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An Unusual Case of Central Nervous System Lymphoma Presenting With Ataxic Quadriparesis Showing 'Wine glass'-Like Appearance

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Dear Editor,

The wine glass sign on brain magnetic resonance imaging (MRI) appears as symmetrical corticospinal tract hyperintensities on coronal sections in T2-weighted imaging. The differential diagnoses of the classical wine glass-like appearance include amyotrophic lateral sclerosis and osmotic myelinolysis.[1,2] However, to the best of our knowledge, this sign has not been reported in other brain conditions, including tumors. Herein we describe an unusual case presenting with progressive ataxic quadriparesis over several months in a patient with a wine glass-like appearance in brain MRI without gadolinium enhancement. The patient was finally diagnosed as primary central nervous system (CNS) lymphoma.

A 71-year-old female presented with recurrent falls accompanied by general weakness. Two months previously she had insidiously developed gait difficulty with postural instability that worsened progressively, resulting in her not being able to walk independently. A neurological examination revealed quadriparesis (4/5 muscle strength) of the motor system in all extremities, whereas sensory function showed no abnormalities. A mild-to-moderate degree of cerebellar ataxia was noted in all extremities. Her deep tendon reflexes were normoactive and her upper motor neuron signs were not remarkable. There were no symptoms of cognitive decline. Routine laboratory tests including of electrolytes produced normal findings. Serologic tests, including a test for vasculitis and an enzyme-linked immunosorbent assay for human immunodeficiency virus, were unremarkable. Brain MRI including axial fluid-attenuated inversion recovery (FLAIR) sequences showed slightly asymmetrical white-matter-dominant hyperintensities extending from the pons up to the corona radiata, although with some marginal lesions involving the thalamus and basal ganglia (Fig. 1A). Especially notable was coronal T2-weighted imaging showing bilateral hyperintensities with a wine glass-like appearance in the corticospinal tracts from the corona radiata to the brain stem (Fig. 1B). Gadolinium-enhanced T1-weighted imaging did not reveal any remarkable enhancement (Fig. 1C). Needle electromyography yielded no evidence for motor neuron disease. Cerebrospinal fluid analysis, including a cytologic study for malignancy, produced unremarkable findings. Evaluations including paraneoplastic antibody, several tumor markers (CA125, CA19-9, CEA, and AFP), chest/abdominopelvic computed tomography, and mammography for hidden malignancy were all unremarkable.

During the workups in Soonchunhyang University Seoul Hospital, the patient's ataxic quadriparesis progressed to 3/5 muscle strength in all extremities, and dysarthria and dysphagia subsequently developed and worsened. The patient was treated with intravenous steroid pulse therapy for 5 days, followed by the oral administration of prednisolone. However, her neurologic deteriorations worsened gradually over the following month, and she became bedridden. Checking of the patient's upper motor neuron signs revealed increased

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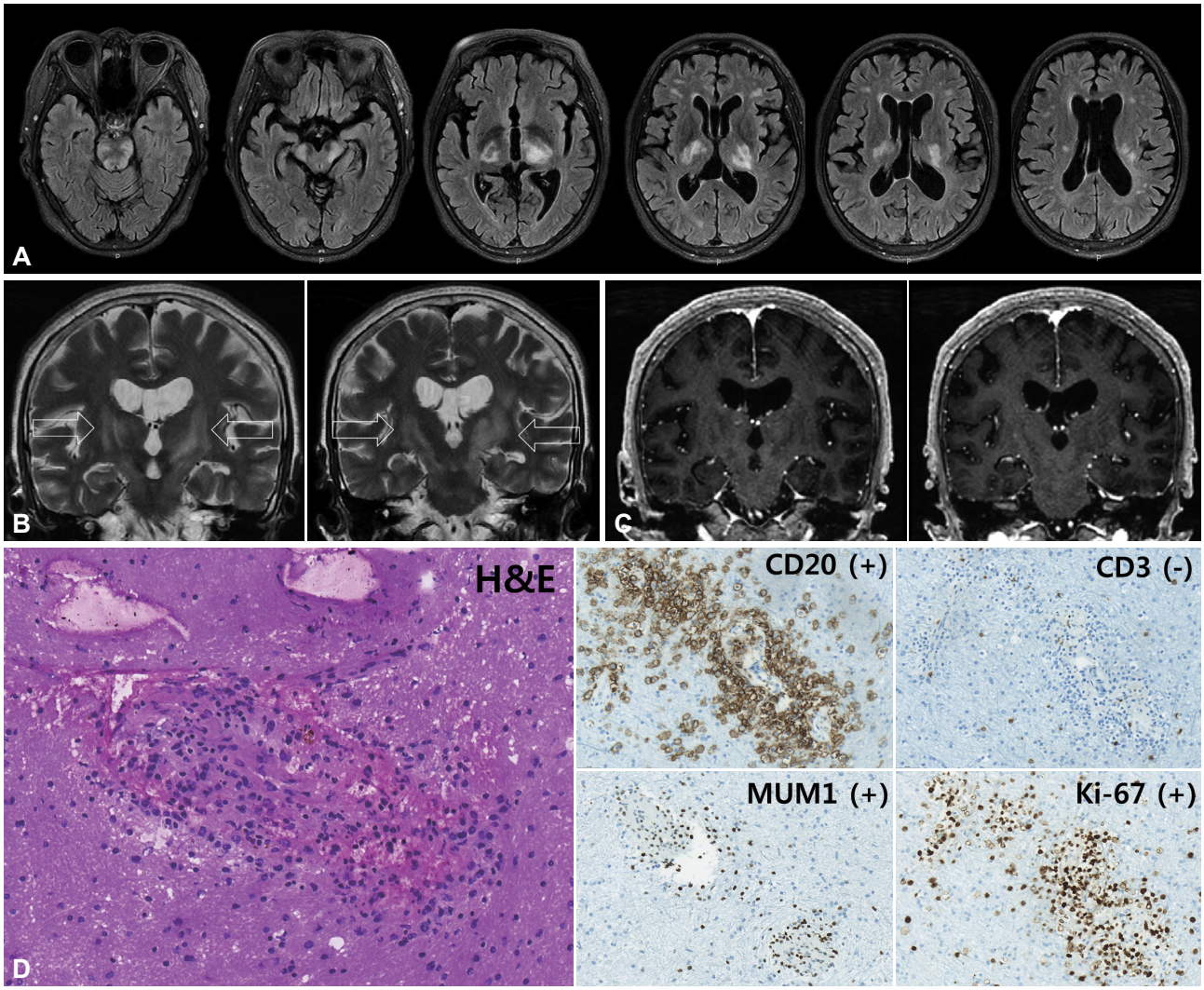

Fig. 1. Brain MRI and pathologic findings of the patient with primary CNS lymphoma. Asymmetrical subcortical white-matter hyperintensities extending from the pons up to the corona radiata with some invasion to the thalamus and basal ganglia on axial fluid-attenuated inversion recovery (FLAIR) sequences were noted (A). Bilateral hyperintensities along with the corticospinal tracts (i.e., wine-glass sign, arrows) were seen on coronal T2-weighted imaging from the corona radiata to the pons (B). The lesions exhibited no gadolinium enhancement in T1-weighted imaging (C). Biopsy samples (D) histologically demonstrate infiltration of atypical large lymphocytes within the perivascular space in hematoxylin/eosin (H&E) staining, and the immunohistochemical markers indicate diffuse large-B-cell lymphoma: CD20 positive, CD3 negative, and MUM1 positive, and Ki-67 positive. The Ki-67 positivity rate was 90%.

deep tendon reflexes in all of her extremities. Follow-up MRI revealed further progression of the hyperintensities, predominantly in the subcortical white matter without gadolinium enhancement (Supplementary Fig. 1 in the online-only Data Supplement). The patient was transferred to Asan Medical Center where a brain biopsy was performed, resulting in a diagnosis of diffuse large-B-cell lymphoma (Fig. 1D). Although the patient received additional intravenous steroid pulse treatment and subsequent chemotherapy, she expired 2 months later.

Based on the finding of a wine glass-like sign, we made a preliminary diagnosis of motor neuron disease or electrolyte imbalance. However, needle electromyography and a laboratory study produced unremarkable findings. The patient's neurologic deterioration gradually progressed over several months, and follow-up MRI at 2-week intervals revealed slight progression of the bilateral lesions without enhancement. Taking these observations together, we deduced the presence of subacute progressive demyelinating lesions of unknown origin, including primary progressive multiple sclerosis, and so the patient was administered intravenous steroid pulse therapy. However, her neurologic symptoms worsened. Although the absence of both brain lesion enhancement and responsiveness to corticosteroid treatment in our case were not

suggestive of CNS lymphoma,[3,4] her brain lesion was finally diagnosed as primary CNS lymphoma. Therefore, this case demonstrates that CNS lymphoma can present with diverse radiologic and clinical manifestations.

The general characteristics of CNS lymphoma is an isointense-to-hyperintense nodule or mass on T2-weighted images combined with variable enhancements with a heterogeneous pattern on postgadolinium T1-weighted images. To the best of our knowledge, we have described a highly unusual case of primary CNS lymphoma that initially presented as the wine glass-like appearance on brain coronal sections as well as a bilateral pyramidal track hyperintensity on axial views of FLAIR imaging (Fig. 1A). These MRI lesions seem to differ from the classical wine glass sign, since bilateral corticospinal tract lesions with perilesional edema and adjacent thalamus and basal ganglia involvements were also noted. More specifically, our case may be diagnosed as lymphomatosis cerebri, a rare variant of primary CNS lymphoma suggesting diffuse infiltration of CNS white matter along the corticospinal tract.[5] A similar recent case with symmetrical pyramidal tract hyperintensity was reported as primary CNS lymphoma.[6] However, in the MRI findings of that patient, the bilateral hyperintensity along with the pyramidal tract differed from the wine glass sign, since they showed strong gadolinium enhancement, indicating a tumorous condition.[6] In addition, bilateral corticospinal tract involvements can be observed in patients with neuromyelitis optica spectrum disorder (NMOSD), and so demyelinating diseases including NMOSD need to be considered in the differential diagnoses of a wine glass-like appearance on brain MRI.[7,8] In conclusion, this case suggests that clinicians need to consider the possibility of a rare variant of primary CNS lymphoma called lymphomatosis cerebri when they encounter patients with the wine glass-like appearance on brain MRI.

Supplementary Materials

The online-only Data Supplement is available with this article at https://doi.org/10.3988/jcn.2022.18.3.367.

Ethics Statement

All procedures performed were carried out in accordance with national law and the 1964 Declaration of Helsinki (in its present revised form). Informed consent was obtained from the patient.

Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

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Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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REFERENCES

1. Jin J, Hu F, Zhang Q, Jia R, Dang J. Hyperintensity of the corticospinal tract on FLAIR: a simple and sensitive objective upper motor neuron degeneration marker in clinically verified amyotrophic lateral sclerosis. *J Neurol Sci* 2016;367:177-183.
2. Saroja AO, Naik KR, Mali RV, Kunam SR. 'Wine Glass' sign in recurrent postpartum hypernatremic osmotic cerebral demyelination. *Ann Indian Acad Neurol* 2013;16:106-110.
3. Küker W, Nägele T, Korfel A, Heckl S, Thiel E, Bamberg M, et al. Primary central nervous system lymphomas (PCNSL): MRI features at presentation in 100 patients. *J Neurooncol* 2005;72:169-177.
4. Lachenmayer ML, Blasius E, Niehusmann P, Kovacs A, Stuplich M, Eichler O, et al. Non-enhancing primary CNS lymphoma. *J Neurooncol* 2011;101:343-344.
5. Li L, Rong JH, Feng J. Neuroradiological features of lymphomatosis cerebri: a systematic review of the English literature with a new case report. *Oncol Lett* 2018;16:1463-1474.
6. Shi K, Shen J, Yue X. Primary central nervous system lymphoma with symmetrical pyramidal tract hyperintensity. *JAMA Neurol* 2021;78:876-877.
7. Kim W, Kim SH, Huh SY, Kim HJ. Brain abnormalities in neuromyelitis optica spectrum disorder. *Mult Scler Int* 2012;2012:735486.
8. Min JH, Kim HJ, Kim BJ, Lee KW, Sunwoo IN, Kim SM, et al. Brain abnormalities in Sjogren syndrome with recurrent CNS manifestations: association with neuromyelitis optica. *Mult Scler* 2009;15:1069-1076.