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Case report

Subdural empyema in adult with recent SARS-CoV-2 positivity case report ☆

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ABSTRACT

Intracranial abscess, including subdural empyema, is a rare central nervous system infectious disease and diagnosis is often delayed due to patient presentation with non-specific neurologic findings. Here we report a 65-year-old male with a recent past medical history of SARS-CoV-2 infection who presented with three weeks of escalating headache in whom MRI imaging revealed a subdural empyema. He subsequently underwent two craniectomies, which resulted in eradication of the abscess and clinical improvement. This report highlights a potential link between SARS-CoV-2 infection and this patient's development of subdural empyema, which has not been documented elsewhere in the literature.

SARS- CoV-2 was first discovered in Wuhan, China in December of 2019 and shortly after developed into a global pandemic [1,2]. An intracranial abscess (ICA) is described as a rare brain infection in which patients often present with headache, fever and altered level of consciousness, but these symptoms can vary based on abscess location in the brain. The diagnosis is challenging to make and can often be delayed, resulting in complications including the spread of the infection, brain herniation, and ultimately death. The approach to the treatment of ICA is mainly surgical, with the removal of the lesion by neurosurgery and subsequent treatment with antibiotics targeting the bacteria. In May of 2020, Turbin et al. reported a case of intracranial epidural abscess formation in an adolescent who tested positive for SARS-CoV2 on presentation after experiencing a 3-day history of orbital swelling, migraine, rhinorrhea, diarrhea and vomiting [3]. Here we report a similar case with a potential link between ICA formation and SARS-CoV2 in a 65-year-old male who tested positive 54 days before presentation with subdural empyema.

Case report

A 65-year-old Caucasian male with chief complaint of an unremitting headache for three weeks presented to the emergency department. The patient was well until three weeks before when he developed a headache described as severe throbbing pain that radiated from the middle forehead to the left ear. This pain occurred every 2-3 hours and lasted a few seconds at a time without identifiable provocation, frequently waking him from sleep. He denied fever, chills, cough, congestion, shortness of breath, chest pain, numbness, tingling or vi-

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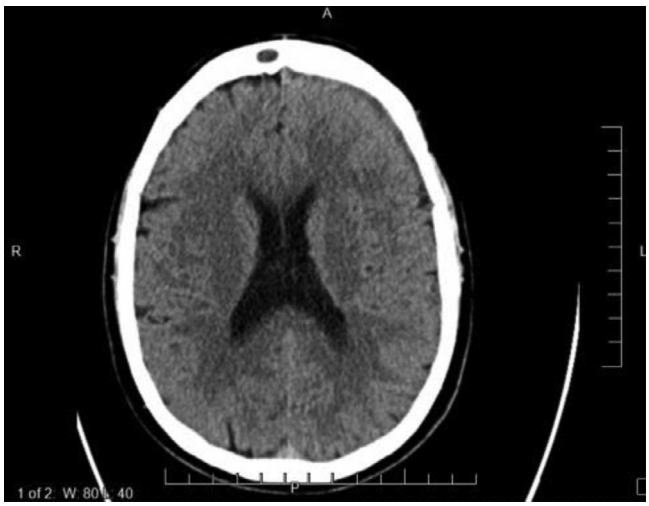

Fig. 1 – CT scan showing a hypoattenuating extra-axial fluid collection over the left anterior frontal convexity.

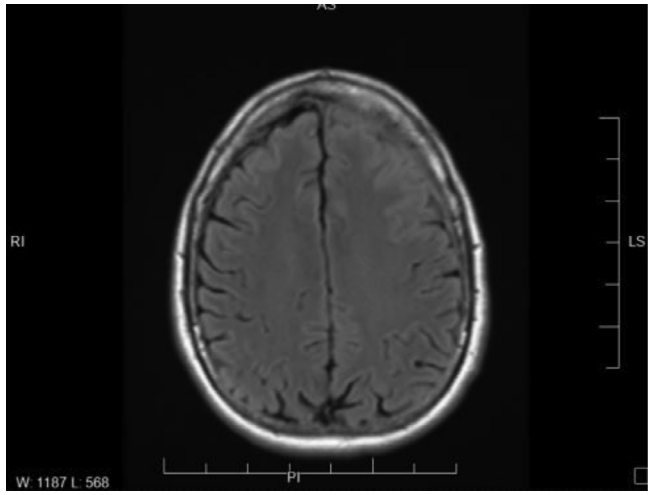

Fig. 2 – MRI showing extra-axial collection demonstrating restricted diffusion identified along the left frontal lobe.

sion changes. He reported tenderness over the left temple and behind the left ear.

His past medical history notably included chronic sinusitis, hay fever and seasonal allergies, all diagnosed in the 1980s. The patient's recent past medical history was significant for COVID-19 infection, for which he visited an urgent care for testing on November 28, 2020 after the development of new-onset cough, diarrhea, and loss of taste and smell and was notified of a positive result on December 01, 2020. He experienced a mild disease course consisting mostly of fatigue and he quarantined for 14 days and received no pharmacologic intervention related to the COVID-19 diagnosis. His medications at the time of presentation included Nasacort and Allegra.

On examination, the patient was alert, oriented and cooperative. His vitals were as follows: temperature of 98.7 degrees F, blood pressure of 150/85 mmHg, heart rate of 118 beats per minute, respiratory rate of 17 breaths per minute and oxygen saturation of 100% on room air. His pupils were equal, round, and reactive, and his neck was supple. Tenderness to palpation was present over the left temple and extended behind the left ear to the mastoid process. The patient was oriented to person, place and time. Cranial nerves II-VII were intact. Sensation was intact in all four extremities. Muscle strength was 5/5 bilaterally in the upper and lower extremities. The remainder of his physical examination was normal.

His labs revealed a white blood cell count of 11,210/uL [ref: 4,000-12,000/uL], hemoglobin of 15.9 g/dL [ref: 14.0-18.0 g/dL] and platelets of 412,000/uL [ref: 150-450/uL]. Erythrocyte sedimentation rate was 33 mm/h [ref: 0-20 mm/h] and C-reactive protein was 11.3 mg/dL [ref: 0-1.0 mg/dL]. SARS-CoV-2 RNA PCR was negative. CT scan of the head without contrast showed opacification and bulging of the frontal sinus and maxillary sinus fluid levels, suggesting acute-on-chronic sinusitis (Fig. 1). A hypoattenuating extra-axial fluid collection over the left anterior frontal convexity close to the frontal sinus was present, concerning for the intracranial extension of sinus disease. MRI was recommended to assess for possible pachymeningitis or empyema. MRI of the head without contrast revealed a small left frontal empyema and pachymeningitis secondary to acute frontal sinusitis without evidence of large intraorbital abscess (Fig. 2)

As a result of the CT and MRI findings, the patient was started on Ceftriaxone, Flagyl and Vancomycin and was transferred to a different hospital for emergent neurosurgical intervention. Two craniectomies with evacuation were performed and once stable, he was discharged to inpatient rehabilitation. Abscess cultures grew *Streptococcus milleri*, consistent with the spread from the sinus cavity to the subdural space. After 25 days spent in rehabilitation, the patient returned home and subsequently presented to the emergency department three days later with calf pain, weakness, confusion, and an episode of pre-syncope and was diagnosed with bilateral and saddle pulmonary embolisms. With the care provided by the inpatient medical team, he was stabilized and transferred to another inpatient rehabilitation facility.

Methods

Written informed consent for publication was obtained from the patient's next of kin. The authors vouch for the accuracy and completeness of the data in this report.

Discussion

The nature and course of disease progression in this case suggests a potential temporal relationship between SARS-CoV-2 infection and the development of subdural empyema. In 2003, Roche et al. reported four histological stages associated with the development and proliferation of parenchymal brain abscess which included "early cerebritis (days 1 ± 3), late cerebritis (days 4 ± 9), early capsule formation (days 10 ± 13) and late capsule formation (days 14 onwards)" [4]. The onset of initial subdural empyema symptoms 19 days after our patient recovered from SARS-CoV-2 infection, followed by development and subsequent diagnosis of subdural empyema 21 days later is consistent with the findings reported by Roche *et al.* [4].

This patient's presentation with subdural empyema is atypical. Intracranial complications from chronic sinusitis are rare and observed most frequently from contiguous spread of foci of infection from otitis and mastoiditis and secondly from sinusitis [5]. Additionally, most cases of ICA and more specifically subdural empyema, develop in males in the second and third decades of life [6]. This is thought to be due to the peak vascularity of the brain's diploic venous system in this age group, easily allowing septic thrombophlebitis through this system into the intracranial spaces [7,8].

In summary, this patient with a past medical history significant for chronic sinusitis developed subdural empyema after testing positive for SARS-CoV-2, illuminating the possibility of a link between development of rare complications of chronic sinusitis in unusual patient populations after SARS-CoV-2 infection. It would therefore be reasonable to examine if infection with the SARS-CoV-2 virus impacts the immune system and makes individuals more susceptible to unusual infections, as our patient developed here. Further investigation is warranted, and a high index of clinical suspicion is necessary to properly diagnose and treat patients who may present with this complication of SARS-CoV-2 infection.

Patient consent

Written informed consent for publication was obtained from the patient's next of kin.

Declaration of Competing Interest

None.

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