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NEWS

Susceptibility-Weighted Magnetic Resonance Imaging Highlights Brain Alterations in COVID Survivors

PURPOSE

The purpose of this study was to investigate the effects of COVID-19 on the human brain using susceptibility weighted imaging (SWI). We hypothesized that the COVID recovered subjects have developed alterations in the brain which can be measured through susceptibility differences in various regions of the brain compared to healthy controls (HCs).

METHODS AND MATERIALS

In this study, SWI volumes from 46 (15 females; mean age = 35.09 ± 11.37 years) COVID subjects and 30 (8 females; mean age = 34.67 ± 9.5 years) HCs were included. The COVID patients were imaged within six months of their recovery. In the pre-processing step, we registered the SWI volumes to the Montreal Neurological Institute space, followed by signal intensity normalization. We then performed an unpaired two-sample t-test over the pre-processed volumes of both the groups with age and sex as covariates of no interest. Finally, cluster-based thresholding was applied at a height threshold of punc < 0.01, with family-wise error correction at pFWE < 0.05 for multiple comparisons.

RESULTS

The group analysis showed that COVID recovered subjects had significantly higher susceptibility values in regions of the frontal lobe and brain stem. The clusters obtained in the frontal lobe primarily show differences in the white matter (WM) regions. Portions of left and right orbito-inferior frontal gyrus along with their respective adjacent WM areas constitute the two clusters. We also found a significant cluster in the right ventral diencephalon region of the brain stem.

CONCLUSIONS

Our results highlight group-level effects in COVID recovered patients, showing differences in the WM regions and brain stem. These observations are consistent with results reported in the literature of single-patient case studies of COVID patients on SWI volumes.

CLINICAL RELEVANCE/APPLICATIONS

Our study demonstrates that COVID-19 affects the susceptibility values in different human brain regions. The present research will help the community to understand the impact of the SARS-CoV-2 virus on the human brain.