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COVID-19

Generalized myasthenia gravis patients infected with COVID-19 should continue eculizumab

Masahiro Mimori[1] · **Teppei Komatsu**[1] · **Takahiro Maku**[1] · **Hidetaka Mitsumura**[1] · **Yasuyuki Iguchi**[1]

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Abstract
Eculizumab, a humanized monoclonal antibody, is a complement inhibitor indicated for refractory generalized myasthenia gravis (MG). However, there are limited data on the safety of eculizumab for MG during coronavirus disease 2019 (COVID-19) infection. We report a case in which eculizumab was continued for MG after contracting COVID-19, followed by a favorable outcome.

Keywords COVID-19 · Eculizumab · Myasthenia gravis

Introduction

Eculizumab, a humanized monoclonal antibody, is a complement inhibitor indicated for refractory generalized myasthenia gravis (MG) [1]. However, there are limited data on the safety of eculizumab for MG during coronavirus disease 2019 (COVID-19) infection. We report a case in which eculizumab was continued for MG after contracting COVID-19, followed by a favorable outcome.

Case report

A 55-year-old man with MG associated with invasive thymoma was admitted to our hospital due to COVID-19 pneumonia. He had been diagnosed with MG at our hospital in 2014. In 2020, he experienced his first myasthenic crisis following an infection, and required mechanical ventilation. He was discharged after 5 months of admission, at which time his quantitative MG (QMG) score was 8 points, and was on cyclosporine and prednisolone (PSL) maintenance therapy. However, following a second myasthenic crisis in November 2020, eculizumab was started biweekly, resulting in improvement in his QMG score to 2. The effect of eculizumab was remarkable, allowing tapering of the PSL dose to 14 mg, which was continued along with 200-mg cyclosporine at the time of his most recent admission. Three days before this hospitalization and 2 days after receiving the second Pfizer-BioNTech vaccination, he developed a fever and headache. Chest CT on admission revealed ground glass opacities in bilateral lungs (Fig. 1 and Table 1). We diagnosed him with COVID-19 pneumonia using polymerase chain reaction (PCR) testing of a nasopharyngeal swab. We used casirivimab and imdevimab on the first hospital day, and although his fever resolved on the second day, he developed a fever of 39.0 °C on the seventh day, requiring oxygen administration of 1–4 L/min to maintain SpO_2 above 92%. Therefore, remdesivir was administered for 5 days (sixth–tenth day) and dexamethasone was administered for 10 days (seventh–sixteenth day). During dexamethasone administration, the regular oral administration of PSL was discontinued. Since discontinuing eculizumab could have resulted in a myasthenic crisis, which could have been fatal; regular eculizumab was administered as scheduled from the eighth day onwards. Subsequently, O_2 administration was discontinued on the thirteenth day, and the patient was discharged on the twentieth day. In this patient, eculizumab did not worsen the clinical course of COVID-19 pneumonia.

Discussion

There are very limited data on eculizumab use during COVID-19 infection [2]. Our experience with the present case suggests that eculizumab can be safely continued during the acute phase of COVID-19 infection in MG patients. Since a myasthenic crisis can be triggered by infection [3], continuing eculizumab might have been responsible for the favorable outcome in our case. On the other hand, eculizumab suppresses the immune

✉ Masahiro Mimori
mr.gaspard.de.la.nuit@gmail.com

[1] Department of Neurology, The Jikei University School of Medicine, Tokyo, Japan

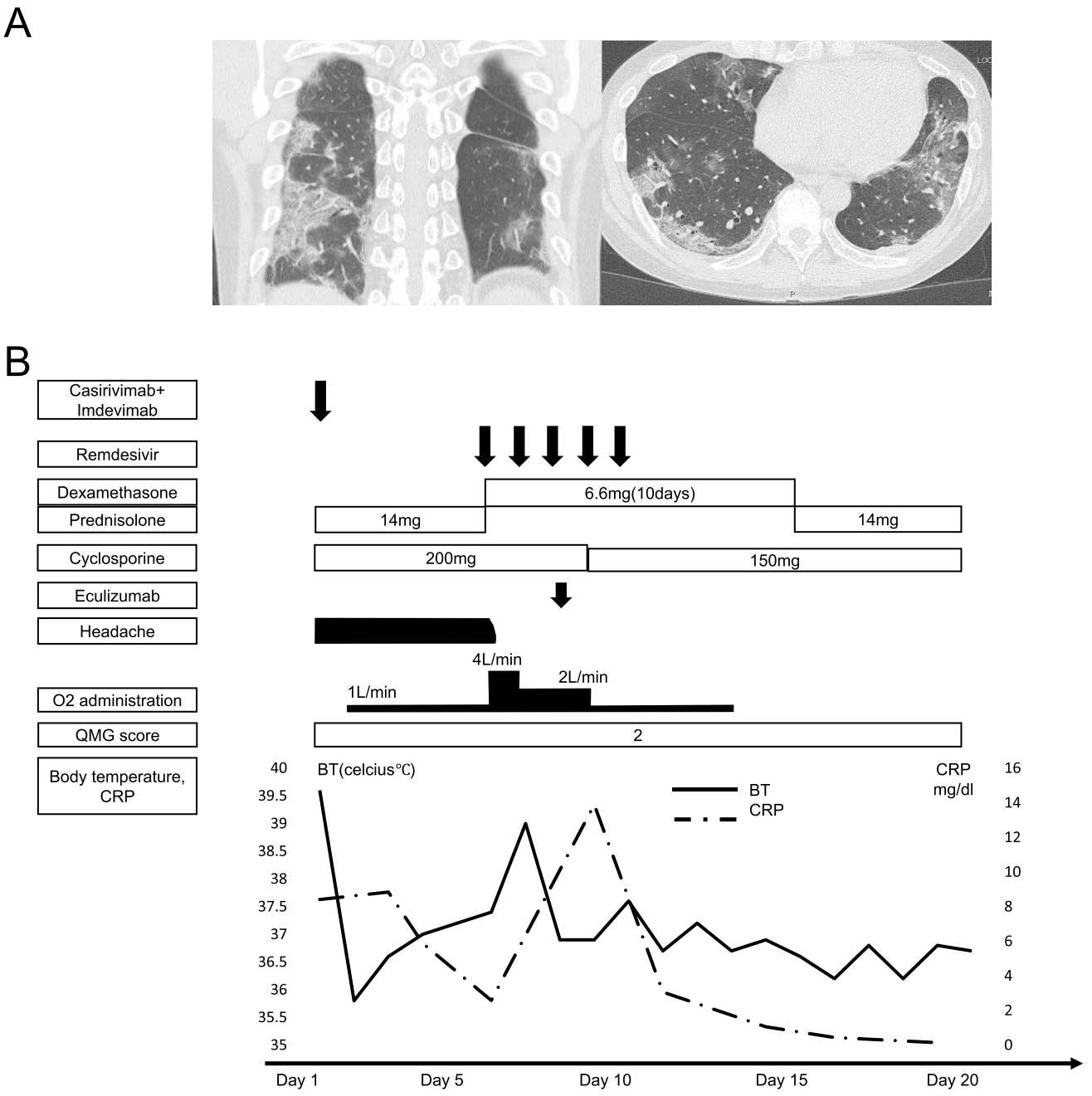

Fig. 1 CT scan and clinical course of the current case. The initial chest CT at admission showed bilateral opacities beneath the pleural membrane. **B** Clinical course of the present case. We performed regular eculizumab administration from day 8 onwards, as scheduled

system by inhibiting the terminal complement pathway, which has been reported to increase the risk of meningococcus and upper respiratory tract infection [4]. Therefore, eculizumab should be administered with caution in patients with active systemic infections [5]. Human responses to viral infections mainly involve the acquired immune system, including T and B cell [6]. In addition, since C5 blockade by eculizumab occurs relatively downstream in the complement cascade, it does not impair the immunoprotective functions of C3b-mediated opsonization and immune complex clearance [7]. Thus, theoretically, we expected that eculizumab would not exacerbate viral infections, such as COVID-19. One previous study also reported administration of eculizumab to treat severe respiratory failure in a patient with COVID-19 pneumonia [8]. Although it is unclear whether eculizumab contributed to improvement of COVID-19 pneumonia in the present case, it surely did not worsen the COVID-19 outcome and resulted in a favorable outcome in terms of prevention of a myasthenic crisis. Hence, we consider that MG patients with COVID-19 infection should continue their regular eculizumab therapy.

Appendix 1

Table 1 Authors

Name	Location	Role	Contribution
Masahiro Mimori, MD	The Jikei University School of Medicine, Tokyo	Author	Study design and conceptualization; data acquisition; data analysis; and drafting of the manuscript for intellectual content
Teppei Komatsu, PhD, MD	The Jikei University School of Medicine, Tokyo	Author	Study design and conceptualization; data acquisition; data analysis; and drafting of the manuscript for intellectual content
Takahiro Maku, MD	The Jikei University School of Medicine, Tokyo	Author	Data interpretation and revision of the manuscript for intellectual content
Hidetaka Mitsumura, MD, PhD	The Jikei University School of Medicine, Tokyo	Author	Data interpretation and revision of the manuscript for intellectual content
Yasuyuki Iguchi, MD, PhD	The Jikei University School of Medicine, Tokyo	Author	Data interpretation and revision of the manuscript for intellectual content

Declarations

Ethical approval None.

Conflict of Interest None.

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