BIOGRAPHY

Inge Edler and the Origins of Clinical Echocardiography

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Introduction
Many cardiologists know that Inge Edler and Hellmuth Hertz started clinical echocardiography in 1953, but few know how their collaboration came about.

Edler was working as Director of the Cardiovascular Laboratory at the University Hospital in Lund in the south of Sweden, and one of his duties was to refer patients with rheumatic mitral disease for closed valvotomy. He aimed to select only those with pure mitral stenosis, but sometimes the results were poor and the clinical consequences disastrous. Surgery for this condition had been started in the early 20th century, but largely abandoned due to mortality rates as high as 88%[1]. After the Second World War there was a renaissance of interest in heart surgery, following the experience gained in treating wounds of the heart, but the results for mitral stenosis remained poor, with a mortality of 66% reported in 1950[2]. Edler wondered how patients could be identified more carefully so that the results would not be unpredictable.

The First Echocardiograms
As a young man Edler had wanted to study engineering at university, but competition was hard and he was unsuccessful. He therefore studied medicine instead, but he retained his interest in new engineering techniques. When considering the problem of patients with mitral valve disease, he thought of using either radar (which had also been developed during the Second World War) or ultrasound to study the heart. He did not know if either would work, so he spoke to his clinic nurse because her husband, Jan Cederlund, was a physicist. He in turn thought of a friend who had been interested in ultrasound systems, and knew that one was being used for non-destructive testing in the Kockum shipyards in Malmö, and so this friend — Hellmuth Hertz — was contacted. Hertz arranged to meet Inge Edler, who had in fact seen him once before when Hertz had consulted him as a patient with headaches.

Edler explained the clinical problem to Hertz, who thought there was a 50% chance that ultrasound might work. Radar would be ineffective because of its high frequency. Hertz visited the testing company (Tekniska Rontgencentralen) in Malmö and used their ultrasonic reflectoscope on himself. Since he obtained some moving signals, he and Edler (Fig. 1) were sufficiently encouraged to agree to work together.

They borrowed the ultrasound machine from the shipyard for one weekend in May 1953. Edler used it on himself and on some patients; he obtained a moving signal at a depth of about 10 cm from the transducer, which he suspected might be from the posterior wall of the heart. This first A-mode scan on a cathode ray oscilloscope has since been published[3]. By chance, Edler and Hertz had borrowed a transducer with a

Figure 1. Inge Edler (right) and Hellmuth Hertz photographed when attending a congress on echocardiography in Rotterdam in 1979 (courtesy of Professor Dr J. R. T. C. Roelandt).
frequency appropriate for transthoracic imaging; if it had been either much lower or much higher they might have been discouraged and could have abandoned their efforts.

The father of Hellmuth Hertz, Gustav Hertz, had worked as director of research for Siemens at Erlangen in Germany, and so it was easy for Hertz and Edler to make a request to the director of Siemens, Wolfgang Gellinek. As a result, they were given their own system (an “Ultraschall-Impulsgerät”) for clinical studies. It was delivered in October 1953, and Hertz made a camera to allow them to record the moving signals. The first trace obtained with this M-mode technique on slowly-moving photographic film, on 29 October 1953, is reproduced in Figure 2. This was the first non-invasive depiction of moving structures within the heart. Edler used the machine for the next 15 years, and it is now in the Museum of Medical History (Medicinhistoriska Museet) in Lund. Edler and Hertz first published their research in 1954, in English, in the Proceedings of the Royal Physiographic Society at Lund[4].

The early promise of this new technique — which they called ultrasound cardiography (or UCG) — appeared to Edler and his colleagues to be fulfilled. They did find differences between patients with pure mitral stenosis and those with mitral regurgitation, in what we now recognise as the EF slope[5], and they also detected specific signs of atrial thrombus, myxoma, and pericardial effusion. In spite of their studies the method was not widely accepted; Edler felt that cardiologists in Sweden thought it was his hobby rather than an investigative tool which they should embrace. There had been many visitors to his laboratory in Lund during the 1950s, including Peter Wells from the United Kingdom and Sven Effert from Germany, but Edler felt that it was not until 6 months after Hellmuth Hertz had sent Edler’s book (a supplement to Acta Medica Scandinavica, published in 1961[6]) to colleagues in the U.S.A., when Edler himself was invited to speak at a meeting in Ubarna in Illinois, that many others began to share their enthusiasm. Jack Reed, working with Claude Joyner, built his own system — the first dedicated cardiac ultrasound scanner — and others such as Harvey Feigenbaum started to perform clinical studies. The name ‘echocardiography’ was given by the American Society of Ultrasound in Medicine.

Comment

It is difficult in medical history to attribute initial developments to particular individuals at a specific place and time, because records may be incomplete and memories imperfect. Often, too, if the intellectual climate is ripe for an idea then many people will have it. Karl Dussik in 1942 was the first investigator to propose...
the use of ultrasound for medical diagnosis\cite{7}. He studied the cerebral ventricles using ultrasound transmitted through the brain and also suggested using echo reflections, but he did not pursue this when the idea was scorned. In 1950 W. D. Keidel suggested using transmitted ultrasound to study the heart\cite{8}, a principle similar to X-ray imaging, but he was unable to develop his technique. Edler and Hertz had not known of these other developments, and they became the first to use reflected ultrasonic signals in diagnostic imaging, which they applied to the heart. Thus, they can justly be considered as the true pioneers of clinical echocardiography. Later developments in cardiac ultrasound were summarized in the first issue of the European Journal of Echocardiography\cite{9}.

Edler and Hertz wrote a joint account of their initial experience\cite{10}, in which they stressed the importance of a stimulating and free atmosphere for the development of new ideas in research. Edler later expanded this\cite{3} after his colleague and friend Hellmuth Hertz had died in 1990\cite{11}. Until the end of his life, Inge Edler (Fig. 3) followed developments in echocardiography with interest.

At the first Euroecho meeting in Prague in December 1997, organized by the Working Group on Echocardiography of the European Society of Cardiology, Professor Edler was awarded the Medal of the European Society of Cardiology by its then President, Professor Günter Breithardt, and he received a warm standing ovation. A medal was also awarded to Professor Sven Eeftert who, after his visit to Lund, had gone on to develop echocardiography in Germany at the Helmholtz Institute for Biomedical Engineering in Aachen. Edler showed the film which he had first used when he presented his work to the 3rd Congress of the European Society of Cardiology at Rome in 1960. Later, in conversation, he explained how echocardiography started, and he subsequently confirmed the accuracy of the details recorded in this account. Professor Edler gave the Working Group on Echocardiography a copy of his film, and he also donated the original copy of his first echocardiographic recording (Fig. 2), which will be displayed in the European Heart House.

This story shares the ingredients of many other advances in science and medicine. The development of echocardiography rests on a combination of good timing (after the recent developments of radar and sonar), propitious circumstances (the development of mitral surgery, and the proximity of the shipyards), chance (the links from Edler to Hertz), luck (the connection with Siemens, and the frequency of their transducer), receptive minds with a ‘silly’ but clever idea (radar could not work, but ultrasound did), collaboration between clinical and non-clinical scientists, links with industry, and perseverance when others were disinterested. It is a tale that we can all learn from, and be immensely grateful for.

References