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Cerebrospinal Fluid Leak From COVID-19 Swab

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cerebrospinal fluid leak, COVID-19 swab, COVID-19 testing, skull base trauma

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Over half a billion COVID-19 tests have been performed in the United States thus far, and this robust trend is expected to continue.[1] The nasopharyngeal swab for COVID-19 testing is generally considered safe; however, it is primarily performed by staff that may not completely understand the anatomy of the nasal cavity and nasopharynx. As otolaryngologists, we are familiar with this anatomy and have been consulted to deal with uncommon adverse events from COVID-19 nasal/nasopharyngeal swab testing, such as epistaxis and premature breaking of swabs in the nasal cavity/nasopharynx resulting in foreign bodies. We present a rare but more serious complication of cerebrospinal fluid (CSF) leak secondary to skull base trauma from COVID-19 swab testing. This case report is exempt from the Baylor Scott & White Research Institute Institutional Review Board.

Case Presentation

A 40-year-old man presented to the clinic for evaluation of CSF leak following COVID-19 testing via nasopharyngeal swab. During the swab, the patient reported feeling ''something crack'' upon deeper insertion of the swab and then had a large amount of clear rhinorrhea. Since the COVID-19 test, the patient had persistent clear fluid drain from the right side of his nose when tilting his head forward. The clear fluid was positive for beta-2 transferrin, and head computed tomographic imaging showed a small osseous defect in the superior and lateral wall of the right sphenoid sinus with opacification (**Figure 1**). The patient had resolution of CSF leak following repair of right skull base defect by an endoscopic transnasal/transsphenoidal approach with nasoseptal flap.

Discussion

Thus far, the number of published case reports of CSF leaks secondary to COVID-19 swab testing is limited (**Table 1**).

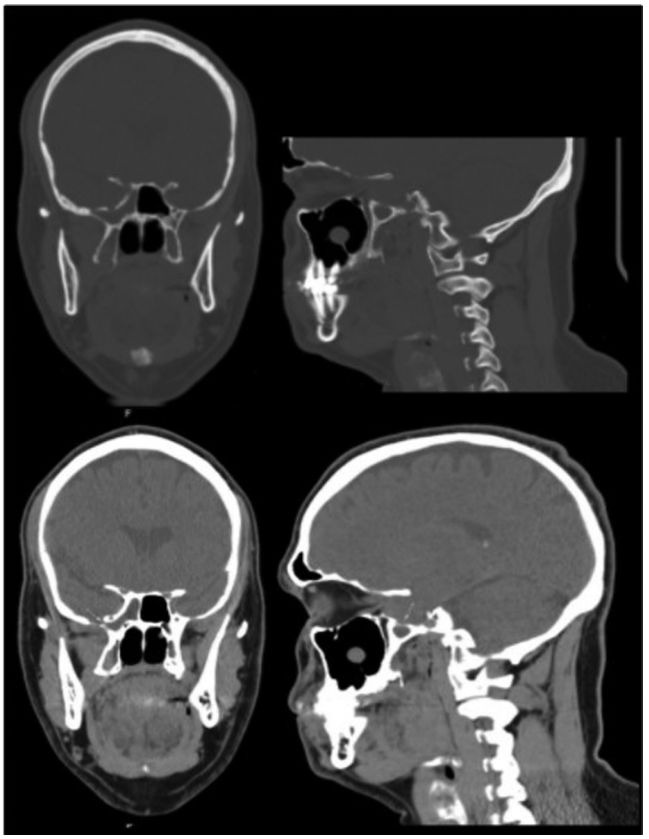

Figure 1. Head sinus computed tomographic imaging in the coronal and sagittal planes in bone and soft tissue window demonstrating the osseous defect of the right sphenoid sinus superolateral wall.

The majority of these CSF leaks occurred in women, with the swab injury site in the cribriform region, and were associated with prior skull base defect secondary to encephalocele/

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Table 1. Case Reports for Cerebrospinal Fluid Leaks Secondary to Traumatic COVID-19 Swab Testing.

First Author (year; doi)	Age, y; sex	Skull base injury/defect site	Preexisting skull base defect	Complications
Sullivan (2020; 10.1001/jamaoto.2020.3579)	40s; female	Cribriform	Yes: encephalocele	
Alberola-Amores (2021; 10.1111/ene.14736)	41; female	Cribriform	No	Meningitis
Rajah (2021; 10.1016/j.jocn.2021.01.003)	59; male	Sphenoid (lateral sella turcica wall)	Yes: encephalocele	
Ovenden (2021; 10.1111/ans.16910)	34; female	Cribriform	No	
Mistry (2021; 10.5694/mja2.51082)	67; female	Cribriform	No	Meningitis
Abdullah (2021; 10.11648/j.js.20210904.16)	45; female	Sphenoid (roof)	Yes: meningocele	
Holmes (2021; 10.5811/cpcem.2021.5.52232)	54; female	Cribriform	Yes: meningocele	Meningitis
Paquin (2021; 10.1002/lary.29462)	38; female	Cribriform	Yes: encephalocele	
Knížek (2021; 10.1001/jamaoto.2021.2216)	40s; male	Cribriform	No	
Agamawi (present case report)	40; male	Sphenoid (superior lateral wall)	No	

meningocele. These characteristics were modeled in the first published case report by Sullivan et al.[2] The skull base injury site in the sphenoid sinus has been reported in only 2 prior cases; however, both of these had a preexisting skull base defect with meningocele/encephalocele.[3,4] This is the first case report that describes a patient with a sphenoid skull base CSF leak secondary to traumatic COVID-19 swab testing who had no preexisting skull base defect. This complication highlights the knowledge deficit of nasal and nasopharyngeal anatomy among staff performing COVID-19 testing.

There is a general anatomic misconception of the nasal cavity due to the external appearance of the nose with its upward slope trajectory from the nasal tip to nasal bridge or glabella region. This ''brain-ward'' direction of the nasal dorsum may have contributed to the incorrect path of the swabs and subsequent skull base traumas. It is also important to keep in mind that the nasal anatomy of patients may be complicated by congenital and/or acquired structural abnormalities, such as septal deviations, existing skull base defects, or other postoperative changes from prior nasal sinus surgery. Besides the positional rhinorrhea, patients with CSF leak may experience headaches and even go on to develop the severe CSF leak complication of meningitis, as first reported by Alberola-Amores et al.[5]

With the escalation of COVID-19 testing, it is crucial that staff administering COVID-19 test swabs not only appreciate the flat nonsloping anterior-to-posterior direction of the nasal cavity to the nasopharynx but be extra cautious when inserting the swab. If any resistance is encountered on swab insertion, advancement should stop immediately and the situation evaluated, especially in regard to technique and patient anatomy, to avoid traumatic complications.

Author Contributions

Yusuf Mosen Agamawi, analyzed patient data, wrote manuscript; **Arya Namin**, analyzed patient data, read and approved manuscript; **Yadranko Ducic**, analyzed patient data, read and approved manuscript.

Disclosures

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