The Research of Medical Science Review

Received: 18 November, 2024
Accepted: 18 December, 2024
Published: 25 December, 2024

ISSN: 3007-1208 | 3007-1216
Volume 2, Issue 3, 2024

RELATIONSHIP OF ATRIOVENTRICULAR BLOCKS IN ACS (ACUTE CORONARY SYNDROME) AND IN HOSPITAL NEED OF PERMANENT PACEMAKER IMPLANTATION

Zakir Ullah[*1], Prabal Nepal[2], Hafiz Abdul Mannan Shahid[3], Sajjad Ahmad[4], Hamayon[5], Shivam Kumar Thakur[6]

[1,2]Resident Cardiology Punjab Institute of Cardiology, Lahore
[3]Assistant Professor Electrophysiology, Punjab Institute of Cardiology, Lahore
[4]Professor of Cardiology Punjab Institute of Cardiology, Lahore
[5]Resident Cardiology Punjab Institute of Cardiology, Lahore
[6]Resident Medicine Mayo Hospital, Lahore

[*1]uzakir126@gmail.com, [2]nepalprabal@gmail.com, [3]drhams79@yahoo.com, [4]drsajjad0910@gmail.com, [5]hamayon.awab786@gmail.com, [6]thakurshivam492@gmail.com

ABSTRACT

Objective: *To find the frequency of need of permanent pacemaker implant in patients of acute coronary syndrome with atrioventricular blocks.*

Study Design*: Descriptive case series*

Place of Study: *Department of cardiology, Punjab Institute of cardiology, Lahore during July to October 2024.*

Material and Methods*: Total 200 patients of both genders presenting with atrioventricular blocks were included in the study. Demographic and medical history, including lifestyle factors and type of MI were noted. Patients were managed according to standard protocol and the need of permanent pacemaker implantation were assessed.*

Results: *The mean age was 57.9%, 63% male vs 37% female. 38.5% had acute inferior wall myocardial infarction and 3rd degree AB block was the most common conduction abnormality 53%. Pacemaker implantation was required in 21.5% of cases, with significant associations found between pacemaker need and factors like obesity, unstable angina, 3rd degree AV block and ST changes (P<0.001).*

Conclusion: *Need for permanent pacemaker implantation was important for patients with specific conduction abnormalities and cardiac condition. While factors like hypertension and life style have limited impact on pacemaker need.*

Keywords: *Atrioventricular block, Pacemaker, Implantation, ECG*

INTRODUCTION

Atrioventricular (AV) conduction is evaluated by assessing the relationship between the P waves and QRS complexes on an electrocardiogram (ECG). Normally, there is a P wave with a fixed PR interval of 120 to 200 milliseconds comes before each QRS complex. A delay or disruption in the impulse's passage from the atria to the ventricles is known as an atrioventricular block. The heart's conduction system may be impaired anatomically or functionally as a result.(1)

The disturbance of regular electrical activity may be temporary or permanent and is further being to be delayed, absent and intermittent. (2) Acute coronary syndrome has a 7.3% frequency of AV blocks, and there is no clear association between the condition and any other clinical characteristic that may predict it.

Therefore, protocols should be established in regular clinical practice to effectively manage this life-threatening condition. (3)

Bradycardias due to sinus node disease, AV node dysfunction, or disturbances in the Purkinje system are important causes of age-related cardiovascular morbidity. Patients typically present with symptoms such as dizziness, syncope, or effort intolerance. An abnormal resting electrocardiogram or rhythm monitoring can help establish the diagnosis. While first-degree AV blocks are generally benign and do not involve an interruption of AV conduction. In contrast, second-degree and third-degree AV blocks are serious. They can completely interrupt of AV conduction, causing a disconnection between atrial and ventricular conduction. These cases often require emergent permanent pacemaker implantation.(4, 5) Permanent pacemaker implantation for all degrees of heart block can provide symptomatic benefit. However, implantation in cases of Mobitz II block, higher-degree AV blocks, and third-degree heart block has shown proven survival benefits. (6)

One study found that the percentage of permanent pacemaker implantation was 50.3% in patients with AV block. (7) Another study found that about 2.7% of patients with acute coronary syndrome were complicated by AV block, and 6.0% underwent permanent pacemaker implantation. In patients with transient AV blocks, 50% resolved within 2 days, and 94% resolved by 10 days. In those who required a permanent pacemaker, 50% were implanted within 1 day, and 67% were implanted by 10 days.(8)

Therefore, this study aims to find the frequency of permanent pacemaker implantation in patients with AV block and analyze their outcomes. Literature showed that about half of patients with AV block need permanent pacemaker implantation. But limited work has been done before and only one study conducted before in Pakistan. Hence, it is important to identify the extent of problem an in local population and implement preventive and improve management strategies to reduce need for permanent pacemaker implantation. This would help us to improve our practice and in future, we will implement findings in local setting

Methodology:

This descriptive case series was conducted in Cardiology Department, Punjab Institute of cardiology, Lahore during July to October 2024. Sample size 200 cases was calculated with 95% confidence interval and 7% margin of error with percentage of permanent pacemaker implantation 50.3% in patients with atrioventricular blocks. Patients age 30 to 80 years with both gender presenting with atrioventricular blocks were included. Patients with symptoms onset while already admitted to hospital, and recurrent atrioventricular blocks, already taking treatment were excluded from the study.

After written informed consent, demographics including age, gender, duration of ACS, occupation, life style, history of smoking (>5 pack years), alcohol intake (>20ml/day), diabetes (BSR>200 mg/dl), hypertension (BP≥140/90 mmHg), dyslipidemia (total cholesterol >200mg/dl), and type of MI, (IWMI, or AWMI) were noted. All the patients were managed as per standard protocol. Patients were examined for need for permanent pacemaker implementation.

Data was entered and analyzed by using SPSS V27.0. qualitative data like age, duration, atrioventricular block was presented as mean and standard deviation. Categorical data like gender, occupation, dietary pattern, life style, history of smoking, alcohol intake, diabetes, hypertension, dyslipidemia, type of MI. Permanent pacemaker implementation was presented as frequency and percentage. Chi square test was applied to compare both groups for permanent pacemaker implementation and outcome. P values <0.05 was considered as significant.

Results:

Total 200 patients were included. The mean age of the patients was 57.9±10.1 years. There were 126(63.0%) male and 74(37.0%) female. Most of the respondents were shopkeeper 31(15.5%) followed by 26(13.0%) business men, 17(8.5%) teacher, 14(7.0%) driver, and all females were housewives.

There were 99(49.5%) respondents' smokers, 61(30.5%) obese, 104(52.0%) hypertensive, 24(12.0%) suffer from dyslipidemia, 117(58.5%) diabetic, 34(17.0%) had history of IHD and only 2(1.0%) used alcoholic drinks. Mostly follow active lifestyle 131(65.5%) and sedentary life's style follow only 69(34.5%) patients.

Acute inferior wall myocardial infarction (WMI) was the most common condition, affecting 77(38.5%) patients. Non-ST elevation myocardial infarction (NSTEMI) was the second most common with 59(29.5%) patients, AWMI reported in 39(19.5%) patients, unstable angina seen in 14(7.0%) patients and the least common LWMI affecting in 11(5.5%) patients. Inferior infarction was the predominant type of myocardial infarction in this study, followed by NSTEMI and AWMI. while lateral wall infarctions and unstable angina are less frequent.

Third degree AV block was the most prevalent, affecting 106(53.0%) patients, bundle branch block observed in 30(15.0%) cases, 1st degree AV block in 22(11.0%) cases, 2nd degree AV block (type I & II) observed in 20(10.0%) patients. Sinus rhythms was the least common, only in 2(1.0%) patients. This data suggests that 3rd degree AV block is the most frequent conduction abnormality, while sinus rhythm is rare among this patient group, indicating a high prevalence of severe conduction disturbances.

There were 173(86.5%) patients exhibited regional wall motion abnormalities, indicating a significant majority with this condition. The presence of ST elevation and depression among a group of patients: 118(59.0%) showed ST elevation and 52(26.0%) exhibited ST depression. ST elevation was more common finding in this patient population, potentially indicating a higher incidence of conditions like ST- elevation myocardial infarction (STEMI). Out of 200 patients, 43(21.5%) needed a permanent pacemaker during their hospital stay, indicating that while pacemaker implantation was necessary for some, it is not required for the majority of the patients in this study. Fig:1

Comparison of patients with and without permanent pacemaker bases on various demographic and clinical factors. Age, gender, smoking status, obesity, diabetes and certain ECG abnormalities reveal different frequency between the two groups, with some reaching statistical significance. For example, obesity was significantly less common among pacemaker recipients (p0.008). In terms of ACS type, there's a notable difference, with unstable angina being significantly more common in pacemaker recipients (p=0.001). Additionally, certain ECG abnormalities like third-degree AV block and ST changes, including both elevation and depression were significantly associated with pacemaker placement (P<0.001). Other factors, including hypertension, dyslipidemia, history of ischemic heart disease (IHD), alcohol use and life style do not show significant differences. This suggests they may not be as strongly associated with the need for pacemaker. Table: 1

The Research of Medical Science Review

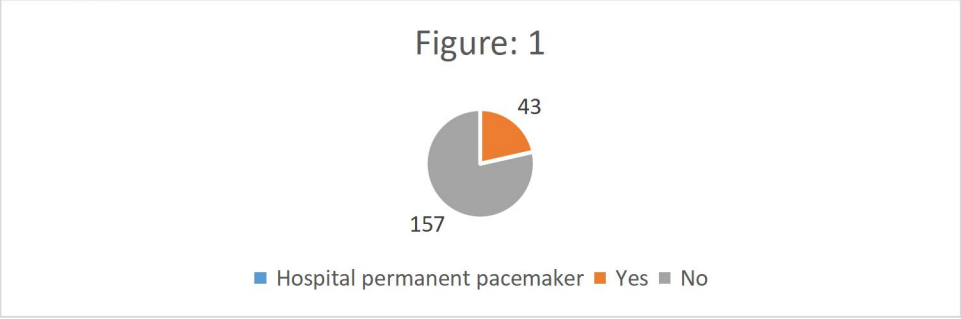


Table: 1

Baseline characteristics of patients with permanent pacemaker implantation [PPI (+) group] compared with patients without permanent pacemaker implantation [PPI (−) group]

		Permanent pacemaker (yes)	Permanent pacemaker (no)	P value
	Mean SD	61.7±11.7	56.8±9.50	0.005
Age	30 to 60	22(18.2%)	99(81.8%)	0.157
	>60	21(26.6%)	58(73.4%)	

Gender	Male	22(17.5%)	104(82.5%)	0.07
	Female	21(28.4%)	53(71.6%)	
Smoking	Yes	16(16.2%)	83(83.8%)	0.06
	No	27(26.7%)	74(73.3%)	
Obesity	Yes	6(9.8%)	55(90.2%)	0.008
	No	37(26.6%)	102(73.4%)	
Hypertension	Yes	24(23.1%)	80(76.9%)	0.57
	No	19(19.8%)	77(80.2%)	
Dyslipidemia	Yes	4(16.7%)	20(83.3%)	0.53
	No	39(22.2%)	137(77.8%)	
Diabetes	Yes	30(25.6%)	87(74.4%)	0.091
	No	13(15.7%)	70(84.3%)	
Alcoholic	Yes	0	2(100%)	0.45
	No	43(21.7%)	155(78.3%)	
History of IHD	Yes	7(20.6%)	27(79.4%)	0.887
	No	36(21.7%)	130(78.3%)	
Lifestyle	Active	27(20.6%)	104(79.4%)	0.67
	Sedentary	16(23.2%)	53(76.8%)	
Type of ACS	Acute AWMI	1(2.6%)	38(97.4%)	0.001
	Acute inferior WMI	2(2.6%)	75(97.4%)	
	Acute lateral WMI	3(27.3%)	8(72.7%)	
	NSTEMI	26(44.1%)	33(55.9%)	
	Unstable Angina	11(78.6%)	3(21.4%)	
LED ECG	Sinus rythms	0	2(100%)	0.001
	1st degree AV block	0	32(100%)	
	2nd degree AV block	0(	20(100%)	
	2nd degree AV block (type II)	4(20%)	16(80%)	
	3rd degree Av block	39(36.8%)	67(63.2%)	
	Bundle branch block	0	30(100%)	
ST elevation	Yes	6(5.1%)	112(94.9%)	0.001
	No	37(45.1%)	45(54.9%)	
ST depression	Yes	24(46.2%)	28(53.8%)	0.001
	No	19(12.8%)	129(87.2%)	
	Yes	22(12.7%)	151(87.3%)	0.001
	No	21(77.8%)	6(22.2%)	

Discussion:

The occurrence of atrioventricular (AV) blocks in patients with acute coronary syndrome (ACS) is a noteworthy complication that has been associated with adverse outcomes, including increased morbidity and mortality. Studies have indicated that AV blocks in ACS, particularly in inferior or extensive anterior myocardial infarctions, necessitate permanent pacemaker implantation if the block is persisted or results in hemodynamic instability. (9) While temporary conduction abnormalities are common in ACS and often resolve with revascularization. Certain patients experience irreversible conduction defect, prompting the need for a permanent pacemaker.(10)

Permanent pacemaker is necessary for patients with symptomatic heart block, however, if the heart block results from a reversible condition, such as metabolic imbalances in the body, alternative treatments may be sufficient.(11) Permanent pacemaker (PPM) is implanted in heart block patients to restore the normal heart rate and rhythm, relieve the bradycardia symptoms and also provide hemodynamic stability. This results leads to improved clinical outcomes and patient health.(12)

The findings of this study indicate that while need for pacemaker implantation was necessary for a small number of patients43(21.5%), it was not needed for the majority. Significant factors associated with pacemaker placement included obesity ($p=0.008$), which was less common among patient's, unstable angina ($p=0.001$), third degree AV block ($p<0.001$) and ST changes. Specifically, elevation and depression ($P<0.001$). These findings suggest that specific acute coronary syndrome and severe conduction abnormalities are more likely to indicate the need for pacemaker. Other factors such as hypertension, dyslipidemia, history of ischemic heart disease, alcohol use and lifestyle did not show significance association ($P>0.05$), indicating a less role in influencing pacemaker requirements. This study highlights the importance of focusing on specific cardiac conditions when assessing the need for pacemaker intervention.

In a study by Gang et al. approximately 10% or patients with AV block in the setting of ACS required permanent pacemaker implantation. (13)This finding emphasizes the critical role of early assessment and management strategies for conduction abnormalities in ACS patients to identify those who may benefit from pacemaker therapy. Furthermore, research suggests that factors such as the infarct location and degree of ischemia play essential roles in determining the likelihood of needing permanent pacing .(14, 15) One study included 152.0 AWMI patients, with 81.6% male and a mean age of 56.25 years. Complete heart block was observed in 12.5% of the patients. There were significant association with hypertension and diabetes insignificant with gender, age, smoking and family history of CAD. (16)

Another study reported that 50.3% of patients with atrioventricular blocks required permanent pacemaker implantation.(7) On study found that 2.7% of cases were complicated by AV blocks, with 1.0% of patients undergoing pacemaker implantation. Among those who needed a permanent pacemaker, 50% received it by 8.0 days and 62% by ten days.(8)

Among 345 patients with acute St-elevation MI, 17.6% experienced conduction defects, with one patient requiring a pacemaker. Another study as Hayatabad Medical Complex in Peshawar documented 415 pacemaker implantations over 6.0 years.(17) Once implanted, pacemaker require regular follow-up and close monitoring, with the frequency of visits depending on the patients' age and existing health conditions.

The Research of Medical Science Review

Conclusion:

The conclusion of the study shows that 21.7% of patients require for implantation of a permanent pacemaker. These findings suggest that assessing specific cardiac conditions and conduction is important in identifying patients who may benefits from a permanent pacemaker.

References:

1.Kashou AH, Goyal A, Nguyen T, Ahmed I, Chhabra L, Kukuc LG. Atrioventricular Block (Nursing). StatPearls [Internet]: StatPearls Publishing; 2023.
2.Kashou AH, Goyal A, Nguyen T, Ahmed I, Chhabra L. Atrioventricular block. StatPearls [Internet]: StatPearls Publishing; 2024.
3.Hashmi KA, Shehzad A, Hashmi AA, Khan A. Atrioventricular block after acute myocardial infarction and its association with other clinical parameters in Pakistani patients: an institutional perspective. BMC Research Notes. 2018;11:1-4.
4.Lao N, Lim J, Bashir H, Mahalwar G, Adebolu O, Mangira C, et al. Incidence of atrioventricular blocks and its association with in-hospital mortality and morbidity in patients with coronavirus disease 2019. Journal of Cardiology. 2022;79(4):482-8.
5.Yu L, Liu Y, Feng Y. Cardiac arrhythmia in COVID-19 patients. Annals of Noninvasive Electrocardiology. 2024;29(2):e13105.

6.Yuyun MF, Squire IB, Ng GA, Samani NJ. Evidence for reduced susceptibility to cardiac bradycardias in South Asians compared with Caucasians. Heart. 2018;104(16):1350-5.
7.Raja TA, Kashif M, Rehman AU, Kiyani A, Shabbir F, Rajput TA. INDICATION AND FREQUENCY OF IMPLANTATION OF PERMANENT PACEMAKER IN COMPLETE HEART BLOCK PATIENTS IN A TERTIARY CARE HOSPITAL IN RAWALPINDI: Implantation of Permanent Pacemaker in Complete Heart Block. Pakistan Armed Forces Medical Journal. 2018;68(5):1339-43.
8.Romer AJ, Tabbutt S, Etheridge SP, Fischbach P, Ghanayem NS, Reddy VM, et al. Atrioventricular block after congenital heart surgery: analysis from the Pediatric Cardiac Critical Care Consortium. The Journal of Thoracic and Cardiovascular Surgery. 2019;157(3):1168-77. e2.
9.Alnsasra H, Ben-Avraham B, Gottlieb S, Ben-Avraham M, Kronowski R, Iakobishvili Z, et al. High-grade atrioventricular block in patients with acute myocardial infarction. Insights from a contemporary multi-center survey. Journal of Electrocardiology. 2018;51(3):386-91.
10.Kusumoto FM, Schoenfeld MH, Barrett C, Edgerton JR, Ellenbogen KA, Gold MR, et al. 2018 ACC/AHA/HRS guideline on the evaluation and management of patients with bradycardia and cardiac conduction delay: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. Journal of the American College of Cardiology. 2019;74(7):e51-e156.
11.Bachani N, Panicker GK, Jadwani J, Lokhandwala Y. Occult etiologies of complete atrioventricular block: Report of two cases. Indian Heart Journal. 2016;68:S186-S9.
12.Khramaz M, Elkarimi S, Benzerroual D, Elhattaoui M, Aboutofail F, Boumzebra D, et al. Diagnostic and management difficulties of complete atrioventricular block in children in marrakech: A report of three cases with a review of the literature. Journal of Atrial Fibrillation. 2016;9(2).
13.Gang UJO, Hvelplund A, Pedersen S, Iversen A, Jøns C, Abildstrøm SZ, et al. High-degree atrioventricular block complicating ST-segment elevation myocardial infarction in the era of primary percutaneous coronary intervention. Europace. 2012;14(11):1639-45.
14.Tjong FV, Reddy VY. Permanent leadless cardiac pacemaker therapy: a comprehensive review. Circulation. 2017;135(15):1458-70.
15.Sidhu S, Marine JE. Evaluating and managing bradycardia. Trends in cardiovascular medicine. 2020;30(5):265-72.
16.Talpur MFH, Shaikh NA, Shah SA, Hulio AA, Detho AS, Faizan M, et al. Frequency of Complete Heart Block (CHB) and Its Association with Hypertension and Diabetes Mellitus in Patients with Anterior Wall Myocardial Infarction (AWMI). Journal of Pharmaceutical Research International. 2022;34(34B):24-9.
17.Shah B, Awan ZA, Khan ZA. Lead erosion in permanent pacemaker: a cumbersome complication. Journal of Ayub Medical College, Abbottabad: JAMC. 2014;26(2):174-7.