

## Cardiac Pacemaker Treatment of Heart Block in Enugu A 5-Year Review

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### ABSTRACT

**Background:** Symptomatic heart block is a treatable cardiac cause of death which occurs globally. In Nigeria it is increasingly diagnosed and treated with permanent artificial cardiac pacemaker insertion and pulse generator implantation, sometimes after a period of misdiagnosis and inappropriate treatment.

**Methods:** Twenty-three patients who were diagnosed with symptomatic heart block and surgically treated with permanent artificial cardiac pacemaker in National Cardiothoracic Centre, Enugu, between April 2001 and March 2006 had their case notes retrospectively reviewed and information entered into a proforma. This was analyzed.

Patients diagnosed with symptomatic heart block but not treated with artificial cardiac pacemaker insertion were excluded from the study. There were eight such patients who could not afford the cost of surgical treatment during the period under review.

**Results:** The mean age of the patients was 70 years and the commonest presentation was shortness of breath (100%). Hypertensive heart disease was present in 65% of the patients and a history of chronic chloroquine usage was positive in 73% of the patients. Predominant pre-treatment pulse rate was in the range of 30-40 per minute (43%) while 21% of the patients had pulse rate below 30 per minute. These categories of patients commonly had Stoke-Adams syndrome. Sixty-seven per cent of the patients had predominantly systolic hypertension on admission and 16% had hypotension. Third degree heart block was present in 65% of the patients and 89% of all patients needed pre-pacing haemodynamic stabilization with positive inotropic / chronotropic drug(s).

Treatment consisted of permanent endocardial pacing in 65% and epicardial pacing in 35% of the patients with equally good response in symptoms, haemodynamic parameters and electrocardiographic features.

**Conclusion:** Permanent artificial cardiac pacing is the

reliable treatment of symptomatic heart block and should be included in the National Health Insurance Scheme list.

**Keywords:** Heart block, artificial cardiac pacemaker insertion.

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### INTRODUCTION

Heart block is fairly commonly seen in Nigeria now as a result of improvement in medical diagnostic acumen and longevity of life. Spontaneous heart block and spontaneous sinus node dysfunction tend to occur in elderly patients. The mean age of patient at the time of diagnosis of spontaneously occurring heart block is 70 years.<sup>1</sup> Patients with complete heart block that are not paced have a 1-year survival of 50%. However 1-year survival for paced patients is 93% and 5-year survival is 83%.<sup>1</sup>

Artificial cardiac pacing has remained the only effective long term treatment of complete heart block since its introduction in the early 1950s.<sup>1,3</sup> However this treatment is expensive and therefore not affordable by some patients who were excluded from this study. They numbered eight and some died under our care and others lost to follow-up, probably dead shortly after home discharge.

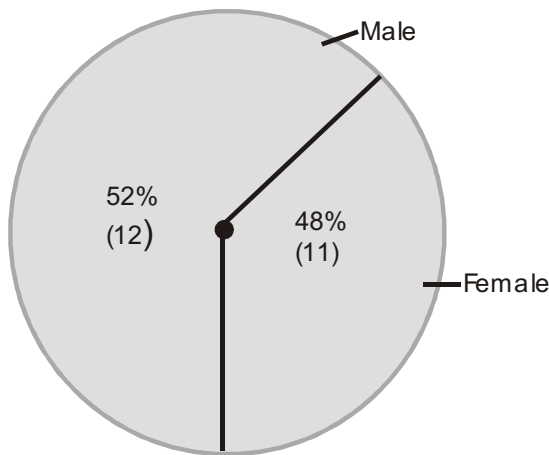
### Materials and Methods

This study was retrospectively carried out at national cardiothoracic centre, University of Nigeria Teaching Hospital, Enugu. Twenty-three patients diagnosed and surgically treated for Heart Block between April 2001 and March 2006 had their clinical notes reviewed. The data collected consisted of information on socio-demographic characteristics of each patient (age, sex,

occupation and residence), presenting complaints, past medical/surgical history, drug history, relevant cardiovascular system findings, relevant chest radiogram, electrocardiogram and echocardiogram features, diagnosis, medical treatment received, surgical pacing received and outcome of treatment (Appendix I-IV). The data was managed on a microcomputer using the EPI-INFO version 2000.

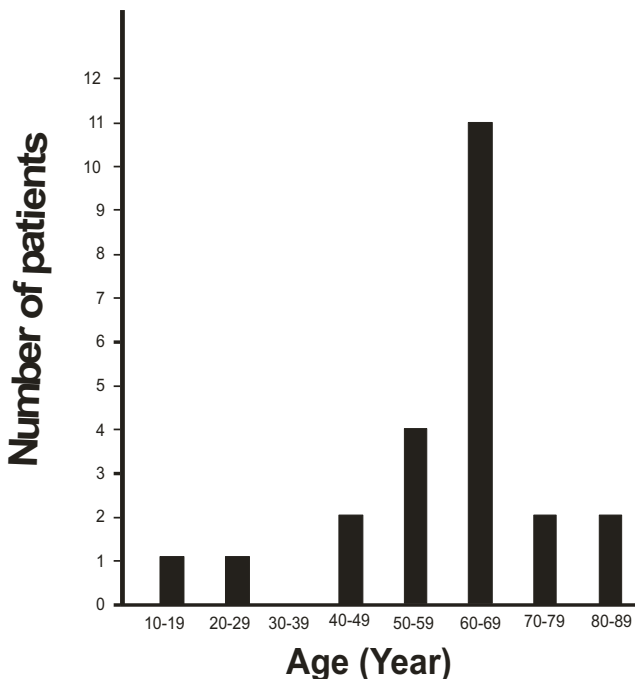
**Tables of Results**

Figure 1: Sex distribution of patients



Sex Ratio = 1:1

Figure 2: Age distribution of patients



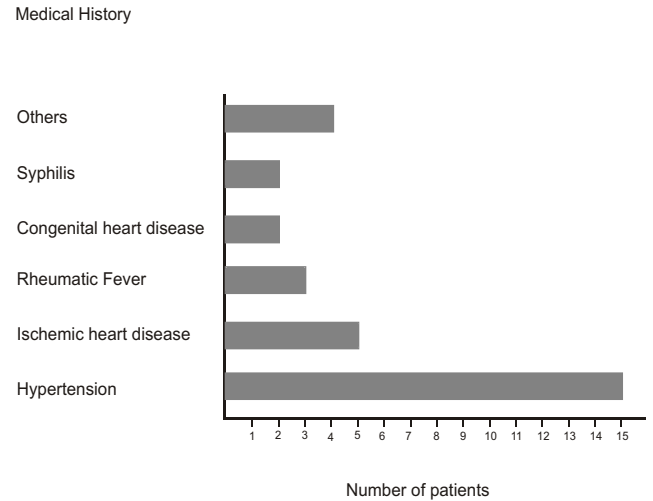
Mean age = 70 years

Table I: Clinical presentation of patients

Clinical presentation	Number	(%)
Breathlessness	23	(100)
Faintness	17	(73.9)
Syncope	13	(56.5)
Convulsion	10	(43.5)
Cardiac failure	9	(39.1)
Others	5	(21.7)

All patients presented with shortness of breath with or without other symptoms.

Figure 3: Relevant past medical history of patients

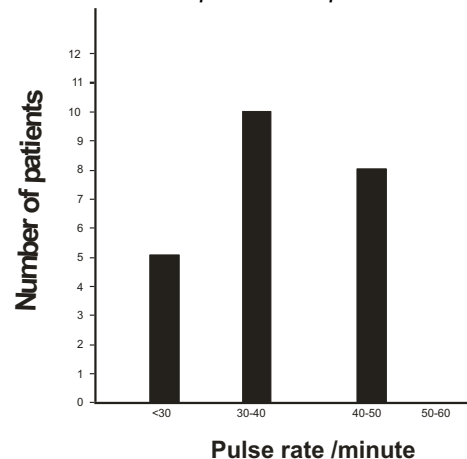


History of chronic hypertension was present in about two-third of the patients.

Drug use	Number	(%)
Chloroquine	17	(73.9)
Propranolol	8	(34.8)
Digoxin	4	(17.6)
Excess potassium	4	(17.6)
Procainamide	3	(13.0)
Quinidine	1	(4.4)

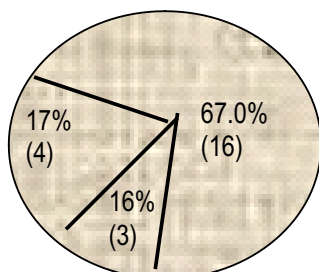
Chronic use of chloroquine was noted in 74% of the patients, and about 70% of patients was on a type of anti-arrhythmic drug.

Figure 4: Pulse rate of patients on presentation



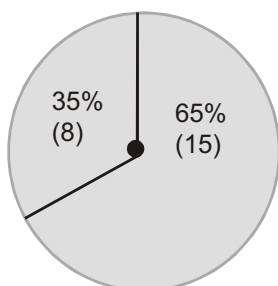
Up to 65% of the patients presented with bradycardia of < 40/min. It was also noted that the other components of Stokes - Adams syndrome were common in this subset of patients.

Figure 5: Pie chart of patients' blood pressure at presentation



More than two-third of patient had high BP consistent with patho- physiologic compensatory mechanism.

Figure 6: Electrocardiographic diagnosis of the patients



About 65% of the patients had 3<sup>rd</sup> degree heart block while 35% had Mobitz II 2<sup>nd</sup> degree heart block.

About two thirds of patients had 3<sup>rd</sup> degree heart block Brady-arrhythmia.

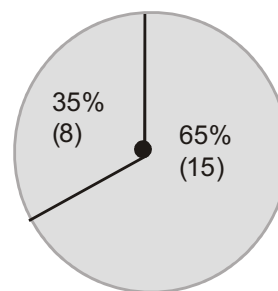
None of our patient who needed permanent artificial cardiac pacemaker implantation had 1<sup>st</sup> degree or Mobitz I 2<sup>nd</sup> degree heart block.

Table III: Pre-pacing chronotropic drug stabilization

Drug treatment	Number	(%)
Isoprenaline	12	(52.2)
Adrenaline	8	(34.8)
Atropine	5	(21.7)
None	8	(34.8)

More than 65% of the patients needed pre-pacing chronotropic support with one or more of isoprenaline (52.2%), adrenaline (34.8%) and atropine (21.7%) drips.

Figure 7: Types of permanent artificial cardiac pacemaker implanted into the patients



About two-thirds of the patients received the less invasive endocardial or transvenous pacemaker. All patients responded well with improvement in symptoms, haemodynamic parameters and electrocardiographic features.

With optimal peri-operative management, complication rate was very low.

## RESULTS

Of the twenty-three patients reviewed, 12 were males and 11 females giving a 1:1 sex ratio, and their ages ranged between 17-83 years with a mean of 70 years (figures 1 and 2).

Table I shows clinical presentations. Seventy-three percent (73%) of patients presented with faintness while breathlessness, syncope, convulsion and cardiac decompensation occurred in 100%, 56%, 43% and 39% respectively. Another 21% of the patient presented with non specific symptoms of body weakness, headache, etc.

Figure 3 shows hypertensive heart disease to be present in 15 (65%) of the patients, ischaemic heart disease in 5 (21%), Rheumatic heart disease in 3 (13%), and syphilis and congenital heart disease in eight and eight percent respectively accounting for two patients each.

Table II shows relevant drug history. Chronic chloroquine use history was positive in 73%, propranolol in 34%, and digoxin and excess potassium in 17% each and procainamide in 13%.

Figure 4 shows the patients' pretreatment pulse rate with 10 (43%) of patients having pulse rate between 30-40/minute, eight (35%) having 40-50/min, and five (22%) having pulse rate below 30/min.

Figure 5 shows that 67% of the patients had high blood pressure (systolic BP > 140mmHg) on admission, more

commonly systolic hypertension, 17% had normal blood pressure, and 16% had low blood pressure (systolic BP < 90mmHg for males and 80mmHg for females).

Figure 6 shows electrocardiographic diagnosis of the patients to be of Mobitz II 2<sup>nd</sup> degree heart block in 35% and 3<sup>rd</sup> degree heart block in 65%.

As shown in table III, 89% of the patients needed optimization with positive inotropic / chronotropic drugs like atropine (22%), adrenaline drip (35%) or isoprenaline (52%).

According to figure 7, 65% of the patients received transvenous (endocardial) permanent pacing and 35% received epicardial permanent pacing. No patients received temporary pacing.

All patients responded well to the treatment with improvement in symptoms, haemodynamic parameters and electrocardiographic features. And with optimal peri-operative management complication rate was very low.

## DISCUSSION

Artificial cardiac pacemaker has remained the only effective long-term treatment for 2<sup>nd</sup> degree Mobitz II and complete heart block not due to a reversible cause.<sup>1,2,3</sup> And artificial cardiac pacemaker system including the implantable pulse generator and lead electrode, has continued to undergo technological sophistication thereby making the cost increasingly exorbitant.<sup>2,4</sup>

Although the incidence of Heart Block in Nigeria may have remained unchanged in both sexes (with male: female ratio of 1:1) over the past two decades, the prevalence of the disease appears to be increasing because of factors like increasing longevity of life, increase in medical facilities, increasing utilization of medical facilities, and increasing diagnostic acumen.

The disease is still prevalent in the elderly population as about two-third of our patients were above 60 years of age. Discovery of heart block in two of our patients less than 30 years of age gave suspicion of congenital aetiology especially as these patients also had untreated congenital heart defect (un-repaired ventricular septal defect). In the absence of major structural abnormalities, congenital heart block is often associated with maternal antibodies to SS-A (Ro) and SS-B (La).<sup>5</sup> Presence of systemic hypertension, probably predating the heart block, and ischaemic heart disease, put together constituting 86% made degenerating heart disease the commonest cause of heart block in our patient population.

Sick sinus syndrome constitutes the major aetiological factor of heart block in Western series.<sup>3,6</sup> Complete heart block can develop from isolated, single-agent overdose, or often from combined or iatrogenic coadministration of AV-nodal, beta-adrenergic, and calcium channel blocking agents.<sup>7</sup> Infectious causes of acquired complete heart block include *Trypanosoma cruzi* myocardial infection.<sup>8</sup>

Important drug toxicity suspected in our patients included chloroquine, propranolol, digoxin and potassium. Such aetiological factor is expected to be reversible with withdrawal of the offending drug, and this may explain why some of our patients receiving demand artificial cardiac pacemaker have their pacemaker functions for up to 10-12 years. Chloroquine toxicity is still important because this drug can be purchased without prescription in our country, it is commonly available, cheap and likely to be repeatedly used in self-medication because of high level of chloroquine resistant malaria in the country.<sup>4,9</sup>

Exertional dyspnoea was uniformly present in all our patients. Stokes-Adams syndrome consisting of severe bradycardia, unheralded syncope and seizures due to cerebral hypoxia, was found in about half of the patients, and cardiac failure in 39%.

Thirty-five percent and 65% of our patients requiring permanent artificial cardiac pacemaker implantation had Mobitz II and 3<sup>rd</sup> degree heart block respectively. Sixty-five percent of these also had severe bradycardia among whom Stokes-Adams syndrome was very commonly seen prior to artificial cardiac pacing. This same subset of our patients also needed pre-pacing inotropic/chronotropic support with isoprenaline infusion (52%); adrenaline drip (34%) and atropine drip (21%). This measure is capable of increasing the heart rate and therefore cardiac output while arrangements are being completed for artificial cardiac pacemaker implantation.<sup>1,9,10,11</sup> Temporary trans-cutaneous or trans-venous cardiac pacing can also be instituted while arrangements are being made for a permanent pacemaker insertion.<sup>12</sup>

Expectedly, majority of our patients had systolic hypertension. This is a result of the compensatory increase in stroke volume and peripheral vascular resistance in an attempt to maintain an adequate cardiac output in established heart block<sup>13</sup>. It was also observed that in this subset of patients, the systolic hypertension responded to a successful artificial cardiac pacing.

All our patients were treated with permanent artificial pacemaker implantation with 65% being transvenous and 35% epicardial. Transvenous/ endocardial pacing is generally preferable to epicardial pacing because it is less invasive and the procedure is associated with much less morbidity and shorter hospital stay. But sometimes epicardial/ transthoracic cardiac pacing may be indicated in some patient populations like children who are still growing, patient with previous transvenous cardiac pacing(s) that cannot be removed (appendix III), patients having mechanical prosthetic valve in the tricuspid location, and patients with massively enlarged right ventricle that may make capture with passive electrode lead difficult.<sup>1,10,13</sup>

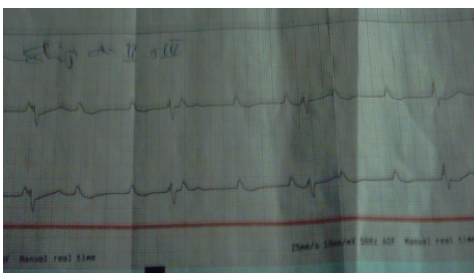
All patients responded well with improvement in symptoms, haemodynamic parameters, and electrographic features. One patient with transvenous artificial cardiac pacemaker had early post-operative loss of capture due to electrode dislodgement. This was successfully corrected under fluoroscopic guidance. Other observed complications were minor and included nausea and vomiting in 8.8% of the patients.

### CONCLUSION

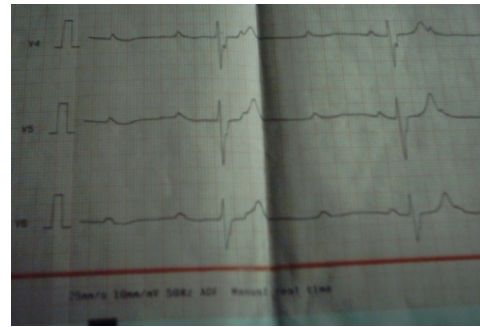
Symptomatic 2<sup>nd</sup> degree and 3<sup>rd</sup> degree heart block in Nigeria is increasingly diagnosed and treated. The only reliable form of treatment has remained artificial permanent pacemaker insertion and pulse generator implantation, which is an expensive form treatment not easily affordable by patients and should be covered by the Nigerian National Health Insurance Scheme (NHIS). This is because artificial cardiac pacemaker treatment is expensive and not affordable by the average Nigerians.

Much still remains to be done for our patients in the area of electrophysiological study which is uniformly unavailable in the country and elucidation of the specific cause of heart block in each patient.

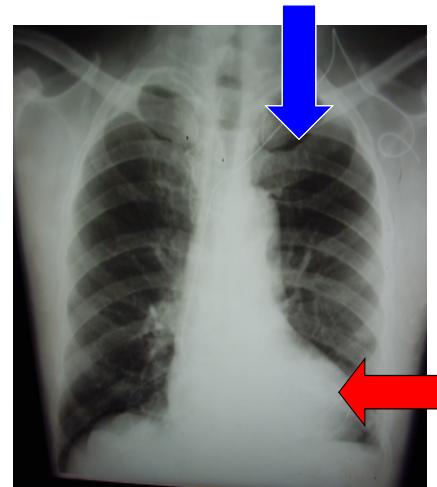
### APPENDIX



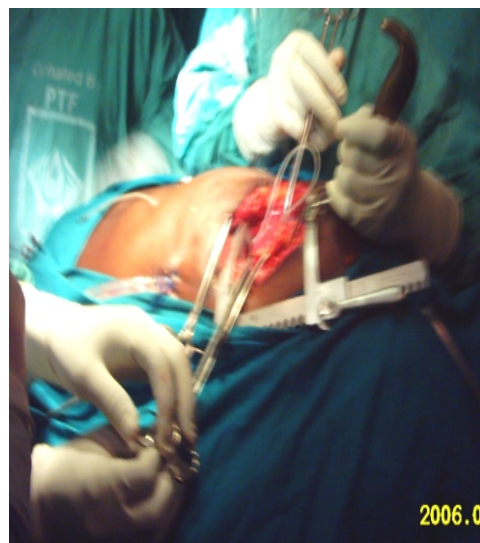
**Appendix I:** Rhythmic stripe of one patient with 3<sup>rd</sup> degree heart block.



**Appendix II:** ECG tracing of another patient with complete heart block.



**Appendix III:** Chest radiogram of a patient with epicardial permanent pacemaker after a previous endocardial which failed after 12 years of use. (Blue arrow points at transvenous lead, red arrow points at epicardial lead)



**Appendix IV:** Operation for transthoracic / epicardial permanent pacemaker insertion & pulse generator implantation in one of the patients.



Appendix V: Multi-channel monitor after permanent pacemaker treatment in one of the patients with complete heart block.

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