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Magnetic Resonance Imaging Study of a Simian/Human Immunodeficiency Virus-Infected Chinese Rhesus Macaque with HIV-Associated Dementia

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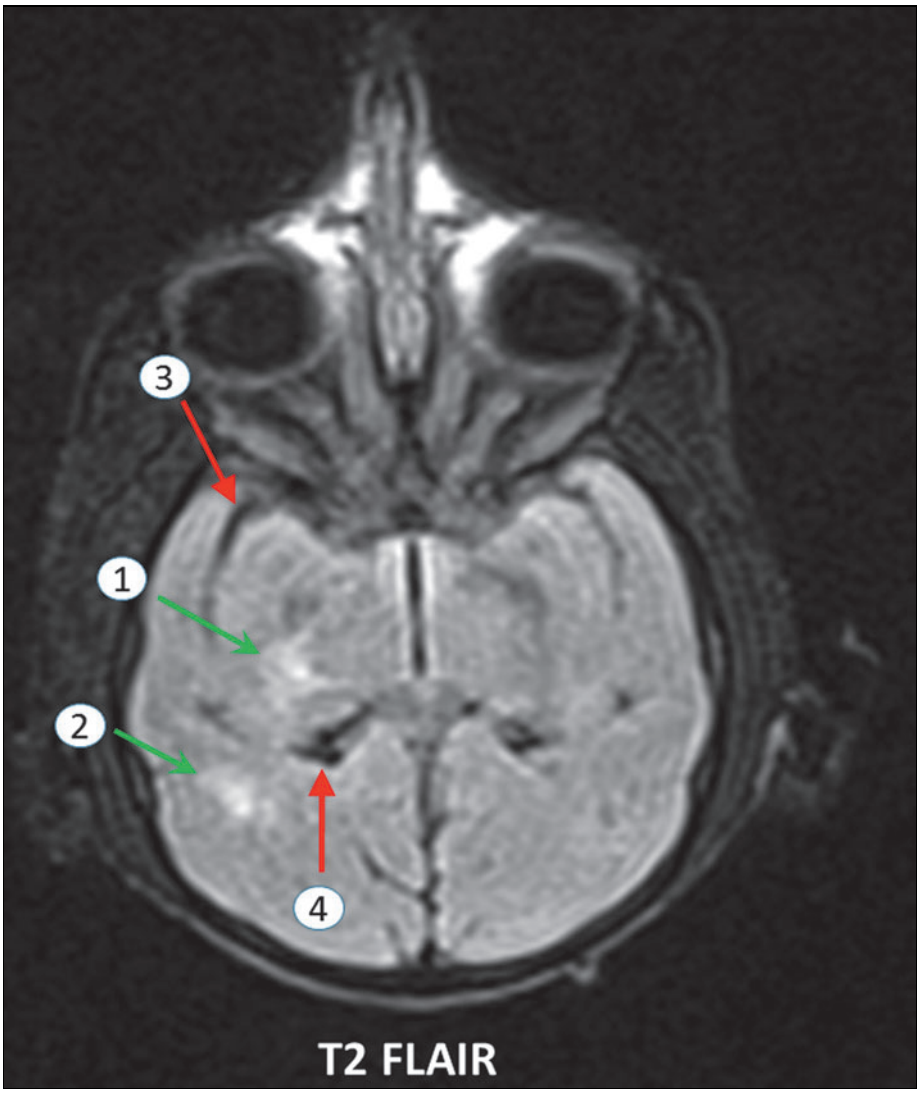

FIG. 1. Neuroimaging diagnosis (magnetic resonance imaging, MRI) of a simian/human immunodeficiency virus $(SHIV)_{KU-1}$-infected Chinese rhesus macaque with dementia and histopathological analyses of the corresponding brain regions. The basal ganglia (1) and temporal-occipital lobe border area (2) had higher signal intensities by T2 fluid-attenuated inversion recovery (FLAIR), and the posterior horn of the lateral ventricle (3) and lateral fissure (4) in the right hemisphere showed an obvious dilation.

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HIV-associated neurological disorders (HAND) comprise cognitive, motor, and behavioral abnormalities in a substantial number of HIV-infected individuals. The introduction of highly active antiretroviral therapy has largely decreased the incidence, but not the prevalence of cognitive impairment.[1] Brain imaging techniques allow the examination of the structure, biochemistry, metabolic state, and functional capacity of the brain. The role of neuroimaging now extends beyond its traditional role of excluding neurosurgical lesions or replacing invasive neurosurgical procedures.[2] In the past decade, there has been growing interest in the use of neuroimaging to determine dementia or other neurodegenerative disorders,[3] including HIV-associated dementia (HAD). While clinical features of HAD have been demonstrated, there is lack of histological validation of neuroimaging data of HAD. Taking advantage of a simian/human immunodeficiency virus (SHIV)-infected rhesus macaque with HAD-like syndrome, we examined dementia using magnetic resonance imaging (MRI) and immunohistochemistry.

Figure 1 demonstrates pathological changes in the brain of an $SHIV_{KU-1}$-infected macaque. The infected animal presented HAD-like syndrome including apathy, slow movements, weak muscles, a twisted neck, and the loss of control of the left side of the body at week 71 postinfection. T2-weighted fluid-attenuated inversion recovery (FLAIR) MRI shows enhanced signal intensity at the right temporal-occipital lobe border area and basal ganglia regions (Fig. 1). Additionally, there is a dilation in the right posterior horn of the lateral ventricle and right lateral fissure, demonstrating asymmetric atrophy in the right hemisphere. FLAIR images usually reflect global cortical atrophy, vascular white matter hyperintensities, and infarctions.[4] No severe vascular white matter lesion was observed here, although the animal displayed hemorrhage when a biopsy was performed the next day. The asymmetric atrophy in the right hemisphere thus may not be related to subcortical hemorrhagic brain lesions.

Not similar to demented human subjects with a prolonged disease progression to death, the SHIV-infected macaque died within 2 months of displaying HAD-like syndrome, which provided an opportunity to perform an immunohistochemical analysis of the demented brain to confirm the MRI findings. The histological findings are in agreement with the structural abnormalities detected by MRI. To our knowledge, this is the first report showing that $SHIV_{KU-1}$ infection resulted in dementia in a rhesus macaque of Chinese origin. These findings support the use of MRI for the early diagnosis of HIV/SIV-associated dementia.

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Author Disclosure Statement

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