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혈액 투석 환자에서 오메가 3와 비타민 D 활성화의 관계

동아대학교 의과대학 내과학교실

이수미, 정유진, 이동열, 손영기, 김성은, 안원석

Effect of Omega-3 Fatty Acid on Vitamin D Activation in Hemodiaysis Patients

Su Mi Lee, Eu Gene Jeong, Dong Yeol Lee, Yong Ki Son, Seong Eun Kim, Won Suk An

Dong-A University School of Medicine, Department of Internal Medicine

Introduction: Extra-renal sources of 1, 25-dihydroxyvitamin D can be increased to normal serum 1, 25-dihydroxyvitamin D levels in CKD patients after administration of high dose 25-hydroxyvitamin D. Recent study observed that 1, 25-dihydroxyvitamin D concentrations were significantly increased after 3 months of omega-3 fatty acid (FA) supplementation compared to baseline levels without 25-hydroxyvitamin D administration in dialysis patients. We hypothesized that omega-3 FA and 25-hydroxyvitamin D supplementations may increase 1, 25-dihydroxyvitamin D concentrations much more compare to 25-hydroxyvitamin D supplementation only in hemodialysis patients with insufficient or deficient 25-hydroxyvitamin D levels.

Methods: We enrolled patients who were treated with hemodialysis with 25-hydroxyvitamin D <30 ng/mL (NCT01596842). Omega-3 FA supplementation group was treated with omega-3 FA with a dose of 2.4 gram/day for 12 weeks and placebo group were treated with olive oil for 12 weeks. Cholecalciferol was also supplemented with a dose of 50,000IU/week if baseline 25-hydroxyvitamin D levels are <15 ng/mL for 12 weeks. We measured changes of 25-hydroxyvitamin D and 1, 25-dihydroxyvitamin D concentrations as a primary outcome at baseline, 6weeks, and 12 weeks. We also measured erythrocyte membrane FA contents with gas chromatography.

Results: Eight patients supplemented with omega-3 FA and 7 patients supplemented with placebo finished this trial. The 25-hydroxyvitamin D levels were significantly increased at 6 weeks and 12 weeks compared to baseline levels in both groups ($p<0.001$). The 1, 25-dihydroxyvitamin D levels were increased in omega-3 FA supplemented group (17.7±8.2 vs. 25.1±12.3 pg/mL) compared to baseline levels but were not changed in placebo group (24.1±11.1 vs. 23.2±7.2 pg/mL) compared to baseline levels at 12 weeks. Erythrocyte membrane oleic acid and monounsaturated FA contents were significantly decreased and omega-3 index was significantly increased in omega-3 FA supplemented group.

Conclusions: Cholecalciferol supplementation definitely increased 25-hydroxyvitamin D levels without increasing calcium and phosphorus levels in hemodialysis patients with insufficient or deficient 25-hydroxyvitamin D levels. Omega-3 FA supplementation may be related with activation of vitamin D although increased 25-hydroxyvitamin D levels caused by cholecalciferol supplementation was not related with activation of vitamin D in hemodialysis patients.

Key Words: 오메가 3, 비타민 D, 투석
Omega-3, 1, 25-dihydroxyvitamin D, 25-hydroxyvitamin D