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1259 Relative Contributions of Pseudohypoxia and Inflammation to Peritoneal Alterations with Long-Term Peritoneal Dialysis Patients

Raymond T. Krediet and Alena Parikova

On the Cover

What is the diagnosis?

A 72-year-old female with history of diabetes mellitus, hypertension, abdominal aortic aneurysm repair, renal artery stent placement, bilateral carotid artery stenosis with stent placement, history of cerebrovascular accident, peripheral vascular disease, history of long-term smoking, deep vein thrombosis, restless leg syndrome, and CKD 3a (eGFR of 48 ml/min per 1.73 m²) with a baseline creatinine of 1.8 mg/dL admitted for nausea and poor oral intake for the past 3 weeks resulting in an unintentional weight loss of 17 pounds. Laboratory results showed serum creatinine of 4.7 mg/dL and blood urea nitrogen of 46 mg/dL. She develops uremic symptoms and hence dialysis was initiated during the same admission. Extensive workup for AKI, including hepatitis panel, serum and urine electrophoresis, immunofixation and kidney ultrasound, was normal/negative. Kidney biopsy showed severe small arterial cholesterol clefts, suggestive of extensive cholesterol embolization in the kidney and acute tubular necrosis superimposed on advanced chronic kidney injury with features of diabetic glomerulosclerosis.

Image Description:

Left image (light microscopy, H&E [400x])—interlobular artery with cholesterol clefts; middle image (light microscopy, H&E [200x])—zonal cortical scarring suggestive of recurrent atheroembolization to the kidney resulting in microvascular obliterative injury and zonal ischemic injury in the kidney parenchyma; right image (electron microscopy [5 μm])—highlighted the parallel angular cleft-like spaces in arterioles with surrounding swollen endothelial cells. Macrophages also accumulated and formed giant cell reaction around the cholesterol clefts.

Teaching Points:

Cholesterol crystal embolism is a common cause of kidney failure in older patients with atherosclerosis, and most of them were older than 70 years.¹ The risk factors for cholesterol crystal embolism include male sex, White race, tobacco use, cardiovascular disease, cerebrovascular disease, hypertension, hyperlipidemia, diabetes, hypercoagulability, abdominal aortic aneurysm, peripheral vascular disease, and family history of vascular disease.² The exact incidence of cholesterol crystal embolism is often underdiagnosed with at least 4% of all inpatient admission.³ It is estimated that about 30%–85% of patients with cholesterol crystal embolism have a history of invasive vascular procedure in the preceding 3 months, while only 4.3% had cholesterol embolism in age-matched controls that did not have invasive vascular procedure.⁴ Clinical presentation includes AKI, CKD, renal infarction, uncontrolled hypertension, and allograft failure. Kidney biopsy is usually diagnostic, and the characteristic lesion is occlusion of cholesterol emboli in the lumina of arcuate, interlobular arteries, and glomeruli. The emboli of cholesterol crystals generally are defined by the empty, biconvex, and needle-shaped clefts, appearing as “ghosts,” because cholesterol crystals usually dissolve during routine histologic preparation procedures. However, in frozen sections, the crystals are birefringent under polarized light and give positive histochemical reactions for lipids.⁵ Interlobular and arcuate arteries usually show perivascular polymorphonuclear and eosinophilic infiltration. Glomeruli can have normal morphology in the initial stage, but ischemic retraction of podocyte foot processes, focal segmental glomerulosclerosis (FSGS), interstitial fibrosis, perivascular fibrosis around the occluded vessels, and tubular atrophy can be seen frequently due to ongoing ischemic injury in the later stages of the disease. Generally, immunofluorescence staining for immunoglobulins are negative. Kidney biopsy has a sensitivity of about 75%. Involvement of renal vasculature is patchy, and the diagnosis may be missed if not enough sections are examined.⁶ There is no specific therapy for cholesterol crystal embolism. Withdrawal of any form of anticoagulants, postponing aortic catheterization, and surgery should be considered first to avoid recurrence of cholesterol crystal embolism. The aim of treatment is to prevent the progression of tissue ischemia and further showering of cholesterol crystals or provide supportive care in the event of kidney failure.⁷

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- (Images and text provided by Mohankumar Doraiswamy, Division of Nephrology, The Ohio State University Wexner Medical Center, Columbus, Ohio; Sampath Thiruveddi, Division of Nephrology, Kettering Medical Center, Kettering, Ohio; and Anjali Satoskar, Division of Pathology, The Ohio State University Wexner Medical Center, Columbus, Ohio)