
Letter to the Editor

Dear Editor:

I would like to offer a small addition to Dr. William Malette's interesting article on pacemakers in the Volume 12, Number 1, issue of the Journal. The years from 1956 through 1960 were filled with developmental activity on a great many fronts. I was most fortunate to witness work which was to have significant impact on pacing as a long-term therapy.

Electrodes were a horrendous problem. Either the wires fractured with stress or the resistance at the electrode/tissue interface, due to fibrous encapsulation, rendered them ineffective. It was virtually impossible to exceed 90 days of pacing.

In the Fall of 1958, Norman A. Roth, then an engineer with Medtronic, walked into our cardiac research laboratory, at St. Joseph's Hospital in St. Paul, with a new electrode. It was a block of silicone rubber with two "thumb tacks" sticking out of it and a length of wire trailing from one end. Norm felt that, by applying the pacing current directly to the myocardium, the resistance caused by encapsulation of the electrode surfaces could be lessened. Also, the bipolar configuration (ie, both electrodes in contact with the heart) and the close proximity between the two electrode "pins" (1.5 cm) would also aid in prolonging the effective longevity of the electrode.

Dr. Samuel W. Hunter, the cardiac surgeon who directed the laboratory, thought his argument had merit and attached a number of these electrodes to dogs. Every few days the resistance between the two poles was measured and every measurement was greater in ohms than the previous one. It looked as though the resistance problem was not to be solved.

Then, at about 3 to 4 weeks, it was discovered that the rate of increase in resistance had slowed considerably. In fact, it eventually leveled off and, under normal circumstances, rose no more! This was the breakthrough for which Hunter and Roth had hoped. Now to try it clinically.

Doctor's lounge conversation disseminated the news of Sam Hunter's work. Dr. Larry Noble who practiced at Bethesda Hospital, just across the St. Paul "loop"

from St. Joseph's, called Hunter on April 3, 1959. He told him he had a patient with a very slow heart rate who would "die" frequently. A blow to the sternum was required to reverse asystole and stimulate the heart to return to its bradycardic rhythm.

The following Saturday, April 4, 1959, our group descended *en masse* upon Bethesda Hospital. Transferring the patient from the Special Care unit to Surgery proved to be the more difficult aspect of the overall procedure. At every jostling, the patient's heart would stop and someone would have to reach over and whap the poor man on the chest.

Using general anesthesia, the right ventricle was exposed via a thoracotomy. Dr. Hunter recalls vividly the yellowish, cyanotic appearance of the heart and the dramatic change in color after the bipolar electrode had been stitched into place and the pacemaker turned on. The entire procedure took about 5 hours with the surgery frequently punctuated by periods of asystole and resuscitation efforts.

The patient, with his Hunter-Roth bipolar "patch" electrode and Medtronic Model 5800 external pacemaker, had begun his "paced life" (as he called it) at age 72. He survived this procedure as well as an auto accident, a stroke, and bouts with cancer and pneumonia. Seven years later, the electrode became only partially effective and its function was replaced with a bipolar endocardial catheter-type electrode. He refused to have an implantable pacemaker inserted because he wanted to change his own batteries. His paced life lasted for nine years.

During the first year or two, the patient was subjected to continuous scrutiny which he accepted graciously. Dr. Hunter received calls almost weekly from Dr. William Chardack for the first few months. Dr. Paul Zoll's colleague, Dr. Arthur Linenthal, studied the patient extensively on the first and second anniversaries of the implant. When Dr. Chardack inserted his first totally implantable pacemaker on April 18, 1960, it stimulated via a Hunter-Roth bipolar electrode.

The flaws in this electrode soon appeared. With both

electrodes attached to a rigid platform, the motion of the heart caused a groove to form about one or both of the "pins". This groove caused intermittent contact which could only occasionally be overcome by pacing at very high amplitudes.

Better electrodes were developed and soon the Hunter-Roth was a forgotten entity. But it had served a significant purpose. It had proved that life-long pacing is possible, that the resistance build-up at the electrode/tissue interface is finite, and that the work of dedicated people in a small lab tucked behind a community hospital can alter the course of medicine. It is an unfortunate fact of life that medical history is

filled with investigators like Hunter and Roth, acclaimed by none and remembered by only a few.

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