Indications and Results of Pacemaker Implantation

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SINCE the first implantation of pacemaker had been performed by *Chardack et al.*¹ 1960, various pacemakers²⁻⁷ have been investigated and developed to be applied for extended indications. However, in management of the long-term pacing, there still remains many problems including pacemaker itself, its indications and conditions of the patients to be implanted. Twenty-four cases have been experienced up to March 1972 since the first implantation of the pacemaker to the patient in October 1966 in the university Hospital of Niigata.

The purpose of this paper is to discuss the indications of pacing and its follow-up results.

METHODS

Symptoms at implantation, types of bradyarrhythmias, postimplantation complications, types of pacemaker and electrode and returning to the social activity were investigated or evaluated for 24 cases with wide age distribution.

RESULTS

Annual number of cases were shown in Table

TABLE I RESULTS OF LONG-TERM PACING
(1966. 10. 4-1972. 3. 31)

Year	No. of Patients	Short-Term Pacing Before Implantation	Death	No. of Replaced PM
1966	1	0	0	0
1967	2	0	0	0
1968	2	0	0	1
1969	4	0	0	1
1970	4	2	0	5
1971	10	8	0	6
1972	1	1	0	3
Total	24	11	0	16

Sex: M : 15 F : 9

Period of Pacing: 1MO-5YR 6MO

The Number of PM: 40

Key Words:

Clinical application
Pacemaker
Bradyarrhythmias
Complication
Follow-up conditions

I. A distinct increase up to 10 cases was noticed in 1971. The longest pacing was five and half years and there was no death after implantation. The average duration of 24 cases is two and half years. Age distribution at the initial implantation

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TABLE II PRIMARY SYMPTOMS

Symptom	No. of Patients
Adams—Stokes Syndrome	24
1) Syncope	20
2) Dizziness	4
Cardiomegaly CTR 50% <	24
Congestive Heart Failure	7

TABLE III SUMMARY OF ELECTRO-CARDIOGRAPHIC DATAS

	No. of Patients
Persistent Complete A-V Block	19 (79.2%)
Intermittent Complete A-V Block	3 (12.5%)
S-A Block and Sinus Arrest	2 (8.3%)
Total	24

TABLE IV FOLLOW UP CONDITION

	No. of Patients
Return to the Preoperative Work	12 (50.0%)
Return to the Domestic Work	9 (37.5%)
Limited Life	3 (12.5%)
Total	24

was between 36 and 88 years of age with an average of 58.4 years.

At the time, they were between 37 and 90 years of age. The symptoms were revealed in Table II.

All 24 cases had been suffered from Stokes-Adams syndrome and demonstrated more or less cardiomegaly. Congestive heart failure had been found in 7 cases.

Types of arrhythmias were shown in Table III.

Persistent complete A-V block, intermittent complete A-V block, S-A block or sinus arrest were recognized in 19, 3 and 2 cases, respectively. The case of persistent complete A-V block occupied 71% of all cases. Among various types of pacemaker (PM), the set rate PM and the demand PM were used in this hospital. At the time of the initial pacing, both types of pacemaker were implanted in respective 12 cases. However, 5 set rate PMs were replaced with the demand PMs at the time of battery change, therefore, 7 patients were treated with the set rate PM and 17 patients with the demand PM, respectively, at this time. An average duration of the initial battery was 32 and 28 months in set rate PMs and demand PMs, respectively.

Epicardial electrode were used in 21 cases and the catheter electrode in only 3 cases.

The pacemaker was concomitantly implanted in one case of mitral and tricuspid valvuloplasty, in another case of isolated tricuspid valvuloplasty.

As shown in Table IV, 12 of all cases returned to the preoperative profession and 9 cases were able to work domestically. Therefore, 87.5% of cases returned to social activity. Two cases, that

TABLE V COMPLICATIONS OF PACEMAKER IMPLANT

No.	Case No.	Complication	Treatment
1	Case 2	Pressure Necrosis	Removal
2	Case 10	Perforation by Catheter Electrode	Changed to Myocardial Electrode
3	Case 15	Infection	Chemotherapy
4	Case 2	Infection	Removal Replacement
5	Case 3	Pressure Necrosis	Chemotherapy

is, a patient with severe diabetes and a patient of 90 years of age were in limited lives and another case was in the immediate postoperative state. Skin necrosis, infection of the implanted areas and myocardial perforation by the catheter electrode were found in 2, 2 and 1 cases, respectively. As shown in Table V, the incidence of postimplantation complication was 12.5%.

Pacemaker malfunction occurred in one case. It was diagnosed pacemaker runaway and the generator was replaced, however, in the same patient, the electrode break occurred. Thereafter, then this patient has been paced by the catheter electrode. The pacemakers in all cases were manufactured by Medtronic Co. T-wave abnormal interference, temporal appearance of sinus rhythm and ventricular arrhythmia were found in 2, 1 and 4 cases in the follow-up period, respectively. An appearance of sinus rhythm was recognized in one case one month after implantation of set rate PM and it was replaced with demand PM. Thereafter, rhythms of this patient ironically changed remained to complete A-V block by this time.

T-wave interference was found in the case with demand PM of Medtronic type 5842 and it was replaced with demand PM type 5942 without further rhythm disturbances. Ventricular extrasystoles were medically controlled by myocardial depressant agents with satisfactory results. Cardiothoracic ratios decreased less than 70% in all patients including those with the preoperative cardiothoracic ratios more than 71%, and 18 of them demonstrated the cardiothoracic ratios less than 60%. Patients initially treated with set rate PM were average 59.8 years of age and those initially treated with demand PM were average 50.1 years of age, and the average duration of complete A-V block was 4.25 years in the former and 2.58 years in the latter, respectively.

DISCUSSION

Since the first report of *Chardack et al.* in 1960, numerous reports have been published. In Japan, in 1964, the first clinical case was reported by Suma et al.⁸ and since then treatment of bradyarrhythmias with pacing has increased year by year. Twenty-four cases have been treated from October 1966 to March 1972 in this hospital and an average duration of pacing was two and half years with the range from one month to five and a half years of length? there was no mortality. In this series, patients older

than 50 years of age occupied 83% of all, but it is noteworthy that there is not infrequently an indication of pacing for younger patients.

The incidence of utilization of the set rate PM was rather higher in this hospital than in others, because complete A-V block had persisted several years in patients treated with this type of pacemaker and the life time of the battery is longer in the set rate PM than in the demand PM. Moreover, the demand PM is larger in size than the set rate PM — this seems practically unfavorable for Japanese patients —, and it is said that there are some defects in operative of mechanism in the former. However, relatively young patients associated with A-V block short duration, those with intermittent A-V block, those with S-A block appeared to be preferably treated with demand PM.

There are epicardial and catheter electrodes and the latter is commonly utilized in many institutes, because its insertion is performed under the simple operative procedure.

However, dislocation and myocardial perforation are the most troublesome problems in use of the catheter electrode. Dislocation was suspected to occur in 10 to 15% at early stage and myocardial perforation appeared to be dependent up on the type of catheter electrode. We have experienced only one case of the latter. We implanted both epicardial and catheter electrodes in respective 21 and 3 cases and the indication of the latter was rather limited to particular cases, that is, a case of 88 years of age, a case of gastrectomy and another case with broken epicardial electrodes.

Getting the chance to return to the social activity is the practice purpose of pacemaker implantation in 12 cases of this series. *Personnet et al.*¹⁰ reported that survival rate 5 years following pacemaker implantation was 60 to 70%. An average survival years in our cases is two and a half years, without any death. Five cases have been well 4 years since pacing, but further observation appears to be necessary.

In this series, the indication of the pacemaker implantation was limited to patients of severe bradyarrhythmias that is complete A-V block or S-A block with Stokes-Adams syndrome. However, it appears that the extended indication of pacing to the severe tachyarrhythmias will be expected in future in Japan, too and that the development of pacemaker machine should be necessary for this purpose.

SUMMARY

In this paper, indications of pacemaking and its results are discussed from 24 cases of severe bradyarrhythmias with Stokes-Adams syndrome experienced from October 1966 to March 1972.

There are no mortality and 87.5% of all returned to social activity. Postimplantation complications, including pacemaker malfunctions, electrode failure and abnormally electrical findings during pacing are investigated.

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