

유지 혈액투석환자에서 세포외액/세포내액 비율과 환자사망을 및 malnutrition-inflammation-arteriosclerosis complex와의 상관관계

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김은정, 류지원, 이정환, 최명진, 오지은, 서장원, 이영기, 윤종우, 김형직, 노정우, 구자룡

Extracellular Fluid/intracellular Fluid (ECF/ICF) Volume Ratio is a Novel Risk Indicator for Survival and Highly Related to Malnutrition-inflammation-arteriosclerosis Complex in Hemodialysis Patients

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Background: Fluid overload and malnutrition are well recognized risk factors contributing to the high mortality in hemodialysis (HD) patients. Recent studies suggest pathophysiological link between fluid overload and malnutrition as a part of malnutrition-inflammation-arteriosclerosis (MIA) complex. Because the ECF and ICF volume can represent fluid volume and nutritional status respectively, ECF/ICF ratio could be defined as a novel integrated marker reflecting both fluid overload and malnutrition. Accordingly we investigated the relationship of ECF/ICF ratio to survival in the context of MIA complex in chronic HD patients.

Methods: 77 HD patients (age 53 ± 13 year, diabetes 38%) were prospectively enrolled. ECF/ICF volume was measured by multi-frequency BIA. Nutrition was assessed by serum albumin and subjective global assessment (SGA). Inflammation was measured by serum high-sensitivity C-reactive protein (hsCRP). Arteriosclerosis was assessed by pulse wave velocity (PWV) and pulse pressure (PP). Serum B-type natriuretic peptide (BNP) was measured to evaluate volume status. Left ventricular (LV) function was evaluated by LV ejection fraction (LVEF) and LV mass index (LVMI)

Results: Mean ECF/ICF ratio was 0.56 ± 0.06 and cut-off value of 0.57 was determined for maximum discrimination of survival by ROC curve analysis. As compared with low ECF/ICF ratio group (ratio < 0.57 , 58%), high ECF/ICF ratio group (ratio ≥ 0.57 , 42%) had higher all-cause mortality, cardiovascular event, age, hsCRP, PWV, PP, LVMI, BNP, systolic BP and lower serum albumin and SGA level. During the 5-year follow-up, 24 cases of all-cause death occurred (18 in high ECF/ICF ratio group versus 6 in low ECF/ICF ratio group, log rank $P < 0.001$). In Cox analysis adjusted for age, diabetes, HD duration, BNP, Kt/V, serum albumin, LVEF, PWV, hsCRP and BP, the ECF/ICF ratio was an independent predictors of all-cause death: hazard ratio (95% CI), 1.69 (1.03-2.77) for a 0.01 increase in ECF/ICF ratio. In correlation analysis, the degree of malnutrition (albumin, SGA), inflammation (hs CRP), arteriosclerosis (PWV, PP) and fluid overload (BNP) were correlated well with ECF/ICF ratio.

Conclusion: Chronic HD patient with high ECF/ICF ratio is not only fluid overloaded but malnourished and have stiff artery with more inflammation. As a novel integrated marker of fluid overload and malnutrition, ECF/ICF ratio is highly related to MIA complex and a major risk indicator for survival of chronic HD patients.

Key Words: 세포외액/세포내액 비, 생존, 혈액투석
ECF/ICF ratio, Survival, Hemodialysis