On May 6th, 2003, we celebrate the 50th anniversary of the first successful open-heart operation performed with the use of the heart-lung machine, one of the most important forms of therapy in the history of cardiac disease. On that spring day in Philadelphia, John H. Gibbon, Jr, MD, of the Jefferson University Medical Center, using total cardiopulmonary bypass for 26 minutes, closed a large secundum atrial septal defect in an 18-year-old woman. Beginning with this case, generations of cardiac surgeons have been able to operate on millions of human hearts with alacrity, efficiency, and consistency to correct complicated congenital heart defects, cardiac valve disorders in the young and old, atherosclerotic coronary artery obstructions, and large aneurysms of the thoracic aorta.

Until 1953, cardiac surgery was in its infancy and was more of a curiosity, except for treatment of rheumatic mitral stenosis, beginning in 1923 with Cutler’s successful case of a closed mitral commissurotomy with a tenotomy knife at the Peter Bent Brigham Hospital in Boston. The only successful heart operations done before 1953 were closed techniques for mitral stenosis, a few clinical experiments in 1952 with “open” heart by deep hypothermic arrest by John Lewis at the University of Minnesota, and the “blue-baby” operations of the 1940s and 1950s.

It is not a fluke that John Gibbon was the first to do this procedure. He had studied and worked tirelessly on this project for 23 years before the first successful application. Dr Gibbon, who would have also celebrated his one-hundredth birthday in 2003, was a medical student at Jefferson and finished his residency in surgery at the Pennsylvania Hospital in the late 1920s. In 1930, he obtained a research fellowship with Dr Edward Churchill, the Chief of Surgery at the Massachusetts General Hospital in Boston. On October 3rd, 1930, Dr Gibbon witnessed the collapse of a patient with a massive pulmonary embolism after a general surgical operation. After a period of deteriorating hemodynamics, watched closely by Dr Gibbon at the patient’s bedside all night, the patient underwent a closed pulmonary embolectomy (Trendelenburg operation) performed by Dr Churchill, but to no avail; the patient died. This dramatic clinical experience had a profound and lasting effect on Dr Gibbon and determined his lifetime academic research interest.

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tered, which was closed with a running cotton suture. The atrium, a large secundum atrial septal defect was encountered, which was closed with a running cotton suture. The patient was removed from the heart-lung machine without incident after approximately 26 minutes. She made an uneventful recovery and was discharged 13 days postoperatively. She was recatheterized 6 months postoperatively, and her defect was completely closed. The case was absolutely astounding to those who witnessed it, as it was to the entire world soon after this first successful case was announced in the press.

Dr Gibbon subsequently operated on 2 additional patients in July 1953, both of whom were young girls about 5 years of age with atrial septal defects. These two patients died at surgery with difficulties again of imprecise diagnosis of atrial septal defect and complications related to bleeding during long time periods on the heart-lung machine. After these two cases, Dr Gibbon, quite upset at these failures, declared a moratorium on open-heart surgery with his heart-lung machine. Curiously, Dr Gibbon’s momentous successful case was not published until one year later in a state medical journal, Minnesota Medicine.11

Dr Gibbon never again did open-heart surgery, leaving his trainees and countless others in the field to carry out the prodigious cardiac feats that we all know and take for granted today. He maintained only a research interest in the development of subsequent models of the heart-lung machine, but it was immediately apparent that others in the field, who were primarily interested in cardiac surgery, such as Clarence Dennis of Downstate University in Brooklyn,12 John Kirklin of the Mayo Clinic,13 and C. Walton Lillehei at the University of Minnesota,14 would pick up the gauntlet, refine Dr Gibbon’s original heart-lung machine, and use it extensively. With the improvement of diagnosis and preoperative preparation, uniform anticoagulation, and improved postoperative care, heart surgery blossomed in the late 1950s and early 1960s. Dr Gibbon’s Model II heart-lung machine was the framework on which other applications were modeled. The first truly commercial heart-lung machine was the Mayo-Gibbon device, which was the most widely used heart-lung machine of the 1950s and early 1960s and was developed by Kirklin and coworkers at the Mayo Clinic after the design of Dr Gibbon.13

After the development of the heart-lung machine, Dr Gibbon returned to the active practice of general thoracic surgery, leaving cardiac surgery to others, recalling that his primary interest had always been thoracic surgery and that his sentinel case of pulmonary embolism was a complication of a general surgical operation. He became Professor and Chairman of Surgery at Jefferson and was President of the American Surgical Association in 1954 and the American Association of Thoracic Surgery in 1961. He gave his last talk on the development of the heart-lung machine at Baylor in late 1972 and shortly thereafter passed away in early 1973 at the age of 69 from a fatal heart attack.5

The world owes John H. Gibbon, Jr, MD, an enormous debt of gratitude for pioneering the technology of cardiopulmonary bypass and persisting for 23 years in its development—until he got it just right, on the morning of May 6th, 1953.
References


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