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Investigating the Manifestation of Coronary Artery Disease and Determining the Role of Effective Factors in the Need for Pacemaker Insertion in These Patients

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Abstract

BACKGROUND: Many patients who are candidates for a pacemaker are also at the same time risk factors for coronary artery disease such as high blood pressure, hypertension, diabetes, and hyperlipidemia, and therefore the probability of having coronary artery disease is significant. Effective diagnostic measures can be taken to prove the factors affecting the incidence of CAD in patients undergoing pacemakers at high-risk, including angiography. Therefore, it can prevent complications during and after pacemaker implantation, which leads to an increase in the quality of treatment in patients requiring pacemaker implantation.

AIM: Therefore, the purpose of this study was to determine the predictive factors of significant coronary artery disease in patients with pacemaker implantation to identify patients in need of coronary angiography at the time of pacemaker implantation.

METHODS: This retrospective study was carried out to examine the patients' files that were placed at the heart of Imam Reza Hospital during the period between March 2017 and September 2017. Demographic data, risk factors, echocardiography findings, and angiography, were collected and then recorded using a checklist. Statistical analysis was performed using SPSS software version 22 and Chi-square, and Mann-Whitney tests were used for determining significates variables.

RESULTS: A group of 102 patients who had undergone a permanent cardiac pacemaker insertion due to an atrioventricular (AV) Block were included in the study, and also coronary anatomy was determined coronary angiography. Based on the results, 13.7% of patients with cardiac pacemaker had obstructive coronary artery disease (stenosis > 70%). Factors affecting coronary artery stenosis on angiography include gender, chest pain, history of myocardial infarction, angioplasty, diabetes, smoking, history of aspirin intake, calcium blocker and Plavix, high hematocrit, ST elevation and ST depression in the ECG, and severe mitral regurgitation.

CONCLUSION: It seems that in most patients requiring permanent pacemaker insertion because of the atrioventricular (AV) Block, angiography does not change the patient's fate, and so can be ignored. However, in patients who have several risk factors from the listed above, coronary angiography is recommended during admission.

Introduction

Coronary Artery Disease (CAD) is the leading cause of death in industrialised countries [1]. In addition to its impact on mortality rates, CAD also causes disability and reduced productivity [2]. Over the past few decades, with the advancement of CAD diagnosis, prevention and treatment, and the mortality rate of this disease has decreased. However, in the United States alone, about 1.2 million cases of myocardial infarction or fatal heart attacks occur annually [3]. Nearly half of all deaths in industrialised countries and 25% of deaths occur in developing countries due to coronary artery disease [4]. By 2020, the number of deaths expected to exceed the number of deaths from infectious diseases [5].

Many patients who are candidates for pacemakers have a simultaneous risk factor for coronary artery disease, such as high age, hypertension, diabetes, hyperlipidemia; so, the probability of having coronary artery disease is significant, with a 30% risk [6], [7].

Also, many patients with bradyarrhythmias, especially the atrial fibrillation block, have symptoms such as chest pain and shortness of breath that overlaps with the symptoms of coronary artery disease, and at the same time, patients may suffer from acute coronary syndrome and bradycardia of the heart [8], [9]. Finally, the pacemaker insertion can be implemented in the cardiac catheterisation room, where there is the possibility of performing coronary angiography simultaneously. However, coronary angiography is not routinely found to indicate in patients with Bradyarrhythmia.

However, if the prediction of patients with significant coronary artery disease is performed, coronary angiography can also be done concurrently with pacemaker insertion and identified the presence and severity of coronary artery disease. Additionally, coronary angiography can be avoided in unnecessary cases, which is an invasive procedure with inherent complications, especially in older patients [12].

Effective diagnostic measures including angiography can be performed by proving the factors influencing the incidence of CAD in high-risk patients who undergo pacemaker implantation to prevent complications during and after placement of the pacemaker and to increase the quality of therapy in patients requiring pacemakers. Several studies have investigated the location of coronary artery involvement in patients with heart block, or have examined the effect of revascularization on the removal of the heart block removal and the implantation of a permanent pacemaker [6], [7], [8], [13], [14], [15].

Therefore, the current study was aimed to evaluate factors associated with coronary artery disease in patients with pacemakers, which can help choose patients who simultaneously require coronary angiography.

Material and Methods

This retrospective study was carried out using the medical record of all patients who had permanent pacemaker implantation from the beginning of March 2017 to September 2017 at the cardiology department, Imam Reza Hospital of Mashhad University of Medical Sciences. The coronary anatomy of patients was determined by angiography during admission or at least one month before or after the pacemaker insertion, and then subjects were included in the study. The location and extent of involvement for all coronary arteries and their branches were determined by the cardiologist via examining the angiographic film, or according to available and reliable written reports.

Based on the results of coronary artery angiography, patients were divided into two groups. The first group was patients with significant coronary artery disease. (There is at least one vessel involved with stenosis of up to 70% in a major vessel or in the main branch of a vessel that needs revascularisation). Group 2: Patients with no significant coronary artery involvement.

The variables studied included: Age, sex, BMI, diabetes, hypertension, dyslipidemia, smoking, serum troponin levels, CK and CK-MB, symptoms in referral time (syncope, chest pain, dyspnea), serum creatinine, left ventricular ejection fraction (LVEF), Mitral valve failure, pulmonary artery pressure, coronary calcification in fluoroscopy during pacemaker implantation, mitral annular calcification in fluoroscopy or echocardiography, cause of pacemaker implantation.

Statistical analysis

Data from patients' demographic and clinical observations were analysed using SPSS software version 22. To describe the data, descriptive statistical methods, including central indicators, distribution, and frequency, were employed. T-test or its nonparametric equivalents were used to compare quantitative variables in two independent groups. Furthermore, the Chi-square test was applied to compare qualitative variables in two groups. In all tests, $p < 0.05$ was considered as a significant level.

Results

This study was performed on 102 patients under coronary angiography and pacemaker insertion. Among all enrolled subjects, 53 (52%) men and 49 (48%) women were present. In this study, individuals with permanent pacemaker implantation were searched form the medical records, and people who had coronary angiography were also examined. Also, subjects who included both of the measures mentioned above were enrolled in the study. The mean age of the patients was determined as 71.25 ± 11.32 year, and the patients were in the range of 44 to 93 years old. Among all 102 enrolled patients, 88 (86.3%) were not found to suffer from coronary artery disease, and 14 (13.7%) had coronary artery involvement.

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Table 1: Average and frequency of demographic and clinical variables in patients with pacemaker implantation based on coronary artery involvement

Coronary artery disease / Disorder	No	Yes	Total	P-value
Age(year)		71.1±11.87	72.21±7.14	71.25±11.3	0.733
Sex	41 (%77.4)	12 (%22.6)	53 (%100.0)	0.008	0.008
	47 (%95.9)	2 (%4.1)	49 (%100.0)		
Smoking	16 (%72.7)	6 (%27.3)	22 (%100.0)	0.037	
Type of referral symptoms	50 (%89.3)	6 (%10.7)	56 (%100.0)	0.787	0.787
	35 (%87.5)	5 (%12.5)	40 (%100.0)		
Type of referral symptoms	53 (%89.8)	6 (%10.2)	59 (%100.0)	0.047	0.047
	21 (%95.5)	1 (%4.5)	22 (%100.0)		
	10 (%66.7)	5 (%33.3)	15 (%100.0)		
	2 (%100.0)	0	2 (%100.0)		
Underlying disease	4 (%50.0)	4 (%50.0)	8 (%100.0)	0.012	0.012
	1 (%50.0)	1 (%50.0)	2 (%100.0)	0.257	0.257
	1 (%20.0)	4 (%80.0)	5 (%100.0)	0.001	0.001
	2 (%100.0)	0	2 (%100.0)	1	1
	1 (%100.0)	0	1 (%100.0)	1	1
	17 (%68.0)	8 (%32.0)	25 (%100.0)	0.005	0.005
	52 (%83.9)	10 (%16.1)	62 (%100.0)	0.38	0.38
	15 (%75.0)	5 (%25.0)	20 (%100.0)	0.102	0.102
	22 (%81.5)	5 (%18.5)	27 (%100.0)	0.399	0.399

As shown in Table 1, no significant difference was found in the mean and standard deviation of age in patients with pacemaker implantation based on coronary artery involvement (P > 0.05). However, the frequency of coronary artery disease in men was significantly higher than that of women (22.6% vs 4.1%) (P = 0.008). The frequency of coronary artery disease in patients with cigarette smoking was significantly higher as compared to non-smokers (27.3% vs 10%), (P < 0.05). Also, the frequency of referral type in patients with pacemaker implantation, based on coronary artery disease, was not significantly different (P > 0.05). Moreover, the incidence of coronary artery disease in patients with chest pain was significantly higher when compared with other patients (33.3%) (P = 0.47).

Frequency of coronary artery disease in patients with myocardial infarction (50% versus 10.6%), angioplasty (80% vs 10.3%) and diabetes (32% versus 7.8%) was significantly higher than other patients without aspects (P < 0.05).

Table 2: Frequency of medication use in patients with pacemaker implantation based on coronary artery involvement

Coronary artery disease / Drug			No	Yes	Total	P-value
Beta blocker	No	Number	44	4	48	
		Percent	%91.7	%8.3	%100.0	0.136
	Yes	Number	44	10	54	
		Percent	%81.5	%18.5	%100.0	
Digoxin	No	Number	86	14	100	
		Percent	%86.0	%14.0	%100.0	0.569
	Yes	Number	2	0	2	
		Percent	%100.0	%0.0	%100.0	
Aspirin	No	Number	63	3	66	
		Percent	%95.5	%4.5	%100.0	0.001
	Yes	Number	25	11	36	
		Percent	%69.4	%30.6	%100.0	
Calcium blocker	No	Number	56	5	61	
		Percent	%91.8	%8.2	%100.0	0.048
	Yes	Number	32	9	41	
		Percent	%78.0	%22.0	%.100	
Plavix	No	Number	87	8	95	
		Percent	%91.6	%8.4	%100.0	<0.001
	Yes	Number	1	6	7	
		Percent	%14.3	%85.7	100.0	

The frequency of coronary artery disease in patients with history of aspirin use (30.6% vs. 4.5%), calcium blocker (22% vs. 8.2%) and Plavix (85.7% vs. 8.4%) %) was significantly higher as compared to other patients without the history of using the drugs

(Table 2).

Table 3: Mean and standard deviation of laboratory variables of patients with pacemakers based on coronary artery involvement

Variable	No	Yes	P-value
FBS	105.06±41.52	103.5±36.22	0.834
Cr	1.04±0.17	1.11±0.14	0.103
Na	139.98±9.97	138.64±2.02	0.633
K	4.77±0.44	4.87±0.49	0.351
Ca	8.85±0.32	9±0.51	0.203
Uric Acid	32.9±8.15	32.07±8.94	0.701
CTn.1	0.004±0.018	0.033±0.05	0.142
CTn.2	0.0007±0.004	0	0.825
Chol	146.21±31.64	153.23±33.88	0.364
TG	118.55±29.78	114.69±57.27	0.327
LDL	103.4±30.6	102.15±18.13	0.812
HDL	42±8.7	39±8.27	0.215
WBC	7.45±1.61	7.22±1.29	0.605
RBC	4.2±1.09	4.35±0.63	0.282
Hgb	13.47±3.22	13.97±1.12	0.569
Hct	40.15±7.23	41.72±2.8	0.042
MCV	89.71±21.86	88.21±2.08	0.949
Plt	200.81±51.72	203.31±69.74	0.456

LDL (Low-density lipoprotein), HDL (High –density lipoprotein ;RBC (Red blood cell), WBC (White blood cell); MCV (mean cell volume).

As indicated in Table 3, the only hematocrit in patients with coronary artery disease was significantly higher compared with patients without coronary artery disease (41.72 vs 40.15) (P = 0.42).

Table 4: Frequency of ECG abnormalities in patients with pacemaker implantation based on coronary artery involvement

Coronary artery disease / Disorder			No	Yes	Total	P-value
AF	No	Number	85	13	98	
		Percent	%86.7	%13.3	%100.0	0.451
	Yes	Number	3	1	4	
		Percent	%75.0	%25.0	%100.0	
AT	No	Number	88	13	101	
		Percent	%87.1	%12.9	%100.0	0.137
	Yes	Number	0	1	1	
		Percent	%0.0	%100.0	%100.0	
AVB 2	No	Number	87	14	101	
		Percent	%86.1	%13.9	%100.0	1
	Yes	Number	1	0	1	
		Percent	%100.0	%0.0	%100.0	
AVB 2.1	No	Number	67	12	79	
		Percent	%84.8	%15.2	%100.0	0.731
	Yes	Number	21	2	23	
		Percent	%91.3	%8.7	%100.0	
CAVB	No	Number	25	2	27	
		Percent	%92.6	%7.4	%100.0	0.266
	Yes	Number	63	12	75	
		Percent	%84.0	%16.0	%100.0	
RBBB	No	Number	71	13	84	
		Percent	%84.5	%15.5	%100.0	0.454
	Yes	Number	17	1	18	
		Percent	%94.4	%5.6	%100.0	
LBBB	No	Number	68	11	79	
		Percent	%86.1	%13.9	%100.0	0.914
	Yes	Number	20	3	23	
		Percent	%87.0	%13.0	%100.0	
Narrow QRS	No	Number	48	10	58	
		Percent	%82.8	%17.2	%100.0	0.264
	Yes	Number	40	4	44	
		Percent	%90.9	%9.1	%100.0	
No Intrinsic QRS	No	Number	87	14	101	
		Percent	%86.1	%13.9	%100.0	1
	Yes	Number	1	0	1	
		Percent	%100.0	%0.0	%100.0	
ST Elevation	No	Number	81	6	87	
		Percent	%93.1	%6.9	%100.0	
	Ant	Number	1	3	4	
		Percent	%25.0	%75.0	%100.0	<0.001
	Inf	Number	0	4	4	
		Percent	%0.0	%100.0	%100.0	
	Lat	Number	1	0	1	
		Percent	%100.0	%0.0	%100.0	
ST Depression	No	Number	82	9	91	
		Percent	%90.1	%9.9	%100.0	<0.001
	Ant	Number	0	4	4	
		Percent	%0.0	%100.0	%100.0	
T wave Inversion	No	Number	79	13	92	
		Percent	%85.9	%14.1	%100.0	
	Inf	Number	2	0	2	
		Percent	%100.0	%0.0	%100.0	0.782
	Lat	Number	1	0	1	
		Percent	%100.0	%00.0	%100.0	

AF (Atrial fibrillation); AVB (Atrioventricular block); CAVB (Complete atrioventricular block); RBBB (Right bundle branch block); LBBB (Left bundle branch block).

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According to Table 4, the incidence of coronary artery disease in patients with ST-segment elevation was significantly lower in the lower wall (100%) and the front wall (75%) than in other patients (P < 0.001). Furthermore, the frequency of coronary artery disease in patients with ST-segment depression in the front part (100%) was significantly higher as compared to patients without ST-segment depression (p < 0.001).

Table 5: Frequency of angiographic impairment in patients with pacemaker implantation based on coronary artery involvement

Coronary artery disease / Angiography			No	Yes	Total	P-value
Vessels involved in angiography	No	Number	85	0	85	
		Percent	%97.7	%0.0	%84.2	
	LM	Number	0	4	4	
		Percent	%0.0	%28.6	%4.0	
	LAD	Number	1	4	5	
		Percent	%1.1	%28.6	%5.0	
	LCX	Number	0	1	1	<0.001
		Percent	%0.0	%7.1	%1.0	
	OM	Number	1	0	1	
		Percent	%1.1	%0.0	%1.0	
	RCA	Number	0	4	4	
		Percent	%0.0	%28.6	%4.0	
	PLV	Number	0	1	1	
		Percent	%0.0	%7.1	%1.0	
Angioplasty after angiography	No	Number	86	6	92	
		Percent	%97.7	%42.9	%90.2	<0.001
	Yes	Number	2	8	10	
		Percent	%2.3	%57.1	%9.8	
CABG after angiography	No	Number	88	12	100	
		Percent	%100.0	%85.7	%98.0	0.018
	Yes	Number	0	2	2	
		Percent	%0.0	%14.3	%20.0	

LM (Left main artery); LAD (Left anterior descending artery); LCX (Left circumflex artery) OM(Obtuse marginal); RCA (Right coronary artery) PLV (Posterior left ventricular).

As summarised in Table 5, the most involved vessels in the patients simultaneously included LM, LAD, and RCA (each of 28.6%). Also, patients experienced angioplasty after angiography (57.1%), and CABG after angiography (14.3%). Regarding the results presented in Table 6, patients with severe mitral regurgitation (100%) had coronary artery disease after implantation of the pacemaker (P < 0.05).

Table 6: Frequency of echocardiography in patients with pacemaker implantation based on coronary artery involvement

Coronary artery disease Echocardiography			No	Yes	Total	P-value
Mitral insufficiency	No	Number	61	6	67	
		Percent	%91.0	%9.0	%100.0	
	Mild	Number	16	1	17	
		Percent	%94.1	%5.9	%100.0	0.003
	Moderate	Number	5	3	8	
		Percent	%62.5	%37.5	%100.0	
	Severity	Number	0	1	1	
		Percent	%0.0	%100.0	%100.0	
Mitral annulus calcification	No	Number	82	11	93	
		Percent	%88.2	%11.8	%100.0	0.128
	Yes	Number	0	1	1	
		Percent	%0.0	%100.0	%100.0	
Tricuspid insufficiency	No	Number	52	4	56	
		Percent	%92.9	%7.1	%100.0	
	Mild	Number	21	4	25	
		Percent	%84.0	%16.0	%100.0	0.123
	Moderate	Number	6	3	9	
		Percent	%66.7	%33.3	%100.0	
	Severity	Number	3	1	4	
		Percent	%75.0	%25.0	%100.0	
Aortic valve position	Normal	Number	73	10	83	
		Percent	%88.0	%12.0	%100.0	
	Calcification	Number	1	0	1	0.721
		Percent	%100.0	%0.0	%100.0	
	Failure	Number	8	2	10	
		Percent	%80.0	%20.0	%100.0	

Discussion

Many patients who are candidates for pacemaker implantation, due to the atrioventricular (AV) Block, have high age and at the same time are at risk for coronary artery disease. Coronary artery blockage can be an etiological factor in the impairment of the cardiac conduction system and require the use of a pacemaker. On the other hand, in patients requiring pacemakers, non-invasive tests, such as exercise tests, are not possible for diagnosis of coronary artery disease, or their diagnostic value is lower than other patients [18], [16]. Therefore, the study of factors associated with coronary artery disease in these patients can help choose patients who simultaneously need coronary angiography.

This study was performed on 102 patients with pacemaker implantation. Among all included patients, 53 (52%) were men, and 49 (48%) were women. The mean age of the patients was calculated to be 71.11 ± 25.32 years old, and the patients were in the range of 44 to 93 years old. Of the 102 patients who were admitted, 88 (86.3%) were without coronary artery disease, and 14 (13.7%) had coronary artery disease. Based on the result presented herein, the mean and standard deviation of age, frequency of f referral type in patients with pacemaker implantation based on coronary artery involvement was not found to be significantly different (P > 0.05). However, it was found that the frequency of coronary artery disease in men was significantly higher as compared to women (22.6% vs 4.1%). The findings revealed that the frequency of coronary artery disease in patients with chest pain was significantly higher while comparing with other patients (33.3%). Frequency of coronary artery disease in patients with myocardial infarction (50% versus 10.6%), angioplasty (80% vs 10.3%) and diabetes (32% versus 7.8%) was significantly higher than other patients without aspects (P < 0.05). However, other diseases did not have a significant relationship with the incidence of coronary artery disease. The frequency of coronary artery disease in patients with cigarette smoking was remarkably higher than non-smokers (27.3% vs 10%). The frequency of coronary artery disease in patients with a history of aspirin use (30.6% vs 4.5%), calcium blocker (22% vs 8.2%) and Plavix (85.7% vs 8.4%) %) was markedly higher as compared to other patients without the history of using the drugs. Regarding laboratory variables, it was found that only hematocrit in patients with coronary artery disease was significantly higher in comparison with patients without coronary artery disease.

Our findings demonstrated that the incidence of coronary artery disease in patients with ST-segment elevation was significantly lower in the lower part (100%) and the front part (75%) as compared to in other patients. The frequency of coronary artery disease in patients with ST-segment depression in the front part (100%) was found to be remarkably

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increased as compared to patients without ST-segment depression.

The findings indicated that the most involved vessels in the patients simultaneously included LM, LAD, and RCA (each of 28.6%). Furthermore, patients experienced angioplasty after angiography (57.1%), and CABG after angiography (14.3%).

Regarding the results presented in Table 6, patients with severe mitral regurgitation (100%) had coronary artery disease after implantation of the pacemaker. In a study conducted by Brueck et al., in 2008, investigated the incidence of coronary artery disease in pacemaker insertion in 507 patients, where 212 (42%) with permanent pacemakers underwent coronary angiography with two months before or after the pacemaker insertion. They indicated that severe conduction disturbances or sinus node dysfunction could probably be associated with CAD, where myocardial revascularisation is needed. In this study, diabetes and hypercholesterolemia were predictors of coronary artery disease. The data show that patients with severe conduction disturbances or sinus node dysfunction have coronary artery disease, with at least one risk factor for atherosclerosis [5].

Based on the data presented herein, out of 102 cases, 88 cases (86.3%) were without the involvement, and 14 (13.7%) had coronary artery disease, which is much lower than study above. The reason for this difference may be due to the sample size and sampling methods, patient demographics, inclusion, and exclusion criteria. The study mentioned above-demonstrated diabetes as a cause of coronary artery disease, which was in concurrence with our observations.

Another study by Alai et al. was conducted to examine the incidence of coronary artery disease in patients requiring pacemaker implantation. They indicated that 45% of patients showed CAD, of which 29% revealed obstructive CAD, reaming 16% exhibited non-obstructive CAD. Furthermore, 53.3% of patients revealed SVD, followed by DVD (15.6%) and TVD (31.1%).

Type I (6.9%), II (34.5%), III (10.3%), and IV (48.3%) coronary anatomies were found in enrolled subjects. The presence of CAD is linked to the history of smoking, dyslipidemia, and family history of CAD. CAD angiography has been found in most subjects with symptomatic bradyarrhythmias and risk factors for CAD, as reported by Alai et al.

It can be said that such patients should undergo coronary monitoring before undergoing pacemaker surgery. Simultaneous CAD treatment is likely to improve the long-term prognosis of these patients [19]. The findings of the mentioned study on coronary artery disease are more than our study. Regarding effective risk factors, only smoking had a significant correlation with coronary artery disease. The reason for this difference may be due to the

difference in the sample size, the difference in patient demographics, the difference in the sampling method and inclusion and exclusion criteria, as well as leaving the study. However, similar to our study, it was found that diabetes is a factor in the incidence of coronary artery disease.

Hsueh et al. investigated the incidence of coronary artery disease and its risk factors in patients requiring pacemakers. They found the following results: Regarding coronary angiography, the incidence rate of CAD has been determined as 20%.

The node-related artery was rarely seen among CAD patients with symptomatic bradyarrhythmia (9%), and the majority of subjects showed stenosis for LAD (74%). The baseline features and symptoms presented in patients with or without CAD were not statistically different.

Hypercholesterolemia and DM were found to be two independent predictors of CAD. Finally, it was concluded that hypercholesterolemia and DM were one of the most important predictors of CAD in these patients.

The node-related artery is rarely involved in patients with CAD and symptomatic bradyarrhythmia [14]. Meanwhile, in our study, it was found that 88 patients (86.3%) had no coronary artery disease, and 14 (13.7%) had coronary artery disease that was less than the study above. By our findings, it became clear that diabetes is a factor in the incidence of coronary artery disease. However, in contrast to the study, hypercholesterolemia in our study did not correlate with CAD incidence [14]. Ciaroni et al., investigate the incidence of coronary artery disease and its risk factors in patients requiring permanent transvenous pacemaker using dobutamine stress echocardiography, thallium-201 myocardial CT, and coronary arteriography during 8 days. None of these patients experienced myocardial infarction. Sixteen (55%) of patients was diagnosed as CAD in angiography. Diagnostic sensitivity for CAD was determined to be 94% for tomography and 88% for echocardiography, but this difference in CAD diagnosis was not found to be significant.

Among 13 enrolled subjects without CAD, 9 patients exhibited positive findings using tomography, where the specificity of 31% was achieved, on the other hand, one patient exhibited positive result based on the echocardiography, e.g., 92%. Therefore, dobutamine stress echocardiography was capable of increasing the rate of false-positive results in these patients and also maintains diagnostic sensitivity for CAD, consistent with myocardial tomography. In the study above, it was also found that male gender, diabetes, and positive family history were among the factors affecting the incidence of CAD in patients under pacemaker implantation (20). Meanwhile, our findings revealed that, among 102 included patients, 88 (86.3%) patients didn't show coronary artery disease, and 102 cases (13.7%) had coronary artery

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disease, that was less than mentioned study The reason for this difference may be due to the sample size, demographic characteristics of the patients, the difference in the sampling method and inclusion and exclusion criteria and leaving the study. In line with our study, it appeared that diabetes and male gender were involved in the incidence of coronary artery disease.

Regarding the fact that some factors are positive in predicting the incidence of coronary artery disease in patients with pacemaker therapy, it is possible to reduce complications and reduce hospitalisation time by performing coronary angiography in essential cases without implementation in unnecessary cases, thus leading an acceptable impact on cost and patient satisfaction.

In conclusion, by proving the factors influencing the incidence of coronary artery disease in patients with pacemaker insertion can perform effective diagnostic procedures for high-risk patients, including angiography to prevent complications during and after pacemaker implantation and increase the quality of treatment in patients requiring a pacemaker.

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