

Retrospective Multicenter Study of the Neuroimaging Incidence of CNS Complications in Hospitalized COVID-19 Positive Patients

PURPOSE

We sought to determine the incidence of acute neuroimaging (NI) findings in hospitalized COVID-19 infected patients in 6 U.S. and 4 European University hospitals.

METHODS AND MATERIALS

Retrospective multicenter study of COVID-19 positive patients admitted (September 2019-June 2020) in 11 institutions was conducted out of which data from 10 institutions were included. Data analysis from remaining 1 institute is in progress. Inclusion criteria: age > 18, confirmed diagnosis of COVID-19 infection, acute neuroimaging findings not attributable to any cause other than COVID-19 on CT or MRI brain. Patients were verified by board certified neuroradiologists. Total incidences were calculated for overall and specific neuroimaging findings in COVID-19 positive patients and in those who underwent NI.

RESULTS

24,315 COVID-19 positive patients were reviewed in 8 centers. Total acute NI incidence in patients who underwent NI was 436/4409 (9.8%) in 10 centers with 279 MRI and 157 CT including 287/3762 (7.62%) in USA and 149/647 (23%) in Europe. Total acute NI positive findings incidence in all COVID-19 positive hospitalized patients was 259/24315 (1.06%) in 8 centers including 0.7% in the US and 2.06% in Europe. Average patient age was 66 ± 12 years across institutions. In those who underwent NI, incidence of ischemic stroke was 6.2% followed by intracranial hemorrhage (3.72%), encephalitis (0.47%), deep sinus thrombosis (0.22%) and, ADEM (0.18%). White matter involvement was seen in 5.8% of NI. The most common distribution was unilateral (5.73%) followed by bilateral asymmetric (3.04%). Most common lobes affected were the frontal (5.35%) and parietal lobes (4.9%).

CONCLUSIONS

We demonstrated an overall incidence of CNS complications in COVID-19 positive patients who underwent NI to be 9.8% including 7.62% in the U.S. and 23% in Europe. Incidence of all positive NI in all hospitalized COVID-19 patients was 1.06% including 0.7% in the U.S. and 2.06% in Europe. We also defined the incidence in a variety of NI abnormalities in USA and Europe.

CLINICAL RELEVANCE/APPLICATION:

In a large international multi-institutional cohort, incidence and distribution of acute neuroimaging findings helped to characterize the neurological complications of COVID-19 thereby assisting in understanding the full extent of this disease process.