KSN SEOUL, KOREA 2023
April 27(Thu) - 30(Sun), 2023
Coex, Seoul, Korea

Submission No.: KT02-9156
Session Title: Kidney Transplantation 2
Date & Time, Place: April 28 (Fri), 17:00 - 18:40, Room 4

New Techniques and Breakthroughs in Noninvasive Allograft Monitoring

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Although the emergence of immunosuppressants has caused significant progress in the management of immunologic rejection, proper application of these medications and dose adjustments require delicate and real-time monitoring of recipients. Nevertheless, most conventional allograft monitoring approaches are based on organ damage or functional tests such as creatinine or proteinuria. Other biopsy-based methods include invasive practices and are accompanied by serious complications. Non-invasive technologies to monitor kidney allograft health utilizing high-throughput assays of blood and urine specimens are emerging and becoming part of clinical practice. HLA epitope analysis and eplet mismatch score determination promise a more refined approach to the pre-transplant recipient-donor HLA matching that may lead to reduced rejection risk. High-resolution HLA typing and multiplex single antigen bead assays are identifying potential new offending HLA antibody subtypes. There is increasing evidences of the deleterious role non-HLA antibodies play in post-transplant outcomes. Donor-derived cell-free DNA detected by next-generation sequencing or dd-PCR is a promising biomarker for kidney transplant rejection. Multi-omics techniques are shedding light on discrete genomic, transcriptomic, proteomic, and metabolomic signatures that correlate with and predict allograft outcomes. This review aims to address the breakthrough for genomic testing in the context for technologies available for testing.