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Early Monitoring of Soluble Immune Checkpoints in Kidney Transplantation and Their Potential Associations with Kidney Function

Cemil Pehlivanoğlu[1,2], Fırat Demircan[3], Başak Aru[2], Süheyla Apaydın[4], Abdullah Demir[2], Rabia Tığlı[2], Gürkan Tellioğlu[3], Ali Osman Gürol[5], Gülderen Yanıkkaya Demirel[2]

[1]İstanbul University Institute of Graduate Studies in Health Sciences, Department of Immunology, İstanbul, Türkiye; [2]Yeditepe University Faculty of Medicine, Department of Immunology, İstanbul, Türkiye; [3]Yeditepe University Faculty of Medicine, Department of General Surgery, İstanbul, Türkiye; [4]Yeditepe University Faculty of Medicine, Department of Nephrology, İstanbul, Türkiye; [5]İstanbul University Aziz Sancar Institute of Experimental Medicine, Department of Immunology, İstanbul, Türkiye

Abstract

Objective: Kidney transplantation is the most effective treatment for end-stage renal disease. Soluble immune checkpoints may regulate immune responses and serve as biomarkers for monitoring and graft function prediction.

Materials and Methods: In this study, serum samples collected and stored from healthy controls (n = 15) and kidney transplant recipients (n = 30) before transplantation (day 0) and after transplantation (days 3 and 7) were analyzed for levels of sCD25, s4-1BB, sCD86, active TGF-β1, sCTLA-4, sPD-L1, sPD-1, sTIM-3, sLAG-3, sGalectin-9, sCD27, and sPD-L2 using a flow cytometry–based multiplex bead assay. Kidney function parameters (creatinine and GFR calculated by CKD-EPI) were retrospectively determined at different time points (day 0, day 3, day 7, week 2, month 1, and month 3). Data were analyzed using SPSS to evaluate the post-transplant dynamics of soluble immune checkpoints and their associations with kidney function parameters.

Results: In pre-transplant patients, levels of sCD25, sPD-L1, sTIM-3, sGalectin-9, sCD27, and sPD-L2 were significantly higher compared with healthy individuals. In the post-transplant period, statistically significant temporal changes were observed in the levels of sCD25, sPD-L1, sTIM-3, sGalectin-9, sCD27, sPD-L2, and sCD86. In contrast, no temporal changes were detected in the levels of s4-1BB, sLAG-3, sCTLA-4, active TGF-β1, or sPD-1, and these levels were comparable to those of healthy controls. Correlation analyses and subgroup analyses based on post-transplant GFR indicated that higher sLAG-3 and sCTLA-4 levels were associated with better kidney function, whereas higher sCD25 and sGalectin-9 levels were associated with poorer kidney function.

Conclusion: Soluble immune checkpoints are linked to early kidney function and may serve as biomarkers and therapeutic targets. Larger studies are needed to confirm their clinical value in improving transplant outcomes.

Keywords: Soluble immune checkpoints, kidney transplantation, transplantation immunology

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Correspondence
Gülderen Yanıkkaya Demirel

E-mail
gulderen.ydemirel@yeditepe.edu.tr

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