FREQUENCY OF ASYMPTOMATIC ATRIAL FIBRILLATION AND RISK OF STROKE IN PATIENTS WITH PACEMAKER DEVICE IMPLANTATION

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ABSTRACT

Objective: To find out the frequency of asymptomatic atrial fibrillation with cardiac implantable electronic device (CIED) and to stratify them for developing thromboembolic complications by using CHA2DS2-VASc scoring system.

Study Design: Cross-sectional study

Place and Duration of Study: Cardiac Electrophysiology department of Armed Forces Institute of Cardiology & National Institute of Heart Diseases (AFIC/NIHD) Rawalpindi, from January to June 2018.

Methods: Study participants included all consecutive patients, fulfilling the inclusion criteria, reporting to our department with complete AV block and were hospitalized and implanted with dual chamber permanent pacemaker device via subclavian approach. Complete medical history and physical examination were obtained for all patients prior to device implantation and upon 6 months follow-up, presence of any pacemaker-detected AF was documented along with duration of longest AF episode.

Results: Sixty three patients were implanted with a PPM cardiac device and AF was detected in 43 out of 63 patients (68.2%), where 41 (65.0%) cases of AF were with more than 5 minutes duration, while 2 (3.2%) with less than 5 minutes duration. Significant associations have also been found among development of device detected AF with hypertension, previous history of AF and CHA2DS2VASc score of >2 with a *p* value of 0.001, 0.039 and 0.04 respectively.

Conclusion: High incidence of asymptomatic atrial fibrillation mandates careful follow-up of patients with implanted cardiac deviceand patients with high risk of developing cerebrovascular thromboembolic events should be considered for oral anticoagulation therapy.

Keywords: Device detected asymptomatic atrial fibrillation, Asymptomatic atrial tachycardia, and cerebrovascular thromboembolic complications.

INTRODUCTION

Atrial fibrillation (AF) is the most common type of atrial tachyarrhythmia (AT),directly linked to high morbidity and mortality,mainly due to strokeand heartfailure[1]. It can be either symptomatic and thus manifest through symptoms and complications; or asymptomatic/silent in nature. The frequency of asymptomatic AF in patients with cardiac implantable electronic device (CIED)is not known. Literature reports that about 90% of the patients with an implanted dual chamber permanent pacemaker (PPM) and formerly documented atrial fibrillation are asymptomatic because they do not encounter irregular ventricular rate[2]. It is also well reported in literature that incidence of AT following pacemaker implant is much higher, the chances of developing symptomatic or asymptomatic AF might increase up to 20%[3], andis associated with an increased risk of thromboembolism and stroke[4].

Subclinical atrial tachyarrhythmias, including asymptomatic atrial fibrillation, can be detected by various CIEDs including implantable cardiac monitors, dual-chamber pacemakers, dual-chamber implantable cardioverter-defibrillators, cardiac resynchronization therapy [CRT] devices, all of which allow remote rhythm

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monitoring. Thus, patients with implanted device have an added benefit of continuous rhythm recording and monitoring, thus leading to detection of atrial fibrillation[5].

As asymptomatic AF increases the risk of thromboembolic cerebrovascular events, guidelines and the validated CHA2DS2-VASc score[6]. Multiple clinical trials haverecognized the role of anticoagulation to decrease the risk of stroke among AF patientswho are at a higher risk of developing thromboembolic complications, as assessed by the CHADS2 orCHA2DS2-VASc

Table: Clinical characteristics of study participants, and comparison between two AF groups

Clinical Characteristics	Overall (n=63)	Comparison Groups with AF		
		No device-detected AF (n=20)	Device-detected AF (n=43)	*p* Value
Age (years)	63.2+3.5	62.9+3.2	63.4+3.6	0.61
Age range	52 - 70	54 - 68	52 - 70	-
Weight (kg)	68.7+10.2	69.7+5.5	67.8+6.0	0.42
Height (cm)	168+9.8	170+11.8	167+10.4	0.53
Gender				
Males	40(63.4%)	13	27	0.53
Females	23 (36.5%)	07	16	
Prior history of AF	24 (38.1%)	04 (20.0%)	20 (46.5%)	0.039*
Currently on anticoagulation therapy				
Yes	10 (15.8%)	04 (20.0%)	06 (13.9%)	0.39
No	53 (84.1%)	16 (80.0%)	37 (86.0%)	
History of Comorbids				
Hypertension	39 (61.9%)	04 (20.0%)	35 (81.3%)	0.001*
Diabetes	17 (26.9%)	05 (25.0%)	12 (27.9%)	0.54
CHA2DS2VASc score				
0 – 1	30 (47.6%)	13 (65.0%)	17 (39.5%)	0.04*
> 2	33 (52.3%)	07 (35.0%)	26 (60.5%)	
LVEF (%)				
<30%	3 (4.7%)	-	3 (7.0%)	0.26
31 – 55%	8 (12.7%)	4 (20.0%)	4 (9.3%)	
>55%	52 (82.5%)	16 (80.0%)	36 (83.7%)	
p-wave duration on ECG				0.0001
<100 ms	26 (41.2%)	15 (75.0%)	11 (25.5%)	*
> 100 ms	37 (58.7%)	5 (25.0%)	32 (74.5%)	

CAD=Coronary Artery Disease, LVEF=Left Ventricular Ejection Fraction, AF=Atrial Fibrillation *significant associations

therefore it is of great value to stratify patients according to their risk of developing asymptomatic AF and detecting the episodes of silent AF. For stratifying the risk of enduring stroke in patients with AF, we had used the risk stratification scale described in ACC/AHA/ESC scoring systems. Anticoagulation with oral anticoagulants is a class I indication in the treatment of AF patients[7].

In this current study, our objectives were to find out the frequency of asymptomatic atrial fibrillation with cardiac implantable electronic

device (CIED) and also to stratify them for developing thromboembolic complications by using CHA2DS2-VASc scoring system. We hypothesized that analyzing 12-lead ECG, and performing pacemaker programmer check can help to identify patients who are developing asymptomatic atrial fibrillation and thus to intervene timely.

MATERIAL AND METHODS

This was a descriptive cross-sectional study conducted from January to June 2018 at cardiac electrophysiology department ofArmed Forces Institute of Cardiology & National Institute of Heart Diseases (AFIC/NIHD).Our study participants included all consecutive patients, fulfilling the inclusion criteria, reporting to our department with complete AV blockand for whom permanent pacemaker implantation was indicated in accordance with the ACC/AHA/NASPE2002 guideline "Update for implantation of cardiac pacemakers and anti-arrhythmia devices"[8].The inclusion criteria comprised of > 50 years of age, either gender and consent for implanting the cardiac device. Patients who failed to fulfil the inclusion criteria or were having any of the following conditions were excluded from the study: left ventricular ejection fraction of <50%, left atrium (LA) size of >50 mm, mitral valve stenosis and/or mitral valve regurgitation.

Enrolled patients were hospitalized and implanted with dual chamber PPM (SIGMA 303 DDDR, Medtronic, Minneapolis,MN, USA) viasubclavianapproach on the non-dominant hand side. Atrial leadwas implanted in the right atrial appendage and ventricularlead in the right ventricular apex using active fixationleads. In all patients, pacemaker was programmed in DDDRmode with the same lower rate of 60 bpm, without any arrhythmicinterventional algorithm available.Prior to device implantation, complete medical history and physical examination were obtained from all hospitalized patients. Standard 12-lead ECG, chest x-ray before and after PPM implantation, echocardiography, and standard laboratory tests were also performed. Study participants were consentedfor following clinical characteristics were noted on case report forms: age, gender, weight/height,BMI, history of comorbidities including diabetes, hypertension, asthma, chronic obstructive pulmonary disease etc., left ventricular ejection fraction andCHA2DS2VASc score also calculated for risk stratification for stroke. Upon 3–6 monthsfollow-up, presence of any pacemaker-detected AF was documented along with the duration of longest AF episode and also the findings of follow up ECG/Echo were considered.

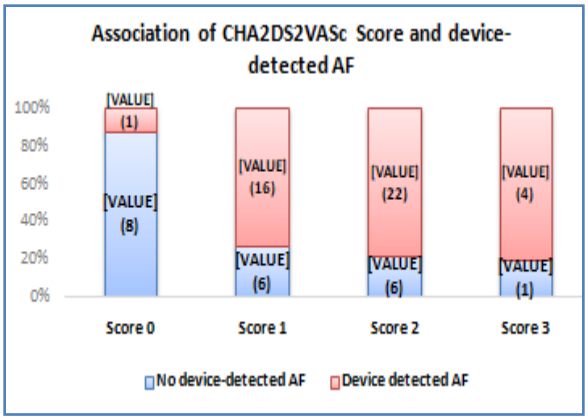

Fig: Comparison of CHA2DS2VASc score and presence or absence of atrial fibrillation upon device monitoring (*p*-value 0.04).

Categorical data were presented as frequencies and percentages and groups were compared via non-parametric chi square test. For continuous data, means and standard deviation or median and IQR were reported after checking normality of data by Kolmogorov-Smirnov test. Continuous variables among two groups were compared via Student's t test.To assess the influence of clinical characteristics on the occurrence of device-detected AF, binary logistic regression was performed. An alpha value of 0.05 was considered to be significant.

RESULTS

During the study time period, 63 patients were implanted with a PPM cardiac device, with

a mean age of 63.2 + 3.5 years and age range of 52 to 70 years.There were 40 (63.5%) males and 23 (36.5%) females in the study group. Out of 63, 39 (61.9%) patients were hypertensive while 17 (26.9%) were diabetic. Only 10 (15.8%) patients were already on anticoagulation therapy as shown in table 1.

AF was detected by the PPM device in 43 out of 63 patients (68.2%), including 41 (65.0%) cases of AF with more than 5 minutes duration, while 2 (3.2%) cases of AF with less than 5 minutes duration. Out of 43 device-detected AF cases, 20 (46.3%) and 21 (53.6%) werewith and without clinical history of AF prior to PPM device implantation respectively.Similarly, out of 41 patients with >5 minutes duration AF, 25 (60.9%) had a CHA2DS2VASc score of more than 2, while 16 patient's score was between 0 to 1, which concludes that almost 61% of patients were at a higher risk of developing cerebrovascular complications related to AF and thus were candidates for life long anticoagulation therapy as shown in figure 1. Electrocardiogram findings showed that a p-wave duration of >100ms was found in 32 (74.4%) patients who developed device-detected AF as compared to others, this finding was statistically significant with a p value of 0.0001. Significant associations have also been found among development of device detected AF with hypertension, previous history of AF and CHA2DS2VASc score of >2 with a p value of 0.001, 0.039 and 0.04 respectively as shown in table.

Univariate analysis showed that hypertension and p-wave duration of >100ms were the only two variables significantly associated with the development of device-detected AF. Patients with history of hypertension were 13.1 times more likely to develop AF (OR=13.1, 95% CI 2.1 – 25.5, *p*-value 0.006), whereas patients with p-wave duration of more than 100 ms were 8.8 times more likely to develop device detected AF (OR=8.8, 95% CI 1.8 – 20.4, *p value 0.007).*

DISCUSSION

Current study investigated the frequency of occurrence of asymptomaticatrial fibrillation in patients who underwent permanent pacemaker implantation over a period of 6 months to 1 year-post-implantation follow up. We also risk stratified our study participants for future risk of stroke based on CHADS2VA2SC scoring system thus identifying patients who are candidates for long-term anti-coagulation therapyfor prevention of cerebro vascular events. We included 63 patients with PPM device Implantation out of which, over period of 1-year post implantation follow-up, 43 (68.2%) patients developed atrial fibrillation, 2 (3.17%) patients developed AF of <5 minutes duration while remaining 41 (65.1%) experienced AF episodes of > 5 minutes. Out of 41, 25 (60.9%) patients hada CHADS2VA2SC score of > 2 and thus were considered to be at a higher risk of developing cerebrovascular events in the future.

In our study, cardiac device detected AF was present in about 68% of patients, half of those patients were without previously documented clinical AF. Other studies have shown quite similar number of device detected AF cases and some studies had reported even greater frequency ofatrial arrhythmias in patients with implanted pacemakers.Healey JS et al reported results similar to our study and stated that more than 50% of patients without previous history of atrial tachycardia developed pacemaker detected AF up on follow up[9]. OrlovMV et al proved that the frequency of AHRE was 89% in patients with previous atrial tachyarrhythmias and 49% in patients with no history of atrial tachyarrhythmias[10]. A study conducted by Quirino et al showed that the frequency ofatrial fibrillation was 74% and also showed positive predictive value of detecting atrial fibrillation with dual chamberpacemakers[11].

The European Society of Cardiology Guidelines for the management of atrial fibrillation states that, implantable devices can detect atrial fibrillation accuratly, particularly

when the cut-off point for durationof AHRE >5 minutes are used[12] and similar findings were observed in present study.Despite multiple clinical trials and studiessupporting the evidence of device detected asymptomatic AF, the management guidelines for such patients remains controversial and suspicion exists in the duration of longest episode of AF and risk of cerebrovascular thromboembolic events on the basis of CHA2DS2VASc score[13-14]. Recent studies and guidelines report that clinically unrecognized and asymptomatic AF can be a potentially important cause of stroke, but conclude with the statement that additional studies are required to be done to further clarify the relationship between AF episodes detected by cardiac implantable devices and thromboembolic cerebrovascular events[15-16].

In present study underuse of anticoagulation therapy was found in patients, only 10 (15.8%) patients were currently on anticoagulation therapy, out of which 5 (50.0%) were at high risk of developing cerebrovascular events with CHA2DS2VASc score of > 2. Overall 33 (52.3%) study participants had a CHA2DS2VASc score of 2 or more, and thus were candidates for anti-coagulation therapy, however only 15% of them were currently on therapy. Similar sort of results had been reported by Cabrera S et al stating the underuse of anticoagulation treatment among high risk group of patients[5]. In addition, Sparks PB et al and Carlsson J et al also highlighted low rates of anticoagulation treatment in their results[17-18]. Sparks et al reports that only 15% of the patients who developed device detected AF and had a high CHA2DS2VASc score were on anticoagulation treatment, while Carlsson J found that 37% of patients with AF who were above age of 80 years were receiving anticoagulation therapy[17-18].

Present study has some limitations to be considered, including lack of a control group to assess the oral anticoagulation treatment in patients with AF who are not implanted with cardiac devices; and sample size was relatively small which compromises the power of study. More sophisticated and well-designed clinical studies are required to be designed and conducted in order to understand the depth of issue under consideration.

CONCLUSION

High incidence of asymptomatic atrial fibrillation mandates careful follow-up of patients with implanted cardiac device and patients with high risk of developing cerebrovascular thromboembolic events should be considered for oral anticoagulation therapy.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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