Resistive Index by Renal Doppler Ultrasonography with Renal Progression in Chronic Kidney Disease Patients

Rapee Pongsamart¹  Bancha Satirapo²
Warin Chuankrerkkul³

¹Department of Medicine, Faculty of Medicine, Phramongkutklao Hospital, Bangkok 10400, Thailand,
²Division of Nephrology, Department of Medicine, Faculty of Medicine, Phramongkutklao Hospital, Bangkok 10400, Thailand,
³Division of Radiology, Department of Radiology, Faculty of Medicine, Phramongkutklao Hospital, Bangkok 10400, Thailand

Background: Estimated glomerular filtration rate (GFR) and albuminuria serve as markers to assess progression of chronic kidney disease (CKD). The renal resistive index (RI) is a measure of renal vascular resistances to blood flow detected by renal Doppler ultrasonography. It might also predict progression of renal disease and renal prognosis.

Objective: To assess the role of the RI measured with the initial GFR for prediction of renal progression in the CKD setting.

Methods: We performed a retrospective cohort of 2-year follow-up study in 209 CKD patients. At baseline, all patients were examined by renal Doppler ultrasonography to calculate RI and renal function by estimated GFR using the CKD-EPI equation. The worsening renal function was defined as a decrease in estimated GFR at least 25 mL/min 1.73 m² at the end of the 2-year follow-up.

Results: The mean age was 67.29±13.54 years, with the estimated GFR of 76.59±26.86 mL/min 1.73 m². A number of 87 patients (41.6%) had high RI (RI ≥ 0.7), with 66% experiencing the worsening renal function. Those with high RI were older and had smaller kidney size. The estimated GFR, hemoglobin, and albumin levels were significantly lower in patients with high RI. High RI group had significantly decline renal function than non-high RI group after 2 years follow-up (estimated percentage of decline GFR 21.08±27.56 vs 7.68±18.77, P< 0.001). Additionally, the proportion of patients with worsening renal function in the group with RI ≥ 0.7 was higher than that of those with RI < 0.7 (66% vs. 34%, P< 0.001). In the multivariable analysis, the high RI group was associated with 2.45-fold (95% CI, 1.019-5.913; P=0.045) increased risk of worsening renal function.

Conclusion: High RI values (cut-point of ≥ 0.7) are independently associated with a rapid decline in GFR, suggesting that renal vascular resistance appears to predict a decrease in renal function in CKD population.

Keywords: Doppler duplex ultrasonography, Renal Resistive Index, Chronic Kidney Disease