
RSNA Press Release

Multi-Institutional Study Looks at Brain MRI Findings in COVID-19

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OAK BROOK, Ill. (June 16, 2020) — A new multi-institutional study published in the journal *Radiology* identifies patterns in abnormal brain MRI findings in patients with COVID-19.

Current data on central nervous system (CNS) involvement in COVID-19 is uncommon but growing, demonstrating a high frequency of neurological symptoms. However, the delineation of a large cohort of confirmed brain MRI abnormalities (excluding ischemic infarcts) related to COVID-19 has never been performed, and the underlying pathophysiological mechanisms remain unknown.

The purpose of this current study was to describe the neuroimaging findings other than stroke in patients with severe COVID-19 and report the clinical and biological profile of these patients.

The retrospective observational national multicenter study was initiated by the French Society of Neuroradiology (SFNR) in collaboration with neurologists, intensivists and infectious disease specialists. Consecutive patients with COVID-19 infection and neurologic manifestations who underwent brain MRI from March 23 to April 27, 2020, in 16 French centers, including 11 university hospitals and five general hospitals were included in the study.

Thirty men (81%) and 7 women (19%) met inclusion criteria, with a mean age of 61 years. The most common neurologic manifestations were alteration of consciousness (27/37, 73%), pathological wakefulness when the sedation was stopped (15/37, 41%), confusion (12/37, 32%) and agitation (7/37, 19%).

Among the 37 patients included, 28/37 (76%) were associated with one neuroimaging pattern, 7/37 (19%) with two patterns, and 2/37 (5%) showed three patterns. The most frequent MRI findings were: signal abnormalities located in the medial temporal lobe in 16/37 (43%) patients, non-confluent multifocal white matter hyperintense lesions on FLAIR and diffusion sequences, with variable enhancement, with associated hemorrhagic lesions in 11/37 patients (30%), and extensive and isolated white matter microhemorrhages in 9/37 patients (24%).

At A Glance

- Brain findings in COVID-19 patients from 16 hospitals showed three distinct patterns.
- A majority of patients had intracerebral hemorrhagic lesions, which were associated with worse clinical status.
- SARS-CoV-2 RNA was detected in the cerebrospinal fluid in only one of 37 patients.

A majority of patients (20/37, 54%) had intracerebral hemorrhagic lesions and a more severe clinical presentation.

“Three main neuroradiological patterns could be distinguished, and the presence of hemorrhage was associated with worse clinical status. SARS-CoV-2 RNA was detected in the cerebrospinal fluid in only one patient, and the underlying mechanisms of brain involvement remain unclear,” the authors wrote. “Imaging and neurological follow up has to be undertaken in order to evaluate the prognosis of these patients.”

RSNA is committed to connecting radiologists and the radiology community to the most timely and useful COVID-19 information and resources. [RSNA’s COVID-19 Resources](#) page houses the latest guidance, original research, image collection and more. The page will be updated on an ongoing basis.

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“Brain MRI Findings in Severe COVID-19: A Retrospective Observational Study.” Stéphane Kremer, M.D., François Lersy, M.D., Jérôme de Sèze, M.D., Jean-Christophe Ferré, M.D., Adel Maamar, M.D., Béatrice Carsin-Nicol, M.D., Olivier Collange, M.D., Fabrice Bonneville, M.D., Gilles Adam, M.D., Guillaume Martin-Blondel, M.D., Marie Rafiq, M.D., Thomas Geeraerts, M.D., Louis Delamarre, M.D., Sylvie Grand, M.D., Alexandre Krainik, M.D., Sophie Caillard, M.D., Jean Marc Constans, M.D., Serge Metanbou, M.D., Adrien Heintz, Ph.D., Julie Helms, M.D., Maleka Schenck, M.D., Nicolas Lefèbvre, M.D., Claire Boutet, M.D., Xavier Fabre, M.D., Géraud Forestier, M.D., Isaure de Beaurepaire, M.D., Grégoire Bornet, M.D., Audrey Lacalm, M.D., Hélène Oesterlé, M.D., Federico Bolognini, M.D., Julien Messie, M.D., Ghazi Hmeydia, M.D., Joseph Benzakoun, M.D., Catherine Oppenheim, M.D., Blanche Bapst, M.D., Imen Megdiche, M.D., Marie-Cécile Henri-Feugeas, M.D., Antoine Khalil, M.D., Augustin Gaudemer, M.D., Lavinia Jager, M.D., Patrick Nesser, M.D., Yannick Talla Mba, M.D., Céline Hemmert, M.D., Philippe Feuerstein, M.D., Nathan Sebag, M.D., Sophie Carré, M.D., Manel Alleg, M.D., Claire Lecocq, M.D., Emmanuelle Schmitt, M.D., René Anxionnat, M.D., François Zhu, M.D., Pierre-Olivier Comby, M.D., Frédéric Ricolfi, M.D., Pierre Thouant, M.D., Hubert Desal, M.D., Grégoire Boulouis, M.D., Jérôme Berge, M.D., Apolline Kazémi, M.D., Nadya Pyatigorskaya, M.D., Augustin Lecler, M.D., Suzana Saleme, M.D., Myriam Edjlali-Goujon, M.D., Basile Kerleroux, M.D., Pierre-Emmanuel Zorn, Ph.D., Muriel Mathieu, Seyyid Baloglu, M.D., François-Daniel Ardellier, M.D., Thibault Willaume, M.D., Jean Christophe Brisset, Ph.D., Clotilde Boulay, M.D., Véronique Mutschler, M.D., Yves Hansmann, M.D., Paul-Michel Mertes, M.D., Francis Schneider, M.D., Samira Fafi-Kremer, Pharm.D., Mickael Ohana, M.D., Ferhat Meziani, M.D., Jean-Stéphane David, M.D., Nicolas Meyer, M.D., Mathieu Anheim, M.D., François Cotton, M.D.

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