Dialysis Type May Predict Carotid Intima Media Thickness and Plaque Presence in End-Stage Renal Disease Patients

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ABSTRACT

Introduction: Carotid intima media thickness (CIMT) and carotid plaques (CP) were shown to be independent predictors of mortality in end-stage renal disease (ESRD) patients.

Methods: ESRD patients who had been on the same renal replacement therapy for at least 24 months were selected. CIMT, CP, known risk factors, and laboratory parameters for atherosclerosis were determined for each patient.

Results: A total of 77 hemodialysis (HD) patients (68% male, 47.6 ± 17.0 years), 61 continuous ambulatory peritoneal dialysis (CAPD) patients (51% male, 45.3 ± 13.9 years), and 36 age- and sex-matched controls (61% male, 43.3 ± 10.6 years) were included. The mean CIMT (m-CIMT) were 0.99 ± 0.24, 0.86 ± 0.22, and 0.60 ± 0.13 mm in the HD, CAPD, and control groups, respectively (HD vs. CAPD, \( P = 0.001 \); HD vs. control, \( P < 0.001 \); and CAPD vs. control, \( P < 0.001 \)). The CPP occurred more frequently in the HD group compared to the CAPD group (64% vs. 39%, respectively, \( P = 0.004 \)). The backward linear and logistic regression analysis of potential confounders revealed that both m-CIMT and CPP was independently associated with dialysis type (beta = 0.249, \( P = 0.008 \); and odds ratio [OR] = 4.11, 95% CI, 1.72 to 6.73, \( P = 0.015 \), respectively).
**Conclusion:** The authors have shown that dialysis type may be an independent predictor of m-CIMT and CPP in long-term ESRD patients.

**Keywords:** Atherosclerosis; Carotid intima media thickness; Carotid plaque; Continuous ambulatory peritoneal dialysis; Dialysis type; End-stage renal disease; Hemodialysis

**INTRODUCTION**

End-stage renal disease (ESRD) is a growing healthcare problem worldwide. These patients have a high risk of death, which is about 10–20 times higher than the normal population [1]. The most common causes of death seen in ESRD patients are complications of atherosclerosis, including ischemic heart disease (IHD). Approximately 50% of ESRD patients lose their lives as a consequence of cardiovascular (CV) diseases due to accelerated atherosclerosis [2, 3].

Measurement of carotid intima media thickness (CIMT) with ultrasonography is a reliable, reproducible, and noninvasive method for detecting and monitoring the progression of atherosclerosis. Therefore, CIMT measurement has been proposed as a method for establishing risk stratification for CV events in both the general population and in dialysis patients [4–7]. It has been shown that increased CIMT, and calcified and noncalcified arterial plaques are independent predictors of CV mortality in dialysis and general populations [6–10].

The pathogenesis of atherosclerosis in ESRD patients is somewhat different from the general population and is affected by nonclassical risk factors, such as apolipoprotein E polymorphism, lipoprotein(a), hyperparathyroidism, hyperfibrinogenemia, hyperhomocysteinemia, and low levels of serum albumin [11–14]. The dialysis modality can also be a confounder on the progression of atherosclerosis in ESRD patients, where this effect may become more pronounced when dialysis duration is increased.

Although there are numerous studies investigating the effect of the type of dialysis on mortality of ESRD patients, to the best of the authors’ knowledge, the independent role of dialysis type on CIMT and carotid plaque presence (CPP) in long-term dialysis patients has not been studied so far.

Thus, the authors aimed to investigate the independent role of type of dialysis (hemodialysis [HD] vs. continuous ambulatory peritoneal dialysis [CAPD]) on mean CIMT (m-CIMT) and CPP.

**MATERIALS AND METHODS**

This cross-sectional study was conducted on HD patients on dialysis therapy at the authors’ institution and CAPD patients who were followed up by the authors’ outpatient clinic. The study participants consisted of 77 HD patients, 61 CAPD patients, and 36 age- and sex-matched controls. All patients included in the study were using the same dialysis modality for at least 24 months. The fractional urea clearance (Kt/V) values of the patients were calculated according to urea kinetics formula. CAPD patients used a twin-bag system with glucose-based dialysis fluid with exchange of dialysis fluid 6–8 L/day. All HD patients were dialyzed on a 4–4.5 hour, 3-times weekly schedule using hollow-fiber filters. The control subjects were selected among volunteer staff at the authors’ institution, who had no known CV or any other systemic disease, and had normal physical examination, chest roentgenogram, and electrocardiogram. Participants < 18 years or > 70 years old, those with underlying malignancy, chronic liver disease, autoimmune disease, current or recent (< 1 month) active