



**INVESTIGATING DIFFERENCES IN CORONARY ARTERIES FROM DIALYSIS
AND NON-DIALYSIS PATIENTS**

**Marina Knysheva (Yan-Ting Shiu, Ph.D)
Department of Internal Medicine**

In the United States, 15% of adults are estimated to have chronic kidney disease (CKD). More than 726,000 of these CKD patients have end-stage kidney disease (ESKD), requiring renal replacement therapy such as dialysis or a kidney transplant [1]. Hemodialysis is the most common form of renal replacement therapy, with 86.9% of ESKD patients using this form of renal replacement therapy in 2017 [2]. Hemodialysis requires suitable blood vessels as vascular access that allows safe and reliable access to the patient's circulation at a high blood flow rate. However, CKD patients have poor vascular health, which could lead to vascular access and cardiovascular dysfunction. Indeed, when compared to the general public population, individuals with CKD are more at risk for developing cardiovascular disease (CVD) [3]. Inversely, pre-existing CVD can also impair renal function. A term used to describe this bidirectional relationship between the kidneys and heart is the cardiorenal syndrome (CRS). There are five CRS classifications [4], with this project focusing on Type 4, which describes the chronic worsening of the kidneys leading to decreased cardiac function and/or adverse cardiovascular events [4]. Using coronary artery samples from dialysis and non-dialysis patients at the University of Alabama–Birmingham hospitals and histopathology techniques, this study investigated the differences in vessel anatomy between dialysis vs. non-dialysis patients, with the goal of better understanding the mechanisms underlying the increased risks of CVD in ESKD patients. Coronary artery samples were formalin-fixed, processed, and then embedded in paraffin. 5- μ m thin sections of each sample were subsequently obtained and stained with Masson's Trichrome (MT), which stains collagen blue, and Verhoeff-Van Gieson (VVG), which stains elastin fibers black. Images of the stained sections were acquired using a whole-slide scanner (Axio Scan.Z1, Zeiss) under brightfield with the same settings. The MT images were analyzed for collagen % in the intima and media layers. The VVG images were used to analyze intima thickness, which spans from the internal elastic lamina to the open lumen. Results are shown as average \pm SEM. This study found that dialysis patients had significantly thicker intima than the non-dialysis patients ($723.4 \pm 197.4 \mu\text{m}$ vs. $215.0 \pm 36.1 \mu\text{m}$, $p=0.0231$). Dialysis patients also had slightly elevated collagen in the intima ($61.25 \pm 3.74 \%$ vs. $57.03 \pm 3.96 \%$, $p=0.4469$) and media ($30.74 \pm 5.21 \%$ vs. $29.56 \pm 3.49 \%$, $p=0.8519$) layers than the non-dialysis patients, but this elevation was not statistically significant. The results show that ESKD is associated with intimal hyperplasia, which is a hallmark of vascular abnormality in CVD. Future research can explore other histopathologies, such as calcification, of the vessel in dialysis vs. non-dialysis patients to better delineate how CKD can lead to accelerated CVD.

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3. National Institute of Diabetes and Digestive and Kidney Diseases. Kidney Disease Statistics. National Institutes of Health, Bethesda, MD, 2016
4. C. Ronco, P. McCullough, S. D. Anker, I. Anand, N. Aspromonte, S. M. Bagshaw, R. Bellomo, T. Berl, I. Bobek, D. N. Cruz, L. Daliento, A. Davenport, M. Haapio, H. Hillege, A. A. House, N. Katz, A. Maisel, S. Mankad, P. Zanco, A. Mebazaa, A. Palazzuoli, F. Ronco, A. Shaw, G. Sheinfeld, S. Soni, G. Vescovo, N. Zamperetti, P. Ponikowski, and for the Acute Dialysis Quality Initiative (ADQI) consensus group. "Cardio-renal syndromes: report from the consensus conference of the Acute Dialysis Quality Initiative." *Eur Heart J.* vol.31, no. 6, pp. 703–711, 2010.