Antibody responses to recombinant polyomavirus BK large T and VP1 proteins in young kidney transplant patients

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BK virus (BKV)-specific immunity is critical for polyomavirus-associated nephropathy, but antibody responses are incompletely defined. We compared the hemagglutination inhibition assay (HIA) with immunoglobulin G enzyme immunoassays (EIA) to BKV proteins expressed in baculovirus-infected insect cells. N-terminal, internal, and C-terminal domains of the BKV large T antigen (BKLT) were fused to glutathione S-transferase (GST), yielding GST-BKLTD1, GST-BKLTD2, and GST-BKLTD3, respectively. The BKV capsid VP1 was expressed as a GST fusion (BKVP1) or as a native VP1 assembled into viruslike particles (BKVLP). We tested 422 sera from 28 healthy donors (HD), 99 dialysis patients (DP; median age, 15 years; range, 3 to 32 years), and 46 age-matched kidney transplant patients (KTP; median age, 15 years; range, 2 to 33 years). In HD, HIA and BKVLP EIA both yielded a 91.7% seroreactivity, whereas all other EIA responses were lower (BKVP1, 83.3%; BKLTD1, 25%; BKLTD2, 29%; BKLTD3, 40%). HIA titers significantly correlated with EIA levels for BKVLP, BKVP1, and BKLTD1 but not for BKLTD2 or BKLTD3, which were barely above the cutoff. In DP, the seroreactivities of HIA, BKVLP, and BKLTD1 were lower than that in HD (63.6%, 86.9%, and 10.1%, respectively) and they had lower titers ($P < 0.001$). In KTP, seropositivities for BKVLP, BKVP1, and BKLTD1 were 78%, 50%, and 17%, respectively, but anti-BKVLP levels increased significantly in KTP with viruria and viremia, whereas anti-BKLTD1 levels increased after clearing sustained BKV viremia. In conclusion, anti-BKVLP is equivalent to HIA in HD but is more sensitive to determine the BKV serostatus in DP and KTP. In KTP, anti-BKVLP responds to recent BKV viruria and viremia, whereas anti-BKLTD1 may indicate emerging BKV-specific immune control.
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