

혈액 투석 환자에서 낮은 T3 수치는 영양실조와 심장기능 부전을 야기하여 사망율을 증가시킨다

연세대학교 의과대학 내과학교실 신장내과¹, 경북대학교 의과대학 내과학교실 신장내과²
 서울대학교 의과대학 내과학교실 신장내과³, 가톨릭대학교 의과대학 내과학교실 신장내과⁴
 전남대학교 의과대학 내과학교실 신장내과⁵, 말기 신부전 임상 연구 센터

구향모¹, 김은진¹, 한재현¹, 한지숙¹, 박정탁¹, 오형중¹, 한승혁¹
 유태현¹, 김용림², 김연수³, 양철우⁴, 김남호⁵, 강신욱¹

The Impact of Low Triiodothyronine Levels on Mortality is Mediated by Malnutrition and Cardiac Dysfunction in Incident Hemodialysis Patients

Hyang Mo Koo¹, Eun Jin Kim¹, Jae Hyun Han¹, Ji Suk Han¹, Jung Tak Park¹
 Hyung Jung Oh¹, Seung Hyeok Han¹, Tae-Hyun Yoo¹, Yong-Lim Kim²
 Yon Su Kim³, Chul Woo Yang⁴, Nam-Ho Kim⁵, Shin-Wook Kang¹

Yonsei University College of Medicine Department of Internal Medicine Division of Nephrology¹
 Kyungpook National University College of Medicine Department of Internal Medicine Division of Nephrology²
 Seoul National University College of Medicine Department of Internal Medicine Division of Nephrology³
 The Catholic University of Korea College of Medicine Department of Internal Medicine Division of Nephrology⁴
 Chonnam National University College of Medicine Department of Internal Medicine Division of Nephrology⁵
 Clinical Research Center for End-Stage Renal Disease

Background: Accumulating evidence has indicated that a reduced triiodothyronine (T3) levels in prevalent hemodialysis (HD) patients is a prognostic factor for adverse clinical outcome rather than an innocent bystander. However, little is known whether low T3 is also associated with mortality in end-stage renal disease (ESRD) patients starting HD and whether the impact of T3 on mortality is mediated by malnutrition, inflammation, and cardiac dysfunction in these patients.

Methods: A prospective cohort of 471 incident HD patients from 36 dialysis centers of the Clinical Research Center for ESRD in Korea was selected for this study. Based on the median value of T3 concentrations, patients were divided into 'high' and 'low' groups, and all-cause and cardiovascular (CV) mortality were compared between the two groups. In addition, the associations of T3 levels with various nutritional, inflammatory, and echocardiographic parameters were clarified.

Results: Compared to the 'high' T3 group, serum albumin, total cholesterol, and triglyceride concentrations, lean body mass estimated by creatinine kinetics (LBM-Cr), and normalized protein catabolic rate (nPCR) were significantly lower in patients with 'low' T3. Moreover, the 'low' T3 group had significantly higher left ventricular mass index (LVMI) and significantly lower LV ejection fraction (LVEF). Furthermore, correlation analysis revealed significant associations of T3 levels with nutritional and echocardiographic parameters. All-cause and CV mortality rates were significantly higher in patients with 'low' T3 compared to the 'high' T3 group (113.4 vs. 18.2 events per 1000 patient-yr, $p < 0.001$, and 49.8 vs. 9.1 events per 1000 patient-yr, $p = 0.001$, respectively). Kaplan-Meier analysis also showed significantly worse cumulative survival rates in the 'low' T3 group ($p < 0.001$). On Cox proportional hazards regression analysis, 'low' T3 was a significant independent predictor of all-cause mortality (Hazard ratio=3.76, 95% Confidence interval=1.06-13.38, $p=0.021$), even after adjusting for traditional risk factors. However, the significant independent impact of low T3 on all-cause mortality disappeared when LBM-Cr, nPCR, LVMI, or LVEF were incorporated in the successive Cox models.

Conclusion: 'Low' T3 is a significant independent risk factor for all-cause mortality in incident HD patients, and its impact on mortality may be attributed, in part, to malnutrition and cardiac dysfunction.

Key Words: T3 감소, 영양 실조, 심장 기능 부전
 Low T3, Malnutrition, Cardiac dysfunction