Results The highest proportions (26%) of white matter events were observed within the bilateral corticospinal tracts. The highest proportions (~10%) of grey matter events were observed in areas including the bilateral superior temporal, precentral, and lateral occipital cortices. Subcortical events were most frequently identified in the Pallidum. The application of a mathematical network diffusion model suggested that the spatial pattern of the small neurological events in COVID-19 can be modelled with a linear diffusion of spread from epicentres in the bilateral cerebellum and basal ganglia (Pearson's $r=0.41$, $p<0.001$, corrected).

Conclusions To our knowledge, this is the first study to systematically characterise the spatial distribution of small neurological events in COVID-19 patients and test whether the spatial distribution of these events can be explained by a linear diffusion spread model. As such, initial sub-cortical events which manifest as altered consciousness could be expected to be followed by later cortical events manifesting as altered sensorimotor functioning.

034

MR SPECTROSCOPY AND DYNAMIC CONTRAST-ENHANCED PERFUSION STUDIES IN TWO SARS-COV-2 INFECTION PATIENTS WITH NEUROLOGICAL COMPLICATIONS AND NO OTHER MR ABNORMALITIES

^{1,2}Xin Zhang, ²Joga Chaganti, ²Bruce Brew. ¹Royal Prince Alfred Hospital, Camperdown, NSW, Australia; ²St Vincent's Hospital Sydney, Darlinghurst, NSW, Australia

10.1136/bmjno-2021-ANZAN.34

Objectives To understand NeuroCovid pathogenesis by using MR spectroscopy and dynamic contrast perfusion in 2 SARS-CoV-2 patients with neurological complications.

Methods MR spectroscopy (MRS) and dynamic contrast-enhanced perfusion (k-trans), which is a sensitive marker of blood brain barrier (BBB) damage, were performed in 2 patients with respiratory viral PCR confirmed SARS-CoV-2 infection and 2 local controls. The MRS and k-trans results were also compared with published controls.

Results Case 1 was a 73-year-old man with critical SARS-CoV-2 infection requiring 4 days of mechanical ventilation. He had persistent anosmia, anorexia and apathy; saccadic pursuit eye movements, action tremor in the left hand and a positive right-sided palmomental reflex. These changes normalised by day 30 of presentation. MRI brain was undertaken on day 37.

Case 2 was a 61-year-old man with critical SARS-CoV-2 infection requiring 43 days of mechanical ventilation. He was slow to wake post weaning of sedation and had residual mild cognitive impairment. MRI brain was undertaken on day 62 of presentation.

No abnormalities were detected on T1, T2, FLAIR, DWI, SWI MR sequences. However, for both patients there was diffuse increase in k-trans especially in the frontal cortex and increased glutamate-glutamine MRS signal intensities in the pons compared to controls.

Conclusions The MRS and k-trans changes show excitotoxicity and BBB damage, in the absence of stroke or MR-defined white matter injury. They suggest a direct effect of SARS-CoV-2 on the brain. These MR techniques can offer insight into NeuroCovid pathogenesis when patients are no longer infectious.

REFERENCES

- Heye AK, Culling RD, Valdés Hernández MC, Thrippleton MJ, Wardlaw JM. Assessment of blood-brain barrier disruption using dynamic contrast-enhanced MRI. A systematic review. *Neuroimage Clin* 2014;6:262–274.
- Langer DL, Rakaric P, Kirilova A, Jaffray DA, Damyanovich AZ. Assessment of metabolite quantitation reproducibility in serial 3D-(1)H-MR spectroscopic imaging of human brain using stereotactic repositioning. *Magn Reson Med* 2007;58(4):666–673.
- Chang L, Munsaka SM, Kraft-Terry S, Ernst T. Magnetic resonance spectroscopy to assess neuroinflammation and neuropathic pain. *J Neuroimmune Pharmacol* 2013;8(3):576–593.

035

CASE-CONTROL STUDY OF RISK FACTORS FOR STROKE AMONG CRITICALLY-ILL PATIENTS WITH SARS-COV-2: AN ANALYSIS OF THE COVID-19 CRITICAL CARE CONSORTIUM (CCCC) GLOBAL REGISTRY

^{1,2,3}Jonathon P Fanning, ⁴Adrian Barnett, ⁵Glenn Whitman, ⁶Rakesh Arora, ⁷Lavien Premraj, ⁸Denise Battaglini, ^{1,2}Sam Huth, ⁹Diego Bastos Porto, ¹⁰Huimahn Choi, ^{1,2}Jacky Suen, ^{1,2,11}Gianluigi Li Bassi, ^{1,2,12}John Fraser, ¹³Matthew Griffiee, ⁸Chiara Robba, ¹⁴Sung-Min Cho. ¹Critical Care Research Group, The Prince Charles Hospital, Chermiside, QLD, Australia; ²Faculty of Medicine, The University of Queensland, Brisbane, QLD, Australia; ³Department of Neurology, Gold Coast University Hospital, Southport, QLD, Australia; ⁴Australian Centre for Health Services Innovation (AushSI) and Centre for Healthcare Transformation, School of Public Health and Social Work, , Queensland University of Technology, Brisbane, QLD, Australia; ⁵Cardiac Intensive Care Services, Johns Hopkins Hospital and University, Baltimore, MA, USA; ⁶Cardiac Sciences Program, St. Boniface General Hospital Research Centre, Winnipeg, Manitoba, Canada; ⁷Griffith University, Gold Coast, QLD, Australia; ⁸San Martino Policlinico Hospital, IRCCS for Oncology and Neuroscience, University of Genoa, Genoa, Italy; ⁹Hospital Sao Camilo de Esteio, Tamandaré, Esteio, Brazil; ¹⁰University of Texas Health Sciences Center, Houston, Texas, USA; ¹¹Institut d'Investigacions Biomediques August Pi I Sunyer, Barcelona, Spain; ¹²St. Andrew's War Memorial Hospital, Brisbane, QLD, Australia; ¹³Department of Anesthesiology, University of Utah, Salt Lake City, Utah, USA; ¹⁴Neurosciences Critical Care Division, Departments of Neurology, Neurosurgery and Anesthesiology and Critical Care Medicine, Johns Hopkins University School of Medicine, Baltimore, MA, USA

10.1136/bmjno-2021-ANZAN.35

Objective COVID-19 has been identified as a risk factor for severe cerebrovascular complications, albeit mostly in small patient populations, limited to specific regions, and including all severities of disease. Utilising the largest database of critically-ill COVID-19 patients, we investigated risk factors for stroke in intensive care unit (ICU) COVID-19 patients.

Methods Data for this matched case-control study were extracted from a large international registry of adult COVID-19 patients requiring ICU admission. Patients with imaging-confirmed cerebrovascular events identified following ICU admission were compared against five controls per case, matched for demographics, morphometrics, illness severity, and ICU days. Expert consensus determined key clinical and laboratory variables for risk assessment.

Results From January 1-December 21 2020, 2,715 ICU patients were registered across >370 sites spanning 52 countries; acute stroke was identified during the ICU stay in 59 (2.2%); 27(46%) haemorrhagic, 19(32%) ischaemic, 13(22%) unspecified. Stroke patients had higher SOFA and APACHE scores, more frequent hypertension and cardiovascular disease, and more often required mechanical ventilation, vasopressors, and ECMO. Diabetes, hypertension, smoking, and Caucasian ethnicity were identified as risk factors for ischaemic versus haemorrhagic stroke and being stroke-free. Ethnicity (Hispanic or black), higher PaO₂, and extracorporeal membrane oxygenation (ECMO) were significant risk factors for haemorrhagic stroke. Anticoagulation had no association with either stroke subtype.