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Teaching NeuroImage: Imaging and Pathologic Findings in SARS-CoV-2–Related Acute Demyelinating Encephalomyelitis

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Case:

A 41-year-old woman with type 1 diabetes admitted with SARS-CoV-2 PCR confirmed respiratory failure developed altered mental status. EEG was unrevealing and CSF showed an elevated protein (110 mg/dL), normal glucose (159 mg/dL), without pleocytosis or oligoclonal bands and normal IgG index. MRI demonstrated FLAIR hyperintensities in the corpus callosum and periventricular white matter (**Figure 1**). She was treated with plasmapheresis for presumed SARS-CoV-2 related acute demyelinating encephalomyelitis (ADEM) but succumbed to cardiopulmonary arrest. Post-mortem histology revealed irregular zones of demyelination with axonal sparing and perivascular inflammatory infiltrate, consistent with ADEM (**Figure 2**). There was no inflammation within the vessel walls as is seen in vasculitis. SARS-CoV-2 ADEM has variable clinical presentations. Involvement of deep white matter and the corpus callosum have been previously reported, as well as hemorrhagic leukoencephalopathy, though only minimal microhemorrhage was present for this patient.[1] ADEM can be difficult to diagnose, and outcomes are often poor.[2]

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Figure 1: MRI brain with contrast:
Diffusion weighted image (A) with Apparent Diffusion Coefficient (ADC) (B) showing confluent areas of restricted diffusion with associated FLAIR hyperintensity (C) involving the corpus callosum and bilateral corona radiata. Microhemorrhages (D) in the corpus callosum. Post contrast images (E) demonstrate heterogeneous enhancement.

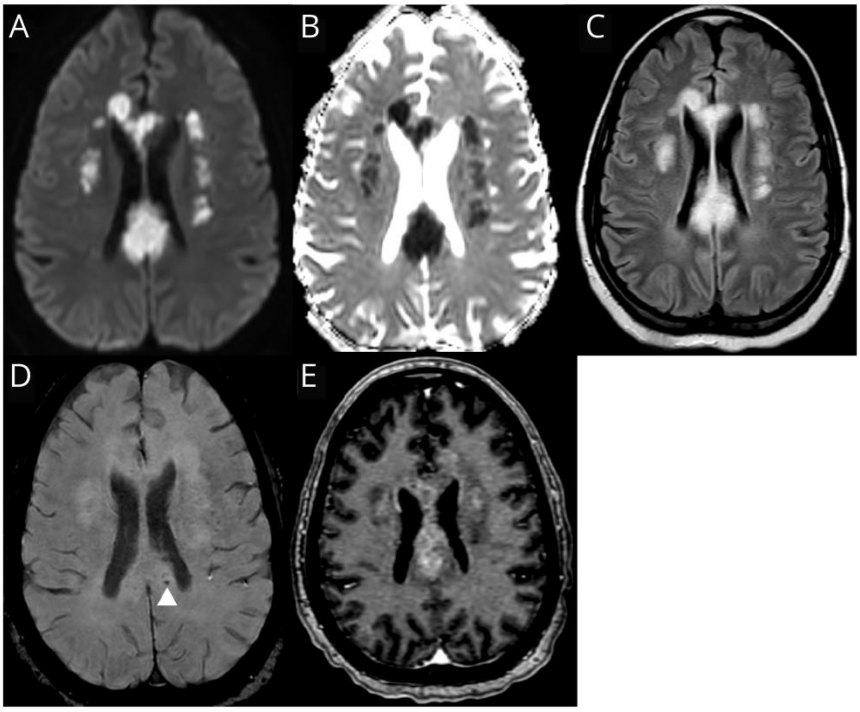
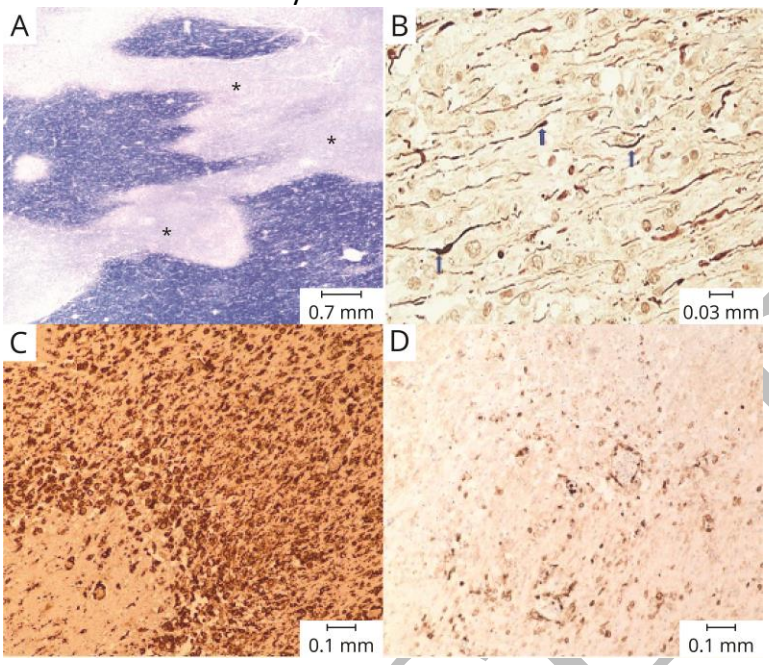


Figure 2: Post-mortem histology from the splenium of the corpus callosum.
(A): Areas of pallor representing demyelination (*) on Luxol Fast Blue stain
(B): Relative preservation of axons (blue arrows), shown by neurofilament immunohistochemistry
(C): Dense macrophage infiltration as evidenced by CD163 immunohistochemistry
(D): Scattered lymphocytic infiltration as demonstrated by leukocyte common antigen immunohistochemistry



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