The Japanese Circulation Society and Japan Society of Medical Electronics and Biological Engineering organized a joint committee of the Committee on Artificial Cardiac Pacemakers in April, 1971, because long-term pacing of the heart for the treatment of various arrhythmias has been widely practised in Japan in recent years. It is a matter of medical and engineering interest, and of some urgent necessity to fix terminology and standards, to know how many patients throughout our country need pacemaker implantation, the natural history of heart block, and to promote medical and engineering progress in this field.

The following are some of the results on activity of the Committee.

I. Japanese Terminology and Standards on Cardiac Pacing and Pacemaker

To avoid confusion in the terminology, the second revised glossary of terminology with definition has been presented. Some terms, however, for example “external pacemaker” have not been fixed yet and are still in discussion.

Minimum requirements and standards on the implantable pacemaker are now under investigation in collaboration with the Japanese Ministry of Health and Welfare. (Terminology and standards will be reported separately from the Committee when fixed.)

It might be rightly said that the design of all pacemakers should be based on a simple, accurate and reliable correlation between battery depletion, component failure and changes of parameters, which could be easily checked. Also, all the data should be supplied by the manufacturer when a new model pacemaker is introduced.

II. Survey of Heart Block and Current Status of

<table>
<thead>
<tr>
<th>Medical Dept*</th>
<th>Surgical</th>
<th>Pediatric</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutions Required to Answer</td>
<td>233</td>
<td>144</td>
<td>26</td>
</tr>
<tr>
<td>Institutions Answered</td>
<td>121 (52%)</td>
<td>78 (54%)</td>
<td>10 (39%)</td>
</tr>
<tr>
<td>Number of The Patients</td>
<td>923</td>
<td>620</td>
<td>58</td>
</tr>
</tbody>
</table>

* Including Cardiac Dept.

Key Words:
- Artificial cardiac pacemaker
- Long-term pacing of the heart
- Chronic A-V block
- Adams-stokes syndrome
- Follow-up result of paced patients

Long-Term Cardiac Pacing in Japan

According to our national survey of “chronic high-degree A-V block” (chronic A-V block with the degree higher than II°, surgical A-V block persistent for more than one month, S-A block

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and sinus arrest complicated with Adams-Stokes syndrome and the cases in whom artificial pacemakers implanted), 1,601 patients were registered during the past 5 years in our country, among which 1,355 were subjected to this study and 610 pacemakers were implanted (Table I).

Of these cases, the groups of ischemic heart disease, undetermined and hypertensive heart diseases were the greatest (Figure 1). Mortality rate was the highest in the group of myocardial diseases, and that in congenital heart disease and ischemic heart disease followed.

The greatest ECG abnormality was complete A-V block with the mortality rate of 14%. The

* From Siddons and Souton: Cardiac Pacemakers, C. C. Thomas, 1967
highest mortality was 28% in intraventricular block and 18% in right bundle branch block plus left axis deviation (Figure 2).

Most patients had a history of Adams-Stokes syndrome, and in these, the highest mortality occurred in pediatric and elderly patients with high-degree A-V block and intraventricular block (Figure 3).

Heart failure was rather frequently seen in postsurgical and elderly patients as well as in patients with myocardial disease with the high mortality rate (Figure 4).

In 1969, there were only 1.6 new implants of artificial pacemakers per one million population in Japan, whereas there were 94 in Sweden, 40 in the United States and 30 in the United Kingdom (Table II). Until recently, a total number of new implants was approximately 1,000 in our country (as of April, 1972): 3 in 1963, 6 in 1964, 10 in 1965, 15 in 1966, 45 in 1967, 96 in 1968, 160 in 1969, 290 in 1970 and about 400 in 1971.
According to the national statistics, the approximate population over age 45 would be 30 million, and death rate from heart diseases would be 900 per one million, which figure must be one quarter of that of the United States. From this calculation and the result of our national survey, the incidence of heart block with bradycardia will be 1,500 per 100 million of the population of Japan each year, most of whom will be potential subjects for pacemaker implantation.

Most of the recently-implanted pacemakers were imported: 95% from the United States, not more than 5% from England and a few from other and our own countries, despite the fact that Japan is a developing and exporting country of electronics.

III. Results of Follow-Up of the Paced Patients

Our national survey could not make a conclusive comparison between the follow-up results with and without pacing. However, from a comparative study of the Heart Institute of Japan between the paced and not-paced patients, it might be concluded that long-term results of pacing with implanted units are quite satisfactory, significantly extending survival preventing Adams-Stokes attack, heart failure and psychophysical disability (Figure 5) and relieving cardiac causes of death.

Furthermore, the satisfactory aftercare of the paced patients and follow-up technology of the implanted pacemakers are contributing in improving the long-term results.

The detailed follow-up and comparative results of the paced and not-paced patients will be reported by the Committee in near future.

IV. Organization and Activity of the Committee

As of April, 1972, the Committee on Artificial Pacemaker consists of the chairman, secretary-general, two secretaries and 21 members, all who have been appointed by the Japanese Circulation Society and partly by the Japan Society of Medical Electronics and Biological Engineering. They are 10 cardiologists, 12 surgeons and 3 engineers (See names and affiliations listed at the end of this paper).

During the first year beginning in April, 1971, the Committee has held eight conferences. The subjects have been (1) Conduction disturbances following acute myocardial infarction, (2) Standards and terminology, (3) Experiences with pacing troubles, (4) Conduction system of the heart, (5) Treatment of arrhythmias by atrial stimulation, (6) Replacement criteria of the implanted pacemaker, (7) A-V block due to experimental ischemia and (8) Plutonium-238 fuelled nuclear batteries for pacemakers.

Under the Committee there are three subcommittees: Terminology and standards, National survey of high-degree A-V block and Telephone transmission and EDPS of pacemaker information. The first subcommittee is working with the Standard Bureau of Ministry of Health and Welfare and the third one is planning either local or centralized aftercare system of the implanted pacemaker utilizing telephone lines and EDPS working with the Nippon Telegraph and Telephone Public Corporation.

Names and Affiliations of the Members: Eiichi Kimura (chairman, Nippon Medical School), Motokazu Hori (secretary-general, Tokyo Women's Medical College), Toru Kobayashi (secretary, Toshiba Central Hospital), Hirotaka Ito (secretary, Nippon Electric Company), Masao Igarashi (St. Lukes International Hospital), Tadashi Inoue (Keio University), Takashi Iwa (Sapporo Medical College), Akihiko Uchiyama (Waseda University), Kiroku Oishi (Kurume University), Kanji Obayashi (Nippon Medical School), Chu-ichi Kawai (Osaka Medical College), Hisashi Komatsu (Toho University), Yoshifumi
Sakurai (Niigata University), Tasuku Shoji (Nippon Medical School), Kozo Suma (Tokyo Women's Medical College), Makoto Takagi (Kyoto Municipal Hospital), Atsuro Takeuchi (Osaka Medical College), Tatsuo Togawa (Tokyo Medical and Dental University), Kunitake Hashiba (Nagasaki University), Jun Hattori (Kanto Teishin Hospital), Koshichiro Hirosawa (Tokyo Women's Medical College), Saichi Hosoda (Tokyo Women's Medical College), Kiyoshi Machii (Mitsui Memorial Hospital) and Toshio Mitsui (University of Tokyo).