

Prevalence of coronary artery disease in patients with symptomatic conduction blocks requiring permanent pacemaker implantation

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ABSTRACT

Background: Patients undergoing permanent pacing are not routinely investigated for coronary artery disease (CAD). This study aims to diagnose the potential CAD in patients admitted with symptomatic conduction blocks who may be at risk of CAD but are not admitted for ischemic symptoms.

Subjects and Methods: This cross-sectional study included 111 symptomatic conduction block non-acute coronary syndrome (N-ACS) patients and had 2 or more conventional risk factors of CAD (family history, diabetes, hypertension, smoking, and dyslipidemia) presented to emergency department in Punjab Institute of cardiology Lahore, Pakistan. All these patients underwent conventional coronary angiogram and coronary anatomy was analyzed by two independent cardiologists.

Results: Mean age of patients was 57.99±10.85 years, 76 (68.5%) were males and 35 (31.5%) females. Hypertension was most common risk factor observed in 101 (91%) patients followed by smoking 51 (45.9%), diabetes 47 (42.3%), family history of CAD 20 (18%) and dyslipidemia 19 (17.1%). Complete heart block was the most common conduction defect found in 87 (78.4%) patients. Among 111 patients, 49 (44.1%) had significant CAD, 20 (18.0%) had non-obstructive CAD and 42 (37.8%) had normal angiograms. Among obstructive CAD, left anterior descending (LAD) artery (73.4%) was the most common involved vessel followed by right coronary artery (RCA) (61.2%), left circumflex artery (LCX) (53.1%) and left main coronary artery (8.2%). Obstructive CAD group was further analyzed according to Mosseri's classification as 5 (10.2%) Type I, 12 (24.5%) Type II, 09 (18.4 %) Type III and 23 (46.9%) had Type IV coronary anatomy. Significant correlation of diabetes ($p = 0.005$) and dyslipidemia ($p = 0.001$) was observed with CAD.

Conclusion: Among patients with symptomatic conduction blocks and multiple CAD risk factors, coronary artery disease on angiography is present in significant population. It supports the coronary evaluation as pre-permanent pacemaker (PPM) workup in these patients at high risk of CAD.

Keywords:

Conduction blocks, CAD, permanent pacemaker, risk factors, angiography.

INTRODUCTION

Conduction blocks are one the major causes in patients seeking medical treatment in emergency room. These can result in adverse sequelae and may cause sudden cardiac death.¹ These comprise of variety of conduction system abnormalities involving sino-atrial node (SA node), atrio-ventricular node (AV node) and Intraventricular conduction system.^{1,2} Spectrum of presentation is broad ranging from asymptomatic ECG changes to symptomatic presentation like syncope, dizziness and to vague symptoms like dyspnoea, easy fatigue.³ Incidence of coronary artery disease (CAD)

found in previous studies in such patients presented for permanent pacing is variable from 15-70% depending upon the methodology used to diagnose ischemia.⁴⁻¹¹ Coronary artery disease may be a cause of these conduction abnormalities in many patients due to atherosclerotic disease in arteries supplying the conduction system. Coronary angiography remains as 'gold standard' for definitive and precise diagnosis of coronary artery disease.⁵ In patients with conduction blocks underlying CAD may worsen the prognosis after permanent pacemaker (PPM) implantation because pre-implantation low heart rate in this population leading to low cardiac workload usually mask the anginal symptoms and underlying disease may remain undiagnosed or under diagnosed and clinical outcome may have serious implications despite permanent pacing.^{6,7} In previous studies incidence of CAD is high

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in patients of sudden cardiac death due to arrhythmias although most of this population have risk factors of CAD but apparently normal, asymptomatic and no documented CAD.⁸⁻¹¹ The rationale of this study is that conduction blocks have a diverse range of aetiologies but patients with multiple risk factors of CAD may have underlying coronary artery disease and this population should be identified selectively to have timely appropriate treatment.

SUBJECTS AND METHODS

This cross-sectional observational study was conducted on patients presented in emergency department of Punjab Institute of Cardiology Lahore with symptomatic conduction blocks from April 1, 2017 till March 31, 2018. After informed consent, 101 patients of both genders with symptomatic conduction blocks having indication of permanent pacemaker (PPM) implantation and having 2 or more conventional risk factors of CAD (diabetes mellitus, hypertension, family history, smoking, and dyslipidaemia) were included. Patients with acute coronary syndrome, systemic disease involving conduction system (i.e. infiltrative disorders, connective tissue disorders etc.) and history of contrast allergy were excluded. The study protocol was approved by the Institutional Ethics Committee and study was funded by same institution. Patient's demographic information, symptom profile as syncope, pre-syncope and dyspnoea on exertion were obtained on designed study proforma. ECG and baseline laboratory investigations required as pre-requisite for conventional coronary angiography were performed. Coronary angiographies were performed through radial or femoral artery access under the standard protocol. The coronary anatomy was analyzed by two independent cardiologists. Obstructive (significant) CAD was defined as > 50% luminal stenosis in any of at least one major coronary artery or its first order branch, while \leq 50% stenosis was graded as non-obstructive CAD. Obstructive CAD was further subtyped as Type-I to Type-IV according to Mosseri classification: Type I: Disease not involving LAD septal perforators or arteries supplying AV node, Type II: Disease involving LAD septal perforators but not involving arteries supplying

AV node, Type III: Disease involving arteries supplying AV node but not involving LAD septal perforators, Type IV: combination of Type II and Type III coronary anatomy pathology.⁶ Data was entered on designed proforma. Data was analysed using SPSS (Statistical Package for Social Sciences) Version 21 for Windows. Mean \pm SD was given for quantitative variables. Frequencies and percentages were given for qualitative variables. Chi square test and Fischer exact test were applied to observe the association of qualitative variables, while for quantitative variables independent t-test was applied.

RESULTS

A total of 111 patients admitted with indication of permanent pacemaker implantation (PPM) were enrolled during the study period. Mean age was 57.99 ± 10.85 years and 76 were male (68.5%) and 35 females (31.5%). Hypertension was most common risk factor followed by smoking, diabetes, family history of CAD and dyslipidaemia (Table 1).

Most of the patients (83.8%) presented with syncope followed by pre-syncope (9%) and exertional dyspnea (8.2%). Most common indication for PPM implantation was complete heart block 78.4% (n=87), followed by 2nd degree (Mobitz II) 18 % (n=20), sinus node disease (SND) 1.8% (n=2) and Trifascicular Block 1.8% (n=2). Out of 111 patients, 42 (37.8%) had normal angiograms, 49 (44.1%) had obstructive CAD and 20 (18.0%) had non-obstructive CAD. Among group with obstructive CAD single vessel disease (SVD) was 30.6%, double vessel disease (DVD) 36.7%, triple vessel disease (TVD) 32.7%. Commonest involved vessel among obstructive CAD was LAD (73.4%) followed by RCA (61.2%), LCX (53.1%) and Left main coronary artery (8.2%). Coronary artery pathology of patients with significant CAD was further analyzed according to Mosseri's classification as 5 (10.2%) Type I, 12 (24.5%) Type II, 9 (18.4 %) Type III and 23 (46.9%) Type IV coronary anatomy (Table 2).

Patients with coronary artery disease were correlated with risk factors between obstructive (significant), non-obstructive CAD and normal

Table 1: Risk factors identified in study patients (N=111)

Risk factor	Frequency
Diabetes	47 (42.3%)
Hypertension	101 (91.0%)
Smoking	51 (45.9%)
Family history of CAD	20 (18.0%)
Dyslipidaemia	19 (17.1%)

Table 2: Distribution of coronary artery disease in study population (N=49)

Types	Frequency	Percentage (%)
Single Vessel Disease	15	30.6
Double Vessel Disease	18	36.7
Triple Vessel Disease	16	32.7
Mosseri type		
Type 1	05	10.2
Type 2	12	24.5
Type 3	09	18.4
Type 4	23	46.9

Table 3: Correlation of risk factors with coronary artery disease

Risk Factors	Significant CAD (Obstructive CAD)	Non-significant CAD (Normal Angio + Non-obstructive CAD)	p-value
Diabetes	28 (57.1%)	19 (30.6%)	0.005
Hypertension	43 (87.8%)	58 (93.5%)	0.294
Smoking	20 (40.8%)	31 (50.0%)	0.339
Family History	6 (12.2%)	14 (22.6%)	0.162
Dyslipidaemia	16 (32.7%)	3 (4.8%)	0.001

angiograms. Significant correlation of diabetes ($p=0.005$) and dyslipidemia ($p = 0.001$) with CAD was identified (Table 3).

DISCUSSION

Patients presenting with symptomatic conduction blocks predominantly belong to old and middle-aged population. Among different causes of conduction blocks, patients with coronary artery pathology have poor outcome due increased risk of sudden cardiac arrest.^{7,8} Most common indication of PPM in this study was complete heart block as in different studies.^{12,13} In this study incidence of significant CAD was found in 44.1% is well within range (15-70%) quoted in earlier studies.⁹⁻¹¹ Various conventional risk factors of CAD studied in this study identified diabetes ($p= 0.005$) and dyslipidemias ($p=0.001$) being significant risk factors. In previous studies significant correlation of common risk factors described with dyslipidemia ($p=0.047$), smoking ($p=0.025$) and family history of CAD ($p=0.002$), hypercholesterolemia ($p=0.010$) and diabetes ($p=0.021$).^{10,11} Type IV (46.9%) was the commonest subtype followed by II, III and I in this study. These types are well-matched with previous studies.¹¹⁻¹⁵ In a study conducted by Alai and colleagues, Type IV (48.3%) and type II (34.5%) were two commonest types.¹¹ In data presented by Tandoğan and associates type IV coronary anatomy (45%) and type II (24%) remained significantly higher than other two types.¹⁴ Revascularization in such patients has variable results in various studies. A study conducted by Zhong and investigators revealed encouraging results of PCI and delayed need of permanent pacing by comparing with control group not undergoing revascularization.¹⁵

While in another study, Cardoso and coauthors did not show any promising results of revascularization to delay or avoid permanent pacing in non-ACS patients.¹² Although chronic CAD may be the contributing cause of conduction disturbance due to recurrent ischemia to conduction system in non-ACS patients, incidence of CAD in this selected population is high. Patients presenting with syncope and underlying CAD are identified at increased risk of sudden cardiac arrest.^{7,8} So early identification of CAD by elective angiography in patients at high risk of developing CAD may help in improving overall disease outcome. However, whether revascularization in non-ACS patients can avoid permanent pacing or not needs to have further large-scale studies.

CONCLUSION

Patients with symptomatic conduction blocks and possessing 2 or more conventional CAD risk factors should be considered candidates for elective coronary angiography which may improve their overall outcome.

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