

Physician Notes

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Thirty Years of Breakthroughs in Cardiovascular Medicine
AT THE MEMORIAL HERMANN HEART & VASCULAR INSTITUTE-TEXAS MEDICAL CENTER PG. 9



Thirty Years of Breakthroughs in Cardiovascular Medicine

When Virgil Mott agreed to be the first patient at Memorial Hermann-Texas Medical Center - and one of the first in the country - to participate in a nationwide clinical trial testing the then-experimental thrombolytic drug streptokinase, he was unaware of the impact his decision would have on the countless patients who received the lifesaving therapy following FDA approval. The date was August 3, 1980, and physicians across the country were still uncertain whether opening the occluded arteries of heart attack patients would benefit them in the long run.

Numerous other clinical trials followed, and the experience of thousands of patients proved that hypotheses formulated by cardiologists at

Memorial Hermann-TMC were correct: the administration of intracoronary fibrinolytics such as streptokinase, urokinase and, later, tissue plasminogen activator (tPA) significantly lower mortality and morbidity rates associated with acute myocardial infarction (MI). Thirty years later, Mott is still going strong at the age of 88, and for the second consecutive year *U.S. News and World Report* ranked the Memorial Hermann Heart & Vascular Institute-TMC among the top 50 hospitals in the nation for heart care and heart surgery in its "Best Hospitals" issue.

"Memorial Hermann-TMC and The University of Texas Health Science Center at Houston (UTHealth) Medical School have long been home to

pioneers in cardiovascular medicine," said K. Lance Gould, M.D., who was recruited to the hospital in 1979 to run the cardiovascular medicine program and is now executive director of the Weatherhead PET Center and Martin Bucksbaum Distinguished Chair of Cardiovascular Medicine at UTHealth Medical School. "Many ideas were generated here 10 to 15 years before they were accepted by the cardiovascular community. Our physicians and scientists discovered fundamental concepts about the pathophysiology of coronary artery stenosis that led to more discoveries and greater innovations - including clinical applications in coronary clot-busting, the development of the first

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heart PET center, new knowledge about reversing coronary heart disease and very advanced work on entirely new ways of analyzing myocardial perfusion images as a guide to decisions about which patients will actually benefit from bypass surgery and stents.

“What really makes us stand out from other tertiary heart programs is the environment here, which is very supportive of innovation,” he said. “That support has allowed us to recruit innovative physician scientists recognized worldwide, and over the years they have put us on the map.”

One of those physicians, Richard Smalling, M.D., Ph.D., published the largest early series of clot-busting study results in the country and drew

conclusions that larger randomized clinical trials later confirmed. In 1980, he was recruited to direct Interventional Cardiovascular Medicine at the hospital, a position he holds today. In a 1981 article that appeared in the *American Journal of Cardiology*¹, Dr. Smalling, Dr. Gould and other authors from Memorial Hermann-TMC presented their observations about the effects of reperfusion on left ventricular performance following intracoronary infusion of streptokinase in patients with acute MI. Related articles followed in *American Cardiology*² in 1981 and the *American Heart Journal*³ in 1982. In 1983, a landmark publication in *Circulation*⁴ demonstrated dramatic improvements in ventricular function with intracoronary streptokinase.

“We later participated in the first pilot trial of intravenous tPA for the treatment of acute MI and subsequently showed that you could administer IV tPA and achieve similar results to streptokinase, which led to the notion that we might be able to begin treating heart attack patients before they arrived in the cath lab,” said Dr. Smalling, who holds the James D. Woods Distinguished Chair in Cardiovascular Medicine at UTHealth Medical School. “This hypothesis expanded the possibilities for treating MI significantly and led to the PATCAR protocol and further clinical trials that advanced the quality of care we provide.”

By 2002, the Institute was working with the Houston Fire Department’s EMS units to transmit ECG results from the field. “We developed protocols for transmitting results directly to our emergency center and for ordering paramedics to give thrombolytics to the appropriate patients,” said Dr. Smalling. “We trained paramedics to interpret 12-lead ECGs. They trained others, and we created a built-in feedback system to report outcomes. The process was formalized into the PATCAR trial, and our door-to-balloon time very quickly went from the former Joint Commission standard of 120 minutes to an average of 60 minutes. Through continual updates and the sharing of data between paramedics, emergency physicians and interventional cardiologists, we created the systems we had to have in place for fast response to heart attack.”

While Dr. Smalling was developing the interventional cardiology program, Dr. Gould turned his attention to building the world’s first cardiac PET center. “The PET scanners available at that time had the capacity to image only slices of the heart,” he said. “Working with physicists, we designed and built the first full-heart PET scanner. It later was propagated into four more



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generations of scanners, one of which we have today at the Weatherhead PET Center.”

With better imaging quality and whole-heart capability, Dr. Gould’s team suddenly found themselves identifying patients with coronary artery disease who were asymptomatic. In response, they developed a vigorous dietary and medication treatment regimen that relieved pain, partly reversing existing disease and preventing additional vascular conditions, heart attacks, sudden cardiac death and the need for balloon dilation or coronary bypass surgery. In 1994, Dr. Gould’s team published the first paper demonstrating improved coronary blood flow by quantitative PET measurements with intense short-term treatment⁵. A separate study was published in the *Journal of the American Medical Association* the following year⁶.

“I focused on PET because I knew that if we did it right, we could select candidates for surgery much more accurately based on coronary flow reserve capacity than by determining percent stenosis on arteriogram,” he said. Research led by Dr. Gould at the Weatherhead PET Center has been

featured on the covers of four medical journals: the *Journal of the American College of Cardiology* in 2003, *The Journal of Nuclear Medicine* in 2007, *JACC Cardiovascular Imaging* in 2009 and *Molecular Imaging* in 2010.

In 2009, Dr. Gould and interventional cardiologist Stefano Sdringola, M.D., began the Century Health Study, which will enroll and follow 1,300 patients over five years. “Heart disease does not have to progress,” said Dr. Sdringola, who holds the Weatherhead Distinguished Chair of Heart Disease and is associate director of the Weatherhead PET Center and principal investigator of the study. “We can stop the disease in 90 percent of patients. Through the Century Study, we’re working to enhance the medical community’s overall approach to cardiovascular disease by prevention through patient education. Our long-range goal is to reduce the cost of cardiovascular care through more accurate diagnosis and a focus on prevention, as well as providing physicians with quantitative coronary blood flow as the best guide for invasive procedures.”

“We couldn’t do what we’ve done here anywhere else in the country,”

Dr. Gould says. “Right now, we have the largest database in the world measuring coronary flow reserve capacity - 1,700 patients. We’re using PET imaging as a guide to elective heart procedures for assessing heart attack damage and selecting patients for procedures based on flow measurements rather than percent stenosis, which is what most cardiologists use.

“These are rolling innovations that are changing the way we practice cardiovascular medicine,” he said. “No heart center in the world has this documented range of innovation in a comprehensive approach to coronary artery disease. Advances like these are rooted in the magic of new ideas, an enormous amount of public and private grant support and the drive to advance and improve care. I’m still amazed at what we’ve accomplished. It’s like you’re driving in a race in unknown territory and see the next hill and wonder what’s over it. When you reach the other side, you find more ways to save hearts and more knowledge that changes the way physicians practice cardiovascular medicine - if they can keep up with you.” ♦

1: Reduto LA, Smalling RW, Freund GC, Gould KL. Intracoronary Infusion of Streptokinase in Patients with Acute Myocardial Infarction: Effects of Reperfusion upon Left Ventricular Performance. *Am J Cardiol*. 1981;48:403-409.

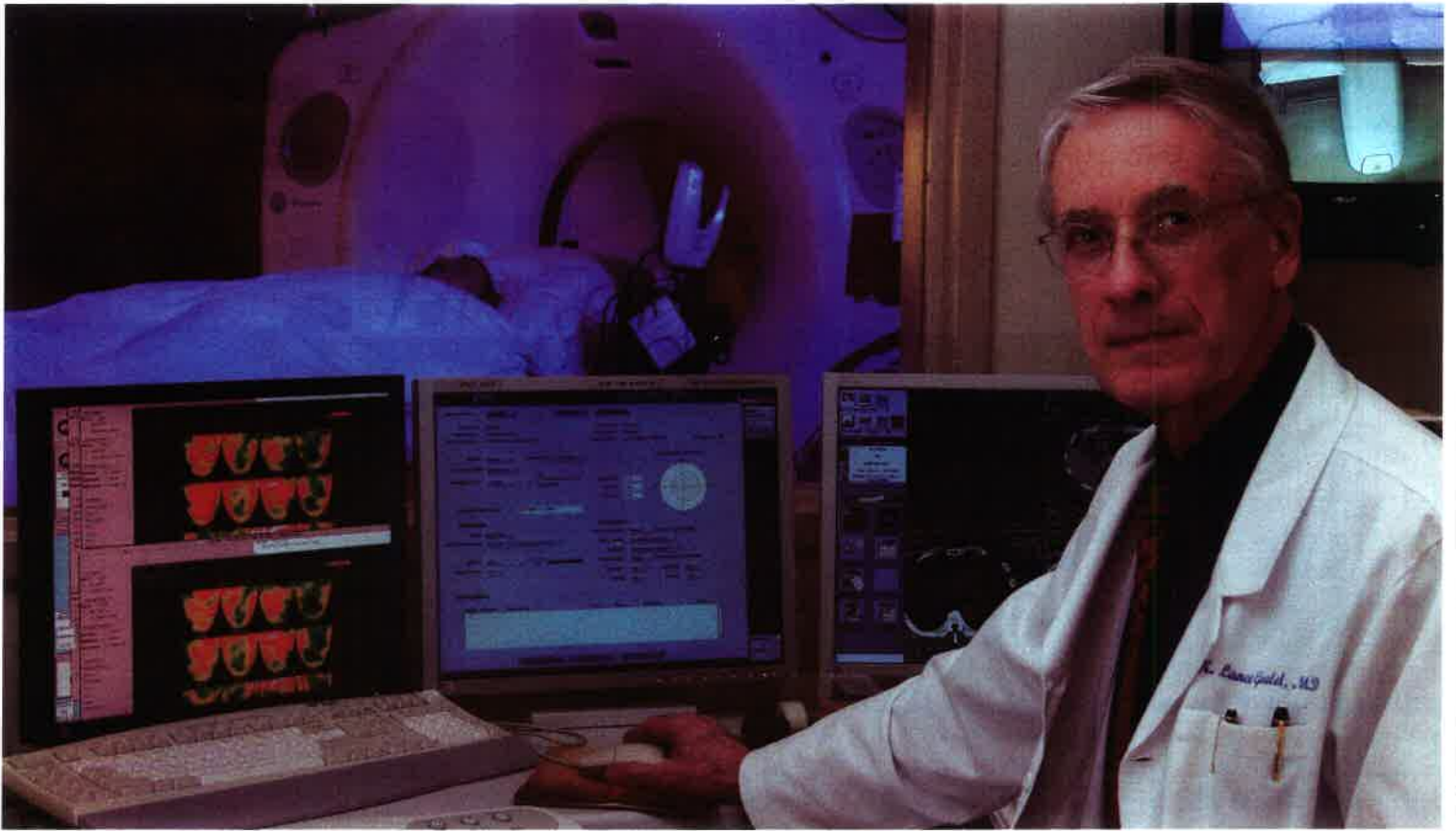
2: Reduto LA, Freund GC, Gaeta JM, Smalling RW, Lewis B, Gould KL. Coronary Artery Reperfusion in Acute Myocardial Infarction: Beneficial Effects of Intracoronary Streptokinase upon Left Ventricular Performance. *Am Heart J*. 1981;48:403-409.

3: Smalling RW, Fuentes F, Freund GC, Reduto LA, Wanta-Matthews M, Gaeta J, Walker W, Sterling R, Gould KL. Beneficial Effect of Intracoronary Thrombolysis Up to 18 Hours After Onset of Pain in Evolving Myocardial Infarction. *Am Heart J*. 1982;104:912-920.

4: Smalling RW, Fuentes F, Matthews MW, Freund GC, Hicks CH, Reduto LA, Walker WE, Sterling RP, Gould KL. Sustained Improvement in Left Ventricular Function and Mortality by Intracoronary Streptokinase Administration During Evolving Myocardial Infarction. *Circulation*. 1983;68:131-138.

5: Gould KL, Martucci JP, Goldberg DI, Hess MJ, Edens RP, Latifi R, Dudrick SJ. Short-term cholesterol lowering decreases size and severity of perfusion abnormalities by Positron Emission Tomography after dipyridamole in patients with coronary artery disease. *Circulation*. 1994;89:1530-1538.

6: Gould K, Ornish D, Scherwitz L, Brown S, Edens RP, Hess MJ, Mullani N, Bolomey L, Dobbs F, Armstrong WT, Merritt T, Ports T, Sparler S, Billings J. Changes in myocardial perfusion abnormalities by positron emission tomography after long term, intense risk factor modification. *JAMA*. 1995;274:894-901.



Innovations

AT THE HEART & VASCULAR INSTITUTE

The Memorial Hermann Heart & Vascular Institute-Texas Medical Center was the first in the world to show that heart disease can be reversed, the first in Texas to give patients thrombolytics, the first in Texas to offer cardiac risk screening designed specifically for women and the first in Houston to perform minimally invasive surgery to correct atrial fibrillation. Lifesaving heart attack treatments developed by physicians at the Institute have reduced the average time it takes to open occluded arteries and restore blood flow to the heart to well below the Joint Commission standard, saving lives and reducing damage to the heart.

The innovations include: ∨

- Memorial Hermann-Texas Medical Center was the first in Texas to administer thrombolytics for acute myocardial infarction and the first in the country to establish a cath lab offering thrombolytic therapy 24/7.
- We are known for our expertise in valvuloplasty - insertion of a special balloon into a narrowed mitral valve - that may delay surgery in mitral stenosis patients for eight to 10 years.
- Our PATCAR protocol reduces the time to treat heart attack patients with lifesaving thrombolytic drugs plus coronary angioplasty, making us one of the city's top hospitals in short door-to-balloon times.
- We were one of 40 clinical sites in the United States for the trial of the Tandem Heart Left Ventricle Assist Device, which provides circulatory support during high-risk coronary procedures, decreasing stress on a damaged heart.
- The first PET scanner capable of imaging the entire heart was developed at the Weatherhead PET Center for Preventing and Reversing Atherosclerosis in 1979, and PET imaging remains the most accurate technology for identifying early or advanced blood flow abnormalities in the heart, including minor changes caused by early coronary artery disease.
- In electrophysiology, our innovative use of minimally invasive maze surgery has a high success rate in stopping atrial fibrillation, allowing patients to return to work in a few days, compared to four to six weeks for the traditional open-heart maze procedure.
- The Heart & Vascular Institute-TMC is the only hospital in Houston and one of only three in Texas chosen to participate in the nationwide Endovascular Valve Edge-to-Edge Repair Study, or EVEREST II, investigating the minimally invasive Evalve® Cardiovascular Valve Repair System for the treatment of mitral regurgitation (MR).
- Research at the Weatherhead PET Center has shown that an intense program of cholesterol-lowering medications and lifestyle change reduces the risk of death or heart attack and the need for angioplasty or bypass surgery by 80 to 90 percent in patients identified with early, asymptomatic coronary artery disease, compared to patients not participating in the program.
- For patients with refractory congestive heart failure, we offer atrial synchronized biventricular pacemaker therapy or cardiac resynchronization therapy (CRT), an innovative new treatment for patients whose disease has progressed.
- Our Minimally Invasive Valve Program is unique in Houston in its primary focus on less-invasive approaches to valve surgery.
- Our surgeons are renowned for their skill in thoracic abdominal aneurysm (TAA) repair, one of the most extreme surgeries the body can tolerate. Surgical methods used by the Heart & Vascular Institute-TMC team since 1992 have dramatically reduced the incidence of paralysis following TAA repair from 16 percent to less than 2 percent. ♦