Transplantation immunity
Definition: transplantation and transfusion
Indications for transplantation
Different types as per donor
Is transplantation an immunological field?
Relation with MHC & blood group
Selecting donors
Fate of transplant-rejection
Clinical attributes
Transplantation

(Trans=Changing position/transfer, plantation=implantation)=Transplantation, other name is 
graft

Definition

Transfer of solid organ or part of it or living tissue from 
donor to recipient is called transplantation. 
Example-kidney, cornea, bone, skin, tendon, blood vessels etc.

Transfer of fluid tissue within individuals is known as 
transfusion. Example-whole blood, fresh plasma, 
coagulation factor, platelets etc.

Transfer of any part of an organ by artificial material is 
known as “prosthesis”
Indications

- Failure of functions of vital organs
- Reconstruction
- Remodeling
- Cosmetic
- Rehabilitation
Types of transplantation (Graft)

- **Autograft** = transfer within the same individual (Karim’s foot to heart)
- **Allograft** = transfer from one individual to another of the same species (Rahim to Karim)
  - **Isograft** = transfer between identical twin
  - **Heterograft** = transfer between persons other than twin
- **Xenograft** = transfer from one individual of one species to another individual of different species (from chimpanzee to man)
Is transplantation an immunological field?

- Unquestionably transplantation is an immunological field
- Because, Transplantation needs proper tissue matching
- Otherwise, grafted tissue in recipient will be recognized as foreign antigen and damaging immune response will be produced
Relation with MHC and blood group

- Transplantation needs tissue matching

- All nucleated cells in human body (excluding RBC but including platelets) have MHC I molecule on their surface
  - Tissues of donor and recipient are compatible while haplotypes of MHC I are almost same
  - Since MHC I molecule is present in almost all cells and tissues in living body, so it is called “major transplantation antigen”

- Immunocompetent cells have MHC II molecules on their surfaces
  - Tissues having ICC will be compatible while haplotypes of MHC II are almost same between host and recipient

- RBC membrane show antigen molecules those are known as “Blood group antigen”
  - RBCs between donor and recipient will be compatible on the basis of several similar blood group pattern
  - Since blood group antigen match RBCs only, so it is called “minor transplantation antigen”
Selecting donors

- Same person for skin and vascular graft
- Identical twin for kidney transplant is best, others are parents, brothers-sisters, close blood relations, unrelated but MHC and blood group matched
- Other animal for heart valve graft
- Cadaver for cornea
- Living individual for bone graft and cartilage
- No need of MHC matching for cornea and cartilage graft
Fate of transplant

Transplanted organ or tissues undergo pathological changes due to short term or long term immune reaction by donor’s immune system. This phenomenon is known as “Rejection”

Ultimate fate of any transplant is rejection

Successful transplantation is claimed when transplant remain functional up to at least 5 years
Types of rejection

**Hyperacute**
- Occur within minutes to hour of surgery
- Due to antigen antibody reaction by preformed antibodies in recipient’s circulation

**Acute**
- Occur within days to weeks
- Typical primary immune response
- Mainly cell mediated, may also be antibody mediated.

**Chronic**
- Occur months to years after surgery
- Cause is unclear
- Slowly progressive reaction
- Recurrence of episodes
Prevalaged transplantation

- Cornea transplantation
- Cartilage transplantation
Graft versus host reaction

Reactions of donor’s transplanted tissues containing active immunocompetent cells against recipient tissue.

- Occurs following bone marrow transplant
- Because, bone marrow recipient undergo whole body irradiation to cripple their own ICC

- Since donor’s marrow contain all types of ICC (macrophage, B cell and T cell) those are capable of producing immune response towards recipient’s tissues
Clinical Attributes

- Recipients selection
- Recipients screening for preformed antibodies
- Recipients preparation by immunosuppressive therapy and if needed by whole body irradiation
- Donor’s selection
- Matching of donor’s MHC and blood group
  - MHC I by lymphocytotoxicity test
  - MHC II by MLR
- Blood group matching by at least 10 grouping systems
- Post transplantation management of the recipient
Other Transplantation

- Kidney
- Skin
- Bone marrow
- Liver
- Heart
- Pancreas
Bone Marrow Transplantation

- Rescue procedure for hemopoietic reconstitution subsequent to cancer chemo- or radio- therapy
Heart Transplantation

- Heart transplantation is indicated for those in end-stage heart disease with a New York Heart Association of class III or IV,
- ejection fractions of <20%,
- maximal oxygen consumption of (VO₂) <14 ml/kg/min, and
- expected 1-year life expectancy of <50%.
Heart Transplantation

- Survival is 80% at five years but at five year 50% also have coronary vascular disease due to chronic rejection.
Graft survival is 72% at one-year and this is further improved if a kidney is transplanted simultaneously.

The overall goal of pancreas transplantation is to prevent the typical diabetic secondary complications: neuropathy, retinopathy, and cardiovascular disease.
Allah Hafez