

복부비만을 동반한 정상 체중 만성 신질환 환자에서의 관상동맥석회화의 위험성

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Normal Weight with Central Obesity and the Risk of Coronary Artery Calcification in Chronic Kidney Disease Patients

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Background: In chronic kidney disease (CKD) patients, body mass index (BMI) showed a U-shaped association with cardiovascular (CV) risk, the best outcomes in overweight and mildly obese patients. In contrast, central obesity was found to be directly associated with increased CV risk. This bi-directional relationship prompted us to evaluate the CV risk assessed by coronary artery calcification (CAC) based on a combination of BMI and waist-to-hip ratio (WHR) in CKD patients.

Methods: We included 1,217 CKD stage 1 to 5 patients who enrolled in the KoreaN cohort study for Outcome in patients with Chronic Kidney Disease. Patients were divided into 3 groups by BMI (normal, $18.5 \leq$ to <23.0 ; overweight, ≤ 23.0 to <27.5 ; obese, >27.5 kg/m²) and were dichotomized by sex-specific median of WHR (0.92 in male; 0.88 in female). CAC was defined as >10 Agatston Unit using a multi-slice computed tomography. Logistic regression analysis was used to assess the independent association of CAC with BMI, WHR, and cross-categorization of BMI and WHR, respectively.

Results: Mean age was 53.8 years, 749 patients (61.5%) were male. CAC was observed in 500 patients (41.4%). In univariate analysis, CAC was more likely to be present in males, smokers, and patients with previous CV disease and diabetes. Increasing age, BMI, WHR, systolic blood pressure, and C-reactive protein, whereas decreased estimated glomerular filtration rate, hemoglobin, and albumin were associated with CAC. Multivariate logistic regression analysis indicated that BMI was not independently associated with CAC (per 1 kg/m² increase, odds ratio [OR]=1.03, 95% confidence interval [CI]=0.98-1.08, $p=0.24$). However, WHR showed an independent linear association with CAC (per 0.01 increase, OR=1.04, 95% CI=1.02-1.07, $p<0.001$). Furthermore, when patients were categorized into 6 groups according to combination of BMI and WHR, normal BMI but increased WHR (OR=1.91, 95% CI=1.05-3.48, $p=0.03$) had the highest risk of CAC compared to others (normal BMI with lower WHR, as reference; overweight with lower WHR, OR=1.46, 95% CI=0.93-2.30, $p=0.10$; obese with lower WHR, OR=1.51, 95% CI=0.68-3.40, $p=0.31$; overweight with increased WHR, OR=1.45, 95% CI=0.95-2.22, $p=0.06$; obese with increased WHR, OR=1.49, 95% CI=0.88-2.53, $p=0.14$).

Conclusion: In CKD patients, normal weight with central obesity was associated with the highest risk of CAC, suggesting that combining BMI and WHR could be more helpful to stratify CV risk than BMI alone.

Key Words: 체질량지수, 허리-엉덩이둘레비, 관상동맥석회화
BMI, Waist-to-hip ratio, Coronary artery calcification