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Heart Transplantation

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Transplantation has ancient roots in mythology and is depicted in a variety of legendary stories from around the world, including Hindu, Greek, Chinese, and Roman mythologies. These myths not only represent humanity's preoccupation with extending life and healing through body part substitution, but they also served as early conceptual frameworks that continue to inspire modern transplantation research and medicine. However, transplantation became a medical reality only in the mid-twentieth century.

The practice of transplantation dates back to the early twentieth century. Emerich Ullmann, an Austrian doctor, recorded the first attempted kidney transplant in 1902, when he performed an autotransplant in a dog by removing the kidney from its original site and transplanting it in the neck by anastomosis. This treatment succeeded in producing urine for a brief period of time before the dog died. In 1906, Mathieu Jaboulay, a French surgeon, performed the first clinical kidney xenotransplant, that resulted in some urine output. However, it was not successful. Alexis Carrel, a French surgeon and biologist, worked on triangulation technique of vascular anastomosis which paved the path for organ transplantation. He was awarded the Nobel Prize in 1912 for his pioneering works. In the next few decades, there were numerous efforts at kidney transplantation. Between 1940 and 1950, most attempts at transplantation failed due to rejection and a lack of immunosuppression. In 1950, Richard Lawler, a Chicago surgeon, performed the first successful kidney allograft transplant on Ms. Ruth Tucker at Mary Hospital in Illinois, utilizing a deceased donor's kidney.

Alexis Carrel and Charles Guthrie performed the first heart transplant in 1905 at the University of Chicago. They performed limb reimplantation, thyroid gland, kidney, and heart transplants

Christiaan Neethling Barnard performed the world's first human-to-human heart transplant operation successfully. He was born on 8th November, 1922 in the rural town of Beaufort West in South Africa, approximately 300 miles from Cape Town. He was the third son (of four) of a church minister, belonging to a poor family. Christiaan Barnard graduated from the local high school and went on to study medicine at the University of Cape Town (UCT), where he was financially supported by two scholarships. He graduated from the University of Cape Town at the end of 1946. After internships in Cape Town, he accepted an opportunity to work at a general (primary care) practice in a small town, which is about an hour's drive inland from Cape Town. He returned to Cape Town for higher studies in surgery. He got appointments first in medicine and then in surgery, at Groote Schuur Hospital (GSH), the major UCT teaching hospital. During this time, in the evenings, he carried out some extremely novel research on a canine model.

He was subsequently offered a scholarship to get surgical experience at the University of Minnesota in Minneapolis. There he was mentored by Professor Owen Wangenteen. He was first introduced to the relatively new specialty of open-heart surgery at the University Hospital in Minneapolis, which was one of just a few hospitals worldwide performing this type of surgery at that time. He saw the potential use of the heart-lung machine. Barnard gained experience working under the pioneers of open-heart surgery, C. Walton Lillehei and his colleague, Richard Varco. From this time onwards, he started considering that heart transplantation would be a major breakthrough in end-stage heart failure patients.

With this view in mind, in 1959, Barnard and his younger brother, Marius, a cardiac surgeon at GSH, started gaining experience of the operation by conducting orthotopic heart transplantation in dogs. He used the techniques used by his predecessors. Barnard learnt the principles of immunosuppressive therapy in patients with kidney transplants by attaching himself to David Hume in Richmond, Virginia. He also learned more about experimental heart transplantation from Richard Lower.

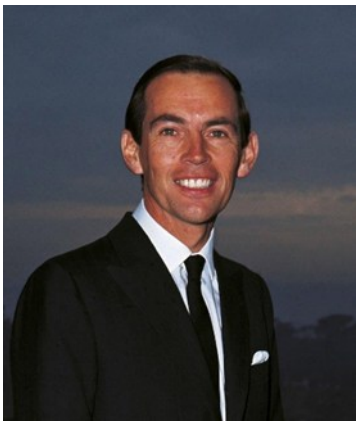
As Barnard got ready for this procedure, he requested the professor of cardiology, Velva ('Val') Schrire, to select a patient who might benefit cardiac transplant. Louis Waskansky, a 53-year-old diabetic, who was bedridden in hospital due to severe heart failure from ischemic heart cardiomyopathy was selected for this purpose, with his consent. Now, they had to wait for a suitable donor. On 2nd December, 1967, Denise Darvall, a 25-year-old woman, was admitted in GSH having suffered a severe brain injury as a result of a traffic accident, being hit by a drunk driver. She was certified brain-dead by the neurosurgeons. Her father gave his consent for transplantation of her heart and kidneys.

The transplantation surgery was conducted in 3rd December, 1967. Although the donor was certified brain dead, Barnard decided to wait for the heart to stop beating before he removed it. He disconnected the ventilator, and waited for about six minutes until the ECG indicated so. The surgical team attached the donor to a heart-lung machine and circulated cold oxygenated blood through her body to reduce the heart's metabolism during the transplant. The heart was quickly cooled to a low temperature, which helped to prevent it from additional ischemia insult. The donor heart was excised in such a way that the donor heart-lung system continued to supply it with cooled oxygenated blood as it was transported to the adjacent recipient operating room. As a result, the heart remained protected. In this orthotopic heart transplantation both native ventricles and all four cardiac valves were removed, and anastomoses were formed between the donor and recipient left atria, two right atria, aortae, and pulmonary arteries.

The recipient started recovering excellently. However, after the first week, Mr. Washkansky began to feel unwell. His condition began to deteriorate and ultimately, he succumbed to pneumonia, 18 days after transplant. However, his transplanted heart was the last organ to fail. On 2nd January, 1968, Barnard conducted the second transplant on Philip Blaiberg, a dental surgeon. The recipient lived a fairly active life for almost 19 months.

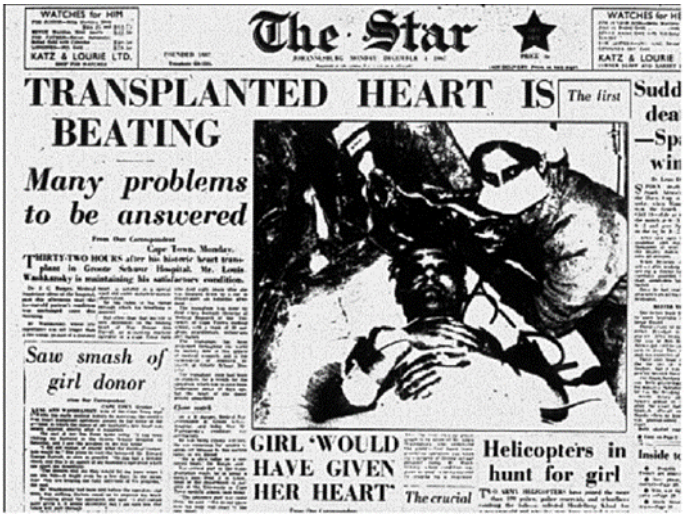
Dr. Juro Wada performed the first cardiac transplantation in Asia in 1968 at Japan's Sapporo Medical University. Similar to the history in the United States, initial procedures produced dismal results until the advent of cyclosporine in 1980. Cultural taboos on organ donation, combined with insufficient legislation regulating brain death, slowed down the widespread use of heart transplantation in Asia. Heart transplantation was eventually performed again in Asian continent in Taiwan and Thailand in 1987, Korea and Hong Kong in 1992, and Japan in 1999.

In India, on 17th February, 1968, Prafulla Kumar Sen, a surgeon from Bombay performed the world's fourth human heart transplant. He received worldwide accolades for his feat, despite the fact that the patient only survived three hours. The first successful heart transplant in India was conducted at the All India Institute of Medical Sciences (AIIMS), New Delhi on 3rd August 1994. The patient survived for 14 years. Today, in India, cardiac transplantation is a life-saving procedure that has improved the lives of many people suffering from end-stage heart disease.



Christiaan Barnard

Image Courtesy: https://en.wikipedia.org/wiki/Christiaan_Barnard#/media/File:Christiaan_Barnard_1968.jpg


The Star

TRANSPLANTED HEART IS BEATING

Many problems to be answered

Saw smash of girl donor

GIRL 'WOULD HAVE GIVEN HER HEART'

Helicopters in hunt for girl

The front page of a South African newspaper on the day following the first heart transplant.

Image Courtesy: Glob Cardiol Sci Pract. 2018 Jun 30;2018(2):11. doi: 10.21542/gcsp.2018.11

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