

Experience With Permanent Pace Maker Implantation at Mayo Hospital, Lahore.

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Permanent pacemaker implantation procedure was started at Mayo Hospital, Lahore in March, 1978. Till December 31st 1998 nine hundred and sixty six permanent pacemakers had been implanted in this institution. 53% patients were males and 47% patients were females. 55% patients were between 50-70 years old. The youngest patient was only six months old while maximum age of the patients implanted with permanent pacemaker was ninety nine years old. 92% patients had first implant while 6% patient had second implant and 2% patient had third implant. 84% patients had complete heart block, 5.5% patients had sick sinus syndrome, 2.7% patients had symptomatic second degree heart block, 2.6% patients had congenital heart block.

Key word: Pace maker, permanent pacing lead, implantation, unipolar, bipolar, single chamber

In 1958 Ake Senning, a thoracic surgeon at the Karolinska Hospital, in Stockholm, implanted myocardial electrodes and a pulse generator with a rechargeable nickel-cadmium battery in a 40 year old patient¹. This pulse generator failed within a few hours, the second lasted about six weeks. Two years later, William M. Chardack, chief of thoracic surgery at VA Hospital in Buffalo, NY, carried out the first successful implantation of a battery powered pacemaker with a myocardial lead². Implantation required a left anterior thoracotomy and exposure to myocardium. Almost all patients at that time had Stokes-Adams seizures. Pacemakers at time were very large and heavy weighing more than 200 grams.

In 1965 transvenous permanent pacing technique gained a general acceptance in Sweden, England and United States³. Till late 1970s cardiac surgeons continued to perform most implants and then a gradual transition got underway to cardiologists. A major impetus behind this shift was the development of an introducer with a peel away sheath when the cardiologists learned that they too could implant pacemakers using subclavian vein⁴. Most of the pacemakers used are programmable VVI while DDD, AVD, VVIR etc are also available.

Spectrum of indications for permanent pacemaker went on increasing with the passage of time with very little change in the previously recommendations. We follow the recommendations of American Heart Association in collaboration with American College of Cardiology⁵

Material and Method:-

This is a retrospective and prospective study expanding over 20 years. Data of all the patients implanted with permanent pacemaker is kept in the record book giving all information's of the patient along with the type of pacemaker and type of lead used. In all patients endocardial lead was used except five patients in whom epicardial lead was used. For endocardial lead the procedure was carried out under fluoroscope in cardiac catheterization laboratory taking all precautions of

antiseptic measures as pacemaker is a foreign body with high risk of infection. After implantation the patient is kept for 24 hours with bed side monitoring in the ward and then for the next 4-10 days for the purpose of intravenous antibiotics and to be reassured that the lead is not displaced. Although after the introduction of tined leads the incidence of lead dislodgment is negligible.

Procedure

After giving local anesthesia with 2% Xylocaine without adrenaline surgical incision was given 2 cm below and parallel to the middle third of the clavicle to expose the cephalic vein. If Cephalic vein was small in size or not found then direct subclavian vein approach was used using peel away introducer set. In 51% of the cases the venisection was successful, in 30% of the cases after failure of the venisection direct puncture of the subclavian was done while in 14% cases direct subclavian vein approach was used without dissecting the cephalic vein as carried out by others^{6,7,8}. Lead was adjusted in the right ventricular apex, confirming on lateral view of the fluoroscope. It was made sure that sufficient length of the lead is lying in Right Atrium making heel like appearance. Patient was advised to take deep breath or to cough to look for any change in the position of the lead or change in the threshold. To look for diaphragmatic stimulation the threshold was raised to 10mv. Pacemaker pocket was made below the subcutaneous tissue above the Pectoralis Major muscle. Lead was tied with non absorbable Ethibond suture while subcutaneous tissues were closed in layers with absorbable Vicryl suture and skin again was closed with non absorbable Prolene suture material.

Combination of antibiotics were used as prophylactic measures, giving first dose 30 to 60 minutes before the start of the procedure and then continued for the next one week or so. Stitches were removed between 7 to 10 days. With the introduction of subcuticle suturing with absorbable material in the early 1998 there was no need to remove the stitches later on.

Discharge from the hospital:

Twenty four hours after the implantation patients were encouraged to be out of bed and walk around. Post op. X-Ray chest PA view and deep penetrating Lt. Lateral view were taken as soon as possible the patient was declared fit to go to X-Ray department to see the position of the lead and Pacemaker. Patients were usually discharged on the 5th day. If the patient belonged to far away station then he was discharged on 10th day.

Pacemaker follow up:-

A special day and room is allocated for follow-up of the patients implanted with permanent pace maker to visit and to get their pacemakers checked regularly. Every patient was explained the importance of follow up. For the first three months we consider the implant as a "New born implant" For first three months the patient was instructed to visit monthly. Later on twice a year.

Patients who have concomitant other diseases were allowed to visit frequently. Despite good explanation to the patient and availability of the doctor the follow up of the patients was restricted to physical complaints as they assume that their disease have been cured for those who become asymptomatic. After 3-6 visits the patients appeared only when they had depleted the battery or had some other complaints.

During follow up, ECG with magnet, heart rate, pulse width, resistance, pacemaker position and wound conditions were noted. The patients were reprogrammed with an external programmer if required during follow up.

Results

Out of 966 patients implanted with permanent pacemaker from March.1978 to Dec.1998 516 (53%) were males and 450(47%) were females. Only one patient was below 10 years old who was only six months old, 34(3%) patients were between 11 to 30 years old, 184(19%) were between 31 to 50 years old, 535(55%) were between 51 to 70 years old 200(21%) were between 71 to 90 years old and only 12(1%) patients were above 90 years old, the maximum age of the patient was 99 years. (Table 7)

Eighty four percent of the patients implanted with pacemaker had complete heart block either acquired or congenital 81% verses 3%, 5.5% patients have sick sinus syndrome, 1.6% patients have atrial fibrillation with ventricular rate less than 40/min or have syncopial episodes. Only 4.7% of the patients implanted with pacemaker had myocardial infarction whether anterior wall or inferior wall. Permanent Pacemaker was implanted in these patients before discharge after observing for sufficient time to be sure that their own rhythm will not come. Rest were having symptomatic 2nd degree heart block, trifasicular block, intermittent heart block etc. (Table 1)

In 520(54%) patients cephalic venesection was successful while in 421(43%) patients subclavian puncture was carried out either as primary or after failure to dissect

the cephalic vein.(Table 2). 890(92%) had first implant procedure, 55(6%) patients had second implant procedure while 21(2%) patients had multiple implant procedures.

Table 1. Indications (n=966)

Type of rhythm disturbance	No.	%age
Complete heart block	810	83.8
Congenital	26	2.6
Acquired	784	81.2
Sick sinus syndrome	54	5.5
Post MI heart block		
Anterior wall	26	2.7
Inferior wall	19	2
AF with slow heart rate	15	1.6
Symptomatic second degree heart block	26	2.7
Miscellaneous	16	1.7

Table 2. Route of implantation

	No.	%age
Venesection		
Left cephalic venesection	490	50.7
Right cephalic venesection	30	3.1
Direct puncture		
Lt external jugular venesection	26	2.7
Rt. External jugular venesection	5	0.5
Direct puncture		
Lt. Subclavian vein	380	39.3
Rt. Subclavian vein	41	4.2
Lt. Internal jugular vein	4	0.4

In more than 99% patients implanted with PPM endocardial leads were used. Before 1985 unipolar leads were used maximally while after 1990 bipolar leads were used only and 1985-1990 was the transition period to switch from unipolar to bipolar lead in our center

In 145(15%) patients Unipolar pacemaker was used while in all rest patients Bipolar Pacemaker were used. Dual Chamber pacemaker were used in only 1% of the cases. (Table 3)

Table 3. Type of pacemaker used.

Type of pacemaker	No.	%age
Unipolar VVI	145	15
Bipolar VVI	786	81.3
Bipolar VVIR	24	2.5
Dual chamber DDD	10	1
Dual chamber DDDR	1	0.1

Complications:-

Peroperative complications were arterial puncture, excessive bleeding, pneumothorax, exposure of the shoulder joint, injury to brachial plexus, arrhythmia's and dependence on permanent pacemaker while checking threshold without having backup with temporary pacemaker. (Table.4)

Early complications (During Hospitalization) include Haematoma, diaphragmatic stimulation, infection, lead

displacement, pacemaker induced arrhythmia etc (Table 5)

Table 4. Per operative complications

Complications	No.	%age
Ventricular arrhythmias	60	6.2
Cardioversion	6	0.6
Asystole	10	1
Pneumothorax	24	2.5
Cephalic vein rupture	3	0.3
Arterial puncture	18	1.9
Injury to shoulder joint	1	0.1
Injury pleura	2	0.2
Accidental lead damage	1	0.1
Subcutaneous emphysema	3	0.3
Haemothorax	1	0.1
Thoracic duct injury	1	0.1

Table 5. Early complications during hospitalization.

Complications	No.	%age
Haematoma	30	3.1
Diaphragmatic stimulation	8	0.8
Pectoral muscle stimulation	28	2.9
Infection	45	4.6
Lead displacement	16	1.6
Pacemaker induced arrhythmias	4	0.4

While in late complications infection, pacemaker migration, lead fracture, pacemaker syndrome, erosion of the skin with pacemaker or lead were noted. (Table 6)

Table 6. Complications after discharge

Complications	No.	%age
Late failure to pace lead displacement	8	0.8
Lead fracture	7	0.7
Early pulse generator failure	16	1.7
Infection	28	2.9
Erosion of skin pacemaker	12	1.2
Erosion of skin by lead	6	0.6
Pacemaker migration	22	2.2
Pacemaker syndrome	30	3

Discussion

Since our last review in 1987 the rate of pacemaker implantation has increased tremendously⁹. Average implantation rate after 93 is 70/ year. The reasons being increased awareness of the doctors to refer the patients to this tertiary unit from district hospitals in time and also awareness of the general practitioners.

In our population initially the patients do not realize that they have problem with their heart rate When they go to their family physician and luckily if the physician has the knowledge of heart block, then he will refer the patient to the Cardiologist but usually the patients fear to go to the hospital and to be admitted there. They come there when there is extreme emergency. Lastly the financial problem arises and the most of the patients fail to collect enough money to purchase the pacemaker, then in the end the government resources either from hospital supply or from

zakat fund become active to help the patient. Every one who was admitted with the indication of permanent pacemaker implantation, he was discharged with pacemaker whatever the source may be. No patient has been refused for implantation due to non availability of pacemaker.

Permanent Pacemaker Implantation has not only improved the quality of life but it has prolonged the life expectancy. As the spectrum of indications is increasing the specific benefits may not be as good as before. With the introduction of new techniques and equipment's the time taken for implantation has decreased dramatically. New generation of small but programmable pacemakers and tined leads with steroid eluciation, multiple stylets of different hardness, peel off introducer sets, exact location for incision to search for cephalic vein, are the responsible factors for the better results and short time period taken for implantation. During this twenty years experience, initial involvement of cardiac surgeons to search out vein gradually vanished with the introduction of peel off introducer sets. Now in our center all the procedures are carried out by the cardiologists in the cath lab. Cardiac surgeons are called only when there is need for epicardial implantation. During the last five years surgeons were called only twice for epicardial implantation. Off course the experience also gives added benefits. As far as the complications are considered, with the passage of time the no of complications are decreasing. New innovations in lead technology i.e. bipolar and tined etc. has almost ended the complications of pectoral muscle stimulation, diaphragmatic stimulation and lead displacement.

The paced population in our study is elderly with VVI pacemakers. Most of the studies conducted in older patients with VVI pacemakers has shown same benefits in term of symptoms and improved exercise tolerance with comparison to dual chamber pacing^{10,11}

Inspite of improved techniques for sterilization and scrubbing of skin before implantation antibiotic prophylaxis has been used which further decreased the incidence of infection.

The proportion of patients receiving a pacemaker for sinus node disease is low as noted by another study¹² The rate of complications is comparable to other centers in the world.

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