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Neuroimaging manifestations in children with SARS-CoV-2 infection: a multinational, multicentre collaborative study

Lindan CE, Mankad K, Ram D et al
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Neurologic complications of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in children are fewer in comparison to those observed in adults. The authors of this study systematically evaluated the neuroimaging manifestations in the largest reported pediatric cohort to date, consisting of 38 children infected with SARS-CoV-2, including children with acute disease and those in the postinfectious period. Cases were included if children were between 0 and 18 years old, had neuroimaging that revealed abnormal findings, had positive clinical and laboratory data consistent with SARS-CoV-2 infection, and presented with no evidence of an alternative cause of the symptoms and findings. The cases were placed into four categories based on a clinical categorization scheme, according to the temporal and clinical relationship of symptoms to the child's suspected SARS-CoV-2 exposure, and according to interpretation of molecular and serological assay results. The authors described that the neuroimaging manifestations of SARS-CoV-2 infection in children can range from mild to fatal. They also determined that the most common imaging findings resemble immune-mediated para-infectious patterns of disease involving the brain, spine and nerves. Some recognizable patterns identified in this study include multifocal T2-bright lesions in brain white matter, vasculitic patterns with ischemic lesions, enhancing neuritis or poly-radiculitis, venous thrombosis, splenial lesions, longitudinally extensive myelitis, and myositis. A unique feature described by the authors was that cranial nerve enhancement did not always correlate with cranial nerve deficits. The most common neuroimaging finding in children diagnosed with multisystem inflammatory syndrome (MIS-C) were splenial lesions and myositis of the face and neck. The authors reported that a minority of children with SARS-CoV-2 infection also suffered from co-infectious organisms, including *Mycobacterium tuberculosis*, methicillin-resistant *Staphylococcus aureus* (MRSA), varicella-zoster virus, *Fusobacterium necrophorum* and *Streptococcus constellatus*. These children were the most severely ill and all succumbed to their illness. Among the rest of the cohort, most children did well, although some had mild residual neurologic deficits, and two remained severely impaired. The authors did not find significant pre-existing conditions among the members of the cohort.

Pediatric ischemic stroke: an infrequent complication of SARS-CoV-2

Beslow LA, Linds AB, Fox CK et al
Ann Neurol (2021) ***89****:657–665*

Pediatric stroke studies have established that inflammation and infections, including asymptomatic infections, can be risk factors for stroke. The known mechanisms of pediatric stroke caused by viral infections and inflammation are arteriopathy and thromboembolism, which might be plausible mechanisms for the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) to cause stroke in children. The authors of this study aimed to determine, in an international cohort, the proportion of pediatric SARS-CoV-2 cases with ischemic stroke and the proportion of stroke incidents in children with concurrent SARS-CoV-2 diagnosis during the first 3 months of the pandemic. The study surveyed 61 international sites with pediatric stroke expertise. The investigators found that 0.82% of hospitalized pediatric patients with SARS-CoV-2 had ischemic strokes. The proportion of stroke cases who were also positive for SARS-CoV-2 between March and May 2020 was 0.9% among neonates with acute ischemic stroke, 3.6% among children with acute ischemic stroke and 1.9% among children with cerebral venous sinus thrombosis. There were no neonates with concomitant SARS-CoV-2 and cerebral venous sinus thrombosis. The authors also stated that the majority of the children with stroke who tested positive for SARS-CoV-2 had at least one other risk factor for stroke. The study results showed that the percentage of children with SARS-CoV-2 who suffer stroke appears to be very low and the number of pediatric ischemic strokes positive for SARS-CoV-2

also appears to be relatively low. However, among the limitations of the study, the authors mentioned that only 30.5% of neonates and 60% of children with strokes were tested for SARS-CoV-2. Because of this limitation, the authors concluded that additional data collection and more robust testing are required to determine the role of SARS-CoV-2 in pediatric stroke and its more detailed pathogenetic mechanisms.

Genetic consultations in cases of unexplained fractures and haemorrhage: an evidence-based approach

Shur N, Summerlin ML, Robin NH et al

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Rare genetic disorders occasionally enter the discussion of a differential diagnosis in children presenting with fractures and concern for abuse. The authors noted that "a number of reports have mischaracterized several genetic disorders as child abuse mimics." The authors indicated that, when appropriate, these genetic disorders "can be readily differentiated and diagnosed using a stepwise approach." The authors of this review discussed these commonly quoted genetic disorders in an organized way, listing pertinent clinical descriptions and diagnostic criteria. The authors also provided useful tables of statistics for detection rates of specific genetic tests for specific conditions. The authors emphasized that genetic disorders have major and minor diagnostic criteria that allow definitive diagnosis when present, and exclusion when absent. This article provides a useful literature review to understand whether cases of children diagnosed with genetic disorders can be reliably differentiated from cases of physical abuse using standard clinical and radiologic evaluations. In addition, the authors provided a list of useful references and recommended articles for further reading about genetic disorders, which can empower pediatric radiologists offering expertise in the courtroom.

The role of 3D reconstruction of the skull in patients with suspected shunt malfunction

Roth J, Kimchi TJ, Shofty B et al

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In children who are dependent on ventriculoperitoneal shunts, it is important to identify mechanical shunt malfunction because this can lead to significant morbidity and mortality. The authors of this study described the role of three-dimensional (3-D) bone reconstruction CT in evaluating shunt integrity and compared it to skull radiographs. The investigators retrospectively reviewed the imaging findings of 48 children with 57 shunts, who had both skull radiographs and 3-D CT; 27 of the patients were children age 18 years or younger. In identifying shunt disconnections, the authors found that skull radiographs had a sensitivity and specificity of 0.88 and 1.0, respectively, while 3-D CT had a sensitivity and specificity of 1.0 and 0.98. The detection of the full valve type and setting was significantly more accurate based on skull radiograph than on 3-D CT, greater than 90% compared to less than 20%, respectively; on the other hand, valve integrity was identified 100% of the time on 3-D CT and only 52% of the time on skull radiographs. The main limitation of 3-D CT found by the authors was identification of valve type and settings, which were identified more often on skull radiographs, while the main limitation of skull radiographs was their decreased utility for evaluating valve integrity compared to 3-D CT; the two modalities were roughly equivalent in detecting shunt disconnections. The authors concluded that, when CT is already available as part of the routine clinical evaluation of shunt malfunction, construction of the 3-D CT from the source data is an effective way to optimize the evaluation of shunt malfunction in a manner that optimally complements the findings on skull radiographs.

On the 400th anniversary of the birth of Thomas Willis

Molnar Z

Brain (2021) ***144****:1033–1037*

This essay is a delight for all those interested in the history of medicine. Thomas Willis is one of the greatest neuroanatomists of our era, considered the founder of neurology and credited with many seminal discoveries, including the all-important arterial circle at the base of the brain, which bears his name. The current year 2021 is the 400th anniversary of his birth. His careful dissections led to the naming of several structures in the brain: corpus striatum, internal capsule, cerebellar peduncles, anterior commissure, claustrum, inferior olives, pyramids, optic thalamus, spinal accessory nerve, stria terminalis, vagus nerve, intercostal nerve (sympathetic ganglionic chain), and ophthalmic nerve. More important, he changed the approach to medicine from one of rote memorization and acceptance of the status quo, to one characterized by open inquiry, assembling of evidence and correlation of clinical findings with anatomical structure. This well-compiled essay and its links to supplementary material are a treat to read.

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