SURGERY

Artificial Heart Sought

The search is on for a new synthetic material that is more compatible with its environment and will not cause the blood to clot, for the construction of artificial hearts.

➤ BEFORE a totally artificial heart can be substituted for a damaged one, scientists may have to develop a new kind of plastic material.

However, despite the technical problems involved, two polymer chemists from the Battelle Memorial Institute in Columbus, Ohio, predict that an artificial pumping organ could be developed in 5 to 10 years.

Instead of relying only on existing materials with their limitations, scientists can now design and modify plastic and plastic-like materials for specific uses.

With added research, a whole new series of synthetic materials with long-term resistance to the implant environment could be developed, reported Dr. Robert I. Leininger and Charles W. Cooper in the Battelle Technical Review, June 1965.

"A major barrier to such use of most materials, polymeric or otherwise, is their incompatibility with blood, or, more simply, the clotting effect," the scientists pointed out.

Scientists must be concerned with the effect of the plastic on the body and the blood as well as the effect of the host upon the plastic, they said.

For ideal performance, chemists Leininger and Cooper recommend three conditions for materials used in the human body or in artificial organs outside the body. The synthetic material must cause no adverse effects in blood or tissue; resist property changes that tend to result from exposure to the body environment; and possess the mechanical properties required for the intended application, including resistance to fatigue and sustained stress.

One new approach to the development of plastic and plastic-like materials for medical and surgical use is to conduct a fundamental study of the interactions between plastics and blood and blood components. If these interactions could be defined, the Battelle chemists note, it might be possible to design plastics or plastic surfaces that would either modify or prevent the interactions.

Another approach would be to extend the results obtained by Dr. Vincent Gott of the University of Wisconsin, Madison, who found that a plastic surface treated first with graphite and then with heparin is essentially nonclotting.

If a heparinized surface could be added to any plastic used in contact with the blood, Dr. Leininger and Mr. Cooper predict that more suitable plastics for artificial hearts, heart valves, arterial prostheses and membranes for use in heart-lung and kidney machines could be produced.

Research in this area is being conducted at Battelle-Columbus under the auspices of the National Heart Institute.

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ACOUSTICS

Detect Disease by Sound

➤ SOUND WAVES DIRECTED through the chest wall to the heart can aid in diagnosing heart disease, three Philadelphia researchers reported.

The sonar-like device that sends these waves to the heart has enabled scientists to define heart size and determine whether or not the chambers are enlarged.

Using this instrument, Dr. Bernard L. Segal, associate professor of medicine, Dr. William Likoff, professor and head of the cardiology section, and physicist Ben Kingsley, all of the Hahnemann Medical College and Hospital, Philadelphia, have also detected obstructions of heart valves, localized tumors in the heart, and calcium deposits.

The Hahnemann team told the 69th meeting of the Acoustical Society of America in Washington, D.C., that the method of using sound waves in diagnosis, called echocardiography, has enabled researchers to sonar-scan the aorta and diagnose aneurysms.

The scientists believe that echocardiography can be combined with an analysis of sounds to define the origin of heart murmurs.

The unique feature of echocardiography is its ability to display and photograph sonar echoes on a TV screen as well as record them on a direct writing device, the team reported. This writing instrument will also simultaneously correlate the information from heart sounds, murmurs and the electrocardiograph, they said.

The variety of echoes are produced by reflections from tissues of different density. Energy directed into the heart from the chest produces echoes on the upper wall and back wall of the heart—thereby defining its chambers. The continuous opening and closing action of the valves that control the blood flow in the heart are represented by fast-moving echoes.

The sonar instrument, when not connected to the writing device, is small, compact and portable. The scientists point out that it now supplements existing diagnostic tools such as the fluoroscope and X-ray. However, they believe that in future years echocardiography will be used as routinely as the portable electrocardiograph units.

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SURGERY

Atlas for Brain Surgeons Should Aid Treatment

➤ TWO BRITISH neurosurgeons are compiling an atlas for brain surgeons that is expected to improve the surgical treatment of Parkinson's disease, involuntary movement disorders and some mental diseases.

The atlas mathematically pinpoints the position of small, deeply placed brain nuclei, some of which are believed to be of significance in treating these disorders. The nuclei are groups of cells situated inside the thalamus of the brain, the groups varying in size from three or four millimeters to up to a centimeter in diameter.

One way to relieve suffering from Parkinsonism and some of the other disorders today is to destroy the action of a particular nucleus through brain surgery. Unfortunately, the different nuclei are not always in exactly the same place in the brains of different individuals and the operations are not always successful.

When the researchers' raw data and pictures are refined and published, the atlas will comprise more than 150 pages and could serve as a standard "road map" for brain surgeons.

"We can therefore expect greater accuracy in finding the correct nucleus, better results from the operations and less complications in the treatment of Parkinsonism, involuntary movement disorders, mental disease, intractable pain and one day perhaps epilepsy," said Dr. E. S. Watkins, one of the researchers.

Dr. Watkins is a member of the department of surgery at the New York State University Upstate Medical Center, Syracuse. The other investigator is Dr. John Andrew, consultant neurosurgeon at the North East Neurosurgical Regional Center at Romford, London, England.

Both surgeons have been studying this problem for the last five years. They studied 26 different brains, dissecting each one and using a special technique for marking the position of the nuclei in relation to certain reference points inside the brain, upon which surgeons depend to find the correct nuclear position for surgery.

The doctors used a specially built IBM 1620 computer to analyze the different positions of the nuclei and arrive at a mean figure for the average position and boundaries of each one of the 20 structures studied.

Dr. Watkins said the variability among all the nuclei was less than expected, some being found to vary in position by little more than a millimeter.

For example, one nucleus is known to play a part in rigidity and muscle tremor, two of the primary disabilities of Parkinson's disease. If this nucleus can be destroyed, a person with Parkinsonism may find relief from the rigidity and muscle tremor, but the operation is not a cure.

Involuntary movements, mental disease and perhaps epilepsy are other disorders which may benefit from surgery to the associated brain nuclei.

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