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ORIGINAL ARTICLE

STUDY OF CONDUCTION BLOCKS IN ACUTE MYOCARDIAL INFARCTION

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ABSTRACT

BACKGROUND AND OBJECTIVES:

Acute myocardial infarction (AMI) is one of the major problems in 21st century. In AMI we come across many complications like ventricular dysfunction, conduction blocks, cardiogenic shock, mechanical complications, ventricular arrhythmias, etc. Prognosis following AMI is worsened in the presence of these complications.

Conduction blocks are frequent complications of AMI. First-degree AV block occurs in 4 to 14% of patients with AMI, Mobitz type I second-degree AV block is observed in up to 10% of patients with AMI and is usually transient. Mobitz type II second- degree AV block occurs in less than 1% of patients with AMI. Third–degree or complete AV block occurs in about 5-8% of patients. Bundle branch block in AMI carries poor prognosis.

The objectives of the study is to study the various patterns of conduction blocks occurring in acute myocardial infarction and to study their prognostic implications.

METHODS:

The study is a clinical, prospective and observational study of 100 Patients of acute myocardial infarction consecutively admitted in Rajah Muthiah Medical College and Hospital,Chidambaram ,Tamilnadu.from ,January 2013 to January 2014 who matched the inclusion criteria. A conventional 12 lead ECG with rhythm strip was recorded at the ix earliest on admission and repeated subsequently each day following admission into the CCU. All the patients were followed up and special attention was paid to detect the occurrence of conduction blocks.

RESULTS:

In the present study among 100 patients, 25 patients (25%) developed conduction blocks. Among the 100 patients, 7 patients (7%) developed first-degree AV block. This was the most common conduction block in the present study. 4 patients (4%) developed second – degree AV block and all had mobitz type I second-degree AV block. 3 patients (3%) developed third-degree AV block. 4 patients (4%) developed left anterior hemiblock (LAHB). 3 patients (3%) developed RBBB and all had complete RBBB. 3 patients (3%) developed LBBB and all had complete LBBB. 1 patient (1%) developed RBBB + LAHB.

CONCLUSION:

Various patterns of conduction blocks develop following AMI and they have a varied impact on the outcome following AMI. All patients with AMI should be watched carefully for early recognition of conduction blocks and appropriate treatment should be started early.

Key words: First-degree AV block; Mobitz type I second-degree AV block; LAHB;RBBB; LBBB.

1.INTRODUCTION

Acute myocardial infarction (AMI) is one of the major problems in 21stcentury. In acute myocardial infarction we come across various complications like ventricular dysfunction, conduction blocks, cardiogenic shock, mechanical complications, ventricular arrhythmias, etc.[1] Prognosis following AMI is worsened in the presence of these complications.

Various types of conduction blocks develop following AMI. First-degree AV block occurs in 4 to 14% of patients with AMI, Mobitz type I second-degree AV block is observed in up to 10% of patients with AMI and is usually transient. Mobitz type II second- degree AV block occurs in less than 1% of patients with AMI[2]. Third–degree or complete AV block 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[2].

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Bundle branch block in AMI carries poor prognosis. This has been attributed both to the extent of myocardial damage[4] and to the frequency of ventricular asystole[5]. Development of conduction blocks worsens the outcome of acute myocardial infarction. Knowledge about various types of conduction block occurring in acute myocardial infarction helps in early recognition of conduction blocks at an early stage, so that appropriate treatment including pacing can be instituted at an early stage.

This study is undertaken to study the various patterns of conduction blocks occurring in acute myocardial infarction.

2.MATERIALS AND METHODS

100 Patients of acute myocardial infarction consecutively admitted in Rajah Muthiah Medical College and Hospital, Chidambaram,Tamilnadu. from January 2013 to January 2014 who matched the inclusion criteria were selected for the study.

INCLUSION CRITERIA:

Patients having acute myocardial infarction as per WHO Criteria[6] the three of the following elements be present.

- History of ischemic type of chest discomfort
- Electrocardiograph changes
- A rise in serum cardiac markers.

EXCLUSION CRITERIA:

- Patients with cardiomyopathy
- Patients with congenital or rheumatic heart disease
- Patients with previous conduction blocks
- Patients with history of intake of drugs causing conduction blocks like clonidine, methyldopa, verapamil, digoxin etc.,
- The patients who had exclusion criteria were not included in the study.

Method of collection of data:

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) were done.

Following admission into CCU, all the patients were followed up and special attention was paid to detect the occurrence of conduction blocks. Continuous electrocardiographic monitoring was performed for an average of 48 hours. Standard 12-lead ECG was taken on admission into CCU and every 12 hours thereafter for the first 2 days and then once daily and more frequently if change in rhythm or conduction was noted.

3.RESULTS AND OBSERVATIONS

Among the 100 patients included in the present study, 70 patients (70%) were males and 30 patients (30%) were females.

The age of the patients ranged from 40 to 79 years with a mean age of 57.9 years (SD±10.6).

The maximum number of patients were in the age group of 60 to 69 years (35%).

Among 100 patients, 30 patients were known hypertensives, 15 were known diabetics, and 8 patients had past history of ischaemic heart disease. 32 patients were smokers and all were males.

Figure 1: Various sites of AMI

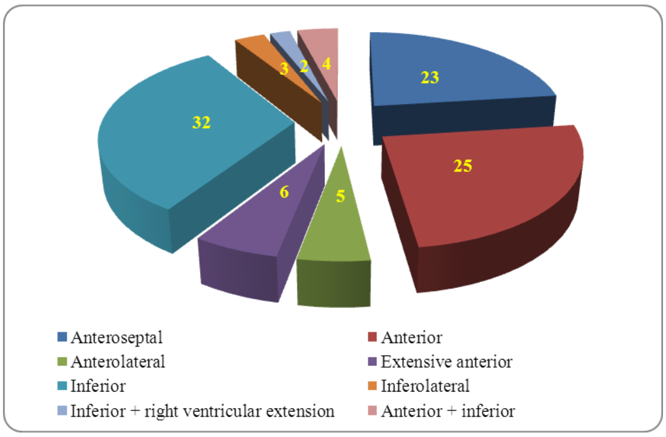


Figure 2: Incidence of various types of conduction blocks

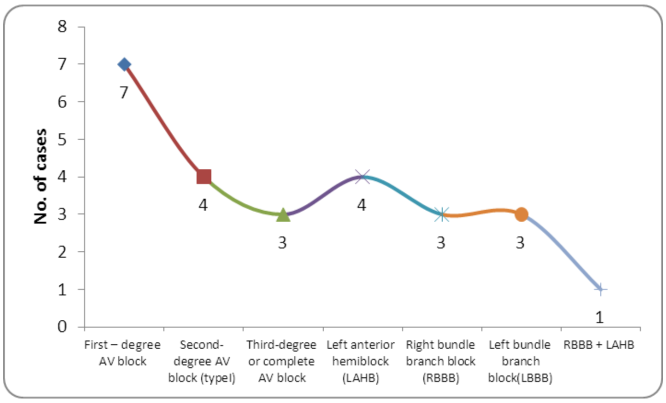
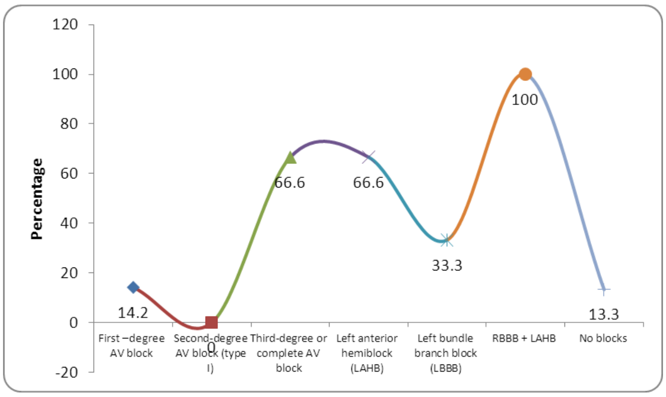


Figure 3: Mortality



Among 100 patients, 32 patients (32%) had inferior wall MI, followed by anterior (25%), anteroseptal (23%), extensive anterior (6%), anterolateral (5%), anterior+inferior (4%), inferolateral (3%) and inferior +right ventricular extension (2%).

In the present study among 100 patients, 25 patients (25%) developed conduction blocks. Among the 25 patients, 7 patients (7%) developed first-degree AV block. This was the most common conduction block in the present study. 4 patients (4%) developed second – degree AV block and all had mobitz type I second- degree AV block. 3 patients (3%) developed third-degree AV block. 4 patients (4%)developed left anterior hemiblock (LAHB). 3 patients (3%) developed RBBB and allhad complete RBBB. 3 patients (3%) developed LBBB and all had complete LBBB. 1patient (1%) developed RBBB + LAHB.

Among 70 males, 19 patients (27.1%) developed conduction blocks. Among 30 females, 6 patients (20%) developed conduction blocks.

In the present study, mean age of patients with conduction blocks was 58.1 years (SD ±10.6) and mean age of patients without conduction block was 57.8 years (S.D ±10.7).

Among 23 patients with anteroseptal MI, 4 patients (17.4%) developed conduction blocks. Among 4 patients, 1 patient (25%) had first-degree AV block, 1 patient (25%) had LAHB, 1 patient (25%) had RBBB and 1 patient (25%) had LBBB.

Among 25 patients with anterior MI, 5 patients (20%) developed conduction blocks. Among 5 patients, 3 patients (60%) had LAHB and 2 patients (40%) had LBBB.

Among 6 patients with extensive anterior wall MI, 3 patients (50%) developed conduction blocks. Among 3 patients, 1 patient (33.3%) had third- degree AV block, 1 patient (33.3%) had RBBB and 1 patient (33.3%) had RBBB+LAHB.

Among 34 patients with inferior wall MI (including 2 patients with inferior wall MI + right ventricular extension), 11 patients (32.3%) developed conduction blocks. 4 patients with inferior wall and 1 patient with inferior wall+ right ventricular extension developed first-degree AV block. 4 patients with inferior wall MI developed second-degree AV block of Mobitz type I variety. 2 patients with inferior wall MI developed third-degree AV block.

Among 4 patients with anterior +inferior MI, 1 patient (25%) developed conduction block and he had RBBB. Among 3 patients with inferolateral MI, 1 patient (33.3%) developed conduction block and he had first-degree AV block.

Among 100 patients, 17 patients (17%) expired. Among 25 patients with conduction blocks, 7 patients (28%) expired. Among 75 patients without conduction blocks, 10 patients (13.3%) expired. Even though the mortality among patients with conduction blocks is found to be higher than the mortality among patients without conduction blocks, the difference is not significant (p=0.08) statistically when chi-square test was used.

Among 7 patients with first –degree AV blocks, 1 patient (14.2%) expired. Among 3 patients with third degree or complete AV block, 2 patients (66.6%) expired. Among 3 patients with RBBB, 2 patients (66.6%) expired. Among 3 patients with LBBB, 1 patient (33.3%) expired. Only 1 patient who had RBBB+LABH expired. However mortality was significantly higher among patients who had third degree AV block, RBBB and RBBB + LAHB, which was tested using Fisher's exact test and was found significant at the level of $P<0.05$.

4.DISCUSSION

Conduction blocks are frequent complications of acute myocardial infarction. The abnormalities in conduction following AMI may be attributable to one of the following:

- Ischemia, which results in transient or permanent structural changes of the tissues surrounding the SA and AV junctions.
- An increase in parasympathetic tone commonly associated with an inferior wall myocardial infarction.
- An increase in extracellular potassium, which can cause slowing of impulse conduction.
- Local release and build up of adensine, a metabolite of adenosine triphosphate breakdown, which slows the velocity of impulse conduction through the AV node[2].

First – degree AV block:

First –degree AV block occur in 4 to 14% of patients with AMI and more often the block is within the AV node[2]

In the present study, 7 patients (7%) developed first-degree AV block. This is comparable with 8.5% reported in study by Meltzer & Kitchell [7] and 5.8% by Hurwitz & Eloit[8].

Among the 7 patients who developed first-degree AV block, one patient expired with a mortality of 14.2%. in all the other patients it was transient an the patients had an uneventful recovery.

Second –degree AV block

Mobitz type I second-degree AV block is observed in upto 10% of patients with AMI. Usually it is transient, the block is located within the AV node and is most often caused by an increased vagal tone or less commonly ischemia of the AV junction. It is more commonly seen with inferior wall MI than with anterior involvement[2].

In the present study 4 patients (4%) developed Mobitz type I second-degree AV block, which is comparable with 3.5% reported by Meltzer & kitchell [7]and 3.3% by Imperial, Carballo & Zimmerman[9].

All the 4 patients had inferior wall MI in the present study. They were transient and all made an uneventful recovery.

None of the patients in the present study developed Mobtitz type II second- degree AV block. It occurs in less than 1% of patients with AMI, usually indicates damage to the AV junction or bundle of his and is more common with anterior infarctions[2].

Third –degree or complete AV block

In the present study 3 patients (3%) develop third-degree AV block, which is comparable with 3.3% reported by Imperial, Carballo & Zimmerman [9]and 4.2% by Miltzer & Kitchell[7].

Among the 3 patients, 2 patients expired with a mortality of 66.6%. this is comparable with 77% reported by Cohen et al[10].

Complete AV block in the setting of inferior infarction usually results from an intranodal or supranodal lesion[1] . When it occurs in anterior infarctions, it results from extensive necrosis of the ventricular septum [11].

BUNDLE BRANCH BLOCKS

3 patients (3%) developed RBBB in the present study and 3 patients (3%) developed LBBB. Incidence of RBBB and LBBB in the present study is same as that reported by Stephen Scheidt and Thomas Killip[12] and it is comparable with the results of Col & Weinberg[13] , Rizzon, Biase & Baissus [14].

In the present study the incidence of RBBB and LBBB is equal. Stephen scheidt & Thomas Killip [12] have also reported an equal incidence of RBBB and LBBB. However some studies have noted a higher incidence of RBBB than LBBB[15,16,17].

Among the 3 patients who developed RBBB in the present study, 2 patients expired with a mortality of 66.6%, which is comparable with 61% reported by Norris & Croxson[17] and 57% by Hunt & Sloman[15.]

Among the 3 patients who developed LBBB in the present study, 1 patient expired with a mortality of 33.3%, which is comparable with 33% reported by Rizzon, Biase & Baissus [14] 30% by Stephen scheidt & Thomas Killip[12] and 29% by Raftery et al[18]

HEMIBLOCKS

4 patients (4%) in the present study developed left anterior hemiblock (LAHB), which is comparable with 4.7% reported by James atkins et al[19].

None of the patients in present study developed left posterior hemiblock (LPHB). It is usually rare. An incidence of 0.3% was reported by Rizzon, Biase &Baissus[14.]

Occurrence of LAHB is more common than LPHB because left anterior fascicle is highly vulnerable to ischemic or necrotic process because of the unique blood supply from septal branches of the anterior descending coronary artery and its delicate structure[13].

The incidence of LPHB is rare because the posterior division of the left bundle branch seems relatively invulnerable to coronary artery disease because it has the shortest pathway to the angle of the interventricular septum and the posterior wall and has the largest diameter of the 2 fascicles. In addition it has a dual blood supply from the anterior and posterior descending coronary arteries[13]. Since it is larger than the anterior fascicle, in general a larger infarct is required to block it and hence the mortality is markedly increased[1].

In the present study there were no deaths among the patients who developed LAHB. Mortality is increased in these patients, although not as much as in patients with other forms of intraventricular conduction blocks[1].

Complete AV block is not a frequent complication of either forms of isolated divisional blocks.

BIFASCICULAR BLOCKS

1 patient (1%) in the present study developed RBBB+LAHB. But Col & Weinberg [13]has reported an incidence of 4.2%.

The patient who developed RBBB + LAHB expired with a mortality of 100% in the present study. Roos and Dunning [20]reported a mortality of 70% and 55.5% by Col & Weinberg[13.]

None of the patients in the present study developed RBBB+LPHB.

The occurrence of RBBB+LAHB is more common than RBBB+LPHB because the anterior fascicle of left bundle branch and the right bundle branch, apart from its very initial part derive their blood supply exclusively from the penertrating branches of the anterior descending coronary artery[14].

Mortality among patients who develop bifascicular blocks is high because of severe pump failure secondary to extensive myocardial necrosis required to produce such an extensive intraventricular block[1].

SUMMARY AND CONCLUSION

- 100 consecutively admitted patients of acute myocardial infarcion were included in the present study.
- Among 100 patient, 70 patients (70%) were males and 30 patients (30%) females.
- The age of the patients ranged from 40 to 79 years, with a mean age of 57.9 years (SD±10.6)
- 30 patients were known hypertensives
- 25 patients were known diabetics.
- 12 patients had past history of ischemic heart disease.
- 32 patients were smokers and all were males.
- Among 100 patients, 32 patients (32%) had inferior wall MI, followed by anterior (25%), anteroseptal (23%), extensive anterior (6%), anterolateral (5%) anterior+ inferior (4%), inferolateral (3%) and inferior + right ventricular extension (2%).
- Among these patients, 25 patients (25%) developed conduction blocks.
- Mean age of patients with conduction blocks was 58.1 years (SD±10.6) Mean age of patients without conduction blocks was 57.8 years (SD±10.7)
- Among 70 males, 19 patients (27.1%) developed conduction blocks. Among 30 females, 6 patients (20%) developed conduction blocks.
- The most common conduction block in the present study was first-degree AV block (7%), followed by second-degree AV block (4%), LAHB (4%), third-degree or complete AV block (3%), RBBB (3%), LBBB (3%), RBBB+LAHB (1%). 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.
- Among 23 patients with anteroseptal MI, 4 patients (17.4%) developed conduction blocks. Among 4 patients, 1 patient (25%) had first-degree AV block, 1 patient (25%) had LAHB, 1 patient (25%) had RBBB and 1 patient (25%) had LBBB.
- Among 25 patients with anterior MI, 5 patients (20%) developed conduction blocks. Among 5 patients, 3 patients (60%) had LAHB and 2 patients (40%) had LBBB.
- Among 6 patients with extensive anterior wall MI, 3 patients (50%) developed conduction blocks. Among 3 patients, 1 patient (33.3%) had third-degree AV block, 1 patient (33.3%) had RBBB and 1 patient (33.3%) had RBBB+LAHB.

- Among 34 patients with inferior wall MI (including 2 patients with inferior wall MI + right ventricular extension), 11 patients (32.3%) developed conduction blocks. 4 patients with inferior wall and 1 patient with inferior wall + right ventricular extension developed first- degree AV block. 4 patients with inferior wall MI developed second-degree AV block of Mobitz type 1 variety. 2 patients with inferior wall MI developed third-degree AV block.
- Among 4 patients with Anterior + inferior MI, 1 patient (25%) developed conduction block and he had RBBB. Among 3 patients with inferolateral MI, 1 patient (33.3%) developed conduction block and he had first – degree AV block.
- Among 100 patients, 17 patients expired with a mortality of 17% in the present study. Among 25 patients with conduction blocks there were 7 deaths (28%) and among 75 patients without conduction blocks there were 10 deaths (13.3%). Even though the mortality among patients with conduction blocks is found to be higher than the mortality among patients without conduction blocks, the difference was not statistically significant.
- Among 7 patients with first-degree AV block, 1 patient (14.2%) expired. Among 3 patients with third-degree AV block, 2 patients (66.6%) died. Among 3 patients with RBBB, 2 patients (66.6%) died. Among 3 patients with LBBB, 1 patient (33.3%) died. 1 patient who had RBBB+LAHB expired. However the mortality was significantly higher among patients who had third-degree AV block, RBBB, RBBB+LAHB with a P value <0.05.

Various patterns of conduction blocks develop following AMI and they have a varied impact on the outcome following AMI. All patients with AMI should be watched carefully for early recognition of conduction blocks and appropriate treatment should be started early.

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