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higher prevalence of patients with normal MRI but mild hyperproteinorrachia/pleocytosis. Most SARS-CoV-2 cases appeared during the onset of COVID-19 and exhibited different response to treatment and long-term outcomes compared to non COVID encephalitis.

#### Conclusions

Conclusions –The registry identified a wide spectrum of encephalitis associated with COVID19 infection, with clinical characteristics and course different from classical infectious and autoimmune encephalitis. Biomarkers studies are warranted in order to evaluate the specific inflammatory pathways associated with SARS-Cov-2 encephalitis.

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## 117804

### Neurological disorders associated with COVID-19 infection: An Italian multi-center cohort study (NEURO-COVID)

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#### Background and aims

A variety of neurological disorders has been reported as presentations or complications of COVID-19 infection. The NEURO-COVID study is a multi-center cohort study of neurological disorders

associated with COVID-19 conducted in 51 centers in Italy, sponsored by the Italian Society of Neurology (SIN).

#### Methods

We present an interim analysis of hospitalized adult patients with COVID-19 infection, defined by a positive SARS-CoV-2 test independently from clinical severity, and concomitant newly diagnosed neurological disorders. Patients were recruited from March 1, 2020 to March 26, 2021 from 18 centers and followed-up prospectively for 6 months. Follow-up data at 6 months are currently ongoing and will be available for the WCN 2021 congress.

#### Results

904 patients with confirmed COVID-19 infection and concomitant newly diagnosed neurological disorders were recruited. The median age was 68 years (IQR 56–78) and 57.5% were males. Severe acute respiratory syndrome occurred in 35.9%. The most common new neurological diagnoses were hypogeusia (21.1%), hyposmia (20.5%), acute ischemic stroke (19.6%), delirium (14.4%), headache (12.3%), cognitive impairment (11.3%), abnormal behaviour or psychosis (8.9%), seizures (5.9%), Guillain-Barré syndrome (5.1%), severe encephalopathy with stupor or coma (3.7%), dizziness (3.0%), encephalitis (2.3%) and haemorrhagic stroke (2.3%). Overall, the onset of neurological disorders occurred during the presymptomatic-asymptomatic phase in 45.9%, during the acute respiratory illness in 37.5% and after recovery in 16.6%. In-hospital mortality was 12.2% and was mostly due to COVID-related respiratory failure (9.1%).

#### Conclusions

A wide spectrum of treatable neurological disorders are associated with COVID-19 infection. Most cases occur in late middle-aged adults with mild or severe respiratory syndrome.

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## 117805

### Brainstem involvement in COVID-19: A neuropathological and neurophysiological study

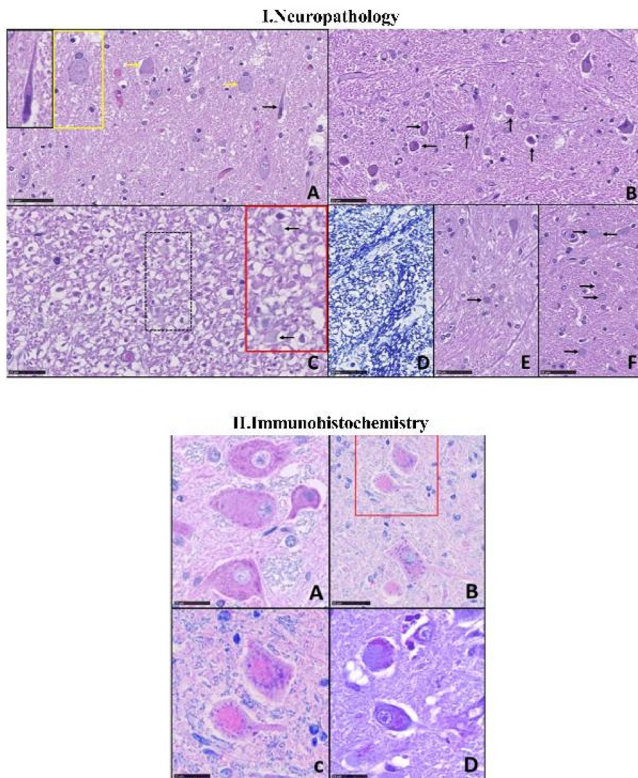
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#### Background and aims

Whilst respiratory failure in COVID-19 arises from severe interstitial lung involvement, SARS-CoV-2 likely spreads also through the nervous system in a prion-like way, possibly reaching respiratory centers in the brainstem. Here, we evaluated neuropathologically, neurophysiologically and clinically the brainstem involvement in COVID-19.

#### Methods

Neuropathological data were acquired from two patients died for COVID-19 and two patients COVID-19 negative; neuronal damage and the number of corpora amylacea (CA)/mm<sup>2</sup> were assessed. The expression of the "nuclear protein" of SARS-Cov-2 was also evaluated. To clarify whether neuropathological findings had a



functional correlate, we studied the blink reflex (BR) in 11 COVID-19 patients, admitted to our Intensive Care Unit (ICU), and compared data both with healthy subjects and non COVID-19 ICU patients. BR assesses a ponto-medullary circuitry partly involving the reticular formation (RF) close to the respiratory nuclei; RF itself modulates the activity of the respiratory centers. An extensive neurological examination, comprising the corneal and glabellar reflexes, was also performed.

#### Results

Autopsies showed a high percentage of neuronal damage and a higher number of CA in the medulla oblongata of COVID-19 patients; immunohistochemistry revealed the presence of SARS-Cov-2 virus in the brainstem (Fig. 1). Neurophysiologically, the medullary RII component of the BR was selectively impaired in COVID-19 and, clinically, the glabellar reflex severely impaired or absent.

#### Conclusions

Our findings provide the neuropathological, neurophysiological and clinical evidence of SARS-Cov-2-related brainstem involvement, suggesting a neurogenic component of respiratory failure.

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### 117806

#### Neurologic disease and COVID-19: A comparative study between first and second wave hospitalized patients in Brescia, Lombardia, Italy

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#### Background and aims

Neurological disorders have been variably associated with SARS-CoV-2 infection. The aim of this study is to compare clinical and laboratory characteristics and outcomes of neurological patients admitted during the first and second waves of COVID-19 pandemic in a neuro-COVID unit.

#### Methods

In this retrospective study, we included all adult inpatients with confirmed COVID-19, admitted to a Neuro-COVID Unit during the first (February 21–May 31, 2020) and the second (February 21–May 31, 2020) pandemic wave. Demographic, clinical and laboratory data were extracted from medical records and compared by Mann-Whitney *U* test,  $\chi^2$  test or Fisher's exact test where appropriate.

#### Results

191 patients were included in this study, 112 admitted during the first wave and 79 throughout the second spreading. Second wave patients exhibited a lower qSOFA score on admission ( $0.59 + 0.7$  vs  $0.88 + 0.7$ ,  $p = 0.010$ ), resulting in a less oxygen support needed. Steroid treatment was adopted in about 4% of patients admitted during the first wave, but in 53% of second outbreak, adjusted for disease severity ( $p = 0.001$ ). The incidence of cerebrovascular diseases was significantly lower in the second outbreak ( $n = 28$ , 34.6% vs  $n = 73$ , 65.2%,  $p = 0.001$ ) with a less severity outcome (mean NIHSS score  $1.8 + 4.4$  vs  $9.36 + 7.3$ ,  $p < 0.000$ ) and a lower in-hospital mortality rates ( $n = 12$ , 14.8% vs  $n = 35$ , 31.3%,  $p = 0.009$ ).

#### Conclusions

Second wave COVID-19 patients admitted with neurological diseases exhibited a lower incidence and a reduced severity of cerebrovascular disease compared to those of the first outbreak, with less systemic inflammatory response and in-hospital mortality. Longitudinal studies are warranted in order to understand the impact of early immunomodulator treatments in neurological COVID-19 patients.

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### 117807

#### Spectrum, risk factors and outcomes of neurological complications of COVID-19

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