

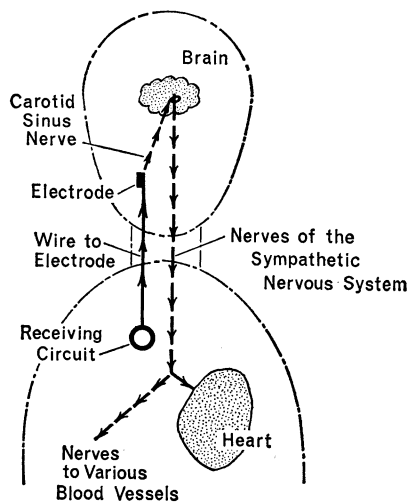
Blood Pressure on Demand

Device permits dial control for hypertension sufferers. A year's experience accumulated so far.

Twentieth century electronics, now rapidly invading so many areas of medicine, may be the answer to one of man's most relentless killers—hypertension, or severe high blood pressure. With a new type of "carotid sinus nerve stimulator," first used during 1966, a patient can dial and control his own blood pressure by means of a gadget worn on a belt around his waist.

Ordinary high blood pressure cases can be treated satisfactorily with certain drugs that have a pressure-reducing effect. But there are some patients on whom the drugs will not bring the pressure down to the necessary levels; and there are others, usually suffering from some additional ailment, whose system cannot tolerate pressure-reducing drugs. The electronic system of adjustable blood pressure reduction has been used with some of these more refractory patients with results described as "encouraging."

Doctors have long known that there are "receptors" in certain parts of the human body that, in effect, measure blood pressure and send signals to the brain to tell it when the pressure should be lowered. The fastest acting receptors, which seem to carry the burden of the pressure sensing, are located in the walls of the two carotid arteries, one on either side of the upper part of the neck. Signals from each of these receptors flow to the brain through a nerve called the carotid sinus nerve.



Thomas W. Hill

Control network for hypertension.

A few years ago it was found that blood pressure could be reduced by electrical stimulation of the carotid

sinus nerve. This was easy enough in the laboratory, but how could it be done with a living, walking human being?

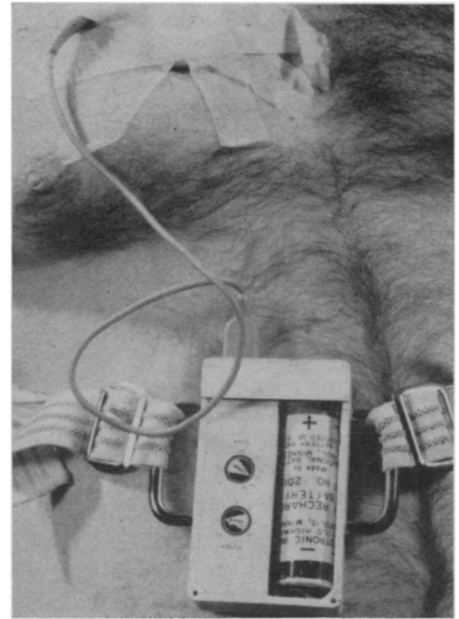
In the early attempts to accomplish this, medical scientists implanted a simple electronic stimulating device inside a patient's chest. A couple of wires connected this stimulator to the carotid sinus nerves on each side of the patient's neck. This early device worked, but doctors realized that it had one major drawback: once it was installed, there was no way of adjusting it to vary the amount of the stimulating pulse it would generate.

There were at least two reasons why variation of the electrical pulse was desirable. For one thing, a person's blood pressure may be different when he is lying down than when standing. If a fixed stimulus is used, adjusted to produce the right blood pressure for a patient when he is in bed, the patient can become weak and dizzy (because of too low a pressure) when he stands up. Secondly, if he should suffer a heart attack or stroke or have severe bleeding of any kind, the low blood pressure that usually follows such events might be pushed still lower by the fixed electrical stimulus, with results that could be fatal.

To take care of the above difficulties, medical scientists worked on the problem of developing a device that would allow the patient to adjust the amount of electrical stimulus and thus vary his own blood pressure at will. Early in 1966 the first externally adjustable carotid sinus nerve stimulator was implanted in a patient by a research team associated with the department of medicine and surgery, Mount Sinai Hospital and the department of medicine, Bronx Veterans Administration Hospital, New York. The members of the team were: Drs. John Tuckman, Theobald Reich, Alan F. Lyon, Berney Goodman, Eugene Friedman and Julius H. Jacobson II. Dr. Tuckman gave some details of this work in a paper he delivered at a recent scientific meeting of the American Heart Association.

During 1966 the research team performed this operation on ten patients. The equipment the doctors have been using consists of:

- An external battery-operated generator connected to an induction coil that is strapped or taped in place.



VA Hospital

Hypertension control device in place.

- A receiving circuit, implanted in the chest and connected by two wires to platinum electrodes in the neck which make connection with the carotid sinus nerves. The external generator produces 30 to 50 electrical pulses per second. These pulses, flowing through the coil on the outside of the chest, induce pulses in the implanted receiver in the same way that a current flowing through the primary of a transformer will induce a current in the secondary.

By turning a dial on the external generator, the patient can change the voltage of the pulses that stimulate his carotid sinus nerves. The range is from about 3 to 10 volts. Some models have additional dials that make it possible to change the number of pulses per second as well as the pulse width. Dr. Tuckman says they have found that the same frequency and pulse width can be used for all patients but individuals vary considerably in their sensitivity to voltage. Because of this—and to keep things simple and convenient for the patient—the generators now being supplied to patients have just one knob, the voltage adjustment.

Under normal operation these nerve stimulating devices cause the patient no pain, although he may get a mild tingling sensation at times. If he turns the voltage up too far he may get sensations of pain in the neck and teeth, caused by stimulation of some of the other nerves near those connected to the electrodes.

Dr. Tuckman stresses that this work must still be regarded as experimental. The results, on patients who have been observed for periods up to nearly a year, are encouraging.