

Recent Advances of Kidney Transplantation

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ABSTRACT

Recent advances in surgical, immunosuppressive and monitoring protocols have led to the significant improvement of overall one-year kidney allograft outcomes. Nonetheless, there has not been a significant change in long-term kidney allograft outcomes. In fact, chronic and acute antibody-mediated rejection (ABMR) and non-immunological complications following kidney transplantation, including multiple incidences of primary kidney disease, as well as complications such as cardiovascular diseases, infections, and malignancy are the major factors that have contributed to the failure of kidney allografts. The use of molecular techniques to enhance histological diagnostics and noninvasive surveillance are what the latest studies in the field of clinical kidney transplant seem to mainly focus upon.

Keywords: Kidney transplantation, renal transplantation, kidney transplant, renal transplant, transplant recipients, transplantation

INTRODUCTION

Kidney transplantation is the optimal treatment for improving survival and quality of life for patients with end-stage kidney disease (ESKD). Advances in surgical, immunosuppressive and monitoring protocols have led to a significant improvement in overall one-year kidney allograft survival of >95%. Nonetheless, there has not been a significant change in long-term kidney allograft outcomes. In fact, chronic and acute antibody-mediated rejection (ABMR) has continued to cause kidney allograft failures. In addition, non-immunological complications following kidney transplantation, such as the recurrence of primary kidney disease and other complications, such as cardiovascular diseases, infections, and malignancy also play important roles in poor long-term allografts and patient survival.

In their research into immunologic monitoring and diagnostics in kidney transplants, a number of groups have made attempts in the recent past towards determining the peripheral molecular fingerprints of ongoing rejection and predicting acute rejection. Contemporary researchers have measured the levels of donor-derived cell-free DNA (dd-cfDNA) and showed higher predictive abilities for acute rejection, especially antibody-mediated rejection (ABMR) diagnostics in cases with a combination of donor specific antibodies (DSA) and dd-cfDNA. In addition, a molecular microscope diagnostic system for the evaluation of allograft biopsies has been recently introduced within transplant practice, particularly in complex cases. This has mainly been introduced for the purpose of enhancing histological diagnostics.

Living donor kidney transplants are the best option for many patients with ESKD for several reasons, including (1) better long-term graft survival, (2) no need to wait on the transplant waiting list for a kidney from a deceased donor, (3) transplant surgery can be planned and (4) lower risks of rejection and DGF. Living donor kidney transplantation is the optimal treatment for patients with ESKD. The expansion of living donor programs was made possible by new modes of living donation and by the extension of the living donor pool.

To expand the donor pool, a well-developed paired kidney donation program and the adequate reimbursement of costs associated with donation are fundamental elements. Paired kidney donation provides living kidney donation for noncompatible donor/recipient pairs that otherwise would not be feasible or need desensitization. Other possible approaches for increasing the donor pool include ABO-incompatible transplantation, the utilization of higher risk donors, advanced donation with a voucher system, and providing donors with financial incentives

Researchers need to instantly shift their focus on the unaddressed concerns with respect to kidney transplants. Because of the limited supply of organs, numerous potential recipients still have to spend more time in dialysis, waiting for a transplant. Sensitization to HLA antigens inhibits the recipients' access to transplants, compromising the survival of the graft due to chronic and acute AMR. The publication of complete data from a multi-center second-phase test that explores how IdeS is useful in desensitization is underway. The phase 3 trial, uncovering the impact of clazakizumab following

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Received: July 08, 2021; Accepted: July 22, 2021; Published: July 29, 2021

Citation: Kumar U, (2021) Recent Advances of Kidney Transplantation. J Kidney 7:206. doi- 10.35248/2472-1220.21.7.233.

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transplantation, was launched recently, with the outcomes of the phase 2 trial to be released soon.

Moreover, the lack of experienced and skilled professionals could hinder the diagnostic correctness of complications following transplantation. Furthermore, medication non-adherence among patients could increase the alloimmune reaction. Notably, medical research on the costimulation blockade during kidney transplantation is underway.

The most recent endeavors in kidney transplantation tend to mainly focus on noninvasive monitoring, as well as the improvement of histological diagnostics with the aid of molecular techniques. Such studies offer creative means that can be used to find immunosuppressive agents, which can effectively overcome critical sensitization, prevent the creation of anti-HLA antibodies, treat chronic active ABMR, and reduce non-immunological complications following kidney transplantation, such as the recurrence of primary kidney disease and other complications, such as cardiovascular diseases, infections, and malignancy. In the present era of utilizing EHRs, it is strongly believed that big data and artificial intelligence will reshape the research done on kidney transplantation in the near future. In addition, the utilization of telemedicine is increasing, providing benefits such as reaching out to kidney transplant patients in remote areas and helping to make scarce healthcare resources more accessible for kidney transplantation.

Moreover, the lack of experienced and skilled professionals could hinder the diagnostic correctness of complications of transplantation. Furthermore, medication non-adherence among patients could increase the alloimmune reaction. Notably, medical research on the costimulation blockade during kidney transplantation is underway. A randomized sixty-month multicenter study in kidney transplant is also underway, with the aim of defining the range of dosage and assessing the tolerability, safety, and effectiveness of some newly developed anti-CD40 monoclonal antibodies in two distinct cohorts in comparison to a tacrolimus-based regimen. Recently, a phase 2a clinical trial, with the purpose of assessing how effective the dual costimulation blockade with anti-CD40 (VIB4920) is when combined with belatacept in kidney transplantation patients, was registered.

Big data is increasingly being utilized, with the establishment of a large collection of cohorts and the usage of electronic health records (EHRs) in kidney transplantation and artificial intelligence, which might be useful in solving problems related to the survival analysis of patients who have gone through kidney transplantation. In the present era, it is strongly believed that big data and artificial intelligence will greatly reshape the research done on kidney disease and, consequently, improve the general clinical practice of nephrology.