K. Lance Gould, MD (born October 28, 1938)

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In 1991, Dr. K. Lance Gould published his seminal book ''Coronary Artery Disease.''[1] The first section of the book describes the anatomic and physiological characteristics of coronary artery stenoses, and the second section describes the use of PET myocardial perfusion imaging to visualize and quantitate the regional distribution of myocardial perfusion and coronary flow reserve. The book summarizes Dr. Gould's then 20 years of clinical experience and the results of meticulous experimental and clinical research of coronary artery stenosis pathophysiology.

Dr. Gould was an early advocate of cardiac risk factor modification. He collaborated with Dr. Dean Ornish in a five-year study of patients with moderate-to-severe coronary artery disease. Patients were randomized to either risk factor modification by low-fat vegetarian diet, aerobic exercise, and stress management, or to usual antianginal care.[2] After 5 years of follow-up, dipyridamole PET imaging demonstrated a decrease in size and severity of myocardial perfusion abnormalities after risk factor modification, compared to worsening of perfusion defects after usual care.

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The basis of this work was laid in Seattle in 1974 in a series of landmark studies by Dr. Lance Gould and his colleagues Drs. Glen Hamilton, Kirk Lipscomb, James Ritchie, and Ward Kennedy.[3,4] They demonstrated that the physiological significance of coronary artery stenoses is revealed during hyperemia induced by intracoronary injection of Hypaque 75. Patients with moderate coronary stenosis and normal resting myocardial perfusion developed regional heterogeneity of perfusion during hyperemia. Dr. Gould recognized that functionally significant coronary artery disease (CAD) is characterized by reduced coronary flow reserve. Dr. Gould then validated the use of pharmacological vasodilators such as dipyridamole and adenosine.

Today, of the millions of radionuclide myocardial perfusion imaging procedures performed around the world, about one-third are performed with pharmacologic vasodilation.

Dr. Lance Gould was born in 1938 in Wilsonville, Alabama.

His father was a family doctor in rural South Alabama. His mother, a PhD in Architectural History, provided home schooling and elementary education for Lance, his brother, and sister. As a 9-year-old boy, Lance accompanied his father on house calls. During these trips, his father would talk about medicine and discuss his approach of treating patients with heart disease. He encouraged his patients to follow a low-fat diet and engage in physical activity, convinced that this preventive regimen would reverse heart disease. These early lessons made an impression on Lance and impacted his professional life as a physician-scientist.

Lance attended Oberlin College (Oberlin, OH) where he graduated in 1960 with a BA in physics. In college, Lance was more interested in physics than in medicine. However, after taking a course in biology during his senior year, he changed his mind and applied to medical school. Lance was accepted to Case Western Reserve Medical School in Cleveland, OH (1960-1964). With his background in physics, Lance's interest was drawn to the physiology of the coronary circulation, its fluid dynamics, and pressure-flow equations.

After medical school, Lance had a residency in internal medicine at the University of Washington School of Medicine in Seattle, WA (1964-1967). After two years of service with the U.S. Epidemic Intelligence Service in Hawaii, Lance Gould returned to Seattle for a fellowship in cardiology under Dr. Robert Bruce, the developer of the treadmill stress test, in the Veterans Administration Hospital (1968-1970).

During his cardiology training, Dr. Gould realized that resting coronary blood flow was often preserved in spite of severe angiographic coronary artery stenosis. Only with near complete coronary occlusion would resting blood flow decrease. He sensed that the functional importance of less-severe stenoses may only become apparent when increased coronary blood flow was required.

After completion of his cardiology fellowship, Dr. Gould was able to pursue his interest in experimental coronary physiology as an Assistant Professor (1972) with a VA Career Development Award (1971-1977). During those years, he systematically researched basic concepts of coronary flow responses in instrumented animals and in clinical investigations.

His seminal research was published as a series of eight integrated original articles (1974-1979). Dr. Gould discovered that the physiologic severity of a coronary artery stenosis can be quantified by measuring coronary flow reserve (CFR) (1974[3], 1978). Downstream of functionally significant stenoses, CFR was blunted. He also noted that during physical exercise, coronary blood flow increased only two times resting level, whereas with pharmacologic coronary vasodilation flow increased 4-5 times resting flow (1978).

Gould recognized the potentially important quantitative and visual implications for Thallium-201 myocardial perfusion imaging. Dipyridamole vasodilation provided quantitatively better image quality with higher count density. Dr. Gould subsequently proposed the clinical methodology of Thallium-201 pharmacological stress imaging. The first promising clinical trial with IV dipyridamole for detecting coronary artery disease was reported in 1978.[5] (note: The FDA approved dipyridamole for clinical use only in 1991).

Dr. Gould postulated three requirements for detection of mild coronary stenoses by radionuclide pharmacologic stress imaging: 1. a potent agent for coronary vasodilation, 2. a myocardial imaging agent that accumulates linearly in proportion to coronary flow at flow rates up to 4-5 times resting level, and 3. tomographic cross-sectional myocardial imaging for better spatial resolution (1978). Since Thallium-201 did not meet the second requirement, Dr. Gould explored Ammonia N-13 PET imaging in collaboration with Drs. Heinz Schelbert, Michael Phelps, and Edward Hoffman (UCLA). Preliminary results in chronically instrumented intact dogs showed that mild coronary stenoses (47% or greater) could be detected by N-13 PET imaging after dipyridamole vasodilation (1979).

In 1976, Dr. Gould was promoted to Associate Professor at the University of Washington. After winning the von Hevesy Award, he was recruited in 1978 by the University of Texas Health Science Center in Houston, TX as Professor of Medicine and Chief of Cardiology. He agreed on the condition that the university would find support for a PET imaging laboratory. In 1979, Dr. Gould moved to Houston as the Founding Director of the Positron Diagnostic and Research Imaging Center.

Once the laboratory had become operational, Dr. Gould investigated, using quantitative coronary angiography and experimental stenoses as references, the value and limitations of CFR and its correlation with fractional flow reserve (FFR) with Dr. Nico Pijls of The Netherlands (1993).

Lance Gould has received continuous NIH grant support from 1961 to 1997.

With his collaborator Dr. Nils P. Johnson, Dr. Gould developed the concept of Coronary Flow Capacity (CFC), a unitless parameter that incorporates, on a pixel-by-pixel basis, both maximal stress blood flow ((cc/min/g) and coronary flow reserve (ratio) (2012[6]). On the basis of CFC values in 1,500 clinical studies, CFC was classified in six clinical categories, ranging from normal to definite ischemia and scar. The diagnostic and prognostic implications of CFC, measured invasively, were subsequently validated in collaborative study of European centers by Drs. van de Hoef and Echavarria-Pinto (2015) in patients with long-term follow-up.

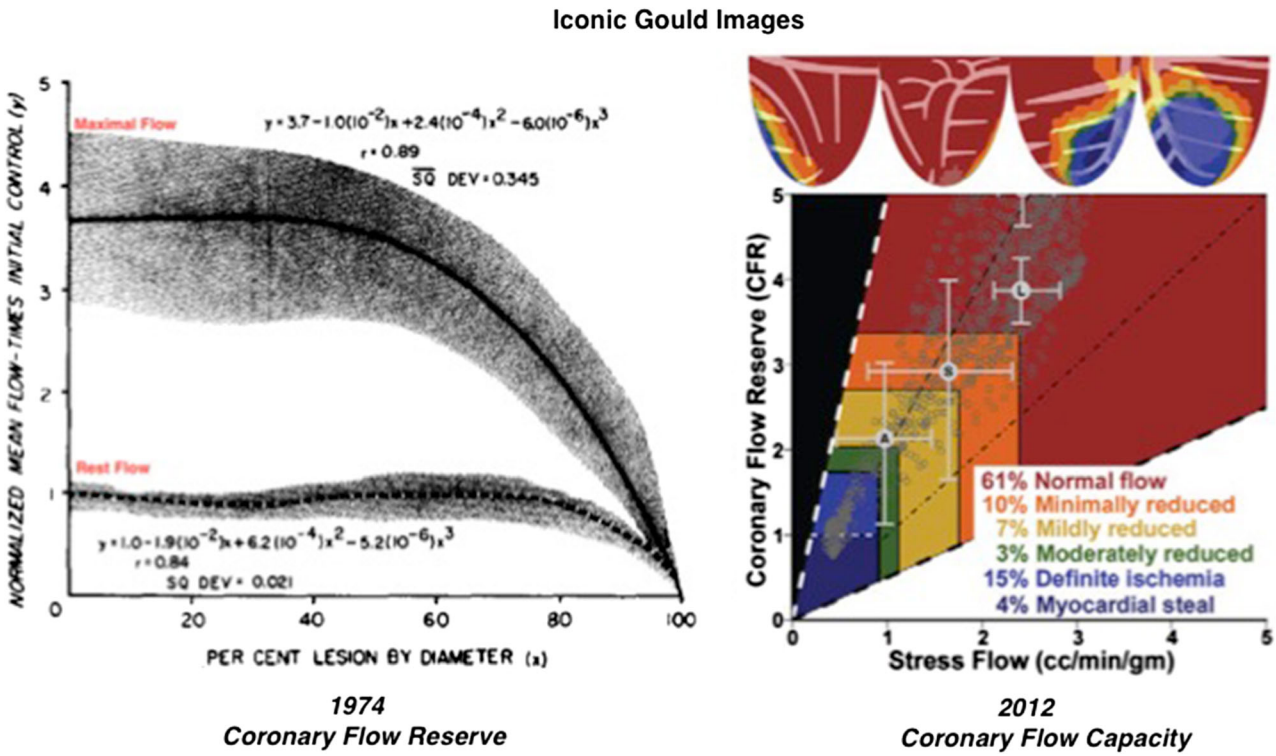
Dr. Gould and University of Texas interventional cardiologists routinely use CFC to make revascularization decisions in individual patients.[7]

Dr. Gould has published over 300 original scientific articles in peer-reviewed professional journals and two books: in addition to Coronary Artery Stenosis, he published ''Heal Your Heart. How to Prevent or Reverse Heart Disease'' (1998).

Dr. Lance Gould is the recipient of numerous awards, including:

The International George von Hevesy Prize for Research, 2nd World Congress of Nuclear Medicine (1978); George E. Brown Memorial Lecturer, American Heart Association (1990); the Al and Celia Weatherhead Endowment in perpetuity (1994); Martin Bucksbaum Distinguished University Chair, University of Texas (1999); American Heart Association Distinguished Service Award (2007); American College of Cardiology Simon Dack Award for Outstanding Scholarship (2011); American College of Cardiology Distinguished Mentor Award (2011); The Hal Anger Memorial Honorary Plenary Lecturer Award, Society of Nuclear Medicine (2017); and American College of Cardiology Distinguished Scientist Award for Translational Research (2018).

In 2019, Dr. Lance Gould has no intention to retire yet, but plans to continue his ongoing research in coronary physiology, that he started 48 years ago.



Acknowledgments

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Disclosure

Frans J. Th. Wackers and other members of the History Corner have no conflicts of Interest to declare.

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