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Sodium-dependent Glucose Transporter 2 Inhibitor Alleviates Renal Lipid Deposition and Improves Renal Oxygenation Levels in Newly Diagnosed Type 2 Diabetes Mellitus Patients: A Randomized Controlled Trial

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Abstract

Background: Sodium-dependent glucose transporter 2 inhibitor (SGLT2i) demonstrated excellent renoprotective effects while improving blood glucose in type 2 diabetes mellitus (T2DM) patients.

Objective: To evaluate the effect of cagliflozin on intrarenal lipid content and oxygenation in patients with newly diagnosed T2DM.

Methods: Sixty-four patients newly diagnosed T2DM with normal renal function were randomized into the carglitazone (n = 33) and the glimepiride control (n = 31). Intrarenal lipid content and oxygenation levels were assayed by functional magnetic resonance imaging scanning. Furthermore, the relationship between body mass index and intrarenal lipid content in T2DM patients were analyzed and the correlation between changes in intrarenal lipid content and improvements in renal hypoxia were further assessed.

Results: The intrarenal lipid content significantly reduced after canagliflozin treatment for 24 weeks. The R2* values, a parameter for quantifying the oxygen content in tissues and is inversely related to the oxygen content, of the renal cortex and medulla in the canagliflozin group decreased from the baseline by 6.40% ($P < 0.01$) and 12.09% ($P < 0.001$), respectively. In addition, the degree of reduction of fat fraction (△FF) in the kidneys of the canagliflozin group was correlated with the degree of improvement of oxygenation level (△R2*) in the renal cortex ($r = 0.422$, $P = 0.014$).

Conclusion: The early nephroprotective effect of SGLT2i in patients with newly diagnosed T2DM may be partly attributed to improved renal hypoxia by alleviating renal lipid deposition.