

Pratique Clinique et Investigation

Evaluation of Implant Time of VVI and DDD Pacemakers in Sub-Saharan Africa Center

Emmanuel A Edafe^{1*}

¹Interventional Cardiology unit, Internal Medicine Department, Bayelsa Specialist Hospital, Yenagoa

***Correspondence:** Emmanuel Auchu Edafe, Consultant Interventional cardiology, Cardiology Unit, Bayelsa Specialist Hospital, Yenagoa, E-mail: dremmanueledafe@gmail.com

ABSTRACT

Background: There are guideline indications for implantation of VVI/VVIR and DDIR/DDDR pacemakers. Going by the guidelines, the commonest form of pacemaker implantation should be DDDR/DDIR because the commonest cause of symptomatic bradycardia is complete heart block. However, in the sub-Saharan Africa; VVI/VVIR pacemaker is still commonly implanted by the cardiologist. Hence, the objective of this study was to evaluate implant time of VVI and DDD pacemakers among male and female subjects.

Methods: This was a descriptive, quantitative, cross-sectional, observational study. It was carried out in patients who presented for pacemaker implantation at the Bayelsa Specialist Hospital, Yenagoa from June 2017 to June 2019. Studied parameters were socio-demographic data: age, gender, height, weight, body mass index; Pacemaker type (VVI/VVIR and DDIR/DDDR) and implant time.

Results: A total of 64 patients of both genders participated in the study, where 54.7 % were female and 45.3 % were male ranging from 40 to 98 years old. The mean implant time for VVI/VVIR pacemakers was 31.72 ± 4.81 while that of DDD/DDI/DDIR was 40.22 ± 8.12 . There was statistically significant difference in the mean of implant time of VVI/VVIR and DDD/DDIR with p-value of 0.017.

Conclusion: VVI pacemaker therapy achieves significant reduction of implantation time and less number of hard ware as compared to DD/DDIR devices. However, guideline indications should be followed in pacemaker implantation in the sub-Saharan African region.

Keywords: *Implant time; VVI/VVIR pacemakers; DDI/DDD pacemakers*

ABBREVIATIONS

VVI/VVIR: Single chamber pacemaker; DDD/DDI/DDIR: Dual chamber pacemaker; BMI: Body mass Index; WHO: World Health Organization

Citation: Emmanuel A Edafe, Evaluation of Implant Time of VVI and DDD Pacemakers in Sub-Saharan Africa Center. *Prac Clin Invest* 3(2): 44-49.

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INTRODUCTION

Pacemakers are devices required for treatment of symptomatic bradycardia. There are single and dual chamber pacemakers, depending on the number of heart chambers paced. The decision to use VVI or DDD pacemakers is clear on the ACC/AHA guideline [1]. VVI pacemaker is used in patient with chronic Atrial fibrillation and complete heart block [1]. DDD pacemaker is indicated when a patient has sinus node dysfunction with atrio-ventricular disease or complete heart block [1]. Despite this, the choice of single or dual chamber pacemaker implant in Sub-Saharan Africa also include convenience of operation, cost of device, affordability, experience of implanting cardiologist or surgeon [2-4]. The objective of this study was to evaluate implant time of VVI and DDD pacemakers among male and female subjects.

METHODS

This was a descriptive, quantitative, cross-sectional, observational study. It was carried out in patients who presented for pacemaker implantation at the Bayelsa Specialist Hospital, Yenagoa from June 2017 to June 2019. It is a reference center for cardiac pacing. It has 100 beds, 10 of which are in the intensive care unit. It is equipped with one cardiac catheterization room for: angiography and angioplasty with stenting General Electronic Innova image and separate room for General Electric Healthcare C-arm theatre.

These rooms are equipped with 2 temporary pacemakers, two of which are Medtronic brand and one Medtronic programmer.

The inclusion criteria were: all patients who received definitive cardiac pacing (VVI/VVIR or DDD/DDI/DDIR) during the study period in the cardiology department. All patients who received biventricular pacing and those who had an implantable Cardioverter defibrillator were excluded. Patients whose records were unusable were excluded.

Data sources were from patient and pacemaker room records. Studied parameters were:

- Socio-demographic data: age, gender, height, weight, body mass index
- Pacemaker type (VVI/VVIR and DDD/DDIR/DDDR)
- Implant time

DATA ANALYSIS

Retrieved data was analyzed using Statistical Package for Social Sciences (SPSS) version 25.0. Categorical variables were summarized as frequency and percentages and presented as graphs, while mean and standard deviation were used to characterize the distribution of continuous variables. The independent sample t-test as well as one-way ANOVA was used to evaluate the difference in mean between and among continuous variables and results presented in tables. Pearson's correlation coefficient was used to assess the association between continuous variables, and the result presented in a scatterplot.

DEFINITIONS

1. Implant time: This was defined as the duration from start of procedure to lead positioned in the ventricle and or atrium and implants parameters and lead stability tested.

2. BMI was calculated as weight in kilograms divided by height in meters' squared and patients were classified using the World Health Organization (WHO) classification of obesity. WHO classified obesity using BMI as follows:

1. 18.5 -24.9 kg/m² Normal
2. 25 – 29.9 kg/m² Overweight
3. 30 -34.9 kg/m² Grade 1 obesity
4. 35 – 39.9 kg/m² Grade II obesity
5. ≥40 kg/m² Grade III obesity

3. The weight was measured in kilograms using a Hensen's weighing scale in light clothing (jackets and coats were removed) with the patient's shoes off.

4. The height was measured in meters (to the nearest 0.5 meter) with the standing feet together, without shoes or headgear, and with the back and the heels placed together against a vertical ruled bar on which a movable attached horizontal bar was adjusted until it came to a stop at the head.

RESULTS

A total of 64 patients of both genders participated in the study, where 54.7 % were female and 45.3 % were male ranging from 40 to 98 years old (Table 1). Table 2 showed the anthropometry of the patients. The mean height, weight and body mass index among males and females were not statistically significant. Among the 64 subjects, 36 were with normal weight, 11 were overweight and 17 were obese (Figure 1). DDD/DDIR/DDDR pacemaker subjects were 36 and 18 had VVIR/VVI. The overall mean time of implant was 37.9 ± 10.6 , male had 39.5 ± 11.4 and females with mean 36.6 ± 10.0 (Table 3). There was not statistical significant in the mean implant time among female and males.

Increasing BMI is associated with increasing implant time (Figure 3). There was statistical significant between implant among overweight and normal weight, and between obese and normal weight subjects (Table 4). There was not statistical significant in implant time between obese and overweight. The Bonferroni Comparison of Mean Implant Time across BMI Classes also showed statistically significant difference between obese and normal subjects (Table 5).

The mean implant time for VVI/VVIR pacemakers was 31.72 ± 4.81 while that of DDD/DDI/DDIR was 40.22 ± 8.12 . There was statistically significant difference in the mean of implant time of VVI/VVIR and DDD/DDIR with p-value of 0.017.

Age (Years)	Male n(%)	Female n(%)	Total n(%)
40-49	1(16.7)	5(83.3)	6(100.0)
50-59	2(40.0)	3(60.0)	5(100.0)
60-69	9(52.9)	8(47.1)	17(100.0)
70-79	11(52.4)	10(47.6)	21(100.0)
80-89	6(42.9)	8(57.1)	14(100.0)
≥90	0(0.0)	1(100.0)	1(100.0)
Total	29(45.3)	35(54.7)	64(100.0)

Table 1: Age distribution of Patients (n = 64).

Anthropometry	Male (n=29)	Female (n=35)	Overall (n=64)	t-test (p-value)
	Mean ± SD	Mean ± SD	Mean ± SD	
Height (m)	1.67 ± 0.11	1.64 ± 0.09	1.66 ± 0.10	1.241(.220)
Weight (kg)	85.55 ± 8.79	79.80 ± 11.89	82.4 ± 10.91	2.161 (.035)
BMI (kg/m ²)	30.96 ± 5.61	29.72 ± 4.79	30.28 ± 5.17	0.959(.341)

Table 2: Anthropometry of the patients.

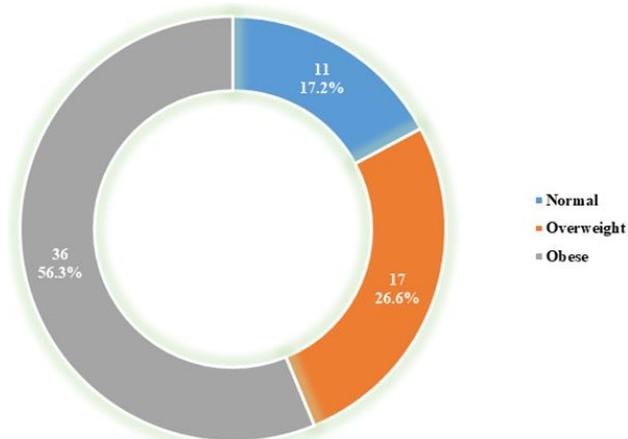


Figure 1: Body mass index (BMI) Classification of the Patients (n = 64).

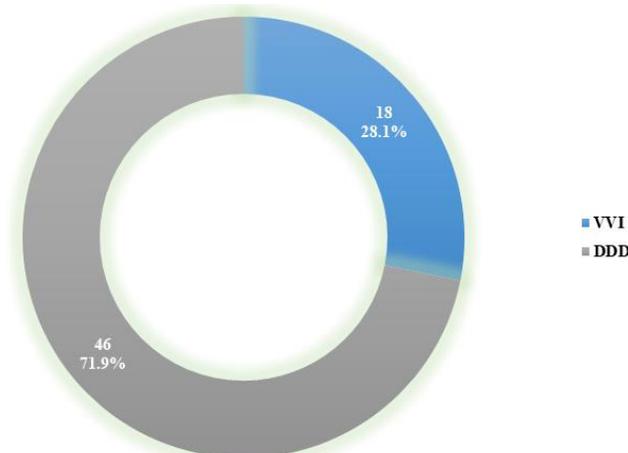


Figure 2: Cardiac Pacemaker Implant Type among the Patients (n = 64). VVI represent VVI/VVIR pacemaker, DDD represent DDD/DDDR/DDI/DDIR pacemaker.

Male (n=29)	Female (n=35)	Overall (n=64)	
Mean ± SD	Mean ± SD	Mean ± SD	t-test (p-value)
39.5 ± 11.4	36.6 ± 10.0	37.9 ± 10.6	1.092(.279)

Table 3: Implant Time.

	Mean	Std Deviation	Std. Error	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
Normal	27.5455	6.43993	1.94171	23.2	31.8719
Overweight	39.7059	7.53131	1.82661	35.8	43.5781
Obese	40.1944	11.18627	1.86438	36.4	43.9793

Table 4: Mean Implant Time across BMI Classes (n = 64)

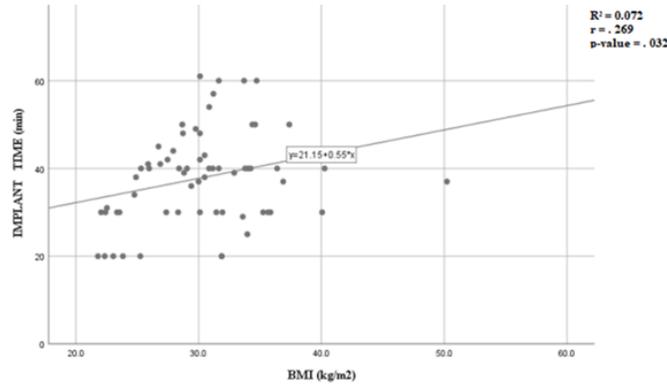


Figure 3: Scatter gram of BMI versus Implant time (n = 64).

	BMI Category	p-value
Normal	Overweight	0.006
	Obese	0.001
Overweight	Obese	1

Table 5: Bonferroni Comparison of Mean Implant Time across BMI Classes (n = 64).

Note: f=7.619; p-value= 0.001.

DISCUSSION

Only a small percentage of patients with VVI/VVIR pacing develop LV dysfunction [4]. In the sub-Saharan Africa, many of the subjects that require pacemakers still end up with VVI/VVIR despite having complete heart block as the commonest indication for pacemaker implantation in the region [5-7]. Kane and colleagues in Dakar, implanted 56% VVI/VVIR and 44% DDD/DDI pacemakers among 606 subjects over 12 years duration. The commonest indication among these patients in 81.5% is complete heart block. 46 (71.9%) of our subjects had DDD/DDI/DIR pacemaker while 18 (28.1%) of our subjects had VVI/VVIR. Single chamber pacemakers (VVI/VVIR) are still very commonly used in developing countries mainly because of the cost consideration and simplicity of implantation.

Our study showed a mean implant time of 31.72 ± 4.81 for VVI/VVIR pacemakers while that of DDD/DDI/DDIR was 40.22 ± 8.12 , and there was statistically significant difference in the mean of implant time of VVI/VVIR and DDD/DDIR with p-value of 0.017. This was in consonant with the report of Wieg and colleagues that showed single chamber pacemakers had significantly shorter implantation time as compared with DDD systems (44 min versus 74 min, p, 0.001). The reason for this similarity could be similar route of access for implantation (subclavian or cephalic vein) and less hardware are required for the implant in VVI/VVIR as compared to DDD/DDIR. There were no significant differences in implant time between male and female subjects. However, there was significant difference in implant time between normal BMI and overweight/obese. The difference may be related to time taken to get access and create a pocket.

CONCLUSION

VVI pacemaker therapy achieves significant reduction of implantation time and less number of hardware as compared to DD/DDIR devices. However, guideline indications should be followed in pacemaker implantation in the sub-Saharan African region.

LIMITATIONS

1. There were few number of subjects involved in the study.
2. Duration of the study was short. A longer duration may result in differences from what is now seen.
3. This is a single center study. Hence it may not be a representation of multicenter study or design.

CONFLICTS OF INTEREST

NO

DECLARATION OF PATIENT CONSENT

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

FINANCIAL SUPPORT AND SPONSORSHIP

NO

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