Honored Guest's Address

A milestone in cardiovascular surgery

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On May 6, 1953, 50 years ago, Dr John H. Gibbon, Jr, at Jefferson Hospital in Philadelphia, successfully repaired an atrial septal defect in an 18-year-old patient by using a mechanical heart-lung apparatus that he and his colleagues had spent 20 years developing. This event fulfilled a dream of Gibbon (Figure 1), who, as a fellow at Massachusetts General Hospital, had witnessed the futility of a pulmonary embolectomy attempted by Dr Edward Churchill in 1932. This event reinforced Gibbon's interest in extracorporeal circulation, because he recognized that a temporary means to substitute for cardiac and pulmonary function would permit such a procedure to be performed with better expectation of success.

During the ensuing years, Gibbon worked intensively to develop a machine to accomplish this purpose, first in laboratories at Massachusetts General Hospital, then at the University of Pennsylvania, and finally at Jefferson Medical College. His wife, Maly, a laboratory technician herself, assisted him on most of the early experiments (Figures 2 and 3). Gibbon's primitive heart-lung machine was improved significantly after Thomas Watson, chairman of the board of International Business Machines, invested corporate funds and placed his engineering staff at Gibbon's disposal to develop a clinical version of the experimental device. After extensive experiments in the animal laboratory, mostly on dogs, Gibbon agreed to clinical trials with the new, more sophisticated apparatus (Figure 4).

On the fateful day, an 18-year-old girl named Cecelia Bavolek underwent the operation. The first assistant was Frank Albritton, Jr, and the second assistants were Thomas Nealon and Bernard Miller. Other surgical residents involved in the procedure were John Y. Templeton and Anthony Dobell. Jo Ann Crother also made history that day as the first-ever perfusionist. The direct suture repair of the secundum defect involved 45 minutes of cardiopulmonary bypass, with 25 minutes of intracardiac repair. Although a pericardial patch had been planned, time was of the essence. According to Dr Miller's account, the patient was underheparinized by today's standards, and thrombi were appearing in the circuit and screen oxygenator, which necessitated quick termination of bypass. Fortunately, the patient made a full recovery.

A subsequent attempt at open repair of a congenital defect was unsuccessful. After that, Gibbon became discouraged and declared a moratorium on clinical use of extracorporeal circulation at Jefferson Hospital. Fortunately for the surgical profession, others, including John Kirklin at the Mayo Clinic, modified the Gibbon machine and used it successfully. Meanwhile, C. Walton Lillehei at the University of Minnesota used a procedure known as cross-circulation, which also demonstrated the feasibility of temporary extracorporeal circulation.

All of us, surgeons and patients alike, owe Dr Gibbon a tremendous debt of gratitude for his tireless dedication to the development of the heart-lung machine. His work made open procedures on the heart a reality. Since then, countless lives

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Figure 1. John H. Gibbon, Jr, surgeon at Jefferson Medical College and developer of the heart-lung machine.

Figure 2. Gibbon and his wife, Maly (assisting), in the laboratory.

have been saved because of heart-lung bypass machines that are based on the principles of the early Gibbon apparatus.

For those interested in a more detailed description of John Gibbon's monumental contribution to cardiac surgery,

Figure 3. The preliminary apparatus developed by Gibbon and his laboratory staff.

Figure 4. Operating room scene showing the clinical version of the heart-lung machine, which had been improved from the experimental model with the help and involvement of Thomas Watson and International Business Machines.

I recommend *A Dream of the Heart*, by Gibbon's close friend Harris B Shumacker, Jr, MD.¹

Reference

1. Shumacker HB. *A dream of the heart: the life of John H. Gibbon, Jr, father of the heart-lung machine*. Santa Barbara (CA): Fithian Press, 1999.