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당뇨 조건 하에서 TCTP의 발현과 족세포 비후 사이의 연관성

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The Impact of Translationally Controlled Tumor Protein on the Podocyte Hypertrophyunder Diabetic Conditions

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Background : Translationally controlled tumor protein (TCTP) is highly conserved in eukaryotic cells and has been suggested to function as a regulator of cell growth and hypertrophy. Since glomerular and tubular hypertrophy are characteristic findings in diabetic nephropathy (DN), there is a possibility that TCTP may play an important role in the pathogenesis of DN. However, the functional role of TCTP on cellular hypertrophy under diabetic conditions has never been explored.

Purpose : This study was undertaken to investigate the impact of TCTP on podocyte hypertrophy in experimental DN and in high glucose-stimulated podocytes.

Methods : In vivo, 12 Sprague-Dawley rats were injected either with diluent (n=6, C) or STZ intraperitoneally (n=6, DM) and were sacrificed at 3-month after DM induction. In vitro, immortalized mouse podocytes were exposed to 5.6 mM glucose (NG), NG+24.4 mM mannitol (NG+M), NG+10-8M angiotensin II (NG+AII), and 30 mM glucose (HG) with or without TCTP shRNA expressing lentivirus. For assessment of TCTP and cyclin-dependent kinase inhibitors (CKIs) mRNA expression, real-time PCR was performed with sieved glomeruli and cell lysates. TCTP and CKIs protein expression were determined by Western blot. Double immunofluorescence (IF) staining with synaptopodin and TCTP was also performed with renal tissue.

Results : TCTP, p21Cip1, and p27Kip1 mRNA and protein expression were significantly higher in DM compared to C glomeruli. Double IF staining with synaptopodin and TCTP revealed that the increase in TCTP protein expression in DM glomeruli was mainly attributed to the increase in podocytes. TCTP, p21Cip1, and p27Kip1 mRNA and protein expression were also significantly increased in podocyte exposed to HG or AII compared to NG cells. Transfection of TCTP shRNA expressing lentivirus efficiently knocked TCTP mRNA and protein expression down. The increases in p21Cip1 and p27Kip1 mRNA and protein expression in HG and NG+AII podocytes were significantly abrogated by TCTP shRNA transfection.

Conclusion : Overexpression of TCTP in podocytes under diabetic conditions seems to be closely associated with the increase in CDKi expression, resulting in podocyte hypertrophy.

Key Words : 당뇨병성 신증, 족세포 비후, TCTP
Diabetic nephropathy, Podocyte hypertrophy, TCTP