Utilizing remdesivir to treat novel coronavirus disease 2019 (SARS-CoV-2) in a patient with acute renal failure on hemodialysis: a case report

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BACKGROUND

- On May 1, 2020, the US Food and Drug Administration issued an emergency use authorization to permit the use of remdesivir for treatment of adults and children hospitalized with severe Covid-19.[1]
- Severe SARS-CoV-2 infection leads to an acute kidney injury in up to 20-40% of critically ill patients.[1]
- Patients with severe acute renal failure on hemodialysis were excluded from remdesivir trials; as a result, these patients may not be considered for treatment with remdesivir.[1]
- Studies suggest remdesivir provides possible clinical benefit in shortening the time to recovery in adults hospitalized with Covid-19.[2]

CITATIONS

ACKNOWLEDGEMENTS

Special thanks to Dr. Francis Zamora for the support and guidance.

DISCLOSURES

The authors have no conflicts of interest to disclose.

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CASE REPORT

A 63-year-old African American male with past medical history of diabetes, hypertension, and vertigo, presented to the emergency department with sore throat, fevers, chills, and shortness of breath. Patient was feeling similarly the week prior and tested negative for SARS-CoV-2. On arrival patient was saturating at 47% on 2 L of nasal cannula. He was found to be SARS-CoV-2 positive. He developed acute respiratory distress syndrome (ARDS) and required intubation. Chest X-ray showed bilateral pulmonary opacities. Upon admission, the patient exhibited acute renal failure with a BUN was 89 mg/dL, SCr of 7.8 and CrCl of 12 mL/min.

On hospital day (HD) 1, the D-dimer was 0.55 ug/mL and renally dosed enoxaparin 100 mg SQ every 24 hours was initiated. Proning was performed for 16 hours. The patient was also given dexamethasone 10 mg daily. On HD 2 to 6, the patient received hemodialysis daily. On HD 7, the remdesivir 200 mg loading dose was given. On HD 9, the patient started hemodialysis on Monday, Wednesday, and Friday. Remdesivir 100 mg maintenance dose was typically administered after hemodialysis, on the respective days for the total treatment duration of 5 days. Apart from one day hemodialysis was delayed, and the patient received the dose of remdesivir 12 hours prior to dialysis.

The D-dimer trended up since admission (2.36 ug/mL on HD 6) and started to trend down on HD 9. On HD day 9, the patient required vasopressors for less than 48 hours. At the start of remdesivir, the D-dimer was 1.24 ug/mL and ferritin was 1581 ng/mL. After the complete 5 days of treatment, the D-dimer was 1.01 ug/mL and ferritin was 923 ng/mL. Liver function tests (LFT) remained within normal limits throughout the full course of therapy. On HD 10 and 11, respectively, AST was 28 IU/L and 24 IU/L. ALT remained 24 IU/L on both days. Three days after completing treatment, LFTs remained within limits (AST of 25 IU/L and ALT of 23 IU/L; usual range 0-35 IU/L).

Despite management efforts made by the multidisciplinary team, the patient's condition remained critical. His acute kidney injury escalated to end stage renal disease. He was unable to tolerate intermittent hemodialysis and was placed on continuous renal replacement therapy. The patient suffered a cardiac arrest and expired on HD 21.

DISCUSSION

Concerns about remdesivir's potential toxicity in patients with kidney disease relates to impaired renal elimination and the potential accumulation of its sulfobutylether- β -cyclodextrin (SBECD) carrier, causing liver necrosis.[1] Remdesivir is a nucleoside analog with a similar chemical structure and mechanism of action as tenofovir disoproxil fumarate (TDF), a nucleoside reverse transcriptase inhibitor (NRTI). Thus, we can assume that remdesivir's elimination in hemodialysis is comparable to TDF. In patient's with ESRD, high-flux hemodialysis efficiently removes tenofovir with an elimination rate of 134 mL/min and an extraction coefficient of 54%.[3]

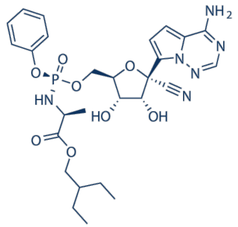

Figure 1. Remdesivir

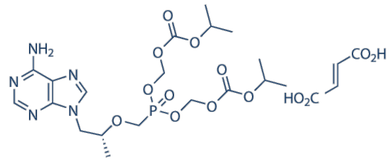

Figure 2. Tenofovir disoproxil fumarate (TDF)

CONCLUSION

The absence of liver function decline in this patient suggests that the benefits of utilizing remdesivir to treat Covid-19 may outweigh its hepatotoxic risks. Ongoing trials are critical in defining the efficacy and safety of remdesivir for the treatment of Covid-19. However, based on this case, remdesivir appears to be safe in patients with acute or chronic renal disease on hemodialysis. Liver function tests should be performed at baseline and daily in this patient population.