A Tale of Two Surgeons

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Abstract:

Cardiac transplantation is one of the greatest medical marvels of the twentieth century. Performing this miraculous operation on 3rd December 1967, Dr. Christiaan Barnard, an unknown surgeon from the then apartheid state of South Africa suddenly became an international celebrity. Probably no single procedure in the history of medicine had attracted so much media and public attention. But there were many who thought that he didn't deserve much of this glory. A lion share of this should have gone to somebody else. Although Barnard completed the final step in the road to transplant, it was the end product of serious research work carried out in many centers around the World. Most important was Stanford University Medical Center, Palo Alto, California USA, where Dr. Norman Edward Shumway was engaged in transplantation related research work along with his junior colleague Dr. Richard Lower. The most of the techniques used in cardiac transplantation today were actually developed by Dr. Shumway and his team. Barnard worked in the same unit with Shumway at University of Minnesota when he came to USA. He visited USA again in 1966 when he observed the works of Shumway's research partner Dr. Richard Lower. During both of his visits he had adopted many techniques from the research work of his American counterparts and later used in his unique accomplishment. Barnard succeeded utilizing techniques developed through Shumway's painstaking work over the years depriving Shumway much of the glory he deserved. Both later on continued in the development of transplantation when most others left because of poor outcome. Shumway excelled the technical details and Barnard drew media and public attention to the importance of this procedure. After almost five decades the name of Barnard is still well known by the common people around the World; whereas Shumway remains unknown even to most of the cardiac surgeons as well. This was the destiny of the two main heroes credited behind this exciting medical accomplishment. Here lies a very interesting story, the tale of two surgeons.

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Introduction:

The Cardiac transplantation is one of the medical marvels of the twentieth century. Dr Christiaan Barnard had become a grand celebrity being known worldwide for performing the first human to human heart transplantation operation on the 3rd of December 1967.[1] Probably no single procedure in the history of medicine had drawn so much media and public attention. This single operation suddenly turned this virtually unknown surgeon hailing from the then taboo apartheid state of South Africa into a superhero. His operative achievement occupied the first pages of the newspapers all over the World; his face was portrayed on the cover of top magazines. This flamboyant surgeon had the opportunity to date Hollywood film stars like Gina Lollobrigida and Sophia Loren.[2] He was literally on top of the World. But there were many who thought that he didn't deserve all these glory. A lion share of these, if not all should have gone to somebody else. Behind this issue there lies a very interesting and illustrious historic story, the tale of two surgeons.

Organ transplantation has been occupying human imagination from the time immemorial. Assyrian, Greek and Indian mythologies contain various humanoid characters. Perhaps the most common imaginary humanoid character is the mermaid, beautiful young lady with fish tail which occupied a lot of space in the childhood literatures. Even monotheistic religions have descriptions of humanoids such as Gog Magog described in old and new testaments which are Yazuz Mazuz in Al Quran and Al Hadith. However with the development of modern medicine the possibilities of organ transplantations were explored. The famous experiments by Alexis Carrel in the early twentieth century paved the initial pathway towards transplantation.[3] The famous Soviet surgeon Vladimir Demikhov excelled in the

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development of surgical techniques of transplantation. The photos and videos of double headed Demikhov dog and other experimental animals still astonishes surgeons today. However their successes were short lived as despite their operative skills, they had virtually no idea of the immunological tissue rejection mechanism. Second World War made tremendous changes in the understanding of human physiology as well as development of surgical techniques. The battle field hospitals full of injured soldiers and the detention centers filled with unfortunate prisoners provided plenty of opportunities for research often by unethical means. Many of these war veteran physicians and surgeons returned to civilian life at the end of the war and contributed in the innovation of a number to machines and methods using their war time experiences. After the war the first intracardiac repair was performed by John Lewis and Walton Lillehi at the University of Minnesota using hypothermia and inflow occlusion technique in 1952. Next year John Gibbon used his newly invented heart lung machine to perform the heart surgery under cardiopulmonary bypass. The identification of blood groups and development of proper transfusion techniques developed in the early twentieth century. The discovery of human leukocyte antigens (HLA) system in the late 1950s was another important breakthrough towards organ transplantation. There was much improvement in anesthesia, and cardiopulmonary bypass techniques as well. In the 60s it became apparent that the dream of organ transplant is not far beyond human capability. Serious research work was going on in many centers around the World. One of such centers was Stanford University Medical Center, Palo Alto, California USA, where Dr. Norman Edward Shumway was engaged in transplantation related research work along with his junior colleague Dr. Richard Lower since 1958.[4]

Norman Edward Shumway was born in Kalamazoo, Michigan USA on 9th February 1923.[4] So he was of similar age or just 4 months younger to be more precise, than his well known competitor Christiaan Neethling Barnard, who was born on 22nd February 1922 in Beaufort province, Western Cape, South Africa.[5] Shumway was drafted in US army in 1943 during the Second World War. The army had sent him to Texas for some engineering courses. He completed medical graduation from Vanderbilt University in 1949. He then went to University of Minnesota for residency program and had the unique opportunity to work under the pioneer cardiac surgeons John Lewis and Walton Lillehei. It was the time when this hospital was playing a significant role in shaping up cardiac surgery as a subject under Lewis and Lillehei's supervision. Incidentally Dr. Christiaan Barnard came to Minnesota in 1956 for a 2 year fellowship training program in cardiothoracic surgery under Walton Lillehei. Shumway and Barnard, the two biggest contributors in developing cardiac transplantation thus came in contact early in their professional life while working in the same department from 1956 to 1958. This interaction between the two disciples of Lillehei probably didn't produce a great friendship for either much to cherish later on. Certainly none of them had any idea how this duo was going to shape the future of cardiac transplant in the days to come.

In the summer of 1958 Shumaway left Minnesota and joined Stanford University Hospital as a dialysis machine operator. Along with his junior colleague Dr Richard Lower he started working in a research lab located on the 5th floor of an old hospital building.[6] Their job was to study the effect of hypothermia on animal heart. Days after days they attached newly developed heart lung machine to the circulatory system of dogs and then put cross clamp isolating the heart from the rest of the circulation immersed in ice cold saline. In those early days of cardiac surgery this was a very important experiment. Tired of boredom of doing the same thing time and again, Shumway decided to go further beyond. Once they had taken the arrested canine heart out of the pericardial cavity and stitch it back to its original position after an hour. It was a break through when the re-implanted heart started beating. Next step was transplanting the heart of a dog into another. Gradually these two surgeons learnt a lot about cardiac physiology and transplant immunology which paved the footsteps of future transplantation. Richard Later moved to Medical College of Virginia at the Virginia Commonwealth University, Richmond to join a cardiac surgical position, where as Shumway continued at Palo Alto. In the late 60s both of these surgeons were virtually inches away from performing the first human heart transplantation. All over the World there were many surgeons, who had this operation in their

minds. But definitely Shumway had the best preparation closely followed by his friend Dick Lower. By the summer of 1966, these 2 and to a lesser extent a few others had acquired the knowledge and skill required for the desired operation. They were just waiting for the opportunity to arrive in the form of a suitable pair of donor and recipient. The other delaying factor was lack of definition of brain death under the US law. In 1966 Richard Lower at Virginia had an interesting visitor from South Africa, Christiaan Barnard. He was kin in studying the transplantation techniques developed by Lower and Shumway. One of Barnard's accompanying technicians told a member of Lower's staff that Barnard was there to learn the techniques and perform transplant on his return to South Africa. When this information was passed to Lower, he was amused in disbelief. He never thought that this might be possible for this visiting surgeon speaking English with a peculiar Africana tone! However this underestimated surgeon actually did the magic. He returned to Cape Town with the US experience and prepared for transplantation with his limited resources.

Surprising it may seem but the Barnard's department was quite well equipped. Standard of medical care Cape Town was quite sophisticated and advanced in the 1960s.[7] There were good research facilities and ample opportunity of sponsored overseas academic exchange programs. Contrary to popular belief Cape Town was by no means an academic backwater, the environment was conducive for academic research.[7]

Fig.-1: *The photos of two of the greatest surgeons credited with cardiac transplantation put together with a symbolic gesture. Dr Norman Shumway on the left scrubbing in preparation for surgery and Dr Christiaan Barnard on the right washing hands on completetion.*

The apartheid country made the best treatment facilities available at least for its white population. The lady luck ultimately favored the brave surgeon of the Southern hemisphere. On 3rd December 1967 Christiaan Barnard did the miracle. He transplanted the heart a young female road traffic accident victim to a middle aged man suffering from intractable heart failure.[7]

The magic around heart transplant was seriously harmed by the abrupt improper rush to get on the bandwagon. A total of 107 cardiac transplants were performed by 64 teams in 24 countries in 1968 alone with inevitable poor results. Ill-trained surgeons without proper knowledge of transplant immunology and postoperative care had ended up with disastrous results. The worldwide euphoria around heart transplantation evaporated soon. Barnard though remained at the focus of media attention. The South Africa Medical Journal published a special issue with articles on the different aspect of the operation.[8] Although Barnard himself was an outspoken opponent of the apartheid policies of his country, the internationally isolated South African government encouraged its most notable son to receive a lap of honor tour around the world in an attempt to improve the outside image. Human heart had always been considered as a mysterious and mythic organ. The person transplanting this special organ became an instant celebrity. It is said that the first serious casualty related to transplant was Barnard's own marriage. Soon he had broken up ending 21 years of conjugal life with his first wife Aletta Gertruida Louw. He married twice more later on, but both also broke down. He had an extramarital affair with Gina Lolobridgita, the famous Italian sex symbol Hollywood actress of his time. His iconic life grew at the expense of his personal life. Even after 48 years of that event is still regarded as a great accomplishment of medical science. The beaten American rivals often were not happy to observe the attention and described this hype as circus around Barnard.

Fig 2. Barnard portrayed on the covers of famous international magazines.

Fig 3: *Barnard with 3 Hollywood actresses, Gina Lollobrigita, Sophia Loren and Princess Grace*

Despite Worldwide poor results Norman Shumway was the only American surgeon to continue with the cardiac transplant effort when all others gave up. With continued research he gradually developed different protocol to combat tissue rejection. He went back to laboratory working with dogs and reemerged a decade later for successful implementation in human subjects.

Fig.-4: *A. Dr Norman Shumway, B. First transplant in US is going on. C. Press conference after the operation.*

With the introduction of Cyclosporine, there was dramatic improvement in the survival of the cardiac transplantation patients in the 1980s. Shumway is credited with actually doing the ground work and many consider him as the father of cardiac transplantation. Before he retired from the operating room in 1993 he oversaw some 800 heart transplants. He received the first life time achievement award from the International Society for Heart & Lung Transplantation. The total number of heart transplantation Worldwide is approaching six digit figures now. Many of the recipients are leading normal life and some of them have even conquered dangerous mountain peaks like Matterhorn in Switzerland and Mt. Fuji in Japan with a gifted heart under their rib cage.[9] These recipients owe a lot especially to these two surgeons among others. One of them Norman Edward Shumway had all the patience and perseverance spending hours in research lab and OT to establish innovative techniques for transplantation. The other one Christiaan Neethling Barnard had the smartness and boldness to make the best use of those techniques. This was the destiny of the two main heroes of heart transplantation, an interesting piece of cardiac history, the tale of two surgeons.

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