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신세뇨관성 단백뇨 환자의 99mTc-DMSA 스캔 소견에 대한 고찰

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Decreased Renal Uptake of 99mTc-DMSA in Patients with Tubular Proteinuria

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Objectives : The exact mechanism of uptake of Technetium- 99m- dimercaptosuccinic acid (DMSA) by renal proximal tubular cells is unknown yet. One of the suggestive mechanisms is glomerular filtration and subsequent tubular reabsorption, and the other is direct uptake from peritubular capillaries. Recently, tubular proteinuria in Dent disease and Lowe syndrome was found to result from defective reabsorption of filtered proteins by proximal tubular cells, which is mediated by multiligand endocytic receptors, megalin and cubilin. In this study, we analyzed the pattern of DMSA renal scan in patients with tubular proteinuria, which would provide more precise information about the mechanism of renal uptake of DMSA.

Patients and Methods : Ten boys were enrolled in this study: 6 with Dent disease and 4 with Lowe syndrome. All patients had tubular proteinuria (random urine β 2- microglobulin/creatinine (RU β 2- MG/Cr), 0.9- 471.9 ug/mg). The absolute uptake of DMSA by each kidney of 7 patients was counted at 3 hours after injection of 1- 5 mCi/kg of 99mTc- DMSA. In the rest 3 patients, the uptake of both kidneys and bladder was measured serially at 30 minutes, 1, 2, and 3 hours. The correlation between absolute uptake counts of DMSA and the degree of estimated creatinine clearance (eCCr), acidosis and tubular proteinuria was evaluated.

Results : All patients had normal renal function (eCCr, 93- 134 mL/min/1.73m^2). Six patients with Dent disease had normal acid- base status, and 4 with Lowe syndrome had acidosis. The absolute uptake of 99mTc- DMSA in right kidney at 3 hours was 0.6- 3.0 % of injected dose (normal range, 21.2$\pm$3.5 %), and that of left kidney at 3 hours was 0.8- 2.6 % (normal range, 21.2$\pm$2.9 %). The renal uptake was already decreased at 30 minutes (2- 5.2%), and in the other subsequent images (3.1- 5.6% at 1, 2.7- 5.9% at 2 and 1.4- 4.7% at 3hours) as well. However, the bladder radioactivity (23.3- 50.55%) was increased consistently in all the serial images compared to the kidney. The decreased of renal uptake of DMSA was related to the degree of RU β 2- MG/Cr (r_s= - 0.803, p=0.009), but not to eCCr and acidosis.

Conclusion : This study strongly suggests that DMSA is filtered in glomerulus and subsequently reabsorbed in proximal tubular epithelium, which is mediated by megalin and cubilin. The degree of decreased renal uptake of DMSA could be used in evaluating renal function of the patients with tubular proteinuria, which needs the long-term follow- up study.

Key Words : 세뇨관성 단백뇨, DMSA, 덴트병
Tubular proteinuria, Dent disease, DMSA