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BRADYCARDIA PACING: INDICATIONS, ECG CHANGES AND MANAGEMENT CHALLENGES IN TERTIARY CARE INSTITUTION, SOUTH INDIA –AN OBSERVATIONAL STUDY

Cardiology

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ABSTRACT

BACKGROUND: Permanent pacemaker implantation is a life-saving procedure that is performed worldwide. There is paucity of reports on pacemaker implantation in south India. The aims of the study were to determine the indications for pacemaker insertion, the demographic distribution of the patients requiring it, the electrocardiographic (ECG) changes, and the management challenges.
MATERIALS AND METHODS: Two hundred consecutive patients who had pacemaker insertion done by our team 2018-2019 were included in the study. The patients biodata, indications for pacemaker insertion,ECG changes, and the treatment profile were recorded.
RESULTS: There was slight female preponderance 54(%) among the patients studied. Third-degree heart block was the indication in 82.5% of the patients and most patients did well with single lead ventricular pacing which is generally cheaper than the dual chamber pacing.
CONCLUSION: The majority of bradyarrhythmia patients in this environment can be maintained on single lead ventricular pacemaker

KEYWORDS

permanent pacemaker,bradycardia

INTRODUCTION:

The implantable cardiac pacemaker is one of modern medicine's greatest contributions to prolonging and improving human life.Pacemaker implantation is a common procedure and more than 500,000 implantations are done worldwide per year(1).

The reliability of pacemaker systems has been greatly improved over the last two decades. The stability of lithium batteries bas been documented,and the introduction of microprocessor circuits reduces the risks for component failures,enables optimal programming, technical and functional pulse generator reports, and smaller cans. Also leads and electrodes have been improved.

The indications for permanent pacing include complete atrio-ventricular block, symptomatic second-degree heart block, sinus bradycardiaand atrial fibrillation with slow ventricular rate and symptoms among others(2). Although complete heart block remains a definite indication for permanent pacing, most permanent pacemakers are implanted for patients with the sick sinus syndrome in the United States.

Access for permanent pacemaker implantation is by the epicardial or endocardial route.Epicardial implantation is through a thoracotomy while endocardial implantation is by subclavian venous access. The latter is the current approach in more than 90% of patients worldwide.

The peri-operative complications of pacemaker insertion include, but are not limited to, pocket hematoma, lead dislodgement, pneumothorax and some of the late complications are pocketinfection, lead dislodgement, and lead erosion(3,4). The study was conducted to determine the indications for pacemaker insertion, the demographic distribution of patients requiring pacemakers,the electrocardiographic (ECG) changes, and the management profile of bradyarrhythmic patients in *south india*

PATIENTS AND METHODS

In a prospective setting, a protocol was designed for the case series of pacemaker implantation. This is a hospital-based study conducted on 200 consecutive pacemaker insertions done within Madras medical college and RGGH,Chennai. The study period was Jan 2018 to December2020. The compiled data included their biodata(age and sex), ECG findings, and their management profile.

MANAGEMENT PROFILE

The patients referred to the interventional unit after full clinical and laboratory evaluation, paying special attention to their symptomatology, ECG, and echocardiographic findings.

A major part of echocardiographic assessment was to ensure that there were no intracardiac clots that could dislodge intraoperatively or postoperatively when myocardial functions improved.

Based on the findings, pacemakers were prescribed to the patients.

OPERATIVE TECHNIQUES

We conducted all the transvenous insertions with 1% plain xylocaine field block. The left subclavian venous route was randomly used for insertion of the leads.We administered prophylactic antibiotics and prolonged post-operative low dose aspirin to all our patients.The pacemakers were checked regularly with programmers as part of postoperative follow up in outpatient clinics.

RESULTS

A total of 200 patients were operated upon within the period of study; there were 108 females and 92 males.

Table I shows the sex and age distribution of patients. The mean age was 61 years with a standard deviation of 7.5. The median was 63.7 years with a Pearson's Skewness of -0.68 and a platykurtic distribution. Third-degree heart block was the indication for permanent pacing in 82.5% of the patient.

TABLE I: AGE AND SEX DISTRIBUTION OF THE PATIENTS

Age Range (Yrs)	Male	Female	Total
40-49	16	20	36
50-59	23	15	38
60-69	28	38	66
70 and above	25	35	60
Total	92	108	200
Percentage	46%	54%	

Prior to lead fixation the R wave and pacing threshold are checked. Target values are R wave greater than 6 millivolts (mV), lead impedance less than 1200 Ohms and pacing threshold less than 1 volt (V). Diaphragmatic pacing is checked at 10V. The pacemaker pocket is irrigated with 1g of ceftriaxone, the pacemaker lead connected to the pulse generator and the wound closed in layers. An arm sling is used in all cases to restrict movement of the arm on the operation side (to reduce the risk of lead displacement) and the patient is transferred to the ward (5). Pacemaker check sequence is 6 weeks, 3 months, and then every 4 months for a year. After a year the checks are done every 6 months. A pacemaker check report is generated after each visit, and a copy is given to the patient and a copy kept on file. Contact details of all patients are maintained on the database so that contact can be made if any appointment is missed.

TABLE II

ECG Changes	Number of Patients
Third-degree or advanced second-degree AV block Symptomatic,	136
Third-degree or advanced second-degree AV block asystole>3.0 second, any escape rate <40 beats/min, asymptomaticpatients in sinus rhythm	22
Third-degree or advanced second-degree AV block , asystole>5 second in awake, asymptomatic patients in atrial fibrillation	7
Chronic bifascicular andTrifascicular block ,intermittent third-degree or advanced second-degree AV block	11
Chronic bifascicular and Trifascicular block, Type II second-degree AV block.	9
Chronic bifascicular and Trifascicular block , Alternating bundle branch block	7
Sinus node dysfunction with symptomatic bradycardia	8

DISCUSSION AND CONCLUSION:

Pacemaker implantation is being done worldwide for the various indications stated earlier.There was slight female preponderance 54(%) among the patients studied. Third-degree heart block was the indication in 82.5% of the patients and most patients did well with single lead ventricular pacing which is generally cheaper than the dual chamber pacing.Only 8 of our patients had symptomatic sick sinus syndrome. The commonest ECG features in bradyarrhythmic patients in our environment werethird-degree heart block.This is in sharp contrast with the situation in the United States where the majority of thepatients had sick sinus syndrome. Seven patients had atrial fibrillation necessitating the use of an antiarrhythmic drug with the implanted pacemaker.

All the patients had multi-programmable demand pacemakers in keeping with the worldwide trend. The transvenous route was used for most ofthe patients because there are few indications for permanent epicardial pacing in modern practice. We also noted with satisfaction that most ofthe bradyarrhythmic patients in this part of the world are doing well with single lead pacing. This is a major advantage because single lead pacemakersare generally cheaper than atrio-ventricular (dual pacing) types (6,7). Further monitoring of the patients will throw more light on the long-term effect of this mode of treatment.A pacemaker follow-up program must be evaluated for patient safety, well-being and acceptance, and for health economy.

SAFETY

Dangerous episodes (no output, lead fracture, or pacemaker runaway) must be prevented whenever possible; A component breakdown probably cannot be prevented even by a frequent follow-upschedule. Some pacemaker systems, however, are known to carry an increased risk for failures, and therefore have to be followed more closely. In bipolar leads for instance, insulation failures mayinsidiously develop, and if the lead is introduced medially in the subclavian vein the wire may break (crush syndrome). Pacemakers or leads notified as recalls also have to be observed accordingto the specific recommendations given.

PATIENT WELL-BEING

Patient well-being requires an adequate pacemaker programming, including a suitable pacing rate and frequently also hysteresis and rate responsivemode. Patients with pacemaker syndrome have to be identified, and problems like symptomatic myoinhibition or muscular stimulation must be circumvented. In congestive heartfailure, heart rate should sometimes be increased. A proper pacemaker to patient adaptation should be completed during the 6- to 12-month running in period. Patient rhythm, pacemaker dependency, or heart function will often change later on. Reprogramming or system change may then be indicated.

When symptoms appear, the patient has to contact the pacemaker clinic. Insidious alterations in heart function may occur unrecognized by thepatient, and therefore be unnoticed when frequent pacemaker follow-up does not take place

PATIENT ACCEPTANCE

When the pacemaker is adequately programmed and adapted to the patient during the first 6-12 months after implantation, and the patientsand their relatives are adequately informed, our experience is that further reprogramming is seldom needed. Patients with relevant symptomsusually called our clinic within reasonable time. Some unnecessary calls were probably related to insufficient patient information; others becausethe patients needed the service of a doctor, and utilized their easy access to the pacemaker clinic.

These were some of the management challenges that our team faced in the course of this work. A way out of this is for hospitals to stockpacemaker generators and leads so that they can be more readily available for implantation even in emergency situations.Majority of bradyarrhythmia patients in this environment can be maintained on single lead ventricular pacemaker.

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