

## 투석을 시작하는 말기 신부전 환자에서 트랜스페린 포화도에 따른 심장 초음파 지표와 심장 표지자의 변화양상 연구

연세대학교 의과대학 내과학교실 신장내과<sup>1</sup>, 경북대학교 의과대학 내과학교실 신장내과<sup>2</sup>  
서울대학교 의과대학 내과학교실 신장내과<sup>3</sup>, 가톨릭대학교 의과대학 내과학교실 신장내과<sup>4</sup>  
전남대학교 의과대학 내과학교실 신장내과<sup>5</sup>, 말기 신부전 임상 연구 센터

구향모<sup>1</sup>, 김은진<sup>1</sup>, 한재현<sup>1</sup>, 한지숙<sup>1</sup>, 박정탁<sup>1</sup>, 오형중<sup>1</sup>  
한승혁<sup>1</sup>, 유태현<sup>1</sup>, 김용림<sup>2</sup>, 김연수<sup>3</sup>, 양철우<sup>4</sup>, 김남호<sup>5</sup>, 강신욱<sup>1</sup>

### Relationships of Iron Status with Echocardiographic Parameters and Cardiac Biomarkers in Incident Dialysis Patients

Hyang Mo Koo<sup>1</sup>, Eun Jin Kim<sup>1</sup>, Jae Hyun Han<sup>1</sup>, Ji Suk Han<sup>1</sup>, Jung Tak Park<sup>1</sup>  
Hyung Jung Oh<sup>1</sup>, Seung Hyeok Han<sup>1</sup>, Tae-Hyun Yoo<sup>1</sup>, Yong-Lim Kim<sup>2</sup>  
Yon Su Kim<sup>3</sup>, Chul Woo Yang<sup>4</sup>, Nam-Ho Kim<sup>5</sup>, Shin-Wook Kang<sup>1</sup>

Yonsei University College of Medicine Department of Internal Medicine Division of Nephrology<sup>1</sup>  
Kyungpook National University College of Medicine Department of Internal Medicine Division of Nephrology<sup>2</sup>  
Seoul National University College of Medicine Department of Internal Medicine Division of Nephrology<sup>3</sup>  
The Catholic University of Korea College of Medicine Department of Internal Medicine Division of Nephrology<sup>4</sup>  
Chonnam National University College of Medicine Department of Internal Medicine Division of Nephrology<sup>5</sup>  
Clinical Research Center for End-Stage Renal Disease

**Background:** Transferrin saturation (TSAT) is the ratio of serum iron to total iron-binding capacity, multiplied by 100, and is closely associated with hemoglobin (Hb) levels. Meanwhile, anemia is mostly accompanied in patients with end-stage renal disease (ESRD) on dialysis, and its impact on cardiovascular (CV) events and mortality has been extensively investigated. However, little is known about the consequence of TSAT on the clinical outcome in dialysis patients.

**Methods:** A prospective cohort of 879 incident dialysis patients with anemia from 36 dialysis centers of the Clinical Research Center for ESRD in Korea were selected for this study. Patients were divided into 7 groups according to the baseline TSAT; <10%, ≥60%, and every 10% increment in between, and all-cause mortality was compared among the groups. In addition, the relationship of TSAT with echocardiographic findings and inflammatory and cardiac biomarkers were clarified.

**Results:** There were no differences in Hb concentrations and the proportion of patients on erythropoietin stimulating agents or iron supplements among the groups. During a mean follow-up duration of 19.4 months, 57 patients (6.2%) died, and CV disease-related death was the most common cause. Compared to patients with TSAT 30-40%, the hazard ratios (HRs) for all-cause mortality in TSAT <10%, TSAT 10-20%, TSAT 20-30%, and TSAT 50-60% groups were 3.17 (p=0.04), 4.57 (p=0.02), 3.13 (p=0.08), and 3.29 (p=0.21), respectively. Logistic regression analysis revealed that patients with TSAT <10% had a significantly low odds ratio (OR) for ejection fraction ≥60% (OR=0.47, p=0.04) and a high OR for left ventricular hypertrophy (OR=1.84, p=0.09). In addition, the OR for increased high sensitivity C-reactive protein levels (≥3 mg/dL) was significantly higher in patients with TSAT <10% (OR=4.15, p<0.001). TSAT <10% was also associated with a high risk of increased N-terminal pro-B-type natriuretic peptide concentrations (≥10,000 pg/mL) without a statistical significance (OR=2.34, p=0.07). Moreover, patients with TSAT <10%, 10-20%, and 20-30% were at significantly greater risks for increased Troponin-T levels (≥0.1 ng/mL) (<10%, OR=2.35, p=0.04; 10-20%, OR=2.06, p=0.04; 20-30%, OR=2.52, p=0.006).

**Conclusion:** Extremely low TSAT was associated with high all-cause mortality in incident dialysis patients, which may be attributed to its relationship with inflammation and cardiac dysfunction.

**Key Words:** 트랜스페린 포화도, 심장 초음파, 심장 표지자  
Transferrin saturation, Echocardiography, Cardiac biomarker