



Baylor University Medical Center Proceedings

The peer-reviewed journal of Baylor Scott & White Health

ISSN: 0899-8280 (Print) 1525-3252 (Online) Journal homepage: <https://www.tandfonline.com/loi/ubmc20>

Fiftieth Anniversary of the First Heart Transplant: The Progress of American Medical Research, the Ethical Dilemmas, and Christiaan Barnard

Peter A. Alivizatos

To cite this article: Peter A. Alivizatos (2017) Fiftieth Anniversary of the First Heart Transplant: The Progress of American Medical Research, the Ethical Dilemmas, and Christiaan Barnard, Baylor University Medical Center Proceedings, 30:4, 475-477, DOI: [10.1080/08998280.2017.11930236](https://doi.org/10.1080/08998280.2017.11930236)

To link to this article: <https://doi.org/10.1080/08998280.2017.11930236>



Published online: 22 Jan 2018.



Submit your article to this journal [↗](#)



Article views: 47



View Crossmark data [↗](#)



Citing articles: 2 View citing articles [↗](#)

Fiftieth anniversary of the first heart transplant: The progress of American medical research, the ethical dilemmas, and Christiaan Barnard

Peter A. Alivizatos, MD

This year marks the 50th anniversary of the first heart transplant by South African heart surgeon Christiaan Barnard in Cape Town that caught the world completely unawares. Surprise was succeeded by admiration and idol-worshipping of the protagonist, who became famous overnight. Newspapers and television channels competed to interview him and reputable scientific associations to recruit him as the principal speaker at their conferences. The jet-set of the time embraced him and famous movie stars adored him. But was Barnard the one who was expected to do it, the “chosen” for this procedure?

Transplanting a heart had been the dream of surgeons from the beginning of the 20th century. In spite of Russian Vladimir Demikhov’s brilliant techniques in the experimental laboratory in the 1950s, the problem remained unsolved: the invention of a simple yet reliable and reproducible method of implantation so the heart would immediately take over the circulation. All this concerned the technical part, since the problem of rejecting the “foreign” organ still had to be addressed (1).

The first hurdle was cleared in the late 1950s at Stanford University by Professor Norman Shumway and his close associate Richard Lower (*Figure 1*), when they achieved the survival of dogs by combining an ingeniously simple surgical technique with local cooling to protect the transplanted heart. Lower came from Michigan; as a Midwesterner, he was a man of few words, with a strong accent and simple manners. After a brief period at Cornell University in New York, Dick, as he was known to his friends, moved to California and Stanford, where cardiac surgery under Norman Shumway was still in its infancy. Shumway came from the famous Minnesota School, which under Owen Wangensteen had made a name for pioneers in heart surgery, like John Lewis and C. W. Lillehei (2). Shumway, another Midwesterner, divided his time between surgery and a primitive experimental

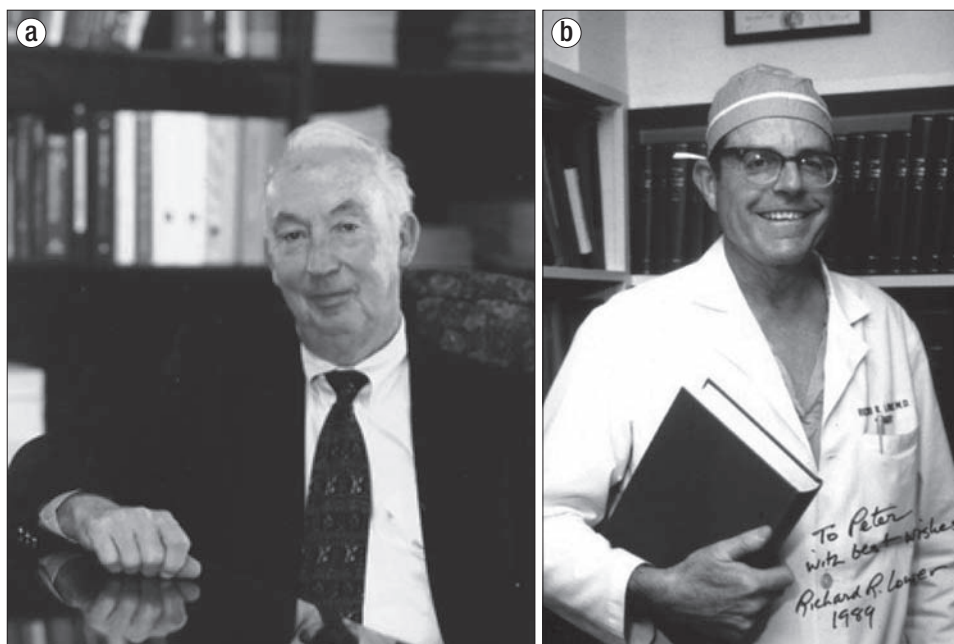


Figure 1. Two pioneers in heart transplantation: (a) Norman E. Shumway from Stanford University and (b) Richard R. Lower from Medical College of Virginia.

laboratory. Genius, however, does not require luxury; on the contrary, it performs its miracles with want and deprivation.

So in 1958 Lower was taken on as Shumway’s first trainee and together they began to experiment on dogs, looking for a way to operate with the heart stopped and dry, but also without compromising myocardial function, which would afterwards take over the circulation. Shumway created a bath in the pericardium in which a cold saline infusion continuously circulated as a preservative. They stopped the heart, therefore, clamping the aorta, and, after waiting an hour, released it to let the blood again circulate in the myocardium. While waiting, they would sit idly around the table until Shumway had the idea that perhaps they could cut into the heart at about the level of the ventricles and suture it together again before opening the

From Baylor University Medical Center at Dallas, Dallas, Texas, and the Onassis Cardiac Surgery Center, Athens, Greece. Dr. Alivizatos was founder of cardiothoracic transplantation at Baylor University Medical Center.

Corresponding author: Peter A. Alivizatos, MD, FACS, FACC, 3600 Gaston Avenue, Suite 404, Dallas, TX 75246 (e-mail: paliviz2013@gmail.com).

aorta. They soon discovered that this procedure was extremely difficult, if not impossible, because there was no tissue left to stitch and furthermore it was so fragile that the animal died of hemorrhage. Then Lower had a brilliant idea: "Why don't we use the heart of another dog so that there will be enough tissue for stitching?" (3). After the first failures, they started to have survivals. When the first dog had survived for a week, the press and television became involved, besieging the department chairman with questions. He was so annoyed that he demanded the dog be put down, causing the researchers dismay. Soon the chairman was dismissed for a different reason, yet Shumway wryly remarked: "Neither the dog nor the chairman lasted much longer, so perhaps some kind of poetic justice was achieved!" (1).

The following year they reported to the American College of Surgeons, before an empty auditorium, the stable survival from 1 to 3 weeks of eight dogs. It was obvious that their work was considered "utopian." However, the publication that followed—concise and lucid like the one by Watson and Crick announcing in 1953 the discovery of the double helix of DNA, which won them a Nobel prize—is still today a landmark in the international bibliography (4).

During the next 7 years, the two researchers, Shumway at Stanford and Lower, now in Virginia, widened the field with innovative work and were considered by the experts to be the most likely to perform the first human heart transplant. However, in 1964 they were almost overshadowed, fleetingly as it turned out, by James Hardy of the University of Mississippi. He lost the race, though, when he implanted a chimpanzee's heart into the chest of a dying man. The result was inevitable—hyperacute rejection—although Hardy and his associates attributed the failure to a size mismatch between donor and recipient resulting in low cardiac output (5). Hardy was expelled for quite a few years from the American College of Surgeons for unacceptable experimentation. When I was a fellow at Baylor University Medical Center in 1973, he came as a visiting professor and during a meeting with the housestaff expressed his bitterness over what, in his opinion, was an unjustly imposed penalty. However, there was no reaction 3 years later when Lower, in order to demonstrate the technical feasibility of a human transplant, grafted a human heart for which there was no suitable recipient into the chest of a chimpanzee, where it functioned for several hours. Well known for his cutting sense of humor, inherited from Shumway and bequeathed to his own disciples, Lower named the procedure "a reverse Hardy"!

Unfortunately, the great opportunity for an ethical reward was lost to Lower in the fall of 1966, when there was the rare coincidence of a suitable donor and recipient. He did not proceed then for what proved later to be a secondary incompatibility of blood groups. Always conscientious and a perfectionist, he did not want to risk this historic operation with something that was *a priori* a negative factor on the scale of success, in spite of insistent urging to proceed by David Hume, chairman of the Department of Surgery at the Medical College of Virginia, who was legendary for his drive and aggressiveness (6).

There was also a third serious contender for the victor's wreath for the first transplant: Adrian Kantrowitz, the charis-

matic, unbelievably industrious and persistent cardiac surgeon of Maimonides Hospital in New York, with 200 experiments under his belt. He had concentrated his efforts on a transplant in a baby on the assumption that its immature immune system was less likely to trigger rejection (7).

So these three, Shumway, Lower, and Kantrowitz, were the players in the arena, desperately trying to prepare a suitable candidate and to locate the necessary donor. Unfortunately, all three faced the same, seemingly insurmountable obstacle: the possible donor was considered dead only after all heart activity had ceased. The required wait until that happened usually meant that the graft was unsuitable for transplantation. Therefore, there was inactivity while the intensity of the rivalry reached its peak.

In 1966, the hitherto unknown Christiaan Barnard asked Dr. Hume if he could come to Virginia to observe his pioneering kidney transplants. He stayed for about 3 months and, encouraged by his fellow-countryman, the pump technician Carl Gosen, he took the opportunity to watch Lower in the animal laboratory. Impressed by the simplicity of the technique—great surgeons make any procedure look easy!—he came back a few weeks later to consolidate his knowledge. As he was leaving, he confided to Gosen that on his return to South Africa he would perform a human heart transplant. When Gosen questioned how he could do that without experimental work, he made the amazing statement: "Ja, I'll do a couple of dogs!" He also added: "You here have too many prohibitions to negotiate before you can find a donor. We have no such obstacles in South Africa" (6).

His motive was his outsized ambition to make his mark and surpass his former colleagues at the University of Minnesota, among whom was Shumway. His excuse for doing an operation for which he was not prepared was the inability of his American colleagues to proceed because of the prohibitive legislation. With great perspicacity he had realized his advantage: in South Africa only the agreement of two doctors was required to declare death in a case of irreversible brain injury, even before the heart had stopped. It was the ace up his sleeve!

With this advantage, on December 3, 1967, Barnard transplanted the heart of 25-year-old Denise Darvall, victim of a road traffic accident, into the chest of 53-year-old Louis Washkansky (8) (*Figure 2a*). In spite of the legal protection and in order to forestall any possible graft deterioration while waiting for the heartbeat to stop, as the anesthesiologist was insisting, he speeded up harvesting with the intravenous administration of potassium (6). Thus, the transplant proceeded and history was made. Its success was not marred, even by Louis's death 18 days later of pneumonia. Three days after Barnard, Kantrowitz performed the first transplant in America, but the baby lived for only a few hours. At the beginning of January 1968, Shumway carried out the first transplant in Stanford and this patient, also, lived for 18 days. In the interests of history, as Dr. Shumway stated, "No experimental orthotopic heart graft had survived more than a few hours in South Africa when Barnard's initial clinical effort took the world by surprise" (9). As a matter of fact, by the time Christiaan Barnard had performed 48 transplants in the laboratory, that was 250 less than Norman Shumway and 210 less than Adrian Kantrowitz had performed (6).



Figure 2. *Life* covers in 1967 and 1971 documenting the early history of heart transplantation. (a) Dr. Christiaan Barnard with his first patient, Louis Washkansky. (b) The sad reality 3 years after the first heart transplant.

Barnard's boldness started a frenzy of heart transplants all over the world, even by surgeons who had criticized him at first for being "premature." As Dr. Shumway put it in his inimitable, sarcastic way: "Suddenly heart transplants were being done in places where one would hesitate to have his atrial septal defect closed!" (9). In 1968, 104 such procedures were carried out, with only 10 survivors, and results for the next 3 years were similar (170 transplants with 24 survivors) (10). This made *Life* magazine in a 1971 issue withdraw its earlier enthusiastic report about transplants (Figure 2b). Even the demigod of American surgery, Denton Cooley, was forced to stop, saying, "The prescription for success in heart transplantation 'cut well, tie well, get well' is a naïveté. The problems come after surgery and they're not surgical problems" (10). The epitaph of this period was pronounced succinctly by the pioneer of the 1948 mitral valvotomies, Charles Bailey, when he said that "cardiac transplantation is 10 years too early" (6). And so during the difficult decade of the 1970s, the torch of transplantation was kept alight by Stanford, inventing new techniques for the prevention and diagnosis of rejection and establishing the "team project" as the necessary precursor to success (11). The proof was the hitherto unsurpassed first-year survival of 65% and 5-year survival of 45% (11, 12). However, a new era started in 1976 after Borel's critical experiments and Sir Roy Calne's clinical use of cyclosporine-A in kidney and liver transplants in 1979 (13). This was the miracle antirejection drug, again used for heart transplantation by Stanford in the early 1980s (14).

What was gained by Barnard's audacity? Certainly not cyclosporine, as already mentioned. Some said that he speeded up the acceptance of brain death (15). But again, during that period, even without wanting to, it was Lower who was responsible. When he carried out his first transplant in May 1968, he was accused of taking the heart of a brain-dead donor, as it was still beating. He sat as a defendant along with 10 other physicians involved in the operation in the famous *Tucker v. Lower* case in

Richmond in May 1972. The judge, A. Christian Compton, in his groundbreaking final jury instruction, allowed: "You shall determine the time of death . . . and in determining you may consider . . . the time of *complete* and *irreversible* loss of all *function* of the brain" (16). It opened the way for a change in legislation, which from that time has allowed us to do transplants.

Lower had been treated unfairly twice over. His labors were enjoyed by someone else while the system almost sent him to jail. I felt his bitterness one Saturday morning during grand rounds, in the spring of 1980, when I was the second-year resident in his program. Before all the staff of the Medical College of Virginia, he gave the lecture on heart transplantation. His final comment has remained indelibly seared into my memory: "In 1966 I did not proceed with the heart transplant and God never forgave me for my hesitation. So glory and reputation went to Cape Town, South Africa, and not to Richmond, Virginia."

Two conclusions: Firstly, we only repent of what we have not done. Secondly, the world respects thought, but worships audacity. Perhaps with some justification.

1. Reichart B, Jamieson SW. *Heart and Heart-Lung Transplantation: Historical Background*. Munich, Germany: R. S. Schultz, 1990.
2. Gott VL, Lillehei, Lewis, and Wangenstein: the right mix for giant achievements in cardiac surgery. *Ann Thorac Surg* 2005;79(6):S2210–S2213.
3. Dong E. A heart transplantation narrative: the earliest years. In Terasaki PI, ed. *The History of Transplantation. Thirty-Five Recollections*. Los Angeles, CA: UCLA Tissue Typing Laboratory, 1991.
4. Lower RR, Shumway NE. Studies on orthotopic homotransplantation of the canine heart. *Surg Forum* 1960;11:18–19.
5. Hardy JD, Kurrus FD, Chavez CM, Neely WA, Eraslan S, Turner MD, Fabian LW, Labecki TD. Heart transplantation in man. Developmental studies and report of a case. *JAMA* 1964;188:1132–1140.
6. McRae D. *Every Second Counts. The Race to Transplant the First Human Heart*. New York: G. P. Putnam's Sons, 2006.
7. Kondo Y, Grädel FO, Chaptal PA, Meier W, Cottle HR, Kantrowitz A. Immediate and delayed orthotopic homotransplantation of the heart. *J Thorac Cardiovasc Surg* 1965;50(6):781–789.
8. Barnard CN. A human cardiac transplant: an interim report of a successful operation performed at Groote Schuur Hospital, Cape Town. *S Afr Med J* 1967;41(48):1271–1274.
9. Shumway NE. The experimental basis for heart transplantation. *Bulletin of the American College of Surgeons* 1981 (June 1), 6–10.
10. Thompson T. *Hearts*. New York: McCall, 1971.
11. Hunt SA, Stinson EB. Cardiac transplantation. *Annu Rev Med* 1981;32:213–220.
12. Fowler MB, Schroeder JS. Current status of cardiac transplantation. *Mod Concepts Cardiovasc Dis* 1986;55(8):37–39.
13. Calne RY, Rolles K, White DJ, Thiru S, Evans DB, McMaster P, Dunn DC, Craddock GN, Henderson RG, Aziz S, Lewis P. Cyclosporin A initially as the only immunosuppressant in 34 recipients of cadaveric organs: 32 kidneys, 2 pancreases, and 2 livers. *Lancet* 1979;2(8151):1033–1036.
14. Oyer PE, Stinson EB, Jamieson SW, Hunt SA, Billingham M, Scott W, Bieber CP, Reitz BA, Shumway NE. Cyclosporine-A in cardiac allografting: a preliminary experience. *Transplant Proc* 1983;15:1247–1252.
15. Ad Hoc Committee of the Harvard Medical School to Examine the Definition of Brain Death. A definition of irreversible coma. *JAMA* 1968;205(6):337–340.
16. Converse R. But when did he die? *Tucker v. Lower* and the brain-death concept. *San Diego Law Rev* 1975;12(2):424–435.