Letter

Subclinical acute kidney injury in COVID-19 patients: a retrospective cohort study

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Text

Dear Editor,

We read with great interest the recent article 'COVID-19 Infection in a Patient with End-Stage Kidney Disease' by Fu(1). Previous studies have reported that ~10% of infected patients may develop acute kidney injury (AKI), which is a strong prognostic factor increasing risk of death(2) (3) (4). We agree with the authors that SARS-CoV2 affects the kidney function and special care of renal function should be taken into account in COVID-19 patients. However, the current definition of AKI does not provide a measurement of loss of kidney function, because serum creatinine level is not a sensitive marker of early tubular injury (elevation of serum creatinine requires damage/dysfunction of >50% of the nephron mass), whereas in contrast biomarkers of tubular injury provide information on early kidney injury and response to noxious stimuli (5).

All COVID-19 infection patients without a prior history of chronic kidney disease included in our study (n=32) were consecutively admitted to in our hospital in February, who were confirmed, classified as three subtype (Common, Severe and Critical subtype) and discharged from our hospital based on the guidelines for the diagnosis and treatment of novel coronavirus disease (version 6) (6).

Most of these patients had mean levels of e-GFR within the normal ranges, whereas 31.3% (n=10) had proteinuria, 9.4% (n=3) had macroalbuminuria and 12.5% (n=4) had microalbuminuria. The proportion of patients with increased the urinary levels of β2-microglobulin (β2MG), α1-microglobulin (α1MG), retinol binding protein (RBP) and N-acetyl-β-D-glucosaminidase (NAG) levels were 20%, 20%, 10% and 10%, respectively. On the first day of hospital admission, there were no significant differences in mean levels of serum creatinine, blood urea nitrogen and e-GFR amongst the common, severe and critical subtypes. However, the proportion of albuminuria as well as the levels of urinary β2MG-creatinine ratio, α1MG-creatinine ratio, RBP-creatinine ratio and NAG-creatinine ratio significantly increased according to the severity of disease. During the hospital stay, the proportion of proteinuria (dipstick >1+) in critically ill COVID-19 patients was significantly higher than that observed in common COVID-19 patients on the first check and gradually improved during the patients' hospital admission. No significant differences were observed in the mean levels of e-GFR both on the first day of admission and during the hospital stay amongst the three patient subtypes. Furthermore, Kaplan-Meier survival curves showed that patients with elevated urinary β2MG and α1MG levels had significantly lower rates of hospital discharge compared to those with normal urinary β2MG and α1MG levels.

In conclusion, we suggest that COVID-19 infection may induce early development of abnormal albuminuria and impair kidney tubular function. Because SARS-CoV-2 has been isolated from urinary samples of an infected patient and the receptor of this virus is the angiotensin converting enzyme II which is expressed on podocytes and proximal straight tubule cells (4, 7). Notably, podocytes and proximal straight tubule cells are particularly vulnerable to viral attacks and our findings suggested that the excretion of these urinary biomarkers may be related to the severity of the infection. Therefore more careful medical surveillance of urinary biomarkers of early AKI is required in COVID-19-infected patients, because early detection and treatment can slow or prevent progression of kidney disease.

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The authors have no conflicts of interest to declare.

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Author Contributions

Dan-Qin Sun and Ming-Hua Zheng conceived and designed the study; Ting-Yao Wang and Yong-Ping Chen collected the data; Dan-Qin Sun and Ting-Yao Wang analyzed and interpreted the data; Dan-Qin Sun and Kenneth I. Zheng drafted the manuscript; Giovanni Targher and Christopher D. Byrne reviewed and edited the manuscript. All authors contributed to the manuscript for important intellectual content and approved the submission.

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Figure Legends

Fig. 1. The proportion of proteinuria (A) and the mean levels of estimated glomerular filtration rate (eGFR) across different disease subtypes of COVID-19 patients during the hospital stay; (B) Kaplan-Meier curves for culmulative hospital discharge rates of COVID-19 patients stratified by urinary levels of kidney injury biomarkers (C: Urinary α1MG; D: Urinary β2MG).