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만성신부전 동물모델에서 알칼리치료가 신기능악화에 미치는 영향

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Effects of Dietary Sodium Bicarbonate on Renal Disease Progression in 5/6 Nephrectomized Rats

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Introduction and Aims: Sodium bicarbonate therapy ameliorated metabolic acidosis (MA) and the decrease in glomerular filtration rate (GFR) only after the control of blood pressure (BP) in 5/6 nephrectomized rats with casein diet. Recent clinical trials, however, showed beneficial effect of sodium bicarbonate in patients with early and late stage chronic kidney disease. We evaluated the beneficial effect of sodium bicarbonate to prevent the decline in GFR and correct MA in rats with a remnant kidney.

Methods: Sprague-Dawley rats ate dietary sodium bicarbonate (NaHCO3) or sodium chloride (NaCl) with 20% casein for 12 weeks after 5/6 nephrectomy.

Results: After treating casein diet, alkali-treated group had higher levels of serum bicarbonate than control group (20.3±0.55 vs. 15.6±0.61 mmol/L at week 4, 25.0±1.73 vs. 13.1±1.29 mmol/L at week 10, and 31.3±3.38 vs. 17.0±0.93 mmol/L at week 12). After week 4, systolic blood pressure in the two groups was over 160 mmHg, and there was no difference between the groups. At week 4, glomerular filtration rate (GFR) in NaHCO3 group was higher than in NaCl group (0.36±0.09 vs. 0.15±0.01 mL/min/100g BW, p=0.011). After week 10, there were no differences in GFR between the two groups (0.14±0.03 vs. 0.15±0.04 mL/min/100g BW at week 10, and 0.07±0.03 vs. 0.07±0.01 mL/min/100g BW at week 12). At week 4 and week 10, glomerulosclerosis (GS) and tubulointerstitial damage indices (TI) in NaHCO3 group were less severe than in controls (week 4: GS 0.17±0.04 vs. 0.47±0.06, p<0.001; TI 0.45±0.10 vs. 0.92±0.12, p=0.004; week 10: GS 0.66±0.06 vs. 0.99±0.074, p=0.001; 1.33±0.12 vs. 1.80±0.12, p=0.010). In contrast, at week 12, GS in the alkali-treated group was more profound than in control group, and there was no difference in TI damage between the two groups.

Conclusion: Dietary sodium bicarbonate had short-term beneficial effects in ameliorating metabolic acidosis and preventing the decrease in GFR without correction of blood pressure. However, these effects did not sustain after 10 weeks.

Key Words: 만성신부전, 대사성 산증, 신기능악화
Chronic renal failure, Acidosis, Renal disease progression