

Transplant rejection

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Organ transplantation is the act of transferring tissues or organs between different individuals, which represents the optimum treatment option for patients in terminal organ failure. However, the potential benefit of organ transplantation has been significantly restricted by the limited survival rate caused by transplant rejection which result in $\approx 5\%$ cardiac graft loss per year through the first 10 years after implantation. The half-life of graft is far from being satisfactory with most of the organs failing within the first two decades following implantation.

Histological studies reveal that lesions typically stop at the suture line, implicating alloimmunity as the primary driver of rejection. Transplant rejection is a type IV hypersensitivity reaction mediated by T cells in which the transplant recipient's T cells become alloreactive, recognizing donor major histocompatibility complex (MHC) antigens and promote immune responses to defend against the graft. However, every transplantation may induce a particular response by the adaptive immune system, promoting humoral or cell-mediated rejection.

Recent studies have demonstrated that pathogenesis of transplant rejection may be multifactorial. The adaptive immune cells are no longer viewed as the only mediator of rejection. Several contributing factors have been put forward to explain the decreased half-life of implanted organs. These include both non-immune causes (such as ischemia/reperfusion injury) and infection. It is now well accepted that following mechanisms are involved in the rejection of transplanted organs: (1) pre- or peri-transplant injuries; (2) infection; (3) innate immunity; (4) T-cell-mediated immunity; and (5) B-cell-mediated immunity. These factors contribute together to determine the ultimate fate of the graft.

Understanding these mechanisms is critical, as it help understand the features of clinical rejection and make an early diagnosis and give appropriate treatment that inhibit both innate and adaptive immune response against implanted organs, thereby ensuring longer survival of graft. Scientific developments and advancement of knowledge, both in preventing pre- or peri-transplant injuries and in immunosuppressive treatment, have allowed a significant improvement in the outcome of organ transplantation, ensuring positive clinical results.

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