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Pre-Transplant HLA-DQ Donor-Specific Antibodies: Differential Characteristics and Clinical Implications in Kidney Transplantation

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Objectives : The aim of this study was to characterize pre-transplant HLA-DQ donor-specific antibodies (DSAs) and to investigate their impact on post-transplant outcomes.

Methods : Among 1,541 ABO-compatible kidney transplant (KT) recipients with available DQ typing at Seoul St. Mary's Hospital (January 2010-December 2024), 180 had pre-transplant DSAs. Patients were divided into DQ (n=58) and non-DQ (n=122) groups, and DSA characteristics, desensitization response, acute antibody-mediated rejection (ABMR), and allograft survival were compared.

Results : Patients in the DQ group had a significantly higher proportion of re-transplantation. Prior to KT, the DQ group exhibited markedly higher DSA titers (8,644.50 [interquartile range (IQR): 4,342.00-19,961.00] vs. 3,186.00 [IQR: 1,862.00-7,159.00], $p<0.001$) and a higher prevalence of C1q-binding DSAs (35.7% vs. 7.9%, $p<0.001$). The reduction in DSA titers per plasmapheresis session was significantly lower in the DQ group (5.66% vs. 11.99%, $p=0.008$), indicating relative resistance to desensitization. Despite the persistence of high titers and C1q-binding capacity, acute ABMR in the DQ group did not manifest in the immediate post-transplant period. Instead, most acute ABMR episodes in the DQ group occurred beyond 1-year post-transplant (41.7% vs. 9.5%, $p=0.036$). Most patients who developed this late-onset acute ABMR exhibited persistent pre-transplant DQ-DSAs. Death-censored graft survival showed no significant difference between the two groups.

Conclusions : Pre-transplant HLA-DQ DSAs were characterized by higher titers, resistance to desensitization, and a unique delayed pathogenicity compared to other DSA types. The persistent nature of DQ-DSA specifically predisposes recipients to late-onset acute ABMR rather than immediate post-transplant injury.