The effect of hyperfiltration mechanism on kidney function in Living-Donor Kidney Transplantation in Cipto Mangunkusumo Hospital, Jakarta, Indonesia: study on renal arterial resistive index, urinary vascular endothelial growth factor, neutrophil gelatinase-associated lipocalin, and heparan sulfate

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Background: While adequate donors' kidney function after donation is desired, some may recover incompletely and develop chronic kidney diseases. Hyperfiltration is an adapting mechanism to overcome nephrectomy-related kidney function loss. This study aims to explain adaptive and maladaptive hyperfiltration mechanism during the first 30 days postnephrectomy.

Methods: Longitudinal observational study was conducted on 46 kidney donors in Cipto Mangunkusumo Hospital in April–December 2019. Estimated glomerular filtration rate (eGFR) and albumin-creatinine ratio (ACR) were examined serially. Subjects were divided into adaptive (eGFR >60 mL/min/1.73 m² and/or ACR <30 mg/g on day 30) and maladaptive group (eGFR <60 mL/min/1.73 m² and/or ACR >30 mg/g on day 30). Kidney resistive index (RI), urinary vascular endothelial growth factor (VEGF), and heparan sulfate (HS) were examined prenephrectomy and on day-2, day-7, and day-30 postnephrectomy. Urinary neutrophil gelatinase-associated lipocalin (NGAL) level was measured before and 6-hour postnephrectomy. Donors' characteristic variables were analyzed using chi-square or Fisher test and logistic regression. Difference of RI, VEGF, NGAL, and HS between two groups were analyzed using Mann-Whitney or independent t-test.

Results: Out of 46 subjects, 40 were included in the final analysis. Nineteen donors (47.5%) underwent maladaptive hyperfiltration. Prenephrectomy eGFR was significantly different with value of 111.17 (11.38) mL/min/1.73 m² and 92.94 (13.21) mL/min/1.73 m² and cutoff of 104.60 mL/min/1.73 m². Outcomes of donors aged >45 years and arterial stiffness >50th percentile were significantly different (P=0.03 and P=0.01). Hyperfiltration was evidenced by significant changes in RI, VEGF, NGAL, and HS after nephrectomy. Significant difference between arcuate artery RI on day-2 and day-30 was found only in adaptive group.

Conclusions: Hyperfiltration does not alter kidney function on day-30 postnephrectomy. Prenephrectomy eGFR, age >45 years, and arterial stiffness are associated with day-30 postnephrectomy kidney function. RI of arcuate artery changes more prominently and rapidly in adaptive group. Further study evaluating kidney function and interfering variables within longer period is necessary.

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