heart Association (AHA)/American College of Cardiology (ACC) guidelines got the same strategy for LBBB[4]. Thus, the current guidelines recommend reperfusion therapy in AMI, including ST-segment elevation (STE) and LBBB of new or unknown onset. It is still unknown whether a new or unknown onset of RBBB is an indication for reperfusion therapy, especially in this modern era of primary percutaneous coronary intervention. The incidence of new-onset RBBB in the setting of acute myocardial infarction was found to be 6.3%[5]. It is quite clear from the previous record that coronary angiography in patients who presented with acute myocardial infarction showed significant left main stem disease, as high as 26% had RBBB[5]. Similarly, angiography in patients presenting with acute myocardial infarction with RBBB showed Single vessel coronary artery disease in 29.1% of patients, Double vessel coronary artery disease in 27.5% of patients, and triple vessel coronary artery disease in 35.1% of patients, respectively[5,6].

Although the thrombolytic therapy has reduced the resolution of RBBB[7], decreased death rates, and improved left ventricular function in patients with AMI[8]. RBBB is still considered a subset of increased mortality in this thrombolytic era[9]. Now randomized controlled trials proved that coronary intervention might be a better choice in comparison to thrombolytic therapy, taking into account the early and late clinical and angiographic outcomes[10]. Thus, it is evident that coronary intervention may alter the implications of RBBB in patients coming with acute AMI.

The rationale of this study was to determine the angiographic findings in patients with new onset right bundle branch block in the setting of acute myocardial infarction. According to the current guidelines patient with RBBB does not qualify for thrombolysis with thrombolytics like streptokinase. In underdeveloped countries like ours, thrombolysis is the main modality of treatment after acute ST-segment elevation myocardial infarction. Patients who present with new onset RBBB and angina are treated as non-ST segment elevation Myocardial Infarction (NSTEMI) if the cardiac enzymes are elevated. Therefore, cardiologists will consider the presence of new-onset or unknown onset RBBB in the setting of acute myocardial infarction as a criterion for reperfusion. This will help cardiologist to recognize RBBB as a marker of risk in the setting of acute myocardial infarction and will help incorporate RBBB in acute myocardial infarction and may be a pertinent method for reducing mortality after AMI. This study will provide us with local statistics on the frequency and angiographic findings in patients with new onset or unknown onset RBBB after acute myocardial infarction and thus point to the optimal treatment strategy for these patients. Once the results are obtained, they will be shared with other local cardiologists, and future guidelines will then be formulated for patients with new onset or unknown onset RBBB in the setting of acute myocardial infarction to improve the outcome of such patients.

Methodology

After approval from the hospital's ethical and research committee, the study was carried out in our hospital. Patients presented to the OPD and emergency Cardiology Department, Lady Reading Hospital, Peshawar starting from 13 May 2016 to 13 November 2016, were included.

Patients of both sexes aged between 30 years and 75 years presenting with acute myocardial infarction presenting within 24 hours were part of this research. A patient who presents >24 after symptoms onset (based on history), a Patient with old RBBB (based on old ECG), and Patients who have implanted CRTD or Pacemaker (based on clinical findings) were not enrolled in this research. After taking the informed consent, patients were admitted to the cardiology ward. All patients underwent detailed history, followed by a complete clinical examination. Baseline workup, including ECG, was done on presentation. All patients were

kept in the cardiology ward till stabilization and management protocols were followed for all enrolled patients. Coronary angiography was done on patients who qualify for early invasive therapy, and angiographic findings were recorded. All the information mentioned above, including demographic features, was documented in an already designed proforma, and exclusion criteria was strictly followed to control confounders and bias in the study results.

The data was examined in SPSS version 22 thoroughly. Mean + SD were calculated for numerical variables like age. Frequencies and percentages were calculated for categorical variables like gender and Angiographic findings (Single vessel disease, double vessel disease, triple vessel disease, and left main stem disease). Angiographic findings were stratified among age and gender to see effect modification. Post-stratification performed via chi-square test keeping P Value≤ 0.05 was considered significant.

Results

In this study, 91 patients with acute myocardial infarction presented within 24 hours observed, of which 49(53.85%) were male and 42(46.15%) were female patients. Male to female ratio was 1.17:1. Patients' age was distributed in three strata, most of which presented with the age of 56 to 75 years, which were 40(44%), while 18(19.8%) patients in the age range of 30 to 40 years and 33(36.3%) were of age range 41-55 years. The study enrolled ages ranged from 30 up to 75 years. The average age was 52.6years+7.71SD. New onset right bundle branch block (RBBB) was found in 13(14.29) patients, while 78(85.71%) patients with acute myocardial infarction were found free of RBBB (Table 1).

Table 1: Baseline Characteristics

Parameter	Age (years)	Frequency	Percentage
Age	30-40	18	19.8%
	41-55	33	36.3%
	56-75	40	44%
Gender	Male	49	53.8%
	Female	42	46.1%
New onset RBBB	Yes	13	14.2%
	No	78	85.7%

Distribution of coronary angiographic findings of RBBB shows that out of angiographic findings, while triple vessel disease was observed in the majority of cases which is 5(38.5%), followed by double vessel in 4(30.8%). In comparison, 2(15.4%) patients have left main stem disease (Table 2).

Table 2: Coronary Angiographic Findings of RBBB

Parameter	Age (years)	Frequency	Percentage
Single vessel disease	Yes	2	15.4
Double vessel disease	Yes	4	30.8
Tipple vessel disease	Yes	5	38.5
Left main stem disease	Yes	2	15.4

Age-wise distribution of RBBB and its coronary angiographic findings among patients with acute myocardial infarction showed that old age is commoner than that of younger age. RBBB was found in the majority of the participants aged 56 to 75 years which was 20%, followed by 12.1% in patients 41-55 years of age, and 5.6% RBBB was found in those aged 30 to 40 years. A similar pattern has been followed approximately by its coronary angiographic findings, but none of them were statistically significant when stratified over age (Table 3).

Table 3: Age Wise Distribution of Coronary Angiographic Findings of RBBB

Parameter	Yes/No	Age (in years)			p-value
		30-40 n (%)	41– 55 n (%)	56-75 n (%)	
New Onset Right Bundle Branch Block	Yes	1(5.6)	4(12.1)	8(20.0)	0.315
	NO	17(94.4)	29(87.9)	32(80.0)	
Single Vessel Disease	Yes	1(5.6)	0(0)	1(2.5)	0.427
	No	17(94.4)	33(100)	39(97.5)	
Double vessel Disease	Yes	0(0)	3(9.1)	1(2.5)	0.234
	No	18(100)	30(90.9)	39(97.5)	
Triple vessel Disease	Yes	0(0)	1(3.0)	4(10.0)	0.224
	No	18(100)	32(97.0)	36(90.0)	
Left Main Stem Disease	Yes	0(0)	0(0)	2(5.0)	0.272
	No	18(100)	33(100)	38(95.0)	

The majority of females, i.e., 7(16.7%) presented with acute myocardial infarction, have RBBB, while 6(12.2%) patients with RBBB were male. Similarly, 1(2.0%) single vessel disease was found in males, and 1(2.4%) was found in females. The rest of the angiographic findings were a little bit high in females as compared to males, but all of them were statistically insignificant (Table 4).

Parameter	Yes/No	Gender		P-Value
		Male n (%)	Female n (%)	
New Onset Right Bundle Branch Block	Yes	6(12.2)	7(16.7)	0.548
	No	43(87.8)	35(83.3)	
Single Vessel Disease	Yes	1(2.0)	1(2.4)	0.912
	No	48(98.0)	41(97.6)	
Double vessel Disease	Yes	2(4.1)	2(4.8)	0.875
	No	47(95.9)	40(95.2)	
Triple vessel Disease	Yes	1(2.0)	4(9.5)	0.118
	No	48(98.0)	38(90.5)	
Left Main Stem Disease	Yes	2(4.1)	0(0)	0.186
	No	47(95.9)	42(100)	

Discussion

Right Bundle Branch Block (RBBB) is considered a risk factor in patients presenting with acute anterior myocardial infarction (MI). Taking into account the structure and blood supply of the conduction system, RBBB occurs in large anterior myocardial infarctions that are often associated with heart failure and atrioventricular (AV) conduction block, but the basic mechanism by which it is labeled as an independent risk factor is still enigma[11,12]. In our study, 91 patients with AMI, of which 49(53.85%) were male and 42(46.15%) were female patients.

Patients' age was stratified into three categories; out the most presented with the age of 56 to 75 years, which were 40(44%) while 18(19.8%) patients in the age range of 30 to 40 years and 33(36.3%) were of age range 41-55 years. The study included ages ranging from 30 up to 75 years. The average age was 52.6±7.71 years.

New onset right bundle branch block (RBBB) was found in 13(14.29%) patients, while 78(85.71%) patients with acute myocardial infarction did not have RBBB. Coronary angiographic findings of RBBB show that triple vessel coronary artery disease was found in most cases which is 5(38.5%), followed by double vessel in 4(30.8%), where 2(15.4%) patients have left main stem disease. When bundle branch block is seen during acute myocardial infarction, the infarct is mostly in the anterior territory and near the area of the proximal bundle branches[13]. This reveals that bundle branch block in acute myocardial infarction is due to infarction of the proximal conduction system resulting from the disease of the proximal left anterior descending artery or septal perforators[14,15].

In the past, the death rate of patients with AMI and RBBB before the introduction of thrombolytics rose to 77%[16]. Recently a study conducted in Denmark showed the increased mortality of AMI among patients with bundle branch block (both LBBB and RBBB), i.e., 33.3% of patients died in hospital and 54.8% died after a year[17].

In the study of Dubois et al., patients with BBB (LBBB or RBBB) had more deteriorating symptoms and higher Killip class on arrival. Both in-hospital mortality (32 vs. 10%, P, 0.001) and 3-year mortality (37 vs. 18%, P, 0.001) were higher among patients with complete bundle branch block[18]. Similar to our study, in one study of 1238 consecutive patients with AMI, RBBB was found in 10.9% of patients[19].

Similar to our study, Satoshi Kurisu et al. carried out a study of 430 patients in which RBBB was found in 35 patients. When coronary angiograms were performed, it revealed that RBBB was associated with occluded LAD artery ($p<0.01$) and multivessel coronary artery disease ($p=0.01$). Similarly, 30 days mortality rate was very high in patients having RBBB than in those without RBBB (14.0% vs. 1.9%, $p<0.01$)[20].

The overall rate of RBBB in our study is 14.2%, which is in accordance with previous studies[21,22]. Previous reports showed that new RBBB in patients with MI is more commonly associated with anterior wall myocardial infarction than with infarction of other territories[23,24,25]. In cases of inferior MI, the RCA was the culprit artery. In the study of James and burch[26], the RCA in more than 90% of the cases supply blood to the upper portion of the IVS, which consists of the AV node, the bundle of His, and the upper part of the two bundle branches. Based on this division of the blood supply, we suppose that occlusion of the RCA may cause the disturbance of AV conduction rather than bundle branch block. Hence it shows that disturbance in the blood supply of the right bundle by blockage of the RCA was not considered to be a cause of RBBB.

Our data show extensive myocardial damage in patients with RBBB and point out that this damage may determine the poor prognosis leading to heart failure. In one study, patients with RBBB were associated with very higher LV end-diastolic pressure, and this high LV end-diastolic pressure was associated with severe remodeling of the LV with fibrosis. This was particularly more pronounced in patients with anterior MI and RBBB[27,28].

The right bundle branch is usually smaller in size and is supplied mainly by the LAD coronary artery and secondarily by the RCA. Only later, when the damage to the myocardium and of the conduction pathways is irreversible, collateral vessels may develop with time[29].

The main limitation of this study was the smaller sample size; further studies on a large sample, sex, and age-standardized study population, including long-term follow-up, would emphasize the close relationship between patients presenting with RBBB and coronary artery disease.

Conclusion

RBBB was observed in 13% of patients where angiographic findings showed triple vessel disease 38.5%, double vessel disease30.8%, single vessel disease 15.4%, and left main stem disease15.4%, respectively. New onset RBBB should be included in future guidelines as an urgent indication for reperfusion therapy, in the same way as LBBB, i.e., irrespective of the presence or absence of ST-segment deviation. Further large-scale and randomized control trials are suggested to declare it as a risk factor for acute MI.

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