



IN MEMORY OF PROFESSOR INGE EDLER

In 1953, Inge Edler was in charge of the Cardiology Department at the University Hospital, Lund, Sweden and was in the position responsible for the preoperative diagnosis of heart disease. At that time, cardiac catheterization and contrast x-rays of the heart failed to give enough data for a correct appraisal of the status of the mitral valve. Since a correct diagnosis is of great importance before an operation, Edler felt strongly the inadequacy of the existing methods. This concern caused him to look for a new non-invasive alternative, which the thought might resemble some kind of a radar.

At the same time Carl Hellmuth Hertz, the son of the famed Nobel Laureate Gustav Hertz, was working as a graduate student at the nuclear physics department of the University of Lund. Because of this interest, he also studied ultrasound. He was acquainted with the ultrasonic reflectoscope developed for nondestructive materials testing. An ultrasonic reflectoscope was borrowed from the Tekniska Röntgen-centralen, a company in the nearby town of Malmö, which specialized in nondestructive testing. With the equipment, they were able to obtain well-defined echoes on the CRT screen moving synchronously with his heart beat.

Since Hertz's father had been the director of the Siemens Research Laboratory before the end of the war, they were able to contact director Wolfgang Gellinek of the Siemens Medical Branch in Erlangen, Germany, to borrow one of their Siemens reflectoscopes. Edler and Hertz received the reflectoscope in October 1953 and set to work on it immediately.

Edler finally established the characteristic motion pattern for the anterior leaflet of the mitral valve. He compared the shape of the fast moving echoes in patients with enlarged hearts due to mitral stenosis during cardiac operations, and found empirically the shape correlated well with the severity of the stenosis. By early 1955, Edler had so much evidence of this relationship that he relied on ultrasound alone for the diagnosis of mitral stenosis. The typical motion patterns of other heart valves, pericarditis, tumors, and thrombosis in the left atrium showed up in their recordings and were identified by close cooperation with Dr. Olle Dahlback's heart surgery group. The advent of a barium titanate transducer produced by Siemens in Germany in 1958 was an important advance for the group and had enabled them to study not only the normal mitral valve but also many other heart structures.

At that time Professor Lars Leksell head of the department of neurosurgery at Lund, had made serious efforts to find a new tool for diagnosing subdural hematoma caused by a blow against the head. In 1950 he borrowed a Kelvin-Hughes Mark 2B flow detector. Experience with this instrument agreed with similar futile efforts by Turner at the Royal Cancer Hospital in Marsden, England. Leksell soon returned the Mark 2B reflectoscope. He borrowed Edler's Siemens reflectoscope and was able to detect a clear displacement of the midline echo. He continued his investigations with a Kelvin Hughes Mark 4 instrument, and in 1957 switched to a single transducer Krautkramer USIP 9.

Alf Sjövall, then professor of obstetrics and gynecology, agreed with Leksell and Edler in 1957 (over the lunch table) that the usefulness of the echo method in early pregnancy should be investigated. He therefore encouraged one of his younger colleagues, Bertil Sunden, to investigate a number of pregnancies with the Krautkramer echoscope. Professor Ian

Donald's description of an echoscope generating a two-dimensional display in 1958 immediately stimulated Sjovall's interest. He sent Bertil Sunden on a three-week visit to Donald and the Smith Industrial Division in Glasgow. His work at Donald's department had resulted in the shipment of the second generation Disonograph® to Lund, with which he produced his doctoral thesis on the use of ultrasound in Obstetrics and Gynecology, and reported his experience on 400 cases of pelvic pathologies. His papers although less well known than those of Donalds actually furnished some very important findings and images in the early development of pelvic and Obstetric ultrasonography. Sunden also studied the possible harmful effects of ultrasound on pregnant rats, and did not find any. Sunden's thesis was published in an English translation in the *Acta Obstetrica et Gynecologica Scandinavica* as a 180 pages supplement in 1964. This consisted as the earliest "text-book" on ultrasonography in Obstetrics and Gynecology, covering equipment, examination techniques, biological effects and A-scan images.

In 1953, the first ultrasound heart examination in the world was performed in Lund. The pioneers behind echocardiography were Professors Inge Edler, cardiologist, and Helmuth Hertz, physicist. They borrowed equipment from the ship-building industry, where ultrasound was used to test construction materials. It soon became apparent that ultrasound could be used for the diagnosis of heart diseases. Other scientist in Lund, like obstetricians and gynaecologists, were also among the first in the world to take advantage of ultrasound technology. In the 1960s, Doppler echocardiography was developed in Lund, and another invention of Professor Hertz's, the ink jet printer, came in handy in the continued development of colour Doppler, which is a method of determining the direction of the blood flow. Pediatric cardiologists in Lund were quick to adopt echocardiography, which is one reason why Lund has become a national centre for child heart surgery.

Even today, the faculty has a leading position internationally in ultrasound research. This is apparent at the Department of Obstetrics and Gynaecology in Malmö, where scientists have perfected a technique for measuring the blood flow in the foetus by means

of ultrasound colour Doppler. The method is the most sensitive indicator of foetal health and can be used to monitor the growth of the foetus. Medical technologists also use ultrasound colour Doppler to measure blood flow in order to examine the elasticity of the walls of blood vessels. Early signs of ar-



terisclerosis may thus be found, which is important for the prevention of stroke. Dynamic examinations by means of magnetic resonance imaging, computerized tomography and different radioactive isotopes are becoming increasingly important in imaging diagnostics. The most modern magnetic camera of all has recently been installed at the Lund University Hospital. It can even generate pictures of thought processes in the brain. Radiologists in Malmö are world leaders in the development of tissue compatible contrast media.

Lars Edler
Professor of Biological Oceanography