

Permanent Pacemaker Implantation: an Analysis of 147 Cases.*

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SUMMARY

At Mayo Hospital Lahore 147 cases had permanent pacemaker implantation from 1978-85. 53.1% were males and 46.9% females. Most of the patients were above the age of 50 years. Amongst these, 76% patients presented with acquired C.H.B., 8% with S.S.S., 5% with intermittent H.B., 4% with congenital C.H.B., 2.7% with post M. I. conduction defects, 2.7% with symptomatic 2nd degree A. V. Block, and 1.3% with A.F. with vent. rate less than 40 had permanent pacemakers implanted. Transvenous, endocardial VVI type of pacemakers were used in all cases. In 32.6% of cases tined lead was implanted, Average pacing threshold was between 0.5-0.7 V. and 0.6-0.8 mA. 90.5% of patients received the pacemakers as their first implant and in only 9.5% of patients second implant was done. Prophylactic Antibiotics were used routinely. Percentage of various known early and late complications were as follows: Hematoma formation 15.6%, lead displacement 6%, Infection 5.9%, Diaphragmatic stimulation 2.7%, pectoral muscle stimulation 2.04%, lead fracture 2.04%, pacemaker migration 2.04%, erosion of skin by lead 1.3%, early increase in threshold, early failure to sense, pacemaker generated arrhythmias and pulse generator component failure all happened with 0.6%. Only 64% patients purchased pacemakers by themselves. 24% were provided by raising funds and 12% got from government sources.

MATERIAL AND RESULTS:

The Cardiac pacemaker is the most successful electronic device implanted in the body. It has been in use worldwide over the last quarter century as one of the mainstays of modern cardiac therapy.

The department of Cardiology, Mayo Hospital, Lahore, started implantation of permanent pacemakers in 1978 and 147 pacemakers were implanted upto December, 1985.

The number of permanent pacemaker implantation has gradually increased over the last few years and it have become a routine procedure performed with an average of about one case per week. Figure 'I' shows the yearly increase in the number of pacemaker implantation.

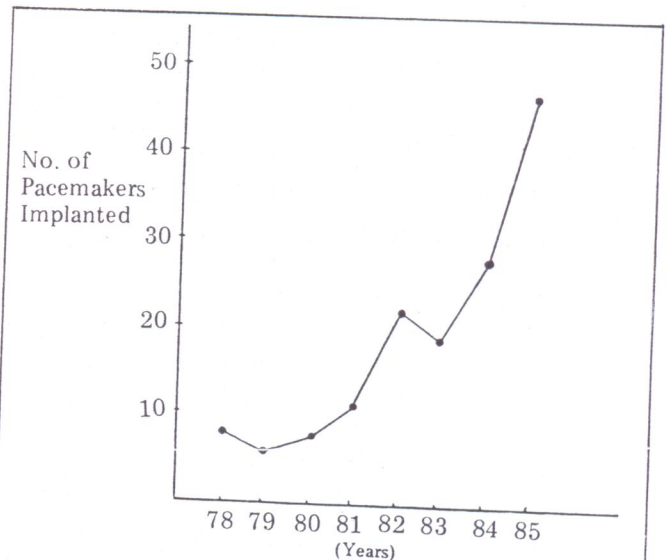


Fig I. Number of pacemakers implanted from 1978 to 1985.

*This paper was presented by Dr. Mahmood Alam in the 7th Congress of Cardiology at AFIC, Rawalpindi. From the Deptt. of Cardiology Mayo Hospital, Lahore.

Amongst these '147' patients, 78(53.1%) were males and 69(46.9%) were females.

The percentage of pacemaker implants by age and sex in these 147 patients is shown in Figure II.

Figure-II shows that most of the patients were above the age of 50 years without any significant dominance of either sex. Although '6' patients above the age of 80 years were males.

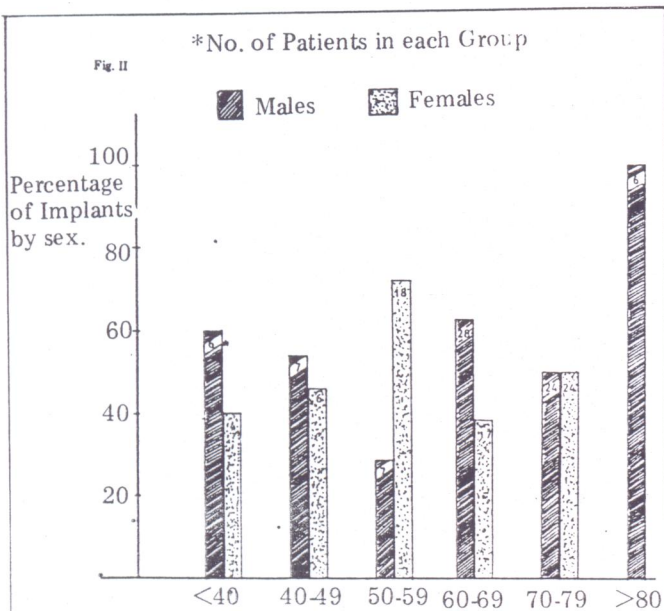


Fig. II. The bar graphs are weighted by the relative proportion of men and women in the overall population at each age groups, as well as by the number of pacer patients who appear in this group.

METHODOLOGY:

Patients selection as a candidate for permanent pacemaker has been divided into two main groups. As shown in Table -I.

In the first group of patients, temporary pacemaker was implanted as an emergency procedure for a symptomatic bradycardia. Mostly these patients were either those who were suffering from Idiopathic Complete Heart Block not known previously, or the patients who experienced infarction recently. Patients with infarction whose conduction defects improved to normal sinus rhythm were not exposed to permanent pacemakers.

In the second group of patients the need for a permanent pacemaker was decided after careful history taking to rule out any drug intoxication in patients with documented conduction disturbances and to exclude other causes of syncope in patients without documentation of conduction defects. Thorough investigations like Holter monitoring and His bundle electrophysiological studies were done to further establish the indication for permanent pacing. These were patients mostly with Sick sinus syndrome or having various fascicular blocks.

INDICATIONS:

Patients with symptomatic bradycardia, due to any cause, are managed by transvenous ventricular demand pacing in our department. Table-I demonstrates the different indications for permanent pacing and number of pacer implants with percentage.

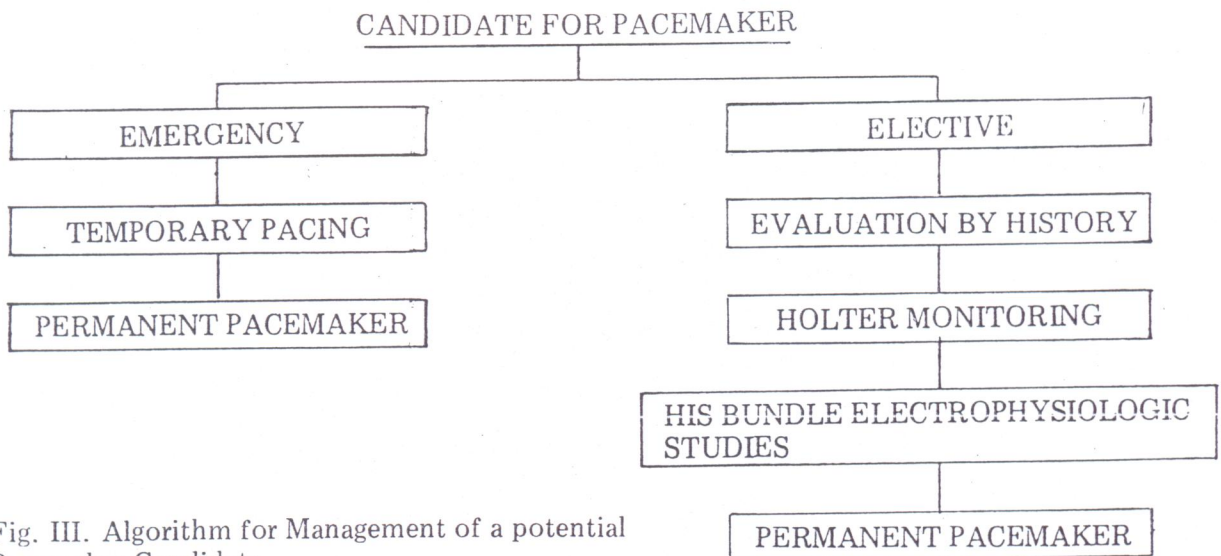


Fig. III. Algorithm for Management of a potential Pacemaker Candidate.

Temporary pacemaker was implanted, in most of the patients prior to permanent pacemaker implantation.

It was indicated because some were totally dependent on pacemakers while others were in cardiac failure due to slow heart rate. The hemodynamic situation was improved before subjecting them to permanent pacemaker therapy.

92% of the patients who got permanent pacemaker due to Idiopathic complete A.V. block were above the age of 50 years. Whereas patients with sick sinus syndrome showed wide range of age variation, youngest being of the age of 30 years and oldest of the age of 83 years. But 41.6% of the patients with sick sinus syndrome were less than 50 years of age.

TABLE-I
INDICATIONS

| No. RHYTHM DISTURBANCE | PACER IMPLANTS | %AGE |
|---|----------------|------|
| 1. COMPLETE HART BLOCK | | |
| - ACQUIRED | 112 | 76% |
| - CONGENITAL | 6 | 4% |
| 2. SICK SINUS SYNDROME | 12 | 8% |
| 3. INTERMITTENT HEART BLOCK | 7 | 5% |
| 4. ATRIAL FIBRILLATION WITH VENTRICULAR RATE 40 | 2 | 1.3% |
| 5. POST M.I. INTRAVENT. CONDUCTION DEFECTS | 4 | 2.7% |
| 6. 2ND DEGREE A. V. BLOCK (SYMPTOMATIC) | 4 | 2.7% |

PROCEDURE:

All the pacemakers were implanted through transvenous route with endocardial leads.

The route of implantation, site of pacemaker pocket and type of lead used are shown in Table-II.

In 48 (32.6%) cases tined endocardial lead was used.

Medtronic, PSA, Model 5300 was the device used to check the preoperative thresholds.

TABLE-II
ROUTE OF IMPLANTATION

| | NO. OF PATIENTS | %AGE |
|---|-----------------|------|
| VEIN | | |
| Left cephalic venesection | 69 | 47% |
| Left ext. jugular venesection | 13 | 9% |
| Right cephalic venesection | 56 | 38% |
| Right ext. jugular venesection | 9 | 6% |
| PACEMAKER POCKET | | |
| Left pectoral region | 82 | 56% |
| Right pectoral region | 65 | 44% |
| All the implanted pacemakers were of VVI type with Unipolar leads | 98 | 67% |
| Bipolar leads | 49 | 33% |

The average preoperative pacing threshold in most of our cases ranged between 0.5 - 0.7 volts and 0.6 - 0.8 mA with the satisfactory and stable lead position in RV apex.

In 133 (90.5%) cases first implant was performed and in only 14 (9.5%) of cases second implant was done. The indications for second implant are shown in Table -III

TABLE-III

| INDICATIONS FOR SECOND IMPLANT | NO. OF PATIENTS |
|--------------------------------|-----------------|
| Infection | 5 |
| Lead fracture | 3 |
| Pacemaker battery depletion | 3 |
| Displaced distorted lead | 2 |
| Component failure | 1 |

In three patients, out of five with infection, 1st implant was done at some other centres. Same was true in one patient out of 3 with lead fracture, in two patients out of 3 with battery depletion and in one patient out of 2 with displaced old lead.

Average 90 minutes time was spent in the procedure from skin to stick. Although some procedures were done as early as in 40 minutes and in some cases 3 - 4 hours were spent.

Preoperative complications were very few. Two patients developed cardiac arrest during the procedure which was managed safely. In one patient excessive bleeding occurred from left cephalic vein, due to some abberent drainage of blood from below, which was secured. In one patient satisfactory lead position was not obtained in spite of repeated efforts and also by changing leads.

We use prophylactic antibiotics, which cover both gram+ve and gram-ve organisms, for 5-7 days. We usually remove stitches on 7-10 post-operative day according to the condition of the wound.

Out of 147 cases, 95(64%) purchased pacemakers themselves. In 35(24%) patients pacemakers were arranged by raising funds in the form of donations.

17(12%) pacemakers were supplied by the government.

COMPLICATIONS:

These are divided into immediate and late. Immediate complications include the problems which arise after performing the procedure and during post-operation hospital stay. Immediate complications are shown in the Table-IV.

Same lead was repositioned in '5' patients out of '7' with displaced leads and in remaining '2' tined lead was used to anchor the lead satisfactorily. The problem of lead displacement has markedly decreased with the use of better leads especially those with tined tips.

Undersensing occurred in one patient which was corrected by repositioning of the lead.

'4' patients developed diaphragmatic stimulation after the procedure. In one it was self limiting and in other '3' cases repositioning of the lead solved the problem.

Pectoral muscle stimulation happened in '3' patients. These were lean patients with very thin skin. In '2' patients it subsided and in remaining one patient, pocket was extended laterally towards axilla which solved the problem.

Post-operative hematoma was formed in '23' cases. In '18' patients it was resolved by itself and in only '5' cases evacuation was needed.

'5' patients developed infection post-operatively leading to explantation of pacemaker in '2' cases. In remaining three, wound was opened, pus was evacuated and wound was allowed to heal by secondary intension under injectable antibiotic cover..

One patient who got second implant of pacemaker developed resistant V. Fib. during post operative period and expired.

**TABLE-IV
IMMEDIATE COMPLICATIONS**

| S. No. | CAUSE | NO. OF PATIENTS | %AGE |
|--------|--------------------------------------|-----------------|-------|
| 1. | EARLY FAILURE TO PACE | | |
| | — LEAD DISPLACEMENT | 7 | 4.7% |
| | — INCREASE IN THRESHOLD | 1 | 0.6% |
| 2. | EARLY FAILURE TO SENSE | 1 | 0.6% |
| 3. | DIAPHRAGMATICS STIMULATION | 4 | 2.7% |
| 4. | PECTORAL MUSCLE STIMULATION | 23 | 15.6% |
| 5. | HEMATOMA FORMATION | 23 | 15.6% |
| 6. | INFECTION | 5 | 3.2% |
| 7. | PACEMAKER-GENERATED — ARRHYTHMIAS | 1 | 0.6% |

**TABLE-V
LATE COMPLICATIONS**

| CAUSE | NO. OF PTS. | %AGE |
|-----------------------------------|-------------|-------|
| 1. LATE FAILURE TO PACE | | |
| Lead Displacement | 2 | 1.3% |
| Lead Fracture | 3 | 2.0% |
| Pulse-generator component failure | 1 | 0.6% |
| 2. INFECTION | 4 | 2.7% |
| 3. EROSION OF SKIN BY LEAD | 2 | 1.3% |
| 4. PACEMAKER MIGRATION | 3 | 2.04% |

Late complications are given in the Table-V

Same lead was repositioned satisfactorily in '2' patients with displaced leads. Lead was replaced in '2' patients out of '3' patients with lead fracture and in '1' new pacemaker implantation was done. Infection was controlled satisfactorily, in '2' patients out of '4' by injectable antibiotics and drainage of the pus. In the other two explantation was done and 2nd implant was performed on the other site. In one patient, with erosion of skin by lead, same lead was buried laterally into the axilla and at the erosion site skin was trimmed and sutured. In other patient new lead was implanted. Pacemaker migration in '3' patients did not effect the lead position in R.V. apex.

DISCHARGE FROM THE HOSPITAL

Mostly patients are encouraged to be up and about on third post-operation day. We usually discharge the patients residing in Lahore on 5th post-operation day if we find the wound condition is good and lead position satisfactory on chest X-ray in both A.P. and lateral views.

These patients are asked to come back on 10th post-operation day for stitch removal. Patients from distant areas are discharged on 10th post operation day after stitches are out.

PACEMAKER FOLLOW-UP

Pacemaker follow-up is necessary to have a check not only on the condition of the battery but also for other problems.

Every patient is explained about the importance of pacemaker follow-up. Following is the schedule for follow up.

| Period | Frequency |
|---------------------------|-----------|
| First month after implant | Weekly |
| During first year | Monthly |
| Following years | yearly |

Unfortunately, pacemaker follow-up response is not good. Patients usually stop coming for follow-up after few visits, as they do not remain symptomatic.

Due to infrequent and irregular visits by the patients, accurate date regarding the pacemaker follow-up is not available with our department.

It has been observed that patients do come for follow-up only if they have some problem or symptoms. Therefore, every patient is advised in the pre-discharge teaching programme to develop the habit of counting his own pulse daily.

In the routine follow-up visit chest auscultation is done, B P is recorded and surface Electrocardiogram is made.

Pacemaker function is analysed by electronic device 'Miniclinic'.

CONCLUSION

It has been said that a patient with pacemaker gets "a new lease on life". And, of course, permanent pacemaker therapy has proved beneficial from improving both quantity and quality of life in patients suffering from life threatening conduction disturbances. The analysis of '147' cases shows that pacemaker implantation is being done in a good way in our department with an acceptable range of complications.

The percentage of various known complications is comparable with any international study.

The indications for permanent pacing are presently being extended into two major directions.

The first is the treatment of the patients who manifest with A.V. Blocks, Sick sinus syndrome, Post M.I. conduction defects and/or prophylactically in patients who have undergone electrophysiologic study with demonstration of a prolonged H. V. interval or other findings indicative of impending A. V. dissociation.

The second is the management of many tachy arrhythmias refractory to medical therapy and where different modes of artificial pacing are used to treat those arrhythmias. Our study demonstrates very limited number of indications for pacemaker therapy belonging to first group only.

76% of the patients in our study belong to older age group with idiopathic CHB Sick sinus syndrome stands second with only 8% of total in our study. In the studies conducted abroad during the last few years, pacemakers were implanted in maximum number in relatively younger patients suffering from Sick sinus syndrome. In those studies % age of patients who need pacemaker for idiopathic CHB. has declined.

We have many limitations for pacemaker therapy. We have implanted only VVI endocardial variety of pacemakers. We feel that lack of

screening and detection of patients due to inadequate primary health care, unawareness of the patients due to illiteracy to general and lack of health education in particular and poor socio-economic conditions are amongst the major factors which deprive the patients of getting the form of specialised therapy.

Patients who reach the big hospitals and specialised centres do face the financial aspect of the treatment. In our study 46% of the patients got pacemakers from the funds raised by donation or by the government supply.

Ideally some patients need A.V. sequential pacemakers, which make the rhythm more physiological, and programmable pacemakers, which provide wider scope of indications and better management on the long term basis, should be implanted but again the finances are the main hurdle. Rate related pacemakers are also coming up with better prospects.

The graph in the Figure-I shows rapid increase in the number of pacemaker implantations over the last few years. As number of patients who require permanent pacemaker implant increases,

it is hoped that the spectrum of indications for permanent pacing with different modes of pacing will also increase in the following years.

REFERENCES

1. Philip Varriale M.D., EMIL A. Naclerio, M.D. CARDIAC PACING, a concise guide to clinical practice, Lea Febiger, Philadelphia, 1979.
2. Hilbert J. Th. Thalen M.D., J. Warren Harthorne M.D., TO PACE OR NOT TO PACE, Controversial subjects in Cardiac Pacing, Martinus Nijhoff, Medical Division 1978.
3. Philip Samet M.D., Nabil El-Sherif, M.D. CARDIAC PACING, Second Edition, Grune & Stratton, Inc. 1980.
4. Eugene Braunwald, M.D. HEART DISEASE, A text book of Cardiovascular Medicine, W.B. Saunders Company. 1984.
5. Walker PR: Pacemakers: Techniques, Indications, results and implications. Pages 367-379 in: Scientific Foundations of Cardiology Sleight P, Jones JV (Editors) Heinemann, 1983.