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Clinical Implication of Vascular Calcification in CKD Not Receiving KRT

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Cardiovascular disease (CVD) is the most common cause of death in patients with chronic kidney disease (CKD), including those with end-stage kidney disease on kidney replacement therapy (KRT). Approximately 40% of all deaths are primarily due to cardiovascular causes, and cardiovascular mortality is known to be 20–1000 times higher in these patients than in the general population. The high cardiovascular risk may be due in part to excess vascular calcification (VC). Patients with CKD have two to five times more coronary artery calcification than healthy age-matched individuals. A large body of epidemiological evidence has subsequently supported biologically plausible, temporal, and dose-response relations between VC and cardiovascular, all-cause mortality risk in patients with CKD. There are many different pathways underlying the occurrence of VC, from the involvement of vascular smooth muscle cells (VSMCs) in the setting of oxidative stress and inflammation, to the involvement of several bone-derived hormones such as fibroblast growth factor (FGF)-23, osteoprotegerin, and fetuin-A. VC in patients with CKD is distinct to that observed in the general population. Patients with CKD have a more intense and prevalent calcification on the intimal and medial layers, while intimal calcification is the predominant form observed in individuals from the general population. Although VC screening tools for patients with CKD include plain radiography, ultrasound, and computed tomography, they are unable to differentiate types of calcification underlying CKD patients. VC in patients with CKD is not only associated with cardiovascular implications such as atherosclerosis, left ventricular hypertrophy, CKD progression, and worse transplant outcomes, but is also associated with non-cardiovascular implications such as sarcopenia, and retinopathy. The recognition that VC comprises a variety of pathogenesis and prognostic impact complicates therapeutic targets of different types of VC.