Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

determine its frequency. With prompt renal biopsy and initiation of steroid therapy, complete remission of nephrotic syndrome and acute kidney injury can be achieved. It is uncertain if and when it is safe to administer a second dose of the Pfizer vaccine in these individuals.

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Minimal change disease following the Moderna mRNA-1273 SARS-CoV-2 vaccine

To the editor: The immunologic response following several varieties of vaccination has been described as a potential trigger for the development of both *de novo* as well as recurrent minimal change disease (MCD).[1] There have been emerging cases, including that described by D'Agati *et al.*, of MCD shortly after vaccination with the BNT162b2 vaccine (Pfizer-BioNTech).[2,3] We report, to the best of the authors' knowledge, the first case of MCD presenting as nephrotic syndrome following the Moderna mRNA-1273 severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) vaccine.

The patient, a 63-year-old woman, had a medical history that was significant only for hypertension and tobacco dependence. She had no prior history of renal disease. In April 2021, she presented to our hospital with a 4-week history of progressive anasarca, fatigue, periorbital edema, and dyspnea. The patient relayed that the edema and development of foamy urine appeared abruptly and occurred less than a week after having received the first (and only) dose of the Moderna mRNA-1273 SARS-CoV-2 vaccine (lot 006B21A). Vaccination was confirmed by cross-referencing her outpatient pharmacy, which administered the dose. Unfortunately, anti-S protein antibody titer is not available to report.

Clinical and diagnostic evaluation also revealed newly uncontrolled hypertension (181/82 mm Hg) as well as mild acute kidney injury (serum creatinine 1.48 mg/dl; baseline was 0.7 mg/dl). Hypoalbuminemia (0.7 g/dl), urinalysis with 3+ proteinuria (without microscopic hematuria), and hyperlipidemia (triglycerides, 221 mg/dl; total cholesterol, 450 mg/dl) were noted. Nephrotic syndrome was confirmed as the 24-hour urine collection revealed 13.4 g proteinuria. Renal biopsy was promptly performed. Pathology confirmed MCD, with mild acute tubular injury, although a focal acute interstitial nephritis was also present. Four of 69 sampled glomeruli were globally sclerosed. There was 10% tubulointerstitial fibrosis. The sampled glomeruli were found to have 100% foot process effacement (Figure 1).

Treatment with conservative measures, including valsartan, 80 mg orally twice a day, for renin-angiotensin-aldosterone system inhibition was initiated along with a loop diuretic. She was also given pulse methyl-prednisolone, 500 mg i.v. for 3 days, followed by 1 mg/kg prednisone orally. On the basis of other case reports and our experience with MCD, we anticipate a prompt response to these measures.[4] We have recommended the patient forgo the second scheduled dose of the Moderna mRNA-1273 SARS-CoV-2 vaccine. In addition, the authors believe further rechallenges

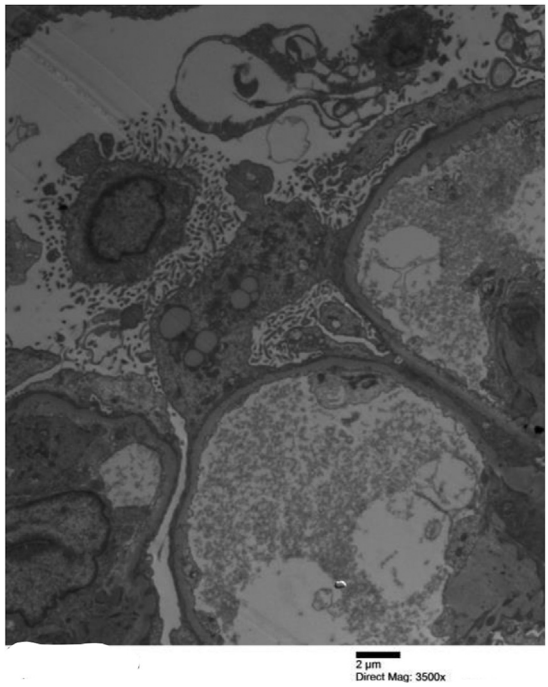

Figure 1 | Electron micrograph featuring glomerular capillary loop with diffuse podocyte effacement. Bar = 2 µm. Original magnification ×3500. To optimize viewing of this image, please see the online version of this article at www.kidney-international.org.

or boosters of this particular vaccine in this patient would be unwise until this potential relationship is more clear.

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Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the editor-in-chief of this journal.

AUTHOR CONTRIBUTIONS

Author contributions were evenly divided, and included but not limited to patient care, research, writing the article, and subsequent revisions.

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Relapse of primary membranous nephropathy after inactivated SARS-CoV-2 virus vaccination

To the editor: Coronavirus disease 2019 (COVID-19) vaccine is one of the most effective public health interventions to end the COVID-19 outbreak. There are insufficient data on the use of COVID-19 vaccines in patients with autoimmune disease, but vaccines appear to be safe, and experience from previous vaccine studies does not indicate an increased risk of relapse/recurrence.[1] However, theoretically, unwanted immunologic events, such as autoimmunity, may be triggered by vaccines. We describe a patient with membranous nephropathy (MN) who stayed in remission for 8 years and experienced a relapse after vaccination with a purified inactivated severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus vaccine called CoronaVac (produced in China by Sinovac).

A 66-year-old female patient presented with lower-extremity edema 2 weeks after the first dose of Sinovac's COVID-19 vaccine. She had been diagnosed with biopsy-proven primary MN 8 years earlier. At that time, secondary causes of MN, such as malignancy, infections, and drugs, were excluded, but anti–phospholipase A2 receptor (anti-PLA2R) antibody could not be tested because it was not available. She was treated with steroid, cyclosporine, and lisinopril 10 mg/d. Complete remission was achieved within 3 months, and all immunosuppressive treatments were discontinued at 6 months while lisinopril 10 mg/d was continued. Renal functions and urinary protein excretion remained in the normal range without immunosuppressive therapy for 8 years. Her medical history also showed hypertension for 1 year and diabetes mellitus and hyperlipidemia for 6 years. On admission, urea was 93 mg/dl, creatinine was 2.78 mg/dl, serum albumin was 2.6 g/dl, spot urine protein-to-creatinine ratio was 9.42 mg/mg, and anti-PLA2R antibody was positive (120.53 relative units/ml [<14, negative; >20, positive]). Secondary causes of MN, such as malignancy, infections, and drugs, were excluded. No diabetic retinopathy was noted. A diagnosis of MN relapse was established given the clinical symptoms and laboratory examination results.

To our knowledge, cases of nephrotic syndrome in MN form have been reported after influenza vaccination.[2,3] A case of minimal change disease with full-blown nephrotic sydrome and acute kidney injury 10 days after the Pfizer-BioNTech COVID-19 vaccination has also been reported.[4] In addition to this case, we observed 2 patients who developed anti-PLA2R–positive MN after SARS-CoV-2 infection. Our observation suggests that the SARS-Cov-2 virus may cause a loss of tolerance to the PLA2R antigen. Consequently, close follow-up of patients with MN after SARS-CoV-2 vaccination is recommended. Further studies are needed to determine whether relapse of MN is specific for inactivated SARS-CoV-2 virus vaccination and to decipher the mechanisms of immune dysregulation in those patients.

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