ORGAN TRANSPLANTATION-AN UPDATE

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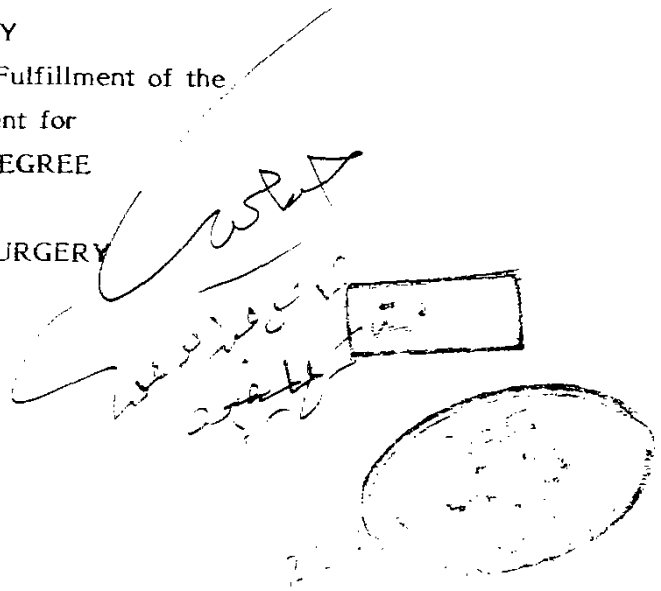

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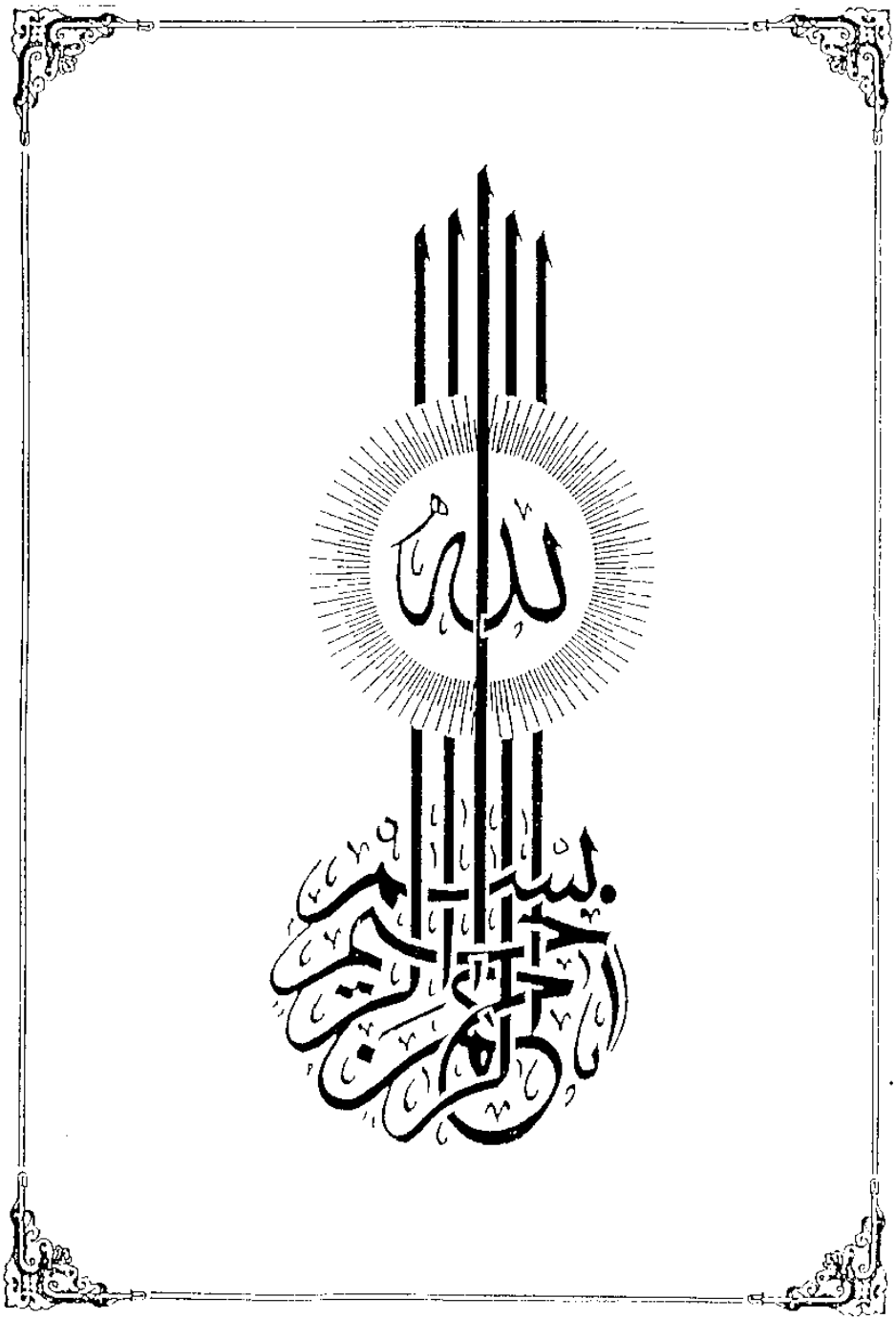

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INTRODUCTION

INTRODUCTION

The terms transplants and transplantation are used broadly in reference to any removal or partial detachment of a part of the body and its implantation into or onto the body of the same or a different individual.

Graft is synonymous with transplant. Host and recipient are synonymous.

According to the genetic relationship between donor and recipient, there are four classes of transplants:

1. atuo graft-donor and recipient the same individual;
2. isograft orsyngeneic graft-donor and recipient genetically identical individuals of the same species (a graft between monozygotic twins).
3. allograft or homograft-donor and recipient genetically dissimilar individuals of the same species and,
4. Xenograft or heterograft-donor and recipient individuals of different species.

According to the site of implantation, transplants are:

Orthotopic: if surrounded by the same kind of tissues or located in the same part of the body after transplantation as before;

heterotopic: not located in its anatomical part of the boy.

According to the technique of implantation, transplants are classified as follows:

1. Anastmosed grafts-the circulation of the host established in the graft at the time of transplantation by vascular anastmosis;
2. Pedicled grafts-the graft connected to the donor site at least temporarily by a pedicle containing blood vessels;
3. Free grafts-isolated pieces of tissue devoid of vascular, nervous and lymphatic connections at the conclusion of the transplant procedure;
4. infused grafts-the graft established by means of an infusion of a cell suspension into the blood stream, a body cavity or tissues of the host e.g. hematopoietic and lymphoid cells.

Bone marrow is transplanted by intravenous infusion. (Delford and Seigler 1981).

HISTORICAL BACKGROUND

The fifteenth Century Italian poet, Calenzio, referred to slaves donating noses to their masters.

The transplantation of a whole leg by Saint Cosmas and Damain was the inspiration of several Renaissance paintings. According to this legend, the leg of a dead black man was successfully used to replace the cancerous leg of a white man. The distinction between the real and the imaginary was not always clear.

The oldest evidence of grafting is seen in remains of trephined prehistoric skulls, in the Bronze Age skull alarge defect was filled by implanting the removed fragments as an orthotopic autograft. In this specimen, the cutmargin showed no sign of healing, so the operation may have been fatal. There is archeologic evidence that teeth were transplanted in a man in ancient Egypt, Greece, pre-columbian North and South America, Rome, and perhaps China. Transplanted teeth did not live; the results were poor and the practice waxed and waned.

Ancient Hindu Surgeons described methods for repairing defects of the nose and ears using techniques of grafting similar to those used in modern times.

During the sixteenth century the Italian Surgeon Tagliacozzi reconstructed the nose using a flap from the arm; it was used to replace noses cut off in combat or for punishment, or dystroyed

by syphilis. The technique is still in use, known as tagliacotian flap or the Italian method.

During the eighteenth century, the scottish surgeon John Hunter recived the practice of transplantation of teeth, and about this operation he wrote "success of this operation is founded on the disposition of all living substances to unite when brought in contact with one another, although they are of different structure and even though the circulation is carried in one of them.

In 1770 Missa reported successful transplantation of the extensor tendon of the middle finger to the extensor tendon of the index finger.

According to woodruffs comprehensive review, reports of the following kinds of grafts were first published during the nineteenth century: free grafts of skin, tendon, nerve, cartilage, cornea, adrenal, thyroid, parathyroid, ovary, adipose tissue and pedicled grafts of muscle, tendon, nerve, and portions of gastrointestinal and urinary tracts.(Delford and Seigler 1981).

Many of the developments in human transplantation were made possible by two developments during the last half of the century:

1. The use of ether and other general anaethetics.
2. Acceptance of Lister's principles of antiseptic surgery. (Delford and Seigler, 1981).

Skin Grafts:

The first well-documented report of successful free autograft of skin as in 1804 by Baronio, who experimented with sheep.

In 1822 Bunger reported successful use of a free full-thickness skin autograft to repair anasal defect.

In 1870 Reverdin reported the observation that small grafts of epidermis on a granulating surface increased in size and grew out to coalesce with adjacent grafts.

In 1886 Thiersch in Germany described the resurfacing of wounds with large sheets of split-thickness skin, such grafts are still somtimes called Thiersch's grafts, although essentially the same procedure was reported 14 years earlier by Ollier in France.

In 1863 Paul Bert, a student of claude Bernard, reported that autografts, allografts and xenografts behaved differently, the significance of these observations received little attention. (Delford and Seigler, 1981).

Cardiac Transplantation:

Cardiac transplantation originated with carrel and Guthrie (1905), who reported successful heterotopic cardiac transplant procedures in dogs. The first fully successful orthotopic cardiac transplantations were described by lower and Shumway in 1960. The first human cardiac transplantation was performed in December 1967.

As of January 1, 1982, at least 664 patients have undergone cardiac transplantation throughout the world. (Bruge et al., 1983).

Liver Transplantation:

The placement of auxiliary whole livers in dogs was described in 1955 by Welch, and within 5 years, attempts at totalhost hepatectomy and orthotopic canine liver transplantation (liver replacement in the normal location) were successful at both Harvard and Northwestern University (Starzl, et al., 1979).

The first clinical trial of liver transplantation took place in 1963. In subsequent 18 years, more than 400 attempts have been made throughout the world. (Starzl and Shunzaburo, 1982).

Renal Transplantation:

Woodruff reviewed reports of 23 renal allografts in man that were published prior to 1959. All but one of these were reported after 1949. The first was by a Russian surgeon, Voronoy, who in 1936 unsuccessfully grafted a cadaver kidney into apatient with mercury poisoning. Hume in 1955 reported the results of nine cases. Included in this series was a cadaver donor graft that functioned 542 months in the thigh of a recipient who received no immunosuppression. In 1954 Murray et al., performed the first transplant of a kidney between monzygotictwins. The long term success of this and subsequent renal transplants between monozygotic twins was followed by agreat increase in clinical studies with renalallografts. (Defford and Seigler, 1981).

Surgical Techniques:

Among the many surgical techniques that has contributed to the development of transplantation during this century, the technique of vascular anastmosis by suturing.

The first reports of consistently reliable vascular anastmosis by suturing were those of Carrel (A French Surgeon Working in Chicago and New York) and Guthrie between 1902 and 1912.

In a large number of animal experiments, these authors immediately used this techniques successfully in the transplantation of blood vessels and whole organs. These authors also made observations contrasting autografts with allografts.Carrel clearly recognized the problem of rejection as he wrote in 1910: should an organ extirpated from an animal and replanted into its owner by a certain technique, continue to functionate normally, and should it cease to functionate when transplanted into another animal by the same technique. (Delford and Seigler 1981).

Problem of Rejection:

Guthrie suspected that rejection was an immune process.

The immunity theory of graft rejection was postulated by several authors during the first decade of this century. (Delford and Seigler, 1981).

Genetics of Transplantation Antigens, Tissue Typing, and Cross Matching:

In 1948 Gorer, Lyman, and Snell described H-2 as a genetic locus controlling strong histocompatibility antigens in the mouse.

The work of Landsteiner during the first four decades of this century with erythrocyte ABO and Rh antigens was a necessary basis for blood banking and blood transfusing, which came into extensive use during and after world war II. The development of blood transfusion contributed to the progress with the problem of graft rejection in three respects.

1. The A and B erythrocyte antigens are widely distributed in tissues and are transplantation antigens that must be considered in the selection of tissue and organ donors.

2. By analogy with typing and croos matching for blood donor selection, one of the major approaches to the problem of graft rejection has been tissue compatibility testing.

3. The serum of patients who have recieved multiple blood transfusions frequently contains antibodies to human leukocytes. It is now known that these are HLA antibodies, and serum from such patients was the principal source of antibodies in early studies of HLA system. (Delford and Seigler, 1981).

The Second-Set Phenomenon:

In 1903 Jensenobserved that a second graft did not survive as long as the first when amouse received two grafts of atumour separated by an interval of several days, and he suggested that immunity accounted for the difference. Holman used skin allografts to treat a burned patient and reported in 1923 that a second group