Hope for the Heart: Advances in Treatment

Today two-thirds of people survive their heart attacks, thanks to medical advances. Learn how some of these medical marvels evolved.

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WebMD Feature

In the late 1950s, when Douglas James, MD, was studying medicine at Harvard, it was still the Dark Ages of heart disease treatment. The rate of coronary deaths in the U.S. was steadily rising, and physicians had little practical wisdom for students like James as to how to save heart patients' lives.

"It was something that you knew about and you didn't do anything about," says James, an associate professor and former chief of cardiology at Dartmouth Medical School in Hanover, N.H.

"We used a lot of morphine and kept people comfortable," he says.

What a difference a half century makes. Doctors now have many marvelous tools on hand to keep an ailing heart pumping, and the death rate from coronary disease continues the steep slide it started after peaking in 1963.

Yet it would be hard to point to one breakthrough that deserves all the credit for the improved standard of care we have today. Every innovation has built on another before it, and often the innovators have been ridiculed for breaking with tradition. It has been a slow and difficult climb towards the relatively enlightened era of 21st-century advances in treating heart disease.

One early pioneer was a doctor named Werner Forssmann. In 1929, as a surgical resident at a small country hospital in Germany, Forssmann became interested in delivering medicine directly to the heart through a catheter. He performed the first experiment on himself, pushing a catheter through a vein in his arm and into his heart. He then walked down to the hospital's basement and took an X-ray picture to prove that the catheter was in there. In other experiments, he used a catheter to inject contrast dye into the heart so it could be more clearly seen on X-ray film.

Many in the medical community were outraged by Forssmann's work, presumably for its daring nature, and he shrank from doing any more research. Others seized upon his idea, however, and used catheters to measure pressures and oxygen levels within the heart, which filled big blanks in science's understanding of how the heart pumps blood, and how disease affects its function. In 1956, Forssmann shared a Nobel Prize with Dickinson Richards and Andre Cournand, doctors at New York Hospital who studied heart function using catheters.

Clot Busters to Prevent Heart Attacks

The full significance of what Forssmann did in 1929 was not realized until the mid-1970s, when Marcus DeWood, MD, of Spokane, Wash., began to use angiography, a procedure based on Forssmann's techniques, to look at blockages in the arteries of heart attack victims. At the time, conventional wisdom held that heart attacks were merely the last gasp of a dying heart, and that they couldn't be reversed once in progress. DeWood's research on coronary blockages was widely derided.

But challenging entrenched ideas by constant scientific inquiry is an essential driving force behind every medical marvel. "Once you actually start looking at stuff, it changes your understanding; your insights change, and what you can do changes," James says.

In 1980, DeWood published data showing that in virtually every heart attack observed by angiography, there was a clot blocking an artery.

"This was a revolutionary change in cardiology," says Jon Resar, MD, director of the Adult Cardiac Catheterization Laboratory at Johns Hopkins University School of Medicine in Baltimore, Md.

At that point, doctors realized that clot-busting medicines, which had been around in various forms since the 1930s, might save lives when given immediately after a heart attack. Now it was known that during a heart attack, a clot starves part of the heart of oxygenated blood, causing the muscle to die. The longer it lasts, the more damage is done. If the clot can be broken up quickly, less heart tissue dies, and you have better odds of survival.

Clinical trials on clot-busting drugs followed, which sought to find out if survival improved when they were used in treating heart attacks. "The improvement was quite pronounced," Resar says.

The best clot buster available in the early 1980s was streptokinase, a drug made from a bacterial culture. But drug companies soon got to work on making "designer" clot busters. In 1987, the FDA approved the first of the next-generation drugs, called tissue plasminogen activator (tPA), for dissolving coronary clots after heart attacks. In 1996, the FDA approved tPA for treating stroke.

Although tPA is no doubt a lifesaver, current medical opinion holds that the best treatment for a heart attack is angioplasty, a procedure in which a catheter with an inflatable segment is pushed through to the blocked artery, and inflated to break up the clot.

Andreas Gruentzig, MD, of Zurich, Switzerland, performed the first angioplasty in 1977, on a patient with stenosis, a condition in which an artery is narrow and hardened. After DeWood's findings, doctors quickly picked up angioplasty as a tool for intervening in heart attacks.

In addition to angioplasty, doctors now insert a mesh tube, called a stent that holds the artery open. Very recently, stents have been coated with a polymer that releases a drug to prevent scar tissue from forming in the artery and causing it to clog, which had been a major problem with them.

Today, many hospitals are equipped with "cath labs" where a specialized team can immediately do angioplasty and put in a stent when a heart attack victim arrives. ERs and clinics without these facilities use clot-busting drugs.

A Lifesaving Shock to the Heart

As technology generally gets more sophisticated, so, too, does medical treatment. The story of the implantable cardiac defibrillator (ICD) really begins with experiments in electricity at the turn of the last century. By the early 1970s, electrical engineering was an advanced science, and doctors had begun to tap the potential of electrical devices for treating heart disease.

Michel Mirowski, MD, had lost a dear friend to sudden cardiac death, caused by an arrhythmia, or abnormal heart rhythm. He was determined to develop an implantable device that could correct potentially fatal arrhythmias before the patient was even aware of a problem. With colleague Morton Mower, MD, he approached Stephen Heilman, MD, at a company called Medrad in Pittsburgh, to carry out the research and make a commercial product.

"Having the idea and actually making a practical device are two different things," says Alois Langer, PhD, an electrical engineer who joined the team in 1972, with a freshly minted degree from MIT. He was charged with figuring out how to build the ICD the medical doctors envisioned.

Pacemakers that keep a slow heart beating normally had already been in use for years. But no one had attempted to make an automatic, implantable defibrillator, which would shock the heart out of an abnormal rhythm like ventricular fibrillation. In ventricular fibrillation, the regular electrical impulses of the heartbeat get disorganized, ventricles flutter chaotically, and the heart doesn't pump blood. It is fatal in minutes or even seconds.

Many doctors were skeptical, even hostile, to the idea, so Mirowski's team experimented and tinkered with their device

for nearly a decade before attempting a human test. "We weren't getting a lot of support from the medical community," Langer says, somewhat understating the opposition.

"At the time, this was a very radical approach," Resar says. Most doctors thought that drugs then available were adequate for controlling arrhythmias, and that an implantable defibrillator was not only improbable but also unnecessary.

In 1980, at Johns Hopkins University Hospital, the prototype ICD was implanted in a patient. It was roughly the size and weight of an iPod or pager, placed in the abdomen with wires running up to the heart.

Langer says two prototypes were made, just in case someone dropped one on the floor. "The first one really did get dropped," he says.

After the device was in, the researchers had to test it, which meant purposely inducing ventricular fibrillation in the patient. Having done so, they waited for the device to switch on and shock the heart back into a normal rhythm. "That seemed like an eternity," Langer says, as the seconds ticked by. But it worked.

"The first indications for use were fairly strict," Langer says. To qualify for an ICD, you had to have experienced sudden cardiac death and been resuscitated. Today, the devices are used much more broadly, and they're a lot smaller. People with heart failure routinely get them. Vice president Dick Cheney has one.

Langer moved on from ICDs to found Cardiac Telecom Corporation, where he developed a telemetry system that keeps track of a heart patient's vitals at home, and alerts doctors or calls an ambulance if something goes wrong.

An Ounce of Prevention Still Best for Heart

Although medicine has come a long way from what James calls "the bad old days" of the late 50s and early 60s, he says it's still a fact that, "the vast majority of the heart disease that we're treating is unnecessary."

For those with access to top-notch cardiac care, it's too easy to think that when we have our inevitable heart attacks, the docs will be able to fix us up and send us home. But prevention -- by diet, exercise, quitting smoking, and taking cholesterol-lowering drugs if needed -- is still most important.

James recalls hospital wards full of people stricken by polio who breathed with the help of huge ventilators known as iron lungs. Most heart disease, like polio, is now preventable, he says. Focusing exclusively on treating end-stage heart disease is like "working on the technology so you could walk around with your ventilator instead of developing the vaccine."

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