Right Bundle Branch Block Is not a Predictor of Coronary Artery Disease

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Abstract- Right bundle branch block (RBBB) is considered as an important predictor of poor outcome in patients with acute myocardial infarction, but the prognostic implication of RBBB in patients with suspected coronary artery disease (CAD) is unclear. Furthermore, the association between RBBB and incidence of CAD also its influence on the severity of stenosis in coronary arteries has not been established. This study was designed to assess the relationship between RBBB and the presence and the severity of CAD in patients with suspected CAD. The study population consisted of 172 patients with RBBB and 174 patients with normal resting electrocardiography (ECG). Severity of CAD was defined as estimated Gensini score according to the degree, quantity and distribution of lesions in angiographic study. According to our study based on angiographic investigations, in patients with RBBB the prevalence of CAD was 77.3 percent versus 70.1 percent in patients with normal resting ECG (P=0.13). Also, there was no significant association between the presence of RBBB and magnitude of Gensini score (OR=0.87, P=0.62). However, male gender and history of diabetes mellitus were associated with higher Gensini score (OR=3.41; 95% CI: 1.96-5.93, P<0.0001 and OR=3.22; 95% CI: 1.77-5.87, P<0.0001 respectively). This study suggests that although RBBB was associated with more severity of stenosis in left coronary system (LAD&LCX), but as a whole there was no association between RBBB and the presence and severity of CAD.

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Keywords: Right bundle branch block; Coronary artery disease; Gensini score

Introduction

Coronary Artery Disease (CAD) is the leading causes of heart failure and death worldwide. Acute cardiac events that may lead to acute myocardial infarction (AMI) and sudden cardiac death are unpredictable. With screening patients at risk of heart attack according to their resting electrocardiogram (ECG), it would be possible to prevent a significant number of acute cardiac events and, as a result, the morbidity and mortality.

Conduction disturbances, like Right Bundle Branch Block (RBBB) or Left Bundle Branch Block (LBBB) may be considered as a predictor of severity of CAD and coronary events. Previous studies revealed the impact of intra-ventricular conduction disturbances on survival of patients with AMI (1-10) and patients with chronic CAD (11-15). Also, there are few other studies that compared the relationship of Bundle Branch Block and severity of CAD in patients with suspected CAD and its impact on survival of patients (16-26).

Most of these studies have been done in patients with left anterior hemi-block (16-22) and LBBB (23-26). However, few studies have been done regarding the relation between RBBB and severity of coronary artery disease. Haft *et al.,* showed no relationship between RBBB and CAD severity in patients with RBBB (27).

In this study, we compared the prevalence and severity of CAD in patients with suspected CAD with RBBB or normal resting ECG.

Materials and Methods

A total number of 346 patients with suspected CAD who underwent coronary angiography from 2002 to 2007 were included in this study. They were divided into two groups. Group A (Case group) was included 172 patients (49.7%) with RBBB and Group B (Control group) was included 174 patients (50.3%) with normal resting electrocardiogram. All patients were suspected of having CAD based on their history and our clinical findings.

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321 patients (92.7%) had CAD based on angiographic findings.

Demographic and clinical characteristics of both groups are presented in Table 1.

Coronary angiographies of patients were reviewed by two observers who were not aware of patient's electrocardiogram (blind study). Severity and extension of CAD were defined as estimated Gensini Score (GS).

Statistical analysis

The SPSS version 15.0 was used for data analysis. The mean and standard deviation (SD) were calculated and independent t-test and chi square test were used for comparing the groups. Kolmogorov-Smirrov and Shapiro-Wilk tests were also used for evaluating normal distribution. Multiple logistic regression analysis was used for multivariate analysis also to evaluate the relative risk (RR) of each risk factor for CAD. All statistical tests were two sided and a P value of <0.05 was considered statistically significant.

Results

Of 346 patients with suspected CAD who were included in the study, 172 patients (49.7%) had RBBB (group A) and 174 patients (50.3%) had normal resting ECG (group B).

The mean age of patients was 58.91+11.36 years. The prevalence of known coronary artery disease risk factors were; positive family history of CAD 23.2%, hypertension 7.1%, diabetes mellitus 28%, hyperlipidemia 53.8%, and smoking 14.5%. On the basis of angiographic findings, 321 (92.7%) patients had had CAD. Both groups were similar regarding cardiac modifiable risk factors. However, they were different regarding age and gender which was statistically significant (P<0.0001 and P=0.01 respectively). Although regarding the prevalence of CAD, trend was in favor of Group A, even though it was not statistically significant (77.3% vs. 70.1%, P=0.13). Demographic and clinical characteristics of patients are presented in table 1.

Severity of involvement of each coronary artery in both groups according to the estimated Gensini Score (GS) is presented in Table 2. Gensini score in the left coronary artery system (not in the right system) was higher in Group A compared to Group B, which was statistically significant (P=0.001 and P=0.043 for left anterior descending and left circumflex respectively).

Relationship between gender, age, cardiac risk factors, and severity of CAD (GS) are presented in Table 3.

Patients older than 45 years, male gender and patients with a history of diabetes mellitus (DM) were associated with higher GS compared to patients younger than 45years, female gender and non-diabetic patients (P=0.012, P=0.0001 and P=0.004 respectively).

Table 1. Demographic and clinical characteristics of both groups.

Characteristics	Case n (%)	Control n (%)	*P*
Age	62.47±11.34	55.38±10.26	<0.0001
Male gender	117(68)	95(54.6)	0.01
Prevalence of CAD	133(77.3)	122(70.1)	0.13
Diabetes mellitus	56(32.6)	41(23.6)	0.063
Hypertension	80(46.5)	82(47.7)	0.82
Dislipidemia	90(52.3)	96(55.2)	0.59
Family history of CAD	37(21.5)	44(25.3)	0.41
Cigarette smoking	29(16.9)	21(12.1)	0.20

Table 2. Severity of coronary artery involvement according to estimated Gensini score.

	Case(group A)	Control (group B)	*P*
Left main (mean±SD)	1.12±0.27	1.21±0.21	0.78
LAD(mean±SD)†	18.17±1.67	12.04±0.87	0.001
LCX(mean±SD)†	9.08±0.92	6.9±0.74	0.043
RCA(mean±SD)†	5.08±0.53	5.69±0.66	0.62
PDA(mean±SD)†	1.57±0.34	0.87±0.26	0.10
Total(mean±SD)†	32.21±2.76	26.5±1.84	0.009

†LAD=Left anterior descending, LCX=Left circumflex, RCA=Right coronary artery, PDA=Posterior descending artery.

Table 3. Relationship between GS and other independent variables.

Variables	Gensini score	*P*	Variables	Gensini score	*P*
Male sex	35.89±2.25		Dislipidemic	31.63±2.10	
Female sex	22.83±2.29	<0.0001	No dislipidemic	29.91±2.67	0.61
Diabetics	38.59±3.02		Positive FH†	30.74±2.40	
No diabetics	27.81±1.97	0.004	Negative FH	30.86±1.92	0.98
Hypertensive	31.96±2.22		Smokes	37.06±6.32	
Normotensive	29.83±2.47	0.52	Nonsmokers	29.78±1.62	0.12

†FH=Family history of CAD

Although in general GS was higher in Group A than Group B which was statistically significant (35.21+2.76 vs 26.5+1.84, *P*=0.009) but since the two groups were not adjusted regarding their age, gender, and history of DM (Table 1) and because of abnormal distribution curve of GS between subgroups, as both Kolmogrov-Smirrov and Shapiro-Wilk revealed (*P*<0.0001), it was necessary to determine a cut off point for GS for doing logistic regression analysis. So Mean for GS (i.e. 28, 35) was determined as a cut off point. As a result, logistic regression analysis revealed that RBBB did not have a significant effect on the GS (OR=0.87, *P*<0.62). However, male patients (OR=3.41, 95% CI: 1.96-5.93, *P*<0.0001) and patients with history of DM (OR=3.22, 95% CI: 1.77-5.87, *P*<0.0001) had a significant effect on the GS.

Discussion

The impact of conduction disturbances like RBBB or LBBB on morbidity and mortality and its relation to the severity of CAD has been controversial for more than three decades.

However, the prognostic importance of intra-ventricular conduction disturbances depends mostly on the nature of the underline heart disease. Although, some epidemiologic studies in 1970 and 1980 decades showed that RBBB had no significant impact on mortality in the general population (17-19). But in patients with acute myocardial infarction RBBB and LBBB were strong predictors of poor prognosis (1-10). Widinsky *et al.,* in their recent study (2011) of 6742 patients with acute myocardial infarction (AMI) reported higher mortality (18.8%) in patients with new or presumably new RBBB compared to patients with old RBBB (6.4%). As a result, they strongly recommend new onset RBBB be added to the future guidelines as an indication for reperfusion therapy (1).

Kręcki *et al.,* reported that in patients with severe chronic CAD, RBBB and LBBB had no significant impact on patient's mortality independent of other risk factors, *i.e.* old age, history of DM, anemia, low LVEF and chronic renal failure, (11). Freedman *et al.,* conducted a study on 15609 patients with chronic CAD and they found that patients who had BBB also had more severe CAD, lower LVEF, and higher two-year mortality (12). Cortigiani *et al.,* revealed that the presence of RBBB with left anterior hemi-block (LAHB) was a strong risk factor for mortality in patients with established CAD (15). In addition, Go AS *et al.,* studied 297832 patients with AMI and they suggested RBBB as the strongest risk factor for in-hospital mortality (10). In their cases 6.7 % (n=19967) of the patients had LBBB and 6.2 % (n=18354) had RBBB. In-hospital mortality in patients with LBBB was 34% (OR=1.34, 95%CI: 1.78-1.39), and in patients with RBBB was 64% (OR=1.64, 95% CI: 1.57-1.71).

Ricou *et al.,* also conducted a study in 1991 on 932 patients with AMI and RBBB (n=178). They reported not only a higher left ventricular failure but also a higher in-hospital and one year mortality compared to those without RBBB. These findings showed that RBBB after AMI could be considered as an independent factor for poor prognosis (9).

In patients with suspected CAD, the importance of conduction disturbances especially RBBB and its effect on prognosis has not been clarified yet.

By reviewing other articles, we realized that there is only one study similar to ours which was conducted in 1984 by Haft *et al.,* They compared coronary angiographic findings of 103 patients with RBBB with 110 patients who had normal resting ECG regarding severity of CAD. Although patients with RBBB had more left ventricular wall motion abnormality, especially in the antero-apical region, but severity and distribution of CAD between both groups were similar (27) that was comparable to our findings.

In our study, there was no significant difference between patients with RBBB and normal resting ECG regarding the prevalence of CAD (77.7% vs. 70.1%, P=0.13 respectively).

Although the severity of CAD according to estimate Gensini Score in Group A was higher than Group B (35.21+2.76 vs. 26.5+1.84, P=0.009 respectively). But since both groups were not completely similar regarding patients age and gender also due to the uneven distribution of diabetic patients (more in Group A), logistic regression analysis revealed that RBBB by itself does not represent severity and extension of CAD in patients with suspected CAD (OR=0.87, P<0.62). In conclusion, in patients with suspected CAD the prevalence and severity of CAD were not related to the presence of RBBB, but were related to patient's age, gender, and history of diabetes mellitus.

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