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Olfactory Bulb Magnetic Resonance Imaging in SARS-CoV-2-Induced Anosmia: The First Report

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Dear Editor,

Since the initial reports of the novel coronavirus disease (COVID-19) in December 2019 in Wuhan, China, and the declaration by the World Health Organization of the disease as a pandemic, increasing numbers of patients are diagnosed with COVID-19 globally on a daily basis. While initially fever, cough and dyspnea were thought to be the dominant symptoms, other unusual presentations of COVID-19 such as altered olfactory function have been increasingly recognized. Recently, isolated anosmia/hyposmia is reported as a marker of COVID-19. The onset of anosmia was sudden in majority of the cases and most had a concomitant decrease in taste sensation (1).

Postviral anosmia is the most common underlying cause of anosmia, accounting for up to 40% of the cases (2). The underlying cause is primarily mucosal congestion, which leads to nasal obstruction and conductive olfactory loss (2). While anosmia in the majority of cases resolves once the clinical symptoms and obstruction subside, some patients are left with permanent anosmia due to virus-induced sensory neuronal damage known as postviral olfactory loss (3). The pathogenesis of severe acute respiratory syndrome (SARS)-CoV-2-induced anosmia is not fully understood. Nonetheless, cellular factors for SARS-CoV-2 entry (i.e. angiotensin converting enzyme 2 receptor and transmembrane serine protease 2) are expressed in the olfactory epithelium and not in the olfactory sensory neurons, indicating olfactory epithelium as the putative entry site of SARS-CoV-2 (4).

Olfactory bulb (OB) magnetic resonance imaging (MRI) is useful for evaluation of patients with anosmia/hyposmia as it allows for examination of the anatomic details, while T1- or T2-weighted images alone or in more advanced sequences such as magnetization-prepared rapid gradient echo sequence (5,8). The main MRI finding in anosmia secondary to upper respiratory infection or trauma is reduced olfactory bulb and tract volume, which correlates with the olfactory function (5).

OB MRI has not been used yet for evaluation of anosmia in COVID-19. Herein we present the first report of the findings on OB MRI in a patient presenting with isolated anosmia secondary to COVID-19 that was confirmed by the polymerase chain reaction assay. Despite the sudden onset of a complete loss of olfactory function, we found normal OB volume without abnormal signal intensity in the OB and tract and no sign of nasal congestion (Fig 1). This finding is consistent with prior reports in 2002-2003 of SARS-CoV-induced anosmia, where OB MRI similarly did not demonstrate abnormal findings (6).

Although the findings on MRI of the olfactory tract were normal in our patient, using hybrid imaging such as single-photon emission computed tomography-MRI with nasal thalium-201 that allows for examination of the olfactory nerve connectivity in patients with impaired olfaction (7). Or additional sequences in the MRI protocol such as magnetization-prepared rapid gradient echo sequence which is the sequence that captures high tissue contrast and provides high

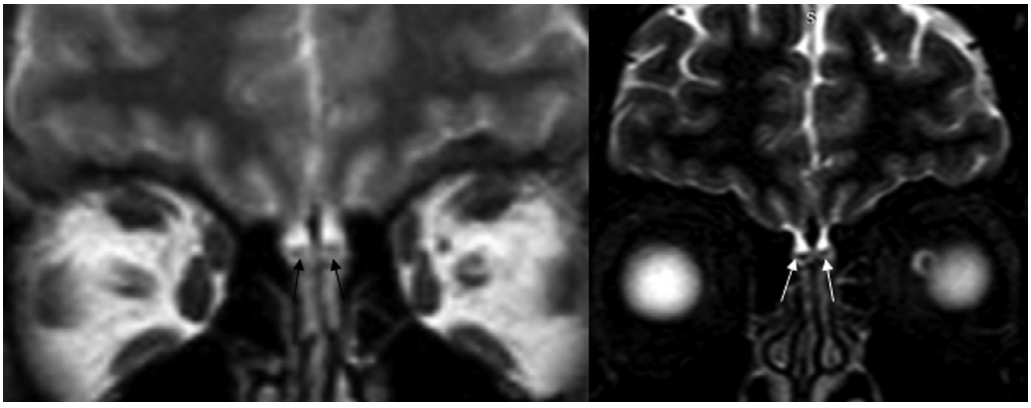

Figure 1. Coronal nonenhanced T2 weighted MR images in a 27-year-old man with isolated sudden-onset anosmia and positive SARS-CoV-2 polymerase chain reaction during the acute phase of disease demonstrated normal volume and signal intensity of olfactory bulb with no sign of nasal congestion (arrows).

spatial resolution with whole brain coverage in a short scan time will be useful for detection of abnormalities that SARS-CoV-2 may cause in the olfactory system (8). Furthermore, our imaging was performed in the early phase of COVID-19 only. We suggest future studies in patients with isolated anosmia secondary to COVID-19 to perform OB MRI longitudinally both in the acute phase and in follow-up to assess for possible temporal evolution of the imaging findings.

PRIOR PRESENTATIONS

No.

AUTHOR CONTRIBUTION

M.K. and J.G. have provided the case and images and A.S., M.B. and S.H. have written the article.

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