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## On the Cover

*What is the diagnosis?*

A 50-year-old male presented with loss of appetite, dyspnea, and AKI following coronavirus 2019 (COVID-19) infection 3 months ago. The AKI required hemodialysis support. Other medications at the time of presentation included erythromycin 500 mg/day, an oral corticosteroid, and telmisartan 20 mg daily for hypertension. Fundus examination was unremarkable. Routine urine analysis showed 1+ protein and no cellular elements. Urine protein-creatinine ratio and serum creatinine were 0.6 g/g and 7.8 mg/dL, respectively. Earlier records documented normal kidney function 1 year ago. Of note, it was discovered that the patient was taking a vitamin C supplement 1 g/day that was initiated during COVID-19 illness and continued for 3 months. Biopsy was performed in view of nonrecovery of kidney function at 3 months.

### Image Description:

Kidney biopsy revealed diffuse acute tubular injury with attenuated epithelium lining. Most of the tubules showed fan-shaped transparent crystals arranged radially within tubular lumens distorting luminal contours. Crystals are birefringent under polarizer. Mild degree of interstitial fibrosis is noted. Glomerular and vascular compartments showed nonspecific findings. Immunofluorescence was negative with entire panel (IgG/A/M, C3/C1q, Kappa/Lambda) of antisera.

### Teaching Points:

AKI in patients infected with COVID-19 may be associated with multifactorial etiologies such as sepsis, hypoperfusion, cytokine storm, possible direct cytopathic effect of the virus, thrombotic microangiopathy, pigment nephropathy, and therapeutic complications. Kidney complications may also be secondary to antibiotics and vitamin C supplements. The unproven rationale for supplementing vitamin C in COVID-19 is to prevent sepsis-induced cytokine production and reduce proinflammatory biomarkers and disease-related mortality. However, endogenous conversion of ascorbic acid to oxalate causes hyperoxaluria. Fontana *et al.* have reported two cases of intravenous vitamin C supplementation-induced oxalate nephropathy with dosage of 50 mg/kg four times per day in patients with COVID-19 infection (1). We believe that continued overdosage of vitamin C led to formation of oxalate crystals. Less than half of patients with oxalate nephropathy require KRT and remain dialysis dependent. Our patient remained dialysis dependent at the end of 4 weeks despite withdrawal of vitamin C following biopsy findings. We attribute nonrecovery to the interstitial fibrosis noted on the histology and hence progressing to CKD. Clinicians should keep occurrence of oxalate nephropathy with vitamin C supplementation among the differentials of AKI in COVID-19 patients.

### Reference:

1. Fontana F, Cazzato S, Giovanella S, Ballestri M, Leonelli M, Mori G, Alfano G, Ligabue G, Magistroni R, Cenacchi G, Antoniotti R, Bonucchi D, Cappelli G: Oxalate nephropathy caused by excessive vitamin C administration in 2 patients with COVID-19. *Kidney Int Rep* 5: 1815–1822, 2020.

*(Image and text provided by Mahesha Vankalakunti, Manipal Hospital, Bengaluru, India; Kiran K. Gowda, Manipal Hospital, Bengaluru, India; and Madhusudan H. Channegowda, Mangala Hospital, Hassan, India)*