MEMORIAL RESOLUTION
HERBERT N. HULTGREN

(1917-1997)

Herbert N. Hultgren, M.D., Professor of Medicine (Cardiovascular), Emeritus, at Stanford University School of Medicine died on October 18, 1997 at his home on the Stanford University campus, from complications of acute myelogenous leukemia. His career epitomized the growth and development of academic cardiology during the second half of the 20th century, a time in which a remarkable transformation of cardiology and cardiac surgery occurred.

Herbert Nils Hultgren was born in Santa Rosa, California on August 29, 1917. His parents were of Swedish origin. He attended Santa Rosa junior College for two years and then transferred to Stanford University, from which he was graduated in 1939. He then attended Stanford University School of Medicine receiving the M.D. degree in 1943. He stayed at Stanford for a residency in internal medicine, and then served in the U.S. Army in Europe in 1944-45. His period of military service was notable for his experience at the end of the war with starved prisoners in German concentration camps. He later published careful and systematic observations on severe starvation, using simple methodology; the account displayed a scientific style that remained characteristic throughout his career.

He returned to San Francisco in 1946 for a year of residency in pathology, and then went to Boston for a year of training in cardiology at the Thorndike Memorial Laboratory of the Harvard Medical School at the Boston City Hospital, under the direction of Dr. Laurence B. Ellis. He arrived in the midst of the beginnings of a new era in cardiology in which cardiac catheterization was being introduced into clinical practice and the surgical treatment of deformities within the heart was beginning.

He joined the faculty of the Stanford University School of Medicine in San Francisco in 1948, founding the Division of Cardiology and establishing the first cardiac catheterization laboratory in northern California. He was the first full-time faculty member at Stanford to specialize in cardiology. Over the next eleven years he teamed with the cardiac surgeon, Dr. Frank Gerbode, in guiding Stanford to a place among the world's leading institutions in the new fields of hemodynamically oriented cardiology and cardiac surgery. Pathophysiologic and diagnostic aspects of valvular and congenital heart disease were his central research interests in this period, as they were with many of the young leaders of academic cardiology in the 1950s. He continued his interest in this area throughout his career, continuing to employ simple clinical and hemodynamic methods even as ever more elaborate and technological methods of study developed. Thirty years later, in the 1980s, he explored the assessment of several types of heart disease, using recordings of the heart sounds and the arterial pulse in the neck, techniques that had been largely abandoned by cardiological investigators after 1970.

An outgrowth of his interest in the pathophysiology of congenital heart disease in the 1950s was a focus on the problem of reduced oxygen content in the arterial blood and its relation to the physiology of the circulation of the blood through the lungs. He linked this academic interest to his lifelong interest in mountain climbing. On a trip to Peru in 1959 he encountered the entity of high altitude pulmonary edema, previously known to relatively

few and not described in the U. S. medical literature. An account published in the Stanford Medical Bulletin in 1960 noted 41 cases seen at the Chulec General Hospital, located at an altitude of 12,300 feet in the Peruvian Andes Mountains. In 1961, with several colleagues, he described these cases in detail, along with 15 cases in U.S. mountaineers, in the first definitive U. S. presentation of this entity.

High altitude medicine in general, and high altitude pulmonary edema in particular, remained his most avid academic interests for the rest of his career. His many further studies documented increased reactivity of the blood vessels in the lungs in response to the reduced oxygen breathed by high altitude residents, and the frequent occurrence of pulmonary hypertension, particularly in those who were subject to high altitude pulmonary edema. An especially notable study was carried out by cardiac catheterization in a series of patients who developed high-altitude pulmonary edema while at high altitude in the Peruvian Andes. These studies showed significant pulmonary hypertension, but no evidence of failure of the left side of heart, which is the usual cause of pulmonary edema in those residing at low altitudes. He developed a theory of the mechanism of high-altitude pulmonary edema, holding that constriction of the blood vessels in the lung, occurring in response to low oxygen levels, may be non-uniform in the lung, resulting in diversion of the blood flow to less constricted areas, excessive blood flow in these areas, and leakage of fluid through the walls of the smallest blood vessels of the overcirculated areas. An analogy was made with the pulmonary edema occasionally seen when large blood clots acutely obstruct most of the blood vessels in the lungs. Experimental work supported this theory, which remains viable, although controversial.

Dr. Hultgren continued his work at high altitude on White Mountain Peak in the Sierra Nevada, where a research laboratory is maintained at an elevation of 12,500 feet. He enjoyed conducting expeditions to high altitude, looking for opportunities for medical observations, and impressing younger colleagues with his endurance at high altitude. He collected his many years of work on hypoxemia and high altitude medicine into a comprehensive book, High Altitude Medicine, published a few months before his death.

When the Stanford University School of Medicine reorganized in 1959, moving all its activities from San Francisco to a new comprehensive academic medical center on the main campus in Palo Alto, it was a major challenge to reestablish the program in cardiology and cardiac surgery. Only a small nucleus of full-time faculty members in the clinical departments made the move, since most of the clinical faculty of that era were primarily based in practice in San Francisco. The new school featured a true full-time faculty and a redirection toward research. Under the direction of Dr. Hultgren as the head of the Division of Cardiology, the program was brilliantly successful, greatly supported by Dr. Hultgren's widely recognized excellence in the field of valvular and congenital heart disease. The program in cardiac surgery, headed by Dr. Norman Shumway, quickly demonstrated excellence, culminating in a signal event - the first adult human heart transplant in the U. S. in 1968.

In 1967 Dr. Hultgren moved across the campus to the Palo Alto Veterans Administration Medical Center, where he remained the head of the Cardiology Division for the next 17 years. Here he developed a third area of research interest - the clinical results of coronary artery bypass graft surgery. In the early 1960s he had already shifted his primary cardiological interest to coronary artery disease. The Veterans Administration Cooperative Study of Coronary Artery Surgery, in which he played a leadership role for many years,

was a pacesetter in the use of large randomized controlled clinical trials, of the type which later assumed vast influence with the advent of "clot buster" treatment for acute heart attacks. Dr. Hultgren brought his clinical acumen and his analytic abilities to bear on this field, becoming the chief spokesman for the study. He ably defended the study against the critics who found its conclusions not always to their liking. The superiority of surgical over medical therapy in left main coronary artery disease was shown, but for other patients the differences in later mortality were not striking. His summary after many years of follow-up has stood the test of time: "Patients who have high-risk left main disease should have prompt surgery irrespective of the severity of symptoms . Survival is improved by surgery in the subgroup of patients with three-vessel disease and impaired LV function. However, there is no evidence that survival is significantly improved by surgery in subgroups of patients without left main disease who have a good prognosis on medical therapy, i.e. patients with single- or double-vessel disease, those without multiple clinical risk factors, and those with normal left ventricular function."

Dr. Hultgren received prominent national recognition in academic cardiology. He was one of a small group of founding members of the Association of University Cardiologists in the early 1960s. He was active in the Association, becoming its President in 1970. He was a member of the Cardiovascular Subspecialty Board of the American Board of Internal Medicine, the examining board for specialists in cardiology. He was the Chairman of the Board from 1972 to 1975, and oversaw the conversion of its examination from the oral to the written format. He was an active and respected voice at the national level in policy statements regarding training and manpower in cardiology. As in his research, his thoroughness, balanced approach, and emphasis on proven fundamentals won him respect in the policy area.

He was a highly respected clinician and clinical teacher, excelling in the one-to-one clinical bedside teaching setting. In 1990 he was the recipient of the Albion Walter Hewlett Award, a high honor awarded by the Department of Medicine for "the physician of care and skill who has committed to discovering and using biologic knowledge, wisdom, and compassion to return patients to productive lives,"

Dr. Hultgren continued his research and teaching as well as his avid outdoorsmanship and mountaineering after his retirement, until the last year of his life. He is survived by his wife, Barbara, three sons, and one grandson. His family and friends, as well as the cardiology and mountaineering communities, owe much to this remarkable man.

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