SARS-CoV-2 Related Encephalitis: MRI Pattern of the Olfactory Tract Involvement

Authors: Olivier Casez, MD; Gauthier Willaume; Sylvie Grand, MD; Benjamin Nemoz, MD; Julien Lupo, MD, PhD; Philippe Kahane, MD, PhD; Jean-Paul Brion, MD

Olivier Casez, Centre Hospitalier Universitaire de Grenoble Alpes, Neurology Department, MS and Neuro-inflammatory disease center, Grenoble, France
Gauthier Willaume, Centre Hospitalier Universitaire de Grenoble Alpes, Neurology Department, Grenoble, France
Sylvie Grand, Centre Hospitalier Universitaire de Grenoble Alpes, Neuroradiology, MRI unit, Grenoble, France
Benjamin Nemoz, Centre Hospitalier Universitaire de Grenoble Alpes, Virology Laboratory, Grenoble, France. Université Grenoble-Alpes, Institut de Biologie Structurale (IBS), CEA, CNRS, Grenoble France
Julien Lupo, Centre Hospitalier Universitaire de Grenoble Alpes, Virology Laboratory, Grenoble, France. Université Grenoble-Alpes, Institut de Biologie Structurale (IBS), CEA, CNRS, Grenoble France
Philippe Kahane, Centre Hospitalier Universitaire de Grenoble Alpes, Neurology Department, Grenoble, France. Université Grenoble-Alpes, Inserm U1216, Grenoble Institut Neurosciences, Grenoble, France
Jean Paul Brion, Centre Hospitalier Universitaire de Grenoble Alpes, Infectious and Tropical Disease Department, Grenoble, France.

Neurology® Published Ahead of Print articles have been peer reviewed and accepted for publication. This manuscript will be published in its final form after copyediting, page composition, and review of proofs. Errors that could affect the content may be corrected during these processes.
Search Terms: SARS-CoV-2, Encephalitis, MRI, Anosmia, Olfactory cortex

Publication history: this article was not previously released

Submission Type: Resident Page: Teaching NeuroImages
Title Character count: 70/79
Number of Tables: 0
Number of Figures: 1

Word count of Abstract: 0
Word Count of Paper: 109

Corresponding Author:
Olivier Casez
ocasez@chu-grenoble.fr

Disclosure: The authors report no disclosures relevant to the manuscript.

Statistical analysis: N/A

Study Funding: No targeted funding reported
A 96-year-old female patient was admitted to the Emergency Room with generalized epileptic seizures and fever followed by left hemiparesis. Two days before admission she started with anosmia, dysgeusia [ref1] and behavioral dysexecutive syndrome. No respiratory symptoms were present or reported. Whereas nasopharyngeal SARS-CoV-2 RT-PCR was negative, chest CT-scan showed several lung areas of ground glass opacity and intralobular cross-links, suggestive of SARS-CoV-2 infection [ref2]. CSF analysis yielded 8 leukocytes/mm3 (75% polymorphonuclear neutrophilic cells) and was negative for SARS-CoV-2 PCR. Brain MRI revealed hyperintensity of the olfactory tracts on T2 FLAIR and diffusion-weighted imaging (Figure 1). Ten days after the admission, SARS-CoV-2 serology returned positive, thus supporting a SARS-CoV-2 related encephalitis.

Appendix 1. Authors

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivier Casez, MD</td>
<td>Centre Hospitalier Universitaire de Grenoble Alpes</td>
<td>Managed the patient, wrote the manuscript and coordinated the interpretation of the MRI and biological data</td>
</tr>
<tr>
<td>Gauthier Willaume</td>
<td>Centre Hospitalier Universitaire de Grenoble Alpes</td>
<td>Managed the patient, wrote the manuscript, and revised the manuscript for intellectual concept.</td>
</tr>
<tr>
<td>Sylvie Grand, MD</td>
<td>Centre Hospitalier Universitaire de Grenoble Alpes</td>
<td>Acquisition and interpretation of MRI data. Revised the manuscript for intellectual content</td>
</tr>
<tr>
<td>Benjamin Nemoz, MD</td>
<td>Centre Hospitalier Universitaire de Grenoble Alpes, Université Grenoble Alpes</td>
<td>Acquisition and interpretation of virological data. Revised the manuscript for intellectual content</td>
</tr>
<tr>
<td>Julien Lupo, MD, PhD</td>
<td>Centre Hospitalier Universitaire de Grenoble Alpes, Université</td>
<td>Acquisition and interpretation of virological data. Revised the manuscript for intellectual content</td>
</tr>
<tr>
<td>Name</td>
<td>Institution</td>
<td>Contribution</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Philippe Kahane, MD, PhD</td>
<td>Centre Hospitalier Universitaire de Grenoble Alpes, Université Grenoble Alpes</td>
<td>Managed the patient, interpreted the data and revised the manuscript for intellectual concept.</td>
</tr>
<tr>
<td>Jean-Paul Brion, MD</td>
<td>Grenoble University Hospital</td>
<td>Oversaw the patient’s management and revised the manuscript for intellectual concept.</td>
</tr>
</tbody>
</table>

Teaching Slides-[http://links.lww.com/WNL/B266](http://links.lww.com/WNL/B266)

References:

Figure 1. Neuroimaging of SARS-CoV-2 related encephalitis.

**FLAIR sequences (panel A and B) demonstrated bilateral cortical hyperintensity involving predominantly the rectus gyrus (1) overlying the olfactory tract and olfactory bulb, the anterior cingulate gyrus (2), polar part of the first frontal gyrus (3), and slight involvement of the piriform cortex (4), amygdala (5) and anterior hippocampus (6). No contrast enhancement was observed on post-gadolinium T1 sequences (panel C). Restricted diffusion was noted in the frontal gyrus (Panel D : DWI, Panel E : ADC). Chest CT showed areas of ground glass opacity in both lungs, predominantly in the middle lobe (Panel F)**