Myelin oligodendrocyte glycoprotein antibody-associated disease (MOGAD) is a monophasic or relapsing inflammatory demyelinating disorder. The most common clinical presentations include acute disseminated encephalomyelitis, optic neuritis, and transverse myelitis. The malignant cerebral edema caused by MOGAD is potentially fatal and may not respond to corticosteroid therapy, intravenous immunoglobulin (IVIG), or therapeutic plasma exchange. The authors from the United States presented two children with severe acute manifestations of MOGAD. Their neurologic deficits did not respond to acute therapies, but interleukin (IL)-6 receptor blocker tocilizumab rapidly improved the condition in both children diagnosed with MOGAD within 24 hours after the administration.

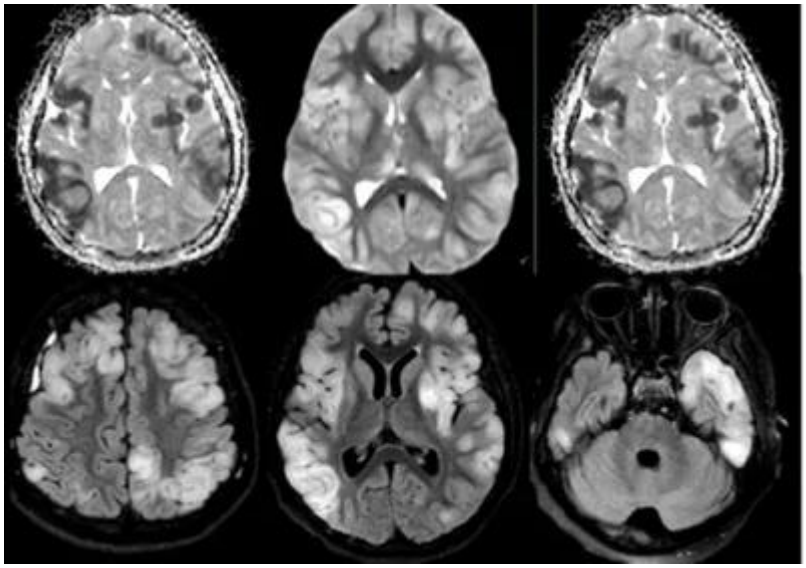
It is known that IL-6 promotes CD4+ T-cell differentiation into a Th17 phenotype and can activate plasmablasts and B cells that potentially promote the production of MOG-IgG antibodies. In addition, IL-6 increases the permeability of the blood-brain barrier (BBB), facilitating the ingress of activated MOG reactive cells and circulating MOG-IgG antibodies.

The authors noted that IL-6 receptor blockade is currently under investigation as a preventative strategy for a relapsing MOGAD. However, there is limited knowledge regarding the treatment of acute MOGAD attacks with IL-6 receptor blockers.

Cases

Case 1

A 7-year-old boy presented with headache, vomiting, and a generalized convulsive seizure. Cerebrospinal fluid (CSF) examination showed a predominant lymphocytic pleocytosis (68 cells/mm^3). A contrasted brain magnetic resonance imaging (MRI) showed multifocal areas of cortical and subcortical T2/FLAIR hyperintensities and mild leptomeningeal enhancement. Over 48 hours, the patient deteriorated to a Glasgow Coma Scale (GCS) of 8. The brain's computerized tomography (CT) showed diffuse cerebral edema with impending herniation. The serum MOG-IgG antibodies were positive.



The original MRI scan from the study of McLendon, LA. et al., 2023

The patient was treated with intravenous methylprednisolone and therapeutic plasma exchange, but, the elevation of intracranial pressure, which was continuously monitored by an intraparenchymal catheter, persisted. On day 13, one dose of tocilizumab was given intravenously. The GCS improved within 12 hours. Within the next 72 hours, the patients became fully alert.

On day 19, he got a second dose of tocilizumab. After nine months, his neurological status returned to normal. The control MRI demonstrated FLAIR hyperintensities and encephalomalacia. He still suffers from mild behavioral disorder.

Case 2

A 15-year-old adolescent presented with headache, somnolence, and emesis. CSF examination showed lymphocytic predominant pleocytosis (149 cells/mm^3), and normal levels of proteins and glucose. He became progressively encephalopathic. A contrasted brain MRI showed multifocal areas of T2/FLAIR hyperintensity and diffuse leptomeningeal enhancement. On day 11, his right pupil was dilated, and the brain CT demonstrated diffuse cerebral edema with impending tonsillar herniation. His GCS was 8. He received methylprednisolone and IVIG. An external ventricular drain and meningeal and brain

parenchymal biopsy showed predominantly neutrophilic inflammation with microglia activation. The serum MOG-IgG antibodies were positive.

Two doses of tocilizumab were administered intravenously, three days apart (days 19 and 22). The intracranial pressure was normalized within 24 hours of the first dose of tocilizumab. By 48 hours, he was awake (GCS of 14). After therapeutic plasma exchange, the patient received IVIG.

Five months after the onset of the disease, he had a normal neurologic examination and a mild memory/cognitive impairment. The control MRI showed an improvement in T2/FLAIR hyperintensity. The serum MOG-IgG antibodies were negative. Seven months after the onset of MOG, he presented with recurrent seizures, positive serum MOG-IgG, and elevated serum level of IL-6 (246 pg/mL). Because of the concern for MOGAD relapse, IVIG was started. The patient recovered and was able to return to school without any further relapses.

Conclusion

This case report showed that IL-6 receptor blocker tocilizumab rapidly improved the condition in two children diagnosed with MOGAD. The authors suggested that tocilizumab might be considered as the treatment of a severe acute life-threatening form of this inflammatory demyelinating disorder.

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Journal Reference

McLendon, LA. et al. Dramatic Response to Anti-IL-6 Receptor Therapy in Children With Life-Threatening Myelin Oligodendrocyte Glycoprotein-Associated Disease. Neurol Neuroimmunol Neuroinflamm 2023; 10: e200150. (Open Access) https://nn.neurology.org/content/10/6/e200150