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by

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The Triumphant Era of Organ Transplantation: 1954-1979

The development of the successful organ transplant and the continued medical research of the 1950s through 1970s epitomized triumph over tragedy. Facing moral criticism and medical failure, doctors and scientists worked together to develop success in the field of transplantation. Despite a combination of religious, social, and immune system rejection, medical accomplishment flourished. The first kidney, lung, liver, pancreas, and heart transplant, immunosuppression, histocompatibility, and non-identical transplants all occurred during the thirty-year period. This thirty-year period not only overcame both medical and moral disapproval, it produced more success than the recent transplant progression. Overcoming moral controversy and medical complications, organ transplantation in the 1950s through the 1970s proved the most successful period in transplant advancements and triumphed over organ failure and subsequent death.

Before the first successful organ transplant in 1954, all other attempts with transplantation paved the path for progress, but lacked sufficient results¹. Greek mythology illustrated evidence of early transplantations. A Greek myth featured the Chimera, a beast made of different animal parts; the Chimera had the head of a lion, a goat's body, and dragon breath

and tail². In India, skin grafting, or skin transplants, began as early as 300 B.C.E.; using pieces of skin from a patient's cheek or neck, physicians repaired injured noses³. In 2 C.E., St. Cosmos and St. Damian amputated a patient's leg, then replaced it with a leg from a man who recently died⁴. Surgeon Gaspere Tagliacozzi of Italy, worked to acquire the technique of skin grafting in the 16th century, but the opposition by the Roman Catholic Church, lack of anesthesia, antibiotics, and sterile equipment languished any efforts⁵. The first serious organ transplant attempts utilizing modern surgical techniques began in the early 1900s⁶. Doctors produced much success in the preliminary stages using animal subjects. Dr. Charles Claude of St. Louis Washington Hospital, created a two headed dog using grafting and Stanford's Norman E. Shumwayir transplanted a non-related dog heart into another dog, but the dog died three weeks later⁷. The ancient and early temporary success generated hope for potential human transplants. In spite of the advances these attempts yielded, inadequate medical knowledge for the time, postponed definite success until 1954.

The first successful organ transplant in 1954 proved a monumental feat. On December 23, 1954, at Brigham Hospital of Boston, Massachusetts, the world's first successful organ transplant occurred⁸. Dr. Joseph E. Murray took a kidney from Richard Herrick's twin brother, Ronald, and implanted it into him⁹. Ninety minutes after one surgical team removed one of Ronald's kidneys, Murray attached it to Richard's blood vessels and the kidney turned pink¹⁰. After the acceptance of all previous skin grafting tests, doctors assumed similar success when applied to organ transplantation. Identical twins have identical D.N.A., therefore, Richard's immune system readily accepted Ronald's organ without rejection¹¹. Richard underwent radiation treatment to ensure rejection prevention¹². Writing in the *New England Journal of Medicine*, Murray and doctors from Harvard Medical School and Peter Brent Brigham Hospital

described the successful organ transplant, which not only spread news of hope, but elicited the initial movement of controversy¹³. Richard Herrick lived for eight years after the transplantation, until the reoccurrence of kidney disease. Ronald, now seventy-two, claimed to never have felt any ill effects¹⁴. This surgery won Murray the Nobel Prize, a small reward compared to the monumental prize of successful organ transplantation¹⁵.

Dr. Joseph E. Murray's essential involvement and accomplishments generated much advance in organ transplantation. Joseph E. Murray compared the concept of spare-parts surgery to that of landing a man on the moon an unthinkable metaphor for the time¹⁶. Spoken with reverence, Murray's name elicited awe and applause. Murray created a new field of medicine in a period of eight years (1954-1962)¹⁷. Murray began his study at Harvard Medical School¹⁸. He spent four years at an army hospital in Valley Forge, Pennsylvania, as a plastic surgeon who did extensive skin grafts on burned soldiers¹⁹. After he completed his term, he settled at Peter Brent Brigham Hospital²⁰. Intrigued by the possibility of overcoming organ rejection, Murray joined Brigham's transplant research team²¹. After he completed the first successful organ transplant, Murray continued to work towards further advancement. Facing moral and ethical controversy, the scarcity of funding, and the still prominent complication of rejection, Murray faltered, but never gave up. After unceasing study, Murray's research led him to abandon irradiation in favor of the new drug, Imuran²². His work and medical opinions thoroughly advanced the entire field. Murray, an intelligent doctor, made organ transplantation possible and successful.

Despite early organ rejection and increased medical complications, organ success persisted because of increased scientific and medical advancement. Histocompatibility understanding and further organ rejection developments, such as immunosuppression via radiation and drugs, obtained and maintained transplant success. Transplanted organs

experienced rejection because the recipient's immune system didn't recognize the replacement organ's foreign proteins²³. The immune systems would not tolerate foreign cells and the activated lymphocytes attacked the invader²⁴. The immune system's memory triggered more vigorous attacks the second time the lymphocytes encountered the foreign substance; for organ transplantation, this meant a much stronger rejection²⁵. Histocompatibility, derived from the Greek word, "histos," for web or tissue, meant tissue compatibility²⁶. Tissue typing and blood matching encompassed the first steps in the avoidance of organ rejection. Transplant teams made sure donors and recipients had matching blood and tissue types to minimize negative immune responses²⁷. "We have a match," meant doctors found a donor and a recipient whose tissues bore many identical major histocompatibility antigens. Because basic genetic structure determined major histocompatibility antigens, doctors discovered relatives of a prospective recipient made the best donor candidates²⁸. Family relations engendered the first eleven successful organ transplants in the 1960s²⁹. The understanding of immunosuppression via radiation and drugs in the 1950s through 70s proved essential to the struggle with organ rejection. The introduction of immunosuppression reduced the effectiveness of the immune system, therefore prevented its ability of organ rejection³⁰.

The discovery and production of immunosuppressant drugs greatly improved the anti-rejection process, and replaced the use of excessive radiation. The combination of tissue typing and radiation made the Herrick transplant triumphant³¹. The use of radiation, whole body x-ray exposure, effectively reduced the activity of the immune system, but further use proved too debilitating, doctors, including Murray and Dr. David G. Nathan, abandoned the treatment³². The origination of immunosuppressant drugs, like Imuran and Cyclosporine provided a safe and efficacious means against organ rejection. Imuran shut down the immune system without leaving

patients permanently weakened. The drug required trial runs, and after three fatal endeavors, Mel Doucette survived and he experienced no rejection³³. Murray renounced irradiation in favor of Imuran. The use of Cyclosporine emanated after its discovery in 1972 by Sandoz Pharmaceuticals. The fungus suppressed the immune system while leaving much of the vital system intact. After the issuance of cyclosporine, the survival rate for heart transplant recipients increased from a 63 percent rate to 83 percent and liver recipients from 35 percent to 70 percent³⁴. The combination of immunosuppression and histocompatibility provided a dependable way around organ rejection.

Many moral issues arose in response to organ transplantation, but its ability to save lives superseded any controversy. Thomas Starzl said it best, “Progress consists of a series of great and small revolutions against authority. A great advance necessitates the overthrow of an established dogma, and when that occurs, the advance itself becomes the new dogma, which advocates flock³⁵.” The introduction of human transplantation proved necessary for the maintenance of life, but first it had to overcome criticism and condemnation. A concatenation of disapproval faced doctors and scientists, but with further advance and success, the acceptance of organ transplantation came through the years of 1954 and 1979. This period produced organ transplant progress and inordinate reproof subsided.

The most suitable organ donors proved, comatose patients kept alive by artificial means; opposition to “pulling the plug” and donating the organs surfaced, but the realization of the ability to save other’s lives outstod any disputes³⁶. Defined in 1968 by a committee at Harvard Medical School, death’s determinate no longer required the heart to stop beating, but only required the brain to cease function³⁷. Any pronounced death, certified by at least two doctors with no connection to the transplant team, guaranteed ethical decisions. Having no obligation to

keep patients alive with the help of artificial means, doctors advised families to make the appropriate decisions; however, if any doubt existed, the doctor's duty remained, the maintenance of life. The decision to cancel artificial respirators required great care. Controversy over the definition of death and possible comatose patient recovery, stood in the way of possible transplantation; Orthodox Jews argued against any action to cease such a life and the followed donation of his/her organs, based on the belief that the soul and spirit persisted, even if machines kept the person alive and on the grounds that the removal of organs mutilated the body³⁸. Organ transplant teams faced an overflow of opposition from religious leaders, families of comatose patients, and fellow colleagues following the pull of the plug and organ retraction; however, the rebuttal against artificial respirators, argued the negligibility of a comatose life, and the relief of an intolerable burden after "pulling the plug". Willingness to cease artificial life and donate the organs not only aided the families and the comatose patients, but it saved the lives of many others in need of organs. How could religious people, in favor of the continuance and value of life, disavow a means of saving one? The definition of death and the understanding of suitable organ donors became imperative to the success of organ transplantation.

Considered risky and unnecessary to the public, the use of live donors became another source of debate; however, live donors provided histocompatible organs for the necessary demand. Critics accused Joseph E. Murray of "playing God" and some colleagues argued the unethical nature of subjecting healthy people to surgery in order to extract their internal organs. Live donors did expose themselves to the dangers of surgery, but the end result, saving someone's life, proved important enough to take such a risk. Ronald Herrick willingly and readily donated his spare kidney to his dying twin brother in 1954. Prior to surgery, Ronald had to convince both lawyers and religious leaders that he understood the ramifications. Only after

conversations with both the doctors of Peter Brent Hospital and Ronald Herrick, did lawyers and religious leaders agree³⁹. Without the use of live donors, the early stages of human transplantation could not have advanced during the 1954-1979 year period. Live donor kidney transplants with identical twins proved very successful with both donors and recipients. The disruption of nerve supply on kidney and ureters did not affect performance and after revascularization, restoration of organ function and full health manifested⁴⁰. One-fourth of kidneys transplanted, a live relative willingly donated the organ⁴¹. Despite controversy, doctors and patients continued with live donor surgeries.

Varying psychiatric, intellectual, and physical effects after transplantation demonstrated temporary negative consequences, and elicited arguments, but further study verified the majority reappearance of the norm. Organ transplantation required emotionally stable attitudes, supportive families, history of good work records, and sufficient responses to prior stresses. Depression following transplantation became common for a period of time after surgery. Recovery proved a burden too great for some patients to handle⁴². The need for constant attentiveness against rejection, the side effects of immunosuppression, and the dependency on medical care negatively affected some organ recipients. After an interval of time however, the majority of patients reverted to normal mental capacity prior to surgery⁴³. The return of previous intelligence accompanied returned mental capacity. Declined mental and intellectual capacities proved a low hurdle to overcome. Intelligence exams directly after surgery showed a deterioration of comprehension, vocabulary, arithmetic, and other subjects. Tests fifty-seven days post transplant in comparison to one hundred and ninety-five days post transplant illustrated relatively low scores. One hundred and ninety-five days after transplantation, tests showed increased scores and the reappearance of quondam intellectual capacity in all cases. Immediately

after transplantation, patients required much care, but with time restoration of normal life and physical activity resulted. Many patients returned to work or continued very dynamic lives; the return to previous activities and any new hobbies or work disproved any permanent ill-effects. Although patients encountered a decline in psychiatric, intellectual, and physical competence, the majority experienced the return of all capabilities prior to surgery⁴⁴.

With the first successful, non-identical twin transplantation, in 1960, further medical headway emerged⁴⁵. The identical tissue compatibility of identical twins provided a way around immediate rejection in all previous successful organ transplants. Admitted to the hospital in December of 1959, A.R. suffered from progressive uremia, a condition where urea, a waste product, remained in the bloodstream. A.R.'s fraternal twin brother, J.R. willingly donated one of his kidneys⁴⁶. Because of rejection concern, the brothers underwent many tests to ensure an effective conclusion. Skin grafts taken from both brothers and placed on each other showed limited signs of immune system dismissal. With such results, the doctors at Brigham Hospital continued with organ retraction and replacement⁴⁷. On January 24, the doctors performed the kidney transplant. Immediately after the kidney connected to the to the recipient's bladder, it functioned. Because of irradiation, adrenocorticoid, and continuous medical care, A.R. overcame his kidney failure and returned to normal renal function and proper clinical well being⁴⁸. As reported in *Time*, on June 27, 1960 A.R., proved healthy and well eighteen months after his transplant. Dr. John P. Merrill, led A.R.'s treatment and reached success through the almost deadly amounts of radiation. Merrill knew radiation treatment could not continue as the only source against rejection, but it remained successful at that time⁴⁹. Such transplantation success with non-identical twins demonstrated the progress procured during the 1950s through 70s.

In 1968 the Southeast Organ Procurement Foundation formed a membership and organization open to transplant professionals in pursuit of perfecting available organ obtainment and tracking⁵⁰. When the availability of an organ arose, the OPO gathered all relevant information about the donor. The OPO ranked all possible recipients based on a scale of physical compatibility, health, and duration the recipient had waited on the list⁵¹. The development of the first computer-based organ matching system in 1977 made donor and recipient connection easier and more fruitful⁵². The introduction of the OPO proved essential to the improvement of organ procurement and proceeding transplantation.

The progress in organ transplantation made in the 1950s through 70s not only triumphed over death as a result of organ failure; it prevailed over criticism and accepted medical capacities for that time period. With the introduction of successful human organ transplants, followed by the invention of immunosuppressant drugs and radiation, the venues of patient recovery, and the OPO, the thirty year time period proved the most progressive span of transplantation advancement. All previous attempts at transplantation breakthroughs lacked ample understanding, money, resources, and relevance to human transplantation; any later furtherance in organ transplantation, anti-rejection, and procurement after the 50s and 70s did not benefit the medical world as greatly as the previous period. Overcoming moral controversy and medical complications, organ transplantation in the 1950s through 1970s proved the most successful period in transplant advancements and triumphed over organ failure and subsequent death.

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