PETER GORDON AND Johan Brink have done a great service in reminding clinicians, in their splendid historic review, of the momentous events of December 1967 in Cape Town, South Africa, when the first “successful” human-to-human heart transplantation was performed by Dr Christiaan (“Chris”) Neethling Barnard and his team (including Drs Joseph Ozinsky [“Oz”] and Cecil Moss who provided the anesthesia) at the University of Cape Town/Groote Schuur Hospital.1 As Dr Barnard mentioned in the introduction to his description of “the operation,”2 this achievement did not come as a surprise to the medical world. In the spring of 1967, Norman Shumway had predicted an early attempt.3 What surprised everyone was where it was accomplished. But they should not have been. The University of Cape Town/Groote Schuur cardiac surgical team was an experienced and innovative group that had performed nearly 1,000 cardiac cases since initiating their program in 1958, which was led by Dr Barnard who had been trained in the cradle of cardiac surgery under Richard Varco and C. Walton Lillehei at the University of Minnesota. The group was supported by strong cardiology and basic science departments and immunologists. For over 3 years, they had thoroughly prepared for this procedure, including visits by Barnard to the Medical College of Virginia (David Hume) and University of Colorado (Thomas Starzl) and trips by the immunopathologist M.C. Botha to Leiden University and the University of California in Los Angeles. They had perfected their techniques in the surgical laboratory, achieving 90% success with heart transplants in dogs, and developed a thorough plan for donor and recipient selection, patient management, and consideration of the ethical issues involved. This background is documented by the articles included with Barnard’s report of this first case in a special issue of the South African Medical Journal published just 27 days after the transplant41 and the recent historic review of the Groote Schuur/University of Cape Town cardiac surgery program by Brink and Cooper.12 Thus, their success was not an accident but the product of preparation and teamwork. Although their first patient only lived for 18 days, undaunted they did a second transplant almost exactly 1 month later (January 2, 1968), and this patient survived nearly 20 months, dying from previously unanticipated donor coronary atherosclerosis.

It is humbling and enlightening for the 21st century cardiac surgeon and anesthesiologist to recognize what smart and dedicated clinicians can accomplish without the equipment and drugs currently considered essential to success. Note that these accomplishments by the Cape Town group were achieved using a bubble oxygenator without an arterial microfilter; without narcotic anesthesia or etomidate; without a pulmonary artery catheter, transesophageal echocardiography, pulse oximeter, and capnography; and without antifibrinolytics, milrinone, and nitric oxide. Their first recipient had severe pulmonary hypertension, diabetes, and peripheral vascular disease and was on cardiopulmonary bypass (CPB) for 223 minutes. Part of this must be attributed to the excellent protection they provided to the donor heart (by continuous hypothermic blood perfusion).

Unfortunately, their successes were followed by an uncontrolled stampede of “me too” heart transplants, often by ill-prepared groups. By the end of 1968, 102 heart transplants had been performed in 52 centers in 17 countries, and 48 were performed the following year. In the words of Norman Shumway, “Suddenly heart transplants were being done in places where one would hesitate to have his atrial septal defect closed.”13 The results were disastrous; nearly half died within a month, and less than 20% survived a year. By 1970, only about 4 groups including the University of Cape Town (Barnard), Hospital La Pitié in Paris (Christian Cabrol), Medical College of Virginia (Richard Lower), and in particular Stanford University in California (Shumway) gradually forged ahead, leading ultimately to the general application and success with heart transplantation that finally were achieved in the mid-1980s.14

Unfortunately, this phenomenon of ill-prepared groups jumping on a “bandwagon” after the introduction of innovative approaches is not unique and continues today. Some examples include port-access surgery, new procedures to treat heart failure, use of augmented venous return during CPB, off-pump coronary artery bypass graft surgery, use of drug-eluting stents, and catheter-based valve procedures. The problem lies not so much with the innovator but with those who follow without adequate background or experience and in the absence of adequate data regarding limitations, complications, and long-term results, often without providing full disclosure to the unwary patients who seek what they heard about in the press or via the Internet and are often encouraged by aggressive marketing on the part of hospitals and cardiac teams. Clinicians must guard against repetition of this phenomenon, and anesthesiologists should display leadership in this regard.

Another noteworthy aspect of this first case was that the donations of the heart (and kidneys) were made after cardiac death (so-called donation after cardiac death or DCD) (although the donor in this case was likely brain dead). The donor was brought into the operating room and disconnected from the ventilator; donation did not commence until 12 minutes later10 when the patient was declared dead by the state’s medical examiner12 based on no electrocardiographic activity for 5 minutes and absent any spontaneous respiratory movement and reflexes.2 This was the usual practice for organ donation in the 1960s until the brain-based definition of death gradually became accepted after the report of the ad hoc committee at the Harvard Medical School in August 1968.15,16 The first Cape Town heart transplant probably helped focus attention on the issues of the definition of death and the ethics of organ harvesting and transplantation.17,18 Soon thereafter, donation after brain death (but during continued circulation) became the standard practice for organ donation in the 1960s until the brain-based definition of death gradually became accepted after the report of the ad hoc committee at the Harvard Medical School in August 1968.15,16 The first Cape Town heart transplant probably helped focus attention on the issues of the definition of death and the ethics of organ harvesting and transplantation.17,18 Soon thereafter, donation after brain death (but during continued circulation) became the standard practice for organ donation in the United States.19 While not demeaning these concerns, it is interesting to note that similar concerns were expressed regarding donation after the declaration of brain death.
40 years ago. Regardless, hospitals are now required to develop a policy regarding DCD, and anesthesiologists should be actively involved in the development of these policies (which can include opting out of DCD) (American Society of Anesthesiologists House of Delegates resolution #5, 2005). These anesthesiologists should be familiar with the relevant literature.21-24

Despite the renewed interest in DCD and the early success with transplantation of hearts harvested after DCD, except for some anecdotal reports, transplantation of hearts after DCD has not gained reacceptance, but further exploration of this approach is anticipated.21 In the case of the first Cape Town transplant, immediately after the donor had been certified dead, heparin was administered, the sternum was opened, and systemic hypothermic hemodilution CPB was initiated via the right atrium to the ascending aorta cannulation.2 Postmortem CPB (often using extracorporeal membrane oxygenation via peripheral cannulation) is being used by some DCD centers, but the Canadian Forum on Donation After Cardiocirculatory Death found no evidence of benefit by some DCD centers, but the Canadian Forum on Donation After Cardiocirculatory Death found no evidence of benefit.25

It should be noted that in this first case the anesthesiologist played an undoubtedly crucial role in optimizing the condition of the donor. At 10:00 pm, they found the donor to be hypotensive and with a mainstem intubation. The endotracheal tube was repositioned, and the administration of blood, calcium, and bicarbonate restored her blood pressure.10 Recently, the Organ Donation Breakthrough Collaborative has encouraged the involvement of intensivists (including anesthesiologists) in optimizing donor care with the aim of improving donor organ availability and function. Optimal medical management has been shown to be effective at improving successful organ transplantation.25 Thus, anesthesiologists (especially cardiac and intensivists) should become familiar with the pathophysiology of brain death and optimal donor management.26-29 It is worth noting that the University of Cape Town group played an instrumental role in defining the pathophysiologic consequences of brain death, especially as it relates to the heart, and in introducing the concept of hormonal therapy.30-31

In the previously mentioned special issue of the South African Medical Journal, this pioneering group did not overlook the importance of professionalism and social consciousness and emphasized the privilege and primary obligation of their profession to serve and help their neighbor. In his essay Ex Unitate Vires, Professor J.H. Louw emphasized, as did Barnard, the importance of teamwork and the critical and essential role of every member of the team.4 He also acknowledged the support of the university and of the state, the contributions of other pioneers in developing heart transplantation, especially in America, the courage of this first patient, Mr. Washkansky, and the compassion and generosity of the donor’s father Mr. Darvell. Considering the state of racial suppression in South Africa at that time, it is noteworthy that Professor Louw courageously pointed out the contributions made by the “colored” laboratory assistants who had become experts in animal research work. It was also noted that the kidney from the white donor was transplanted into a “colored” child at another hospital. (Brink and Cooper stated that in defiance of government policy to segregate patients according to race, Dr. Barnard tried to avoid such segregation in his department.22).

Finally, the editorial that accompanied this first report6 addressed an issue that still confronts clinicians today. How do clinicians justify and reconcile the performance of resource-consuming advanced procedures such as heart transplantation when a large portion of the population(s) is not receiving basic preventative and curative care?

For all of these reasons, clinicians are in debt to this pioneering team from Cape Town who performed a miracle 40 years ago, and to the reminder provided by Gordon and Brink.

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REFERENCES