Original Research Article

# Prognostic Signifincance of Conduction Blocks in Cases of Acute Myocardial Infarction: A Prospective Observational Study at Tertiary Care Hospital

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## Abstract

**Introduction:** Conduction blocks are frequent complications of acute myocardial infection. Development of complete AV block is associated with poor prognosis likely owing to the extension nature of the infarction. Bundle branch block in acute MI carries poor prognosis. This has been attributed both to the extent of myocardial damage and to the frequency of ventricular asystole. Development of conduction block worsens the outcome of acute myocardial infarction. So recognition of conduction block at an early stage, helps in appropriate treatment including pacing can be institutes at an early stage. **Aims and Objectives:** To study various patterns of conduction blocks and prognostic implications of conduction blocks in acute myocardial infarction. **Materials and Method:** A prospective observational study was done on 100 myocardial infarction patients admitted in J.A. Group of Hospitals, Gwalior over a period of January 2019 to June 2020. ECG was continuously observed in CCU and daily ECGs were done. Cardiac markers, fasting blood sugar, lipid profile, serum electrolytes were performed and data was collected. The chi square test was used and p value < 0.05 was considered as statistically significant. **Result:** A total of 100 patients were included. Out of 100 patients 68 had conduction blocks, out of which 50 had bundle branch blocks whereas 18 had AV blocks. Most of the acute myocardial infarction patients were males (74%). Overall hypertension and smoking was the most common risk factor seen in this study. AV blocks were more common in inferior wall MI and bundle branch blocks were more common in anterior wall MI. There is common association of inferior wall MI with RBBB compared to that of which LBBB (p<0.0001). There was statistical association between type of block and location of MI. Cardiogenic shock was the common complication seen in patients of MI with conduction blocks. Past history of MI was found to be predominant risk factor among mortality seen in 33.3%. Among bundle branch block mortality more with LBBB (23%) and among AV block mortality more with 3o AV block (50%). **Conclusion:** Conduction blocks were associated with increased risk of in hospital morbidity and mortality in the form of other vascular events during hospital stay. Patients with acute myocardial infarction should be observed carefully for early recognition of conduction blocks and they need close monitoring and optimum clinical care to reduce mortality and morbidity.

**Keywords:** Acute myocardial infarction, conduction block, bundle branch block, atrioventricular blocks.



### Introduction

Acute Myocardial Infarction (AMI) is one of the major problems in 21stcentury[1]. Acute Myocardial Infarction is usually associated with many complications like ventricular dysfunction, conduction blocks, cardiogenic shock, mechanical complications, ventricular arrhythmias, etc. In presence of these complications acute Myocardial Infarction is usually having a guarded prognosis[2]. Conduction blocks are frequent complications of AMI. They can be defined as a delay or interruption of the cardiac impulse.

Various types of conduction blocks develop following AMI. First-degree atrioventricular block (AVB) occurs in 4-14% of patients with AMI; Mobitz Type I second-degree AVB is observed in up to 10% of patients with AMI and is usually transient. Mobitz Type II second-degree AVB occurs in >1% of patients with AMI.1 Third-degree or complete AVB occurs in about 5-8% of patients[3].

The development of complete AV block is associated with poor prognosis likely owing to the extensive nature of the infarction.

Bundle branch block in AMI carries poor prognosis. This has been attributed both to the extent of myocardial damage and to the frequency of ventricular asystole[4].

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Development of conduction blocks worsens the outcome of AMI. So recognition of conduction blocks at an early stage, helps in appropriate treatment including pacing can be instituted at an early stage.

### Material and Methods

This study will be carried out in ICCU, Department of Medicine, G.R. Medical College Gwalior.
**Sample Size** - 100
**Type of study** - Prospective and observational studies.
**Duration of Study** - Jan 2019 - June 2020

**Inclusion criteria**

- Patients who reported as ischemic heart disease with Trop-T positive admitted as AMI.
- Patients when admitted had conduction blocks or developed conduction block within 24 hours of admission.

**Exclusion criteria**

- Patients with old bundle branch block.
- Patients with cardiomyopathy.
- Patients with congenital or rheumatic heart disease
- Patients with history of intake of drugs causing conduction blocks like clonidine, methyl dopa, verapamil, digoxin etc.

- Any chronic illness/any diseases causing dyselectrolimia.
- Subjects who do not provide consent for the study.

**Methodology**

After a detailed history and through clinical examination, routine investigations including ECG, serum cardiac markers-serum CPK, LDH, SGOT, fasting blood sugar, lipid profile, blood urea, serum creatinine serum electrolytes, chest X-ray, echocardiography (wherever possible) was sent. Following admission into ICCU, all the patients were followed up and special attention paid to detect the occurrence of conduction blocks. Continuous electrocardiographic monitoring performed for an average of 48 hours. Standard 12-lead ECG taken on admission into ICCU and every 12 hours thereafter for the first 2 days and then once daily and more frequently if change in rhythm or conduction appeared.

**Results**

A total of 100 patients were included in the study. The mean age of the study population was 57.9 years (SD – 11.522). Maximum number of patients were in age group of 61-70 years (32%). Among 100 patients, 74 patients (74%) were males and 26 patients (26%) were females. General ratio in the present study was M:F = 2.8:1. History of smoking was present in 30 patients (30%), hypertension in 30 patients (30%), diabetes mellitus in 25 patients (25%), past history of MI in 12 (12%), obesity in 5 patients (5%).

**Table 1: Various sites of AMI (ECG Infarct)**

| ECG (Infarct) | | |
|---|---|---|
| | **Frequency** | **Percent** |
| ANT | 24 | 24.0 |
| INF | 32 | 32.0 |
| E-ANT | 7 | 7.0 |
| AL | 5 | 5.0 |
| AS | 23 | 23.0 |
| ANT-INF | 4 | 4.0 |
| IL | 3 | 3.0 |
| INF-RV | 2 | 2.0 |
| Total | 100 | 100.0 |

P value <0.005*; significance value 0.01

Among 100 patients, 32 patients (32%) had inferior wall MI, followed by anterior (24%), anteroseptal (23%), extensive anterior (7%), anterolateral (5%), anterior+inferior (4%), inferolateral (5%) and inferior right ventricular extension (2%).

**Table 2: Various sites of AMI (ECG Type of C. block)**

| ECG (Type of C. block) | | |
|---|---|---|
| | **Frequency** | **Percent** |
| N | 32 | 32.0 |
| RBBB | 33 | 33.0 |
| LBBB | 13 | 13.0 |
| RBBB-LAHB | 1 | 1.0 |
| LAHB | 3 | 3.0 |
| I° AV BL | 6 | 6.0 |
| II° AV BL | 5 | 5.0 |
| III° AV BL | 6 | 6.0 |
| Total | 100 | 100 |

Among the 100 patients, 6 patients (6%) developed first-degree AV block. 5 patients (5%) developed second – degree AV block and all 5 had mobitz type I second- degree AV block. 6 patients (6%) developed third-degree AV block. 3 patients (3%) developed left anterior hemiblock (LAHB). 33 patients (33%) developed RBBB and all 33 had complete RBBB. 13 patients (13%) developed LBBB and all 13 had complete LBBB. 1 patient (1%) developed RBBB + LAHB.

**Table 3: Association of site of infarct with Conduction Blocks**

| ECG (Type of C. block) | Anterior (%) | Inferior (%) | E-ANT | AS | AL | ANT + INF | IL |
|---|---|---|---|---|---|---|---|
| RBBB | 9 | 3 | 3 | 3 | 3 | 1 | 1 |
| LBBB | 8 | 0 | 1 | 3 | 0 | 0 | 1 |
| RBBB-LAHB | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| LAHB | 2 | 1 | 0 | 0 | 0 | 0 | 0 |
| I° AV BL | 0 | 4 | 0 | 1 | 0 | 0 | 0 |
| II° AV BL | 0 | 5 | 0 | 0 | 0 | 0 | 0 |
| III° AV BL | 0 | 5 | 1 | 0 | 0 | 0 | 0 |

P value <0.0001

Most common conduction block in AWMI is RBBB followed by LBBB,where as in inferior wall MI 2nd degree & 3rd degree AV block is common. It is found statistically significant that There is more common association of inferior wall MI with RBBB compared to that of with LBBB (p<0.0001).In patients with Extensive anterior wall MI ,RBBB is more common compared to LBBB. In patients with anterioseptal MI both RBBB and LBBB are equally seen where as in Anterolateral MI ,RBBB is common than LBBB.In inferolateral MI RBBB and LBBB are equally present.

**Table 4: Sex wise distribution according to the Conduction blocks**

| ECG (Type of C. block) | Male (n) | Female (n) |
|---|---|---|
| RBBB | 25 | 8 |
| LBBB | 9 | 4 |
| RBBB-LAHB | 1 | 0 |
| LAHB | 3 | 0 |
| I° AV BL | 5 | 1 |
| II° AV BL | 4 | 1 |
| III° AV BL | 3 | 3 |

P value <0.005*

RBBB is common (25%) than LBBB (9%) in males which is highly statistically significant (p value = 0.0006). The distribution of females is found to be statistically non-significant.

**Table 5: Relation of risk factor to mortality**

| Risk Factor | Incidence | Mortality | Percentage |
|---|---|---|---|
| Hypertension | 30 | 3 | 10 |
| Diabetes | 25 | 5 | 20 |
| Past h/o MI | 12 | 4 | 33.3 |
| Smoking | 30 | 5 | 16.6 |
| Obesity | 5 | 1 | 20 |
| Family h/o CAD | 6 | 0 | 0 |

P Value > 0.05*

Highest mortality rates are associated with past history of MI (33.3%), followed by diabetes mellitus and obesity (20% each).followed by smoking (16.6%) ,and followed by hypertension (10%).

**Table 6: Relation of complication to Mortality**

| | Incidence | Mortality | Percentage |
|---|---|---|---|
| Cardiogenic shock | 21 | 9 | 42 |
| Arrythmia (VT/VF) | 8 | 3 | 37.5 |
| Cardiac failure | 24 | 8 | 33.3 |

p value < 0.05*

Complications like Cardiogenic shock (42%), cardiac failure (33.3%), and high degree Arrythmia arecommonly seen in patients of MI with conduction blocks.Mortality is more commonly seen in patients with cardiogenic shock followed by arrthymias.

**Table 7: Mortality according to type of blocks**

| Type | Incidence | Mortality | p value* |
|---|---|---|---|
| RBBB | 33 | 6 | 0.05 |
| LBBB | 13 | 3 | |
| RBBB+LAHB | 1 | 1 | |
| LAHB | 3 | 1 | |
| I° AV BL | 6 | 0 | |
| II° AV BL | 5 | 1 | |
| III° AV BL | 6 | 3 | |

Mortality is more with RBBB, found in 6 patients out of 33 patients followed by LBBB which is in 3 patients out of 13 patients. This finding is statistically not significant. Among 6 patients with first – degree AV blocks, no patent expired. Among 5 patients with second degree, , 1 patient expired, Among 6 patients with Third –degree AV blocks, 3 patient expired. Among 3 patients with RBBB, 2 patients expired. Among 3 patients with LAHP, 1 patient expired. Only 1 patient who had RBBB+LABH expired. However, mortality was significantly higher among patients who had third degree AV block, LBBB, RBBB and RBBB + LAHB, which was tested using Fisher's exact test and was found significant at the level of P=0.05.

**Discussion**

The present study is conducted in Department of General Medicine, Gaja Raja Medical College & J.A. group of hospitals, Gwalior (M.P) with an aim to study. Prognostic significance of conduction blocks in cases of acute myocardial infarction.

In our study 100 patients were included, out of which 68patients were found to have conduction blocks. Out of which 50 patients had bundle branch blocks whereas 18patients had Atrio-ventricular blocks. Out of 50 patients with bundle branch blocks, 33patients had RBBB, 13 had LBBB, 3 had LAHB and 1 had RBBB+LAHB. Majority of this patients were in the age group 50-69.The most common risk factor associated was hypertension, diabetes and smoking. Mortality was seen in 11patients among bundle branch block patients whereas 4 patients had mortality in patients among AV block. There was no significant mortality among patients with bundle branch block and AV nodal block.

Singh Sandhuet al did a similar study with 30 patients with bundle branch block, which showed 76.66% LBBB, 13.33% RBBB and 10% had other bundle branch blocks. Mortality was seen in 30% of patients.[5]

**Age**

In the present study the mean age of patients with conduction blocks is 54.95% and that of patients without conduction blocks is 55.75%. Escoteguy et al in 1992 studied the bundle branch & AV block as complications of acute MI in thrombolytic era, and mean age of studied population was 59.9±15.2 years. Newby et al studied incidence of BBB in patients treated with thrombolytic therapy and

mean age was 63.60. Hindman et al studied the clinical significance of BBB complicating acute MI, mean age of study was 65±12. Sgarbossa et al studied the acute MI with BBB on hospital admission with mean age group 69.54. Melgarejo-Moreno et al studied the BBB in acute MI with mean age years 67.7±10.1.

**Table 8: Mean age of patients in our study and other studies**

| Studies | Mean age in years |
|---|---|
| Present study | 57.9 |
| Escoteguy et al | 59.9 |
| Newby et al | 63.6 |
| Hindman et al | 65±12 |
| Sgarbossa et al | 69.54 |
| Melgarejo-Moreno et al | 67.7 |

Patients in our study are younger than those in other studies. It may be because CAD appears earlier in Indians as compared to developed world.

**Gender**

In the present study males were 74 and females were 26. Among patients with conduction blocks, 50 were males and 18 were females. There was no significant difference between occurrence of conduction blocks in males when compared to females. Similar results were found with previous studies as well. Asif Bhalli et al study also had predominantly males(87%) but occurrence of conduction blocks was similar in both groups. Sgarbossa et al study had 75% males & 25% females. Newby et al study had 71.1% males and 24% females. Melgarego-Moreno et al studied significance of BBB in acute MI and had 68% males and 32% females. Hindman et al study had 65% males and 45% females.

**Table 9: Gender of patients in our study and other studies**

| Study | Percentage of males |
|---|---|
| Our study | 73.5% |
| Muhammad AsifBhalli | 87% |
| Sgarbossa et al | 75% |
| Hindman et al | 65% |

**Risk factors**

In the present study, most common risk factors noted in decreasing order of frequency smoking (30%) followed by Hypertension (30%) followed by diabetes mellitus (25%) and past history of MI(12%) & family history of CAD (6%)remaining were obesity(5%). Among patients with conduction blocks, predominant risk factor was smoking(31%) followed by hypertension(25%).Hypertension patients were predominantly found to have bundle branch blocks whereas patients with smoking had incidence of both bundle branch block as well as AV nodal blocks. Past history of MI was found to be a major risk factor among mortality, seen in 33.33% which was statistically not significant (P>0.05%). Our results were similar to many of the previous studies with major risk factors as smoking, hypertension and diabetes mellitus. Abidov et al found smoking in 43%, diabetes mellitus in 24% and hypertension in 37%. Our findings of pre-ponderance of these risk factors are similar to other studies like study by Newby et al, Moreno et al and recent study by AsifBhalli et al in 2009.

**Site of infarct**

In our study, Anterior wall MI predominantly presented with Bundle Branch Blocks whereas Inferior wall MI presented predominantly with AV nodal blocks. This finding in our study is consistent with a study by Majumder et al which was carried out in Bangladesh. He found strong association of AV blocks with inferior MI & that of BBB with anterior MI & concluded that conduction defects were associated with increased rate of complications & death. Our data was also closely similar to findings of Escosteguy et al and in Hero-2 trial by Wong et al.

**Type of BBB**

In our study 68 patients were found to have conduction blocks. Out of this 50 had bundle branch block and 18 had AV nodal blocks. Among blocks, RBBB was found to be predominant (33%). On comparing with previous studies. Melagarejo-Moreno et al documented 76% RBBB & 24% LBBB patients. The lower value of our study when compared to this study may be because Moreno et al, included all new, in determinate & old BBB which we have excluded. Hindman et al observed RBBB in 62% of patients & LBBB in 38% of patients.

**Cardiogenic shock, cardiac failure and arrhythmia**

In our study, Cardiac failure was predominant and was found in 24%, cardiogenic shock found in 21% of patients and arrhythmias in form of VT or VF occurred in 8% of patients. Mortality was found maximum in cardiogenic shock group (42%) followed by VT or VF (37.5%)followed by cardiac failure group (33.33%). Out of total in hospital mortality of 18patients, 15were with conduction blocks whereas 3 were without conduction blocks and the major cause of death being cardiogenic shock and its complications.

This similar finding is seen in study done by Melgarejo-Moreno et al, which documented cardiac failure in 40% of patients of RBBB and 64% of LBBB but this is found to be statistically non significant.

In our study mortality rate is higher in patients with LBBB than RBBB among bundle branch blocks. On studying about AV block, 3$^{o}$ AV association in MI is prone for poor survival benefits.

Sgarbossa EB et al studied 26,003 patients enrolled in GUSTO-1, of these 420 (1.6%) had left (n=131) or right (n=289) BBB. Patients with BBB had higher 30-day mortality rates (18% VS 11%, p=0.003) and were more likely to experience cardiogenic shock (19% VS 11%, p=0.0008) or AV block/asystole (30% VS 19%, p<0.012).[6]

Beher S et al studied 2273 patients of inferior wall MI who were enrolled in SPRINT trail. 251 patients (11%) had complete heart block. These patients exhibited more serious arrhythmic and mechanical complications during hospitalization. The in hospital mortality is also higher in patients with complete heart block (37% Vs 11%, p<0.001) than in those without AV block.[7]

Moreno AM et al performed a multicentre prospective study of 1238 patients with Acute Myocardial Infarction for 1 year. 135 patients (10.9%) were found to have RBBB (new cases-51, old cases – 46, indeterminate time of orgin-38 cases). Patients with RBBB were frequently associated with heart failure (46% VS 24%,p<0.001), AV block (11% VS 3.6%, P<0.001) and higher 1 year mortality (40.7% VS 17.6, P<0.001). Patients with new RBBB, permanent RBBB had even higher mortality.[8]

Our study was comparable to many of the previous studies, however it need a larger studies to confirm and show significance to all its data.

**Conclusion**

- All patients with second-degree AV block in the present study, had Mobitz type I variety and all patients with RBBB and LBBB had complete RBBB and complete LBBB respectively.
- Different types of conduction block occur following acute myocardial infraction and they have a varied impact on the outcome following acute myocardial infarction.
- Patients with acute myocardial infarction should be observed carefully for early recognition of conduction blocks and prompt treatment should be started early.
- Conduction blocks are associated with increased risk of inhospital mortality and morbidity in the form of other cardiovascular events during hospital stay.
- Conduction blocks are important predictors of poor outcome in patients with Acute Myocardial Infarction.

In summary, our study demonstrate the presence of LBBB and 3$^{o}$ AV blocks in patients with AMI is associated with an increased risk for mortality and pretended as a potential marker of prognosis in coronary atherosclerotic disease.

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