Pacemakers Move Ahead

Demand and nuclear-powered heart aids are beginning to poke over the horizon.

At least 15,000 people with unreliable hearts are wearing implantable pacemakers today—many of them driving cars or running for the bus on their way to a normal day's work.

A 70-year-old woman is doing her own washing in a Pennsylvania town after reporting that she was barely able to get around with a slow heart beat.

Heart block, in which patients often need to have their heart beats regulated with an artificial pacemaker, is caused by clogged arteries or by calcium deposits in the hearts of aging persons in whom nerves fail to trigger pumping heart muscles. This slows the heart down to 35 or fewer beats a minute instead of a normal 70, and there is danger of a person blacking out entirely.

Not all heart blocks occur in the elderly, but they are most likely in persons 50 years old or older. One condition helped by a pacemaker is Adams-Stokes disease, a condition in which the heart's atrial and ventricular chambers beat independently of each other leading to fainting or dizziness. Some heart blocks are caused by inherited heart disease, and pacemakers have been used in infants six months old.

At the recent meeting of the American College of Cardiology in Washington, D.C., a number of panel discussions and exhibits demonstrated differences in the various pacemakers now being manufactured:

- The asynchronous, which delivers timed electric shocks to heart muscles to cause them to contract and pump out the blood.
- The synchronous, timed with the heart's pacing.
- The intravenous.

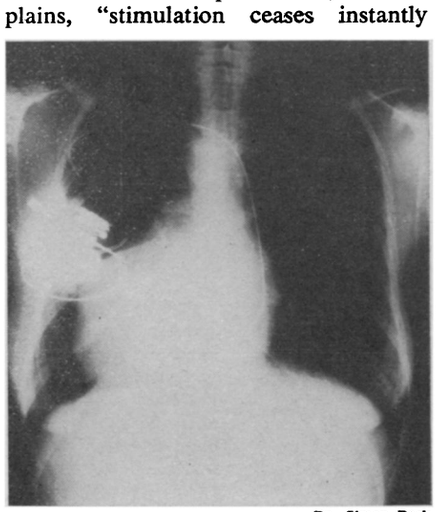
All of these devices, along with a newer variety called the demand or standby pacemaker, require a battery-run device under the skin or otherwise implanted.

The synchronous pacemaker takes its signal from the natural electric output of the upper chambers of the heart, and delivers its shocks painlessly to the lower, larger, pumping portion of the heart, thus closely imitating and pacing itself to the heart's own delivery system.

But there are times when another kind of demand must be met, and there is a research effort currently underway on the new "demand" family of instruments.

Barouh V. Berkovits, director of Research and Development of the Medical Division, American Optical Company, Waltham, Mass., has worked on the demand pacemaker with both Dr. Louis Lemberg of the University of Miami School of Medicine and Dr. Dwight E. Harken of the Harvard Medical School.

"In the demand pacemaker," he explains, "stimulation ceases instantly when a natural heart rate exceeds the present rate of the pacemaker. Stimulation is automatically resumed when the natural heart rate drops below the rate of the artificial pacemaker. In this way the danger of fibrillation or rapid or irregular heart beats is eliminated."



Dr. Simon Dack

Electrode threaded to heart.

After two years of evaluation on dogs in the laboratory, the first clinical implant of the Berkovits demand pacemaker was made last August, at Peter Bent Brigham Hospital, Boston, by Dr. Harken.

"It was used on a 39-year-old patient who had undergone previous open-heart surgery," Berkovits explains. "Heart block had occurred after the operation and had been treated by a continuous pacemaker outside the body. His own heart set up a pace that competed with the artificial pacemaker and called for a demand type that would turn off or on as needed to control the competition."

Berkovits says that some manufacturers, both in the United States and in Europe, "realizing the importance of the demand pacemaker, by-passed the lengthy lab evaluation and introduced their units for people earlier, but I

believe our long and careful evaluation in the dog lab was very important."

Because batteries in all forms of pacemakers have to be replaced at intervals of three years or even less, several researchers are working on pacemakers that could dispense with batteries. Dr. John H. Kennedy with a team of researchers at Western Reserve University, Cleveland, says the batteryless pacemaker is not yet ready for human use, but has been successful in animals. The latest version of the instrument has a diameter of 1.5 inches and could be applied directly to the sac around the heart called the pericardium.

Dr. Nicholas P. D. Smyth, chairman of the department of surgery, Washington Hospital Center, Washington, D.C., also has been working with an "epicardial electrode," which would not require the usual neck or chest surgery for pacemaker implantation.

"Although we plan to do some remodeling on the device, it already has been used in two patients. One of them was a 67-year-old diabetic housewife whose own heart-pacing device had begun to fail after 18 months."

Dr. Smyth and his co-workers reported their synchronous pacemaker lead in the March issue of MEDICAL ANNALS OF THE DISTRICT OF COLUMBIA. The Cordis Corporation of Miami, Fla., has produced this pacemaker with the aid of J. Walter Keller, electrical engineer.

The Atomic Energy Commission has awarded a contract to design and develop the world's first nuclear-powered heart pacer to Nuclear Materials and Equipment Corporation of Apollo, Pa. Power will be derived from the heat given off by the man-made radioisotope plutonium 238. This heat will be converted directly into electricity used to stimulate the heart to beat.

After testing the pacer on animals it is expected that it will be implanted in humans to maintain rhythmic beating of the heart for a mimimum of 10 years. Cordis Corporation of Miami will be NUMEC's principal subcontractor.

Among other companies producing various types of pacemakers are Medtronic Inc. of Minneapolis and General Electric Company's X-ray department in Milwaukee.

The first reported work on heart pacers was done by Dr. P. M. Zoll of Beth Israel Hospital, Boston, in 1952, but the first pacers were external.

The idea of internal stimulation was reported by Dr. C. Walton Lillehei of the University of Minnesota in 1957, and in 1960 Dr. William M. Chardack of the Veterans Administration Hospital, Buffalo, reported the first success-implantation.