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The Role of Kidney Multiciliated Cells in Glomerular Disease Outcomes

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Objectives : The causes and functions of kidney multiciliated cells (MCCs) have not been clarified. We aimed to identify kidney MCCs in patients with glomerular diseases and investigate the clinical implications of MCCs in outcomes of glomerular diseases.

Methods : We included cases of 134 adult patients with pathologically confirmed cases of IgAN, diabetic kidney disease (DKD), minimal change disease, primary focal segmental glomerulosclerosis, and ANCA-associated GN. The expression of kidney tubular MCCs was measured with immunohistochemical staining of acetylated alpha-tubulin. Outcomes included the initiation of renal replacement therapy (RRT), progression to end-stage kidney disease (ESKD), death, a 50% decline in eGFR from baseline, and eGFR slope.

Results : MCC positivity was confirmed in 86 individuals. In multivariable analysis adjusting for age, sex, baseline eGFR, uPCR, and diabetes, the increase in MCC ratios significantly correlated with an increased risk of ESKD (HR, 1.413; 95% CI, 1.012-1.972; p=0.042) and ESKD with death (HR, 1.401; 95% CI, 1.028-1.909; p = 0.033). Within the ANCA-associated GN group, the decrease in baseline eGFR and the increase in uPCR were significantly associated with an increase in MCC expression ($\beta = -0.087$; p = 0.009, $\beta = 0.208$; p = 0.043, respectively). Furthermore, in the IgAN and DKD groups, a decrease in baseline eGFR was correlated with an increase in MCC expression in the IgAN ($\beta = -0.016$; p = 0.028) and DKD ($\beta = -0.031$; p = 0.002) groups.

Conclusions : The expression levels of MCC were significantly higher in DKD and ANCA-associated GN compared to controls. An increase in MCC was associated with an elevated risk of ESKD. Among the patients with IgAN, DKD, and ANCA-associated GN, a significant association was observed between kidney function decline and an increase in MCC expression.