THIRTY-FIVE CENTS MAY 28, 1965

TIME

THE WEEKLY NEW

TOWARD AN ARTIFICIAL HEART

SURGEON MICHAEL DEBAKEY

HENRY KOERNER

VOL. 85 NO. 22
(REG. U.S. PAT. OFF.)

SURGERY

The Texas Tornado

(See Cover)

Heart disease is the top killer in the U.S. today, and strokes rank third, just behind cancer. But heart disease and strokes both develop from diseases of the arteries, and together they account for 75% of all U.S. deaths. The deadly statistics, contends Houston Surgeon Michael E. DeBakey, make cardiovascular (heart-artery) disease the most pressing problem of modern medicine.

Dr. DeBakey speaks with singular authority. Since 1948, the dexterous scalpel and deft needle of Baylor University's professor of surgery have operated on more than 10,000 human hearts and arteries. From the far corners of the earth the great and the humble have traveled to Texas to have Surgeon DeBakey patch up their arteries with Dacron or implant artificial valves of plastic and sophisticated alloys in their hearts.

DR. DeBAKEY & THE WINDSORS

A dexterous scalpel, a deft needle and Dacron.

To Dr. DeBakey went H.R.H. the Duke of Windsor to have a potentially fatal, grapefruit-sized aneurysm removed from his abdominal aorta (TIME, Dec. 25). And it was to Dr. DeBakey and Houston's Methodist Hospital that the TV producers of the U.S. and Europe turned a month ago when they wanted to let 300 million televiewers, aided by Comsat's Early Bird, watch an exquisitely delicate heart operation, with the surgeon literally holding a life in his hand. To Dr. DeBakey both Presidents Kennedy and Johnson turned when they needed a man to head committees and commissions to recommend means by which Americans can get the best of medical and surgical care when they fall victim to heart disease, strokes or cancer.

While admiring colleagues boggle at the versatility and variety of his accomplishments—the arterial-replacement surgery, the delicate work inside the heart, the bold approach to strokes—DeBakey races on toward more imaginative goals. Now from his busy laboratories comes the confident prediction that surgical skills may soon be equal to the ultimate achievement—the implantation in a human of an artificial heart.

Diet & Stress. His vast experience has left Surgeon DeBakey firm in the conviction that the various artery diseases have as many distinct causes as there are different kinds of fevers. He is sure that it will take long and painstaking research to pinpoint all those causes and find cures or preventives. He is sure that causes and cures will eventually be found, but he is frankly disappointed with the results so far.

Diet and cholesterol are still largely unknown quantities. "We have examined thousands of arteries that had been blocked by arteriosclerosis, and we have compared the cholesterol levels of these patients with those of normal, healthy people," he says. "We can find no consistent, significant relation between the cholesterol levels and the extent and severity of the disease." The effects of stress the pragmatic surgeon dismisses with characteristic scorn: "Man was made to work, and work hard. I don't think it ever hurt anyone."

DeBakey is deeply involved in the forward-looking research that may some day do away with the need for his surgical skills. "We can't stand by and wait for final answers," he says. "There are lives to be saved today, and future illnesses to be prevented."

Widened Horizon. The artery disorders for which DeBakey and his colleagues have devised ever more daring surgical procedures fall into two main classes: blockages and aneurysms. Blockages may be almost anywhere—in the greatest vessel of all, the aorta, in the coronary arteries embedded in the heart wall itself, in arteries leading to the legs, and in the carotid and vertebral vessels carrying blood to the brain (*see diagram, opposite page*). The brain itself, however, is the province of the neurosurgeons.

Blockages in coronary arteries may go undetected for years, or cause moderately disabling disease, then suddenly become total or near-total shutdowns and cause the type of heart attacks called coronary occlusions. The reaming out of such an artery ("endarterectomy") is impossible in most cases and immensely hazardous at best.

Partial shutdowns of the aorta are sometimes caused by narrowing ("coarctation"), which may be present from birth, but more often by the later development of obstructive deposits containing calcium and cholesterol. What is responsible for these deposits is one of the basic questions not yet answered. In this area, DeBakey's work first dealt with shutdowns in the abdominal section of the aorta, because there the big blood vessel could be clamped shut well beyond the point where arteries branch off to supply the brain. The lower part of the body could be deprived of its blood supply long enough to let the surgeons cut out the diseased section and replace it with knit Dacron tubing. When the heart-lung machine became a practical adjunct in surgery, the horizon was suddenly widened. It became possible to operate anywhere along the aorta, while the machine supplied blood continuously to the brain.

Clots & Strokes. Obstructions involving the iliac, femoral and popliteal arteries supplying the legs and feet are common, and may actually begin in the aorta just before it splits to form the two main iliac arteries. A familiar feature of insufficient blood supply to the legs, which causes pain in the calf muscles so acute that the victim can hardly walk, is its on-again, off-again nature. Ten days after DeBakey has bypassed the blocked artery with a length of tubing, the patient who previously could walk no farther than a city block without disabling pain can usually go a leisurely mile.

The most daring, and still somewhat controversial, of Dr. DeBakey's innovations is an operation on arteries leading to the brain; it is done to ease the effects of a stroke and to reduce the likelihood that the patient will have more strokes. Though some strokes are the result of hemorrhaging from burst arteries, the great majority are caused by clot shutdowns where the arteries are inside the skull and inaccessible. But Dr. DeBakey thinks that as many as 20% of the clots occur in the carotid and vertebral arteries, below the floor of the skull, where the surgeon can get at them through an incision in the neck.

Clotting in the carotids, as in the coronaries, results from narrowing of the vessels by atherosclerosis, the deposition of porridge-like material containing cholesterol and other complex chemicals. Again, though theories abound, no one knows the underlying cause of the process or how the sites of deposits are determined.

DeBakey did his first carotid endarterectomy in 1953. Ever since, he has been disappointed that the idea has been slow to catch on. One difficulty is that precise X-ray diagnosis, demanding great skill of the radiologist, is essential to show just which arteries are narrowed and where. Arteriography of this type is also highly uncomfortable, if not acutely painful, since the patients usually are fully conscious and only mildly sedated; partly because they must remain as cooperative as possible during the tests, partly to avoid the risks of anesthesia.

If only one of the four brainward arteries is involved, the operation is not too dangerous when done by skilled hands. But the risks increase if, as is often the case, two or even all four of the arteries are diseased. In any case, when an artery is exposed and clamped on each side of the diseased section, Dr. DeBakey has to slit it before deciding just what repair procedure will be best. It may be enough to ream out the atheromatous stuff from inside the artery. Afterward, however, simply to sew up the wound would make the artery narrower and increase the risk of a later shutdown. The reamed section must be made wider by stitching a patch of Dacron over the slit.

In many cases, the blood supply to the brain through other arteries is too tenuous for even one of them to be clamped shut for long. Then Dr. DeBakey has to install a temporary shunt of synthetic tubing while he works on the diseased section. If the blockage is too severe to be reamed out, DeBakey either leaves a permanent bypass in place or replaces the diseased section completely with a graft.

Up to the Arch. "Aneurysm," first used around A.D. 200, describes part of a vessel that has been "widened across." It remained buried in medical texts until DeBakey made it a household word. Aneurysms arise from two main causes: either an arteriosclerotic process, which weakens the artery wall, or a process by which two layers of the three-ply wall separate and blood forces them farther apart. Doctors call this second class "dissecting" aneurysms. Aneurysms are also classified by shape: saccular (like a bag) or fusiform (spindle-shaped). The saccular is likely to be on only one side of an artery, while the dissecting is usually fusiform and surrounds it.

Beginning in 1949, Dr. DeBakey diagnosed many aneurysms among aged veterans and charity patients—but usually at autopsy, for the disease was almost always fatal. Working with Dr. Denton A. Cooley, DeBakey decided that something could be done about the problem if the artery could be strengthened with a synthetic wrapping—or, better still, cut out and replaced. Freeze-dried calves' arteries and segments of human arteries taken from accident victims were tried, but grafts of Dacron tubing proved to be the answer.

Steadily, the Baylor surgeons worked their way up from simpler and more accessible aneurysms in the abdominal cavity. The advent of the heart-lung machine had the same stimulating effect on aneurysm surgery as it had on arterial obstructions: it made possible the removal of diseased sections of the aorta in the chest cavity, in and around the aortic arch, near where the arteries branch off to the arms and head. The Duke of Windsor's case was typical of the more manageable abdominal type, although his aneurysm proved to be larger than expected.

Perhaps the most forbiddingly difficult of DeBakey's aneurysm cases involved a man of 38 with a dissecting aneurysm that began in the chest cavity above the diaphragm and had not only grown in width but had also extended downward through the diaphragm, making a wide split where there is normally a tight fit. Worse still, the splitting of the arterial walls extended into parts of four branch arteries—the two renals, supplying both kidneys; the mesenteric, supplying much of the intestines; and the celiac, supplying the stomach, liver and spleen. Using a graft with six connections, Dr. DeBakey replaced the entire assemblage of arterial piping.

Triple-Play Team. Surgeon DeBakey performs such intricate operations so often that he seems to be supplied with inexhaustible energy. His 20-hour day begins before dawn, when he tackles the paper work in his den at home. His first chore at the hospital starts at 7 a.m., when he checks three adjoining operating rooms to make sure they have all been set up in accordance with orders worked out with his two chief assistants, surgeons Dr. H. Edward Garrett, 38, and Dr. Jimmy Frank Howell, 32. A typical day's schedule reads:

ROOM 3
Mrs. A.B.—mitral commissurotomy, with pump stand-by
Mr. C.D.—right carotid endarterectomy
Mr. E.F.—left carotid endarterectomy

ROOM 4
Mrs. G.H.—aortic valve replacement, with pump
Miss I.J.—mitral valve replacement, with pump
Mr. K.L.—right carotid endarterectomy

ROOM 5
Mr. M.N.—aneurysm of abdominal aorta
Mr. O.P.—right femoral-popliteal bypass; right lumbar sympathectomy
Mr. Q.R.—renal artery bypass

Surgery begins at 7:30, and in what