ORIGINAL ARTICLE

Atrioventricular Blocks And Bundle Branch Blocks In Acute Miocardial Infarction

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Background: Although atrioventricular (AV) blocks and bundle branch (BB) blocks are common complications of acute myocardial infarction (MI), patients characteristics and association with outcomes remain poorly defined.

Material and method: A prospective study of 341 consecutive patients admitted to the Clinic of Cardiology of the Institute of Cardiovascular Diseases Târgu Mureș, from January 31, 2008 to December 31, 2010, with ST-segment elevation myocardial infarction. Patients underwent routine clinical exam, lab tests, echocardiogram.

Results: The incidence of AV blocks complicating myocardial infarction was 10.85% and for BB blocks was 11.14%. Statistically significant correlations were found between AV blocks or BB blocks and age ($p<0.01$), arterial hypertension ($p<0.02$), and localization of myocardial infarction ($p<0.001$).

Conclusions: Post-MI blocks are more common in elderly patients (70–80 years and over), in patients with arterial hypertension and in case of inferior localization of the MI. However no statistically sifgnificant correlations were found between the occurance of conduction disorders post acute MI and some important risk factors such as diabetes, smoker satus or hypercholesterolemia.

Keywords: infarction, AV blocks, BB blocks

Introduction

Conduction defects complicating acute myocardial infarction (MI) are frequent and associated with increased mortality and complications. Common conduction defects after acute MI are atrioventricular nodal blocks (1st, 2nd and 3rd degree) and intraventricular conduction defects (right or left bundle branch blocks and hemiblocks). In myocardial infarction occlusion of coronary arteries at different levels affects the conduction system of heart leading to various types of blocks. Conduction defects usually reflect extensive damage to the myocardium [1,2].

The improved survival of hospitalized patients with acute myocardial infarction was a result of an increased understanding of cardiac arrhythmias and their successful management and prevention. The precipitating factors, natural history, and modes of therapy for manifestations of ventricular irritability in acute infarction are well established. A comparable understanding of disturbances leading to bradycardia, or different degrees of A-V or BB blocks, has not yet been accomplished [3,4]. One reason for this is that most previous studies have considered the whole spectrum of A-V blocks or BB blocks as an entity without characterizing homogeneous clinical subgroups that are at high or low risk of specific target events.

Complete atrioventricular block (AVB) complicates myocardial infarction (MI) in 11% to 15% of cases. It usually clusters with conditions indicative of poor clinical status, such as right ventricular infarction, cardiogenic shock, and atrial fibrillation, probably related to its association with a larger infarct size [5,6]. The pathophysiological mechanism underlying AVB remains unclear, with Bezold-Jarisch reflex, AV node ischaemia, and accumulation of intracellular metabolites being proposed as possible aetiological factors [7,8]. Also large myocardial necrosis can be involved in AV or BB blocks, more frequently in anterior MI. In-hospital mortality rate is invariably high although longterm clinical outcome does not appear affected especially in inferior localization of MI [9,10].

This study evaluates the bradiarrytmic complications during hospitalization of a group of patients with acute myocardial infarction, trying to establish significant correlations between these conduction disorders and different clinical or paraclinical parameters.

Material and methods

We conducted a prospective study, in the Clinic of Cardiology of the Institute of Cardiovascular Disease and Transplant Târgu Mureș, betweev January 31, 2008 and December 31, 2010. We included 341 consecutive patients >18 years with with ST-segment elevation myocardial infarction (Non ST-segment elevation myocardial infarction patients were excluded from the study). All patients were receiving specific medication for AMI, with thrombolytic treatment or per primam PTCA.

The parameters evaluated were: sex, age, arterial hypertension, diabetes, smoking, cholesterol and triglyceride blood level, myocardial infarction territory, atrial fibrillation, atrio-ventricular blocks, bundle branch blocks, mitral regurgitation and left ventricular ejection fraction. The following blood tests were performed: complete blood count, biochemical analysis. All patients underwent transthoracic color-Doppler ecochardiography (Vingmed system) from the left parasternal window (long-axis and short-axis views) and left ventricular apex (4-chamber and 2-chamber views). Ejection fraction was determined using the formula of Simpson.

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Table I. Clinical characterstics of patients with acute myocardial infarction

Mean age, y	63.87
Male, %	63.04 (215 pts)
Female, %	36.95 (126 pts)
Diabetes mellitus, %	19.64 (67 pts)
Hypertension, %	74.78 (255 pts)
Current smoker, %	23.46 (80 pts)
Anterior MI locatoion, %	39.88 (136 pts)
Postero- inferior MI location, %	20.23 (69 pts)
Infero-lateral MI location, %	22.28 (76 pts)
Lateral location, %	3.81 (13 pts)
Other location, %	1.17 (4 pts)
PTCA, %	38.12 (130 pts)
TTFL, %	13.78 (47 pts)
MR, %	38.48 (121 pts)
AF, %	11.60 (39 pts)
AV blocks, %	10.85 (35 pts)
BB blocks, %	11.14 (38 pts)

Table II. Clinical characteristics of patients with AMI and AV block

Mean age, y	68.14
Male,%	65.71 (23 pts)
Female, %	34.29 (12 pts)
Diabetes mellitus, %	22.85 (8 pts)
Hypertension, %	56.25 (18 pts)
Current smoker, %	20.00 (7 pts)
Anterior MI location, %	14.29 (5 pts)
Postero-inferior MI location, %	40.00 (14 pts)
Infero- lateral MI location, %	42.86 (15 pts)
Other location, %	2.86 (1 pt)
Hypercholesterolemia, %	21.43 (6 pts)
MR, %	73.91 (17 pts)
AF, %	14.29 (5 pts)

Table III. Clinical characteristics of patients with AMI and BB block

Mean age, y	69.73
Male,%	62.57 (28 pts)
Female, %	37.43 (10 pts)
Diabetes mellitus, %	21.05 (8 pts)
Hypertension, %	60.64 (20 pts)
Current smoker, %	24.38 (7 pts)
Anterior MI location, %	42.10 (16 pts)
Postero-inferior MI location, %	13.15 (5 pts)
Infero- lateral MI location, %	36.84 (14 pts)
Other location, %	7.89 (3 pts)
Hypercholesterolemia, %	26.31 (10 pts)
MR, %	34.21 (13 pts)
AF, %	21.05 (8 pts)

The correlations between these parameters were analyzed using a chi-squared test in order to find statistically significant ones.

Results

From the 341 patients in the study cohort, 38 patients (11.14%) developed AV blocks and 37 patients (10.85%) developed BB blocks during the evolution of acute MI. Clinical characteristics of patients with acute miocardial infarction are presented in Table I.

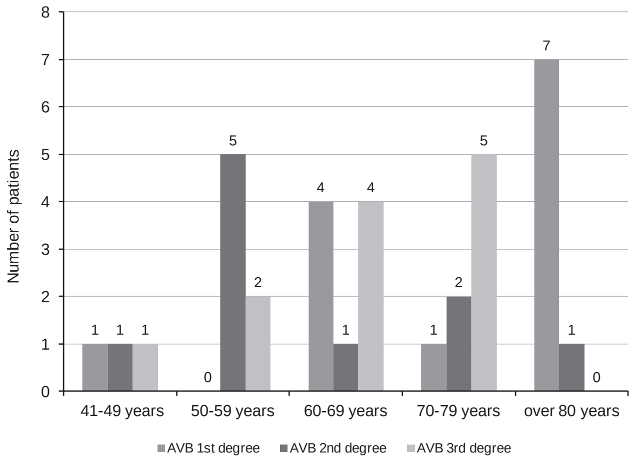

Fig. 1. Correlation between age groups and AV blocks, p=0.008

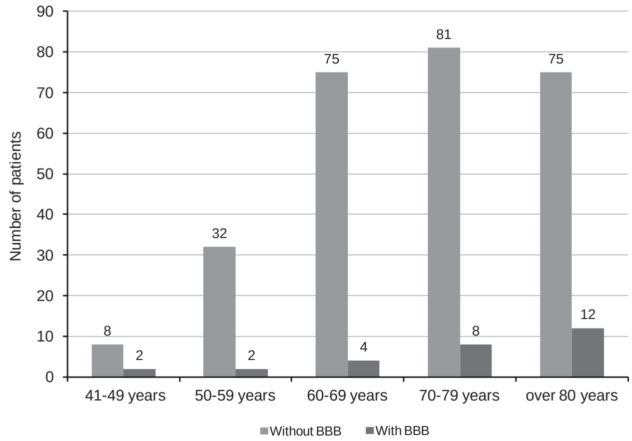

Fig. 2. Correlation between age groups and BB blocks, p=0.006

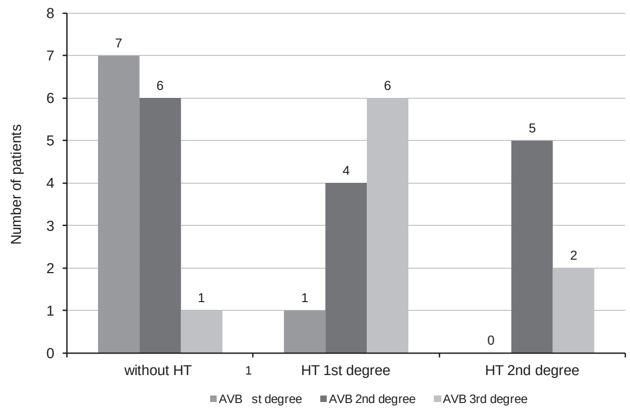

Fig. 3. Correlation between arterial hypertension and AV blocks, p=0.014

Clinical characteristics of patients with acute miocardial infarction and AV blocks are presented in Table II.

Clinical characteristics of patients with acute miocardial infarction and BB blocks are presented in Table III.

According to statistical calculation there is a statistically significant correlation between age and the occurance of AV or BB blocks (p=0.008), as presented in Figures 1 and 2, and also between occurance of AV or BB blocks post acute miocardial infarction and arterial hypertension (p=0.01) as seen on Figures 3 and 4.

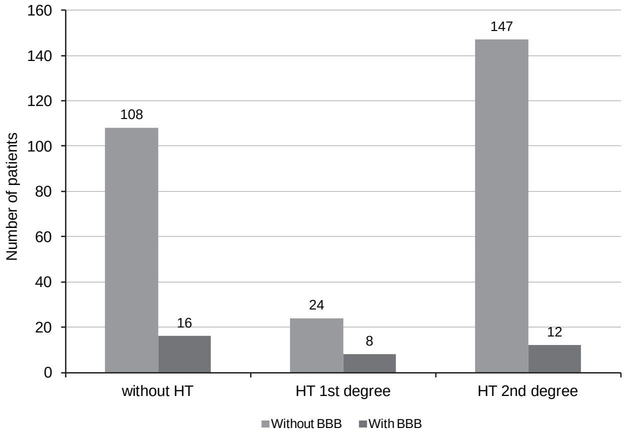

Fig. 4. **Correlation between arterial hypertension and BB blocks, p=0.014**

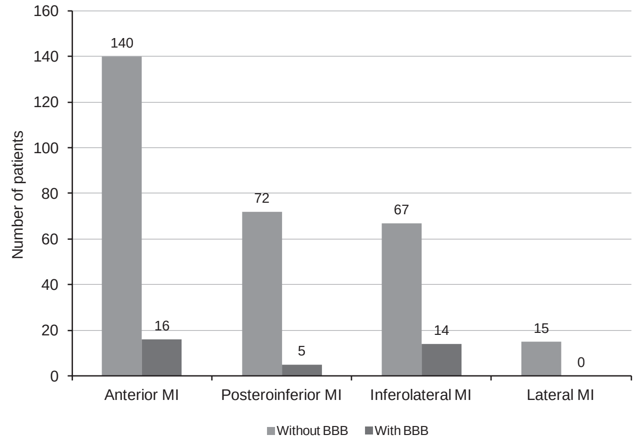

Fig. 5. **Correlation between the localization of MI and BB blocks, p<0.01**

The localisation of the MI is also very important, inferior MI being statistically significant associated with a higher risk of developing BB blocks (p=0.0009), see Figures 5 and 6.

Atrial fibrillation complicating acute MI was an important factor associated with the developing of BB blocks (p=0.01), see Figure 7. In this correlation may be involved rate dependent BB blocks which appears at a higher heart rate during the AF episode.

Discussions

Large community-based studies have demonstrated a reduced incidence of complete AVB complicating acute MI in the thrombolytic era compared to pre-thrombolysis, suggesting the beneficial role of reperfusion on prevention and resolution of complete AV blocks in acute MI [11]. However, the development of complete AV blocks is still associated with a higher risk of short and long-term mortality compared to patients without AV blocks.

This decrease in the frequency of conduction defects in last few years is due to reduction in the extention of myocardial injury with the use of early thrombolytic therapy or percutaneous coronarian interventions [12].

As reported before, patients with inferior AMI who developed AV block had a poor hospital outcome but long-term prognosis was similar in hospital survivors who had AV block and in those without this complication [13,14].

The distinction between inferior and anterior MI is important in the setting of complete AVB. AV conduction abnormalities, including complete AVB, commonly complicate inferior MI. This is due to involvement of the blood supply to the AV node, as the AV nodal artery arises from the right coronary artery in most people [11, 14]. The AVB in inferior MI usually resolves promptly with acute revascularisation in most cases, and permanent pacemaker implantation is usually not required. In contrast, development of complete AVB in anterior MI suggests extensive myocardial damage [15].

The incidence of AV or BB blocks in our study was similar with the data reported in different studies (between 11–15%) [7,10,16].

Conclusions

Conduction disorders represent common complications of acute MI, occurring in 10.85% of patients in case of AV blocks and in 11.14% in case of BB blocks in our study cohort. Both AV and BB blocks are more common in older patients (70 years and over) and also in hypertensive pa-

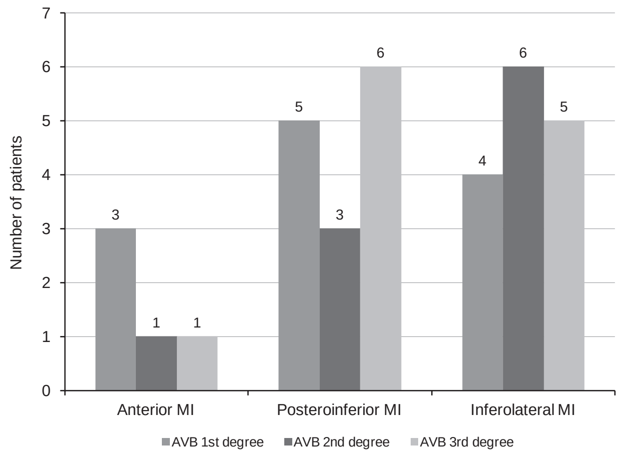

Fig. 6. **Correlation between the localization of MI and AV blocks, p=0.59**

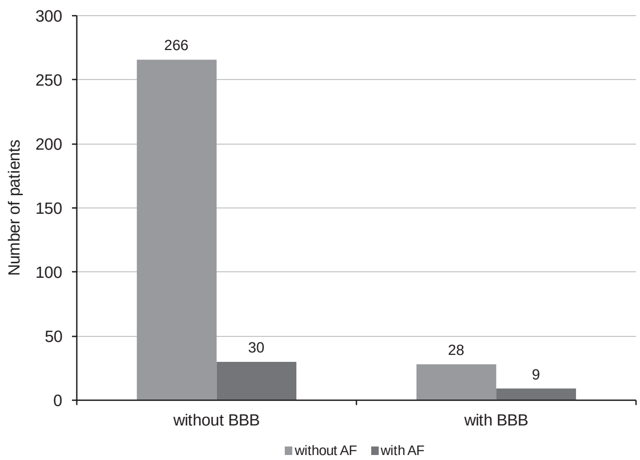

Fig. 7. **Correlation between atrial fibrillation and BB blocks, p=0.01**

tients and in case of inferior localization of MI (postero-inferior and infero-lateral).

Atrial fibrillation was frequently associated with appearance of BB blocks, probably related with developing of rate dependent BB blocks or aberrant ventricular conduction at higher heart rate which occurs frequently in AF with rapid ventricular response.

In opposition with these datas, no statistically sifgnificant correlations were found between the ocurance of conduction disorders post acute MI and some important risk factors such as diabetes, smoker satus or hypercholesterolemia.

A limitation of our study is represented by the surveilance of the patients, performed only during the hospitalisation period, without any data available related to evolution, morbidity or mortality after discharge.

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