*Case Report*

**SAGE Open Medical Case Reports**

SAGE Open Medical Case Reports
Volume 10: 1–7

DOI: 10.1177/2050313X211066646
journals.sagepub.com/home/sco
SAGE

# The clinical course of a 79-year-old stroke survivor in the setting of a late-onset COVID-19 infection

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**Abstract**

Although several therapeutic agents have been evaluated for the treatment of coronavirus disease 2019 (COVID-19), no specific antiviral drug has been proven effective for the treatment of patients with severe complications. However, a nucleoside prodrug remdesivir (GS-5734) was recently approved by the Food and Drug Administration for the treatment of hospitalized patients with COVID-19. Preclinical data in animal models of coronavirus diseases have demonstrated that early treatment with remdesivir leads to improved survival and decreased lung injury. Recent clinical data have demonstrated the clinical activity of remdesivir in terms of shorter recovery period and higher odds of improved clinical status in patients with COVID-19. Here, the story of a 79-year-old patient, with 11-year-old left hemiparesis, concomitant cardiovascular disease, infected with SARS-CoV-2, and the clinical improvement after administration of remdesivir during his second hospitalization period is reported.

**Keywords**

Infectious disease, respiratory medicine, remdesivir, comorbidity, COVID-19

Date received: 27 September 2021; accepted: 28 November 2021

## Introduction

The latest viral infection, COVID-19, has caused a global disturbance for all of humanity, especially the population with chronic diseases and a high risk of infection. Its outbreak in the Chinese city of Wuhan in the last month of 2019, caused its spread in most countries worldwide within a few months. Hence, World Health Organization (WHO) officially labelled COVID-19 as a pandemic on the 11th of March 2020, with the disease having spread to >190 countries.[1] As of 9 February 2021, there were more than 107,077,257 confirmed cases with over 2,338,302 deaths.[2] COVID-19, caused by a newly discovered coronavirus (SARS-CoV-2), is an infectious disease that due to its high transmission rate erupted to become the greatest challenge to the global healthcare system.

Although coronaviruses are naturally zoonotic in their origin, the latest one, having a close genetic similarity to bat coronaviruses,[3–5] was first isolated from people who had visited the Wuhan seafood market in China.[6] Similar to other coronaviruses, SARS-CoV-2 has spike proteins, responsible for allowing the virus to attach and fuse with the membrane of a host cell, especially binding the ACE2 receptor located on type II alveolar cells and intestinal epithelia, hence responsible for the acute respiratory syndrome.[7–9] Although the clinical presentation for SARS-CoV-2 varies from mild to moderate respiratory illness, older people with pre-existing conditions, such as diabetes, chronic respiratory disease, cardiovascular disease, and cancer are more likely to develop a serious illness with complications and death.[10] This has posed challenges in halting the transmission via droplets due to asymptomatic carriers as well as identifying drugs that might be effective in treating patients who can potentially

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decompensate later in the clinical course.[11] Consequently, as of off-label use, some existing drugs have been given to patients with COVID-19, including anti-HIV, anti-influenza, and anti-malaria agents.[12,13] Beyond that, the Food and Drug Administration (FDA) has also authorized treatments that may be used for patients who have been hospitalized with COVID-19. In October 2020, the FDA approved the antiviral drug Veklury (remdesivir), which was developed for the treatment of Ebola haemorrhagic fever, for use in adult and paediatric patients of 12 years of age and older requiring hospitalization for the treatment of COVID-19.[14,15]

## Case presentation

On the 19th of November 2020, a 79-year-old male patient resulted positive for the SARS-CoV-2 infection, after testing the nasopharyngeal swab sample for SARS-COV-2 antigens, 5 days after his wife had resulted positive. The test was accomplished through the immune chromatography qualitative method by AMP diagnostics from Austria.

At the time there was no history of fever, sore throat, cough, muscle aches, headache, or any symptoms suggestive of pneumonia due to COVID-19 infection. He was admitted to the outpatient service at the Main Family Health Centre of the town for the routine check-up of his blood pressure, where he presented his test results too. At the Main Family Health Centre, he underwent a blood routine examination along with D-dimer and lung X-ray. Except for the elevated D-dimer which reached 1.35 μg/mL (reference range <0.50 μg/mL) and mild anaemia ($3.75 \times 10^{12}$/L, reference range 3.8–$5.8 \times 10^{12}$/L), neither were there any alterations in white blood cell (WBC) ($4.6 \times 10^{9}$/L, reference range 3.5–$10 \times 10^{9}$/L), with 23.4% of lymphocytes (reference range 15%–50%) and 68.8% neutrophils (reference range 35%–75%), nor in platelet series ($134 \times 10^{9}$/L, reference range 100–$400 \times 10^{9}$/L). C-reactive protein (CRP) was within normal ranges too (1.82 mg/L, normal <10 mg/L), but thorax radiography showed slight pulmonary infiltration (Figure 1(a)). Due to the medical history of left-sided hemiparesis, the patient was referred to the Infectious Diseases Clinic of the University Clinical Centre of Kosovo (UCCK) in Prishtina for evaluation and further treatment. Until admission on the 21st of November, he was on enoxaparin 0.6 mL SC. every 12 h, clarithromycin tab. 500 mg every 12 h, and B-complex vitamins every 12 h too (Table 1).

On admission (21 November 2020), the physical examination revealed normal body temperature, respiratory rate, pulse, and blood pressure, but slightly aggravated bilateral breathing with $SpO_2$ 97%. The blood routine examination revealed the following: elevated sedimentation rate (ESR) of 48 mm/1 h, haematocrit rate (HTC) of 38.9%, slightly decreased WBCs of $3.4 \times 10^{9}$/L (with granulocytes of 65.6%, monocytes 4.9% and lymphocytes 29.5%, respectively) and elevated D-dimer of 1.35 μg/mL, but normal levels of CRP (1.8 mg/L). During hospitalization period, until the 25th of November, the patient was treated every 12 h with glucose solution, ciprofloxacin amp., pantoprazole amp., UTC amp. (methylprednisolone), fraxiparine 0.8 mL, vitamin C amp. and B-complex. The $SpO_2$ was >94%; hence, no O2 therapy was required. On the 25th of November, upon the patient's request, the discharge form was signed by the hospital and the patient was sent home with the prescription of 7 days therapy as follows: fraxiparine amp. 0.6 mL every 12 h, pancef tab.400 mg (cephalosporin) every 24 h, vitamin D 2000 UI once a day and vitamin C tab. 500 mg every 8 h (Table 1).

On the 29th of November, the patient had a feeling of fatigue and difficulty breathing. On the 30th of November, these symptoms were accompanied by a body temperature of 38.7 C; therefore, along with his prescription therapy, the patient also took paracetamol tab. 500 mg twice within 3 h in the evening until body temperature dropped to 36.7 C, and remained stable overnight without the need for an additional dose of paracetamol.

On the 1st of December, based on the instruction on the leaflet regarding the consultation with the infectologist as needed, the patient was instructed for another chest X-ray and routine laboratory test. The radiography was described with bilateral pulmonary infiltrates (Figure 1(b)) while routine blood test showed increased levels of the ESR as of 98 mm/1 h with normal WBC count of $5.5 \times 10^{9}$/L (neutrophils of 75.3%, monocyte 3.4%, and lymphocyte 21.3%) but elevated CRP level of 35.0 mg/mL. The D-dimer level had dropped closer to normal value (0.75 μg/mL, normal <0.5 μg/mL). After consulting the pulmonologist and infectologist, the patient was treated at home with 7-day intravenous therapy, with the instruction to report immediately to the hospital in case of further deterioration of his health condition. Over the next 2 days, the patient was treated with the following therapy: NaCl sol. 0.9% 100 mL, imipenem amp. 500 mg every 8 h, ciprofloxacin amp. 200 mg/100 mL every 12 h, fraxiparine 0.8 mL SC. every 12 h, dexamethasone amp. 4 mg in bolus once a day and paracetamol tab. 500 mg every 8 h (Table 1).

In the morning of the 4th of December, the patient came to the UCCK emergency department with difficulty breathing accompanied by wheezing and was immediately hospitalized in the Infectious Diseases Clinic for further treatment. On admission, the physical examination revealed a normal body temperature, a respiratory rate of more than 26 breaths per minute, a pulse rate of 76/min. and blood pressure of 128/70 mm Hg. During pulmonary auscultation, difficult bilateral breathing accompanied by wheezing was described, but the pulse oximetry was 96%. The lung X-ray showed lesions significantly larger compared to those of 1 December, with diffuse bilateral atypic inflammatory infiltrates, but with free pleural spaces (Figure 1(c)).

During the 10-day hospitalization, the patient received the following medical treatment: NaCl sol. 0.9% 100 mL, imipenem amp. 500 mg every 12 h, ciprofloxacin amp. every 12 h, pantoprazole amp. every 12 h, aminophylline amp. every 12 h, vitamin C amp. every 12 h, fraxiparine amp. SC

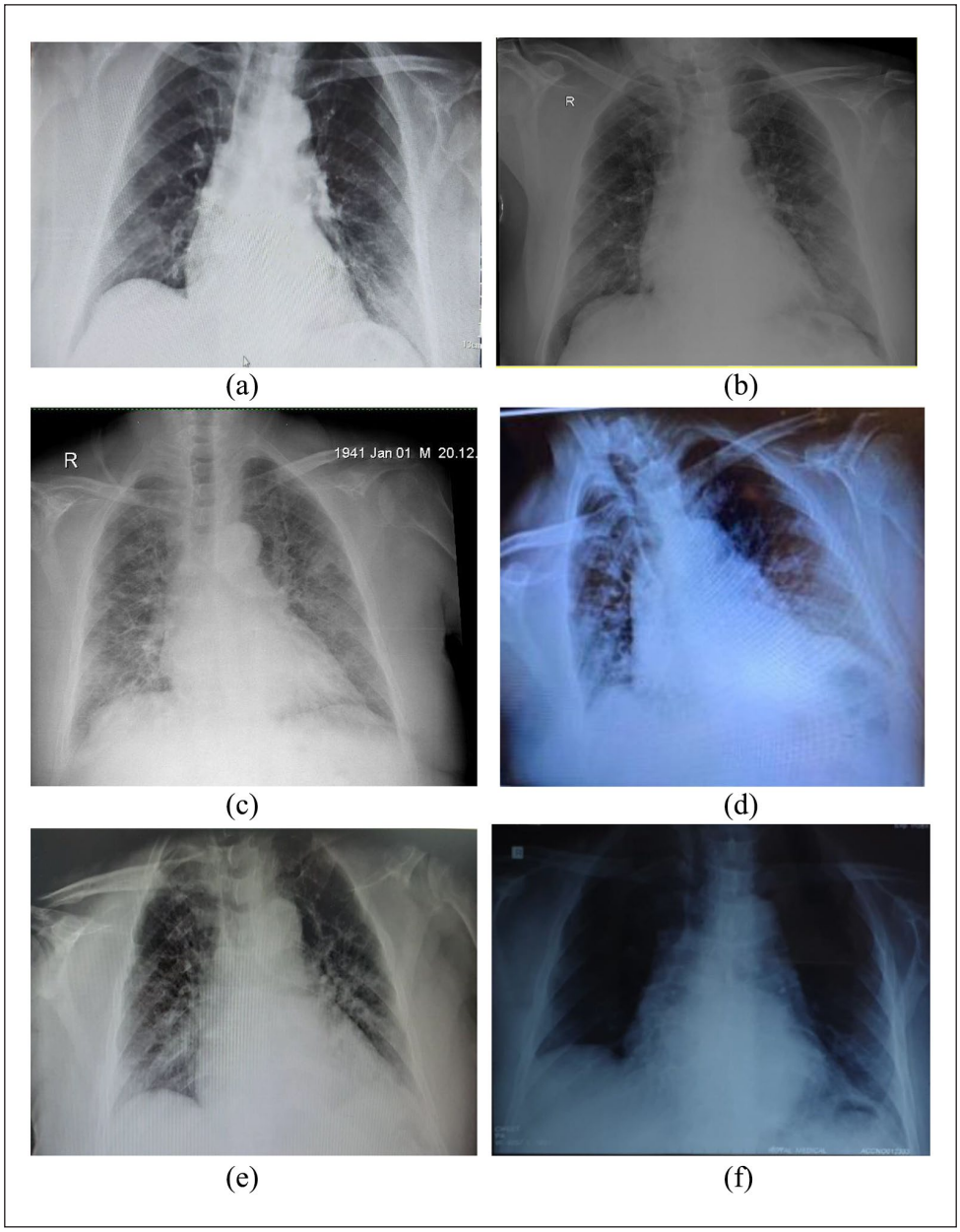


**Figure 1.** (a) Pulmonary X-ray image showing slight pulmonary infiltration. (b) X-ray image showing bilateral pulmonary infiltrates. (c) y X-ray image showing diffuse bilateral atypic inflammatory infiltrates. (d) X-ray image showing inhomogeneous basal shading. (e) X-ray image showing improvement of inhomogeneous shading. (f) Pulmonary X-ray image reviling significant improvement in lung lesions.

0.6 mL every 12 h and remdesivir amp. 100 mg every 24 h (on the first day 200 mg and every other day 100 mg). On 6 December, the pulse rate was most of the time above 113/min. so the IV aminophylline was discontinued and was replaced by rolastymComby caps. 12/200 mcg every 12 h (formoterol fumarate/budesonide) and bisoprolol tab. of 2.5 mg was administered ½ in the morning (Table 1).

During hospitalization, the patient developed nasal congestion and intermittent cough, although breathing difficulties appeared only while talking and short walking. At the time, the pulse oximeter recorded variable values of oxygen saturation which ranged between 92% and 88%; consequently, from time to time the patient was treated with supplemental oxygen of 5–6 L/min administered through the nasal cannula.

On 8 December, another routine test revealed elevated levels of alanine transaminase (ALT)/aspartate transaminase (AST) of 44/70 (normal range 3–41 U/L and 2–37 U/L), the glucose of 6.18 nmol/L (normal range 4–6 nmol/L), urea/creatinine of 86.4/30.5, albumin/total proteins of 30.5/58.7, and lactate dehydrogenase (LDH) of 503. Routine blood tests confirmed a decrease in sedimentation rate (10.1 mm/1 h) and a decrease in CRP to 10.1 mg/L. The venous blood gas analyses and electrolytes were also done and the results

**Table 1.** Lab results and therapy.

| Date | Analyses | Results | Normal ranges (for males) | Units | Therapy |
|---|---|---|---|---|---|
| 19 November 2020 | D-dimer | 1.35 | <0.50 | µg/mL | At home, no therapy |
| | RBC | 3.75 | 3.8–5.8 | $10^{12}$/L | |
| | WBC | 4.6 | 3.5–10 | $10^9$/L | |
| | Lymphocyte | 23.4 | 15–50 | % | |
| | Neutrophyle | 68.8 | 35–75 | % | |
| | Platelet | 134 | 100–400 | $10^9$/L | |
| | CRP | 1.82 | <10 | mg/L | |
| | SARS-CoV-2/antigen (nasopharingeal swab) | Positive | | Quality control | |
| 20–21 November | | | | | At home:<br>Enoxaparin 0.6 mL SC. ×12 h; clarithromycin tab. 500 mg. ×12 h; B-complex ×12 h |
| 21–25 November | $SpO_2$ | 95 | 95–100 | % | Hospitalization:<br>Glucose sol. ×12 h; ciprofloxacin amp.; pantoprazole amp.; methylprednisolone amp.; fraxiparine 0.8 mL SC.; vitamin C amp. 500 mg/2 mL; B-complex amp. 1 mL |
| | ESR | 48 | <20 | mm/1 h | |
| | Hct | 38.9 | 35.0–51.5 | % | |
| | WBC | 3.4 | 3.5–10.0 | $\times 10^9$ L | |
| | Lymphocyte | 65.6 | 15–50 | % | |
| | Monocyte | 4.9 | 1–15 | % | |
| | Neutrophyle | 29.5 | 35–75 | % | |
| | D-dimer | 1.35 | <0.50 | µg/mL | |
| | CRP | 1.80 | <10 | mg/L | |
| 25 November | | | | | Hospital discharge with 7 days at home therapy:<br>fraxiparine amp. 0.6 mL ×12 h; cephalosporin tbl. 400 mg ×24 h; vitamin D 2000 UI ×24 h; vitamin C tbl. 500 mg ×8 h |
| 1 December | ESR | 98 | <20 | mm/1 h | Exacerbation of symptoms:<br>NaCl sol 0.9% 100 mL.; imipenem amp. 500 mg ×8 h; ciprofloxacin amp. 200 mg/100 mL every 12 h, fraxiparine 0.8 mL SC. every 12 h, dexamethasone amp. 4 mg in bolus 1 ×24 h; paracetamol tab. 500 mg ×8 h |
| | WBC | 98 | <20 | mm/1 h | |
| | Lymphocyte | 21.3 | 15–50 | % | |
| | Monocyte | 3.4 | 1–15 | % | |
| | Neutrophyle | 75.3 | 35–75 | % | |
| | CRP | 35.0 | <10 | mg/L | |
| | D-dimer | 0.75 | <0.50 | µg/mL | |
| 4 December | Respiratory rate | >26 | 12–16 | /min | Another 10 day hospitalization due to breathing difficulties with wheezing:<br>NaCl sol. 0.9% 100 mL, imipenem amp. 500 mg ×12 h; ciprofloxacin amp. ×12 h; pantoprazole amp. ×12 h; aminophylline amp. ×12 h; vitamin C amp. ×12 h; fraxiparine amp. SC 0.6 mL ×12 h and remdesivir amp. 100 mg ×24 h (on the first day 200 mg and every other day 100 mg) |
| | Pulse rate | 76 | 60–100 | /min | |
| | $SpO_2$ | 96 | 95–100 | % | |
| 6 December | Pulse rate | 113 | 60–100 | /min | Idem, exept:<br>Stop: aminophylline; start: formoterol fumarate/budesonide caps. 12/200 mcg ×12 h; bisoprolol tbl. 2.5 mg ½ ×1; Supplemental $O_2$, 5–6 L through nasal cannula |
| | $SpO_2$ | 88–92 | 95–100 | % | |
| 8 December | ALT | 44 | 3–41 | U/L | Idem |
| | AST | 70 | 2–37 | U/L | |
| | Glucose | 6.18 | 4–6 | nmol/L | |
| | Urea | 86.4 | 14–41 | mg/dL | |
| | Creatinine | 30.5 | 62–106 | µmol/L | |
| | Albumin | 30.5 | 35–54 | g/L | |
| | Total proteins | 58.7 | 60–83 | g/L | |
| | LDH | 503 | 140–280 | U/L | |

*(Continued)*

**Table 1.** (Continued)

| Date | Analyses | Results | Normal ranges (for males) | Units | Therapy |
|---|---|---|---|---|---|
| | ESR | 10.1 | <20 | mm/1 h | |
| | CRP | 10.1 | <10 | mg/L | |
| | pH | 7.5 | 7.35–7.45 | | |
| | $pCO_2$ | 36 | 40–50 | mm Hg | |
| | $pO_2$ | 108 | 30–50 | mm Hg | |
| | K | 3.8 | 3.5–5.0 | mmol/L | |
| | Na | 139 | 136–146 | mmol/L | |
| | Ca | 1.1 | 0.95–1.50 | mmol/L | |
| 10 December | Albumin | 27.3 | 35–54 | g/L | Idem, plus: albumin solution ×1 24 h (for 2 days) |
| | Total protein | 52.6 | 60–83 | g/L | |
| | Glucose | 4.9 | 4–6 | nmol/L | |
| | CRP | 8.8 | <10 | mg/L | |
| | ESR | 15 | <20 | mm/1 h | |
| | D-dimer | 0.67 | <0.50 | µg/mL | |
| | ALT | 31 | <40 | U/L | |
| | AST | 18 | <40 | U/L | |
| 14 December | | | | | Hospital discharge due to improvement along with 7 days home prescription therapy: pancef 400 mg ×24 h; prednisolone 16 mg ×24 h (first 4 days, then another 10 days ½ ×24 h); vitamin C 1000 mg ×24 h; vitamin D3 1000 IU ×24 h; anticoagulant xarelto 20 mg ×24 h; pantoprazole 40 mg ×12 h and fluconazole 200 mg ×24 h |
| 22 December | ESR | 11 | <20 | mm/1 h | No therapy |
| | WBC | 15.0 | 4.0–10.0 | $\times 10^3$ µL | |
| | Lymphocyte | 14.1 | 20.0–40.0 | % | |
| | | 2.1 | 0.6–4.1 | $\times 10^3$ µL | |
| | Monocyte | 4.4 | 1.0–15.0 | % | |
| | | 0.7 | 0.1–1.8 | $\times 10^3$ µL | |
| | Neutrophyle | 81.5 | 50.0–70.0 | % | |
| | | 12.2 | 2.0–7.8 | $\times 10^3$ µL | |
| | RBC | 4.52 | 4.0–6.2 | $\times 10^6$ µL | |
| | Hgb | 13.4 | 12.3–16.7 | g/dL | |
| | Hct | 38.5 | 35.0–51.5 | % | |
| | MCV | 85.3 | 80.3–103.4 | fL | |
| | MCH | 29.6 | 26.0–34.4 | Pg | |
| | MCHC34.8 | 34.8 | 31.8–36.3 | g/dL | |
| | RDW | 16.1 | 10.0–16.0 | % | |
| | Plt | 148 | 134–377 | $\times 10^3$ µL | |
| | MPV | 8.6 | 6.5–11.0 | fL | |
| | PDW | 12.5 | 10.0–18.0 | % | |
| | PCT | 0.12 | 0.10–50.0 | % | |
| | Glucose | 4.1 | 3.9–6.1 | mmol/L | |
| | Urea | 7.2 | 2.1–7.1 | mmol/L | |
| | Creatinine | 93.6 | 62–106 | µmol/L | |
| | SGPT | 26.4 | <40 | U/L | |
| | SGOT | 28.1 | <40 | U/L | |

revealed as follows: pH = 7.5, $pCO_2$ = 36, $pO_2$ = 108, K = 3.8, Na = 139 and Ca = 1.1. The chest X-ray showed inhomogeneous basal shading (Table 1 and Figure 1(d)).

On the 10th of December, another routine test revealed decreased levels of albumin/total protein of 27.3/52.6 (and the albumin solution was administered once a day for two consecutive days), the glucose of 4.9 nmol/L, AST/ALT of 18/31, CRP of 8.8, ESR of 15 mm/1 h and D-dimer of 0.67. Another chest X-ray showed improvement of inhomogeneous shading, although still persistent (Table1 and Figure 1(e)).

On the 14th of December, the patient was released home in a stable clinical condition, with another 7 days tablet therapy prescription as follows: pancef 400 mg every 24 h; prednisolone 16 mg every 24 h, first 4 days, then another 10 days ½ every 24 h; vitamin C 1000 mg once a day; vitamin D3 1000 IU every day; anticoagulant xarelto 20 mg every day; pantoprazole 40 mg every 12 h and fluconazole 200 mg every 24 h (Table 1). On 22 December, the chest X-ray revealed significant improvement on lung lesions and blood routine tests were all within normal ranges (Table 1 and Figure 1(f)).

## Discussion

Although the signs and symptoms of COVID-19 present at illness onset vary, throughout the disease many people with COVID-19 experience fever or chills, shortness of breath or difficulty breathing, fatigue, the new loss of taste and smell, headache, muscle or body aches, congestion or runny nose, nausea or vomiting and diarrhoea. Also, symptoms may differ with severity of disease, such as shortness of breath commonly reported among people who are hospitalized than among non-hospitalized patients; fever and respiratory symptoms experienced later during illness among older adults with medical comorbidities than people who are younger and with no comorbidities.[16,17] A large cohort study from China, including 44,000 people with COVID-19, showed that illness severity can range from mild to critical.[18] Risk factors for severe illness were the age of 65 years or older, prior stroke, diabetes, chronic lung disease, and chronic kidney disease.[19] Clinical management of COVID-19 includes infection prevention, control measures, and supportive care, including supplemental oxygen and mechanical ventilatory support when indicated, according to the National Institutes of Health (NIH) guidelines.[20] Based on these guidelines, patients with absence of viral pneumonia and hypoxia may not initially require hospitalization and will be able to manage their illness at home; however, patients with risk factors for severe illness should be monitored closely, especially in the second week after symptom onset. This requires inpatient management of most common complications: pneumonia, hypoxemic respiratory failure/acute respiratory distress syndrome (ARDS), cardiomyopathy and arrhythmia, thromboembolism, including secondary bacterial and fungal infections.[20] Nevertheless, the patient presented here has been successfully managed based on the aforementioned protocol. A 79-year-old man with left hemiparesis due to prior stroke was presented with mild COVID-19 symptoms and initially treated for 7 days with macrolide antibiotics, vitamins, anticoagulant enoxaparin, with different strength based on D-dimer results, and methylprednisolone (2 days at home setting and another 5 days at the hospital). As his symptoms were not aggravated during his hospital stay, upon his demand, the patient was discharged from hospital on day 5, with the prescription therapy for another 7 days. However, 3 days after discharge from hospital (which would be the 10th day after a positive test for COVID-19), his symptoms progressed to fatigue and breathing difficulties, and his condition worsened in the following days forcing physicians to continue his treatment for another 10 days with remdesivir. Taking into account two main processes that are thought to be drivers of the pathogenesis of COVID-19, replication of the virus early in the course of infection and exaggerated inflammatory response later in the course, it would be anticipated that antiviral therapies would have the greatest effect early in the course of the disease, while immunosuppressive/anti-inflammatory therapies are likely to be more beneficial in the later stages of COVID-19.[20] Early on, there were hopes that remdesivir, which was originally developed to treat hepatitis C and later found effective against Ebola, could be used as an antiviral against COVID-19. However, a large clinical trial showed inconclusive results, and the WHO subsequently announced that remdesivir did not significantly reduce mortality rates and came up with the statement against the use of remdesivir in November 2020.[21] However, after the second hospitalization of the patient, on day 11 of illness (hospital day 1), a 200 mg IV loading dose of remdesivir was administered to the patient. This was followed by remdesivir 100 mg IV maintenance dose every 24 h for the next 9 days. During the following days, the patient continued to progress, with no adverse effects reported, or recorded to remdesivir, his oxygen saturation remained stable, his chest X-ray on hospital days 4 and 6 showed resolution of initial shedding, while on day 19 after remdesivir administration, the chest X-ray revealed significant improvement of lung lesions.

## Conclusion

This case report has found that remdesivir may be an effective antiviral agent against SARS-CoV-2, even if used in the late stage of the disease.

### Acknowledgements

The authors thank all individuals who contributed to the management of this case, including doctors, nurses, clinical engineers, pharmacists, laboratory technicians and medical clerks.

### Author contributions

V.L.-B. conceived the Case Report and wrote the first draft. V.L.-B. and S.A. collected data. B.G.L. contributed radiology images. S.A.

interpreted and photographed radiology images. All authors participated in the construction and editing of the manuscript and revisions.

## Consent for publication

Written consent for publication was obtained from the patient.

## Consent to participate

I confirm that the patient described in our paper has given written consent to the inclusion of material belonging to him, and is assured that the same cannot be identified through the paper and that it is completely anonymous.

## Data availability

Data relevant to this case report are not available for public access because of patient privacy concerns but are available from the corresponding author on reasonable request.

## Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

## Ethical approval

On behalf of my coauthors, I declare that this study follows the principles of the Declaration of Helsinki. Our institution does not require ethical approval for reporting individual cases or case series.

## Funding

The author(s) received no financial support for the research, authorship and/or publication of this article.

## Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

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