Letters

OBSERVATION

Cerebrospinal Fluid Leak After Nasal Swab Testing for Coronavirus Disease 2019

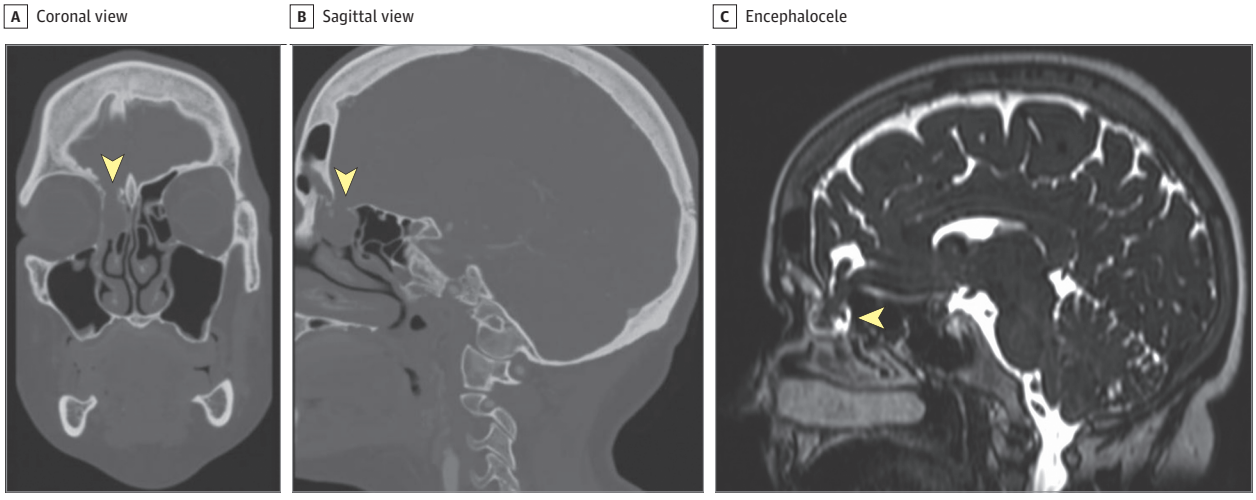
In March 2020, coronavirus disease 2019 (COVID-19) emerged as a global pandemic. Testing for presence of active severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection is 1 pillar of the global response.[1] In particular, nasopharyngeal, anterior nasal, and midturbinate swabs are 3 of the 5 methods for initial diagnostic specimen collection recommended by the US Centers for Disease Control and Prevention (CDC).[2] However, complications associated with nasal swab testing are not well characterized. We describe the first case of a cerebrospinal fluid (CSF) leak after nasal testing for COVID-19, to our knowledge.

Report of a Case | A woman in her 40s presented with unilateral rhinorrhea, metallic taste, headache, neck stiffness, and photophobia. The patient had recently completed nasal COVID-19 testing for an elective hernia repair. Shortly after, she developed unilateral rhinorrhea, headache, and vomiting. The patient's medical history was notable for idiopathic intracranial hypertension and removal of nasal polyps over 20 years before presentation. Physical examination revealed clear rhinorrhea from the right side. Flexible nasopharyngoscopy revealed a mass in the right anterior middle meatus, but did not identify the source of the fluid. The nasal drainage tested positive for β_2-transferrin. Computed tomography (CT) and magnetic resonance imaging (MRI) identified a 1.8-cm encephalocele extending through the right ethmoid fovea into the middle meatus and a right sphenoid wing pseudomeningocele. Comparing these images to findings on CT performed in 2017 revealed that the encephalocele dated at least to that time (**Figure 1**). The 2017 CT diagnosis was paranasal sinus disease but not an encephalocele. The patient was admitted to the hospital for endoscopic surgical repair. At the beginning of the procedure, intrathecal fluorescein was infused through a lumbar drain. An encephalocele was identified in the right anterior ethmoid cavity (**Figure 2**). After reduction of the encephalocele, a skull base defect in the fovea ethmoidalis was repaired with a combination of acellular human dermal matrix and a poly (D,L-lactic) acid. The patient was admitted postoperatively for neurological monitoring and lumbar drain management.

Discussion | To our knowledge, this is the first report of an iatrogenic CSF leak after a nasal swab for COVID-19. Of prior reported iatrogenic CSF leaks from intranasal procedures, surgical trauma at the cribriform plate is the culprit in CSF leaks 8% to 58% of the time.[3] Idiopathic intracranial hypertension is a risk factor for meningocele formation,[4] and this patient had an undiagnosed skull base defect at the fovea ethmoidalis that was present on imaging dating back to 2017. We therefore theorize that the swab itself did not result in a violation of the bony skull base, but rather the invasive test caused trauma to the patient's preexisting encephalocele.

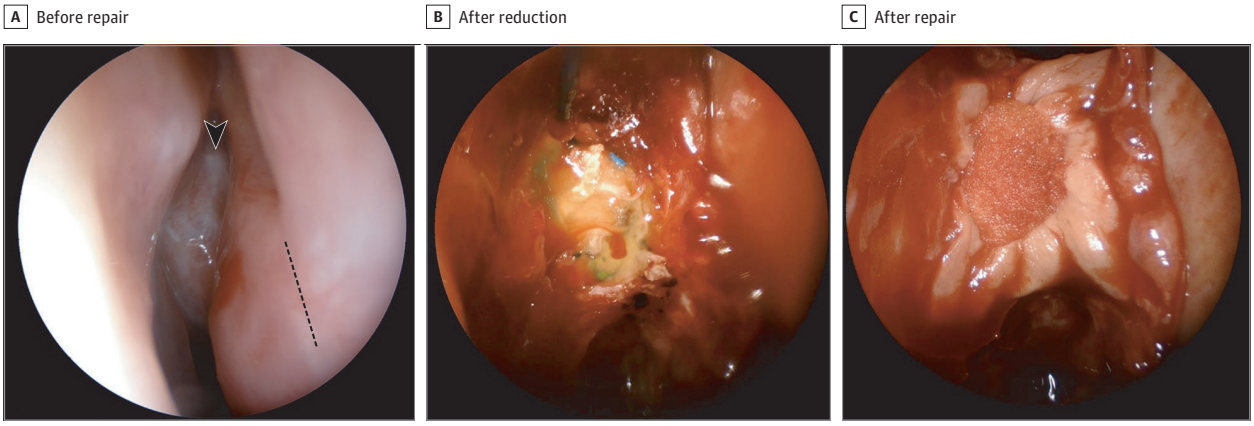
Capacity for COVID-19 testing is increasing in the US, with plans to ramp up to as many as 6 million tests per day by the end of 2020.[5] Although it is now routine in the US to rule out

Figure 1. Imaging Prior to Cerebrospinal Fluid (CSF) Leak



A, Brain computed tomographic image from 2017 in the coronal and sagittal planes demonstrating encephalocele situated over the fovea ethmoidalis prior to nasopharyngeal testing for COVID-19. The arrowhead demonstrates skull base defect. B and C, High-resolution magnetic resonance imaging (T2 sequence) in the sagittal plane during hospital admission in July 2020 after development of iatrogenic CSF leak. The yellow arrowheads indicate the encephalocele.

Figure 2. Endoscopic Findings and Surgical Repair



A, Intraoperative photograph of right ethmoid sinus with visible encephalocele (black arrowhead) prior to endoscopic transnasal repair. Note that the middle turbinate is scarred to the septum (black line), widening the middle meatus and exposing the skull base defect. B and C, Intraoperative photograph of right ethmoid sinus after reduction and repair of the encephalocele with cerebrospinal fluid leak identified by intrathecal fluorescein.

COVID-19 prior to elective surgeries, for many hospital admissions, and for symptomatic individuals, additional testing may help contain the spread of COVID-19. As the number of daily COVID-19 nasal and nasopharyngeal swab specimen collection procedures increases, a greater burden is placed on the health care system to properly train clinicians and even the general public to safely perform nasal and nasopharyngeal swab testing. High-quality instruction on how to properly obtain an adequate nasopharyngeal specimen for testing is available.[2] However, adverse events may still occur owing to complex and delicate anatomy. Such complications have not been well described in the existing literature.

This case of iatrogenic CSF leak from nasal swab testing for COVID-19 illustrates that prior surgical intervention, or pathology that distorts normal nasal anatomy, may increase the risk of adverse events associated with nasal testing for respiratory pathogens, including COVID-19. One should consider alternative methods to nasal screening in patients with known prior skull base defects, history of sinus or skull base surgery, or predisposing conditions to skull base erosion.

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Conflict of Interest Disclosures: Dr Walsh reported a patent to apparatus, systems and methods for negative pressure face shielding pending and a patent to apparatus, systems and methods for unified endoscopic procedure performance and visualization pending. No other disclosures were reported.

Additional Contributions: We thank the patient for granting permission to publish this information.

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