

Leaking Skull Base - Imaging of Two Cases of Spontaneous Cerebrospinal Fluid (CSF) Rhinorrhea Involving Sphenoid Sinus.

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DOI: 10.31080/ASNE.2023.06.0572

Received: June 20, 2022

Published: December 07, 2022

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Abstract

Spontaneous cerebrospinal fluid (CSF) leaks that occur without underlying etiology; involving the sphenoid bone are rare. They pose a diagnostic challenge and an impending risk of complications like rhinorrhea, low pressure headaches or meningitis. Causes for such spontaneous rhinorrhoea include congenital anatomic defects but involvement of sphenoid bone is rare. Neuroimaging plays a pivotal role in identification of the site of leak thereby aiding surgical planning and approach for dural repair. We report two such cases of spontaneous CSF rhinorrhea presenting with watery discharge from nose and headache for a prolonged period with osteodural defects in sphenoid revealed on neuroimaging. Surgical intervention was done on one of the cases while other had a conservative management.

Keywords: Spontaneous Sphenoid; CSF Leak; MRI

Introduction

Spontaneous cerebrospinal fluid (CSF) rhinorrhea is a rare condition of unknown etiology. It is typically linked to congenital abnormalities and anomalies of the temporal bone, skull base, and dura. CSF rhinorrhea can also be brought on by a meningeal thinning that already exists in conjunction with unexpected trauma. Variations in intracranial pressure lead to the gradual herniation of the dura mater into the bone fissure, which over time results in the dura becoming thinner. A compromised dural structure increases the likelihood of dural tear formation, diverticula or expansion formation, and, eventually, CSF leaking into the epidural space. Nasal leaking in patients without a history of trauma is frequently disregarded. To avoid the potentially fatal effects of CSF rhinorrhea, such as bacterial meningitis and brain abscesses, early identification and proper care are essential. We describe two such cases of spontaneous CSF rhinorrhea

Case 1

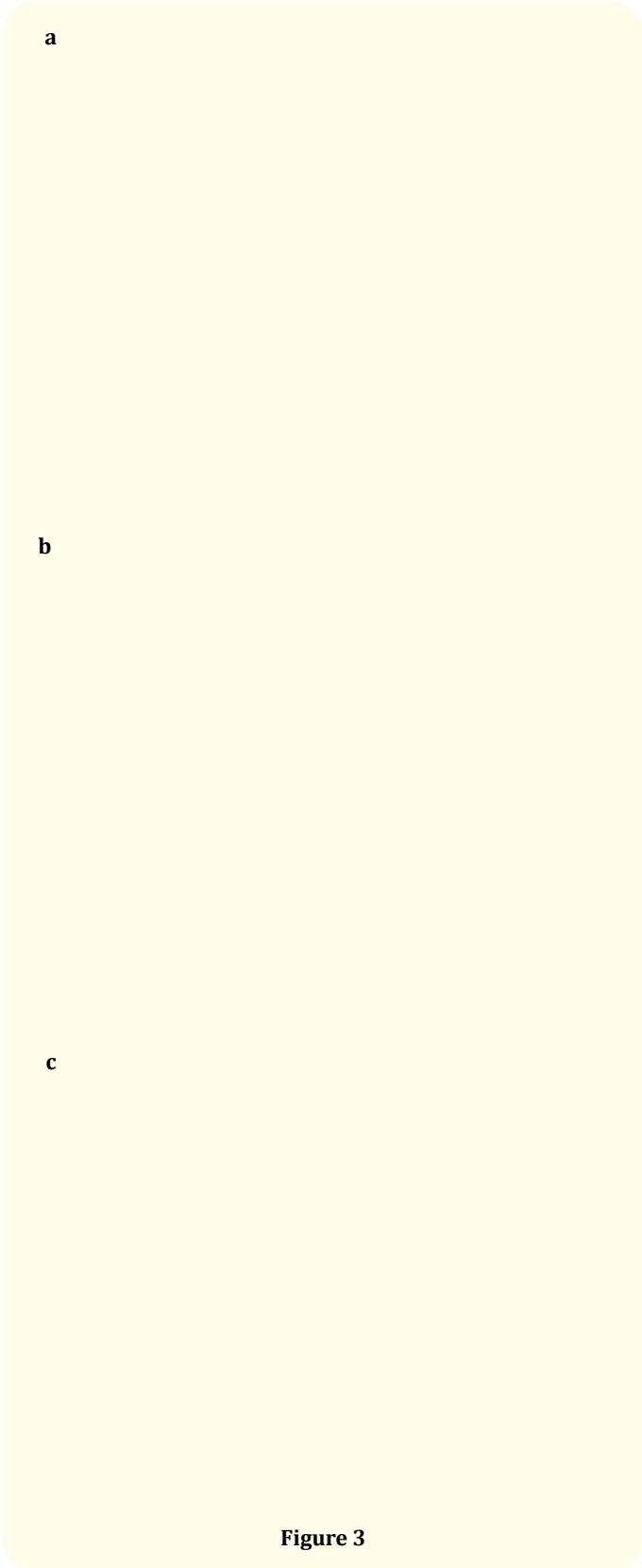
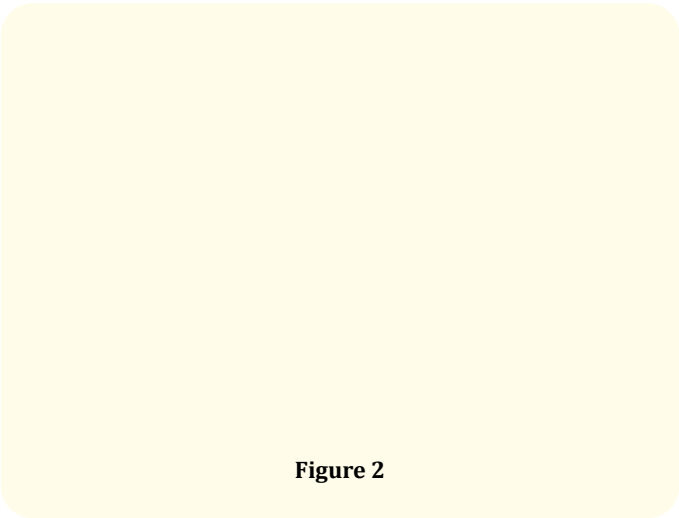
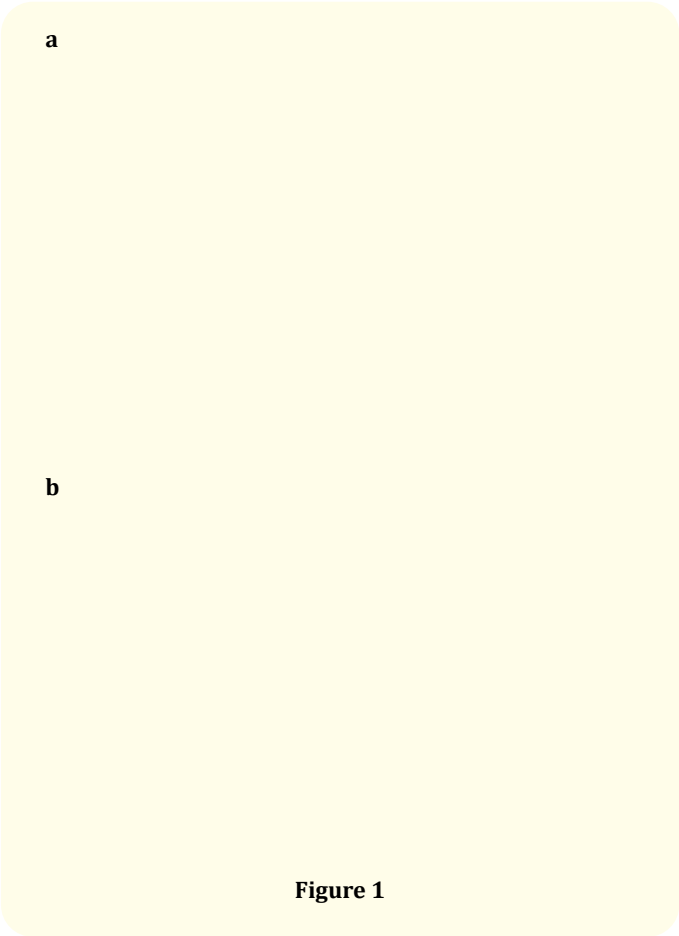
A 26-year-old man presented with history of watery nasal discharge since two years. It increased on sneezing and forward bending. Patient was afebrile with no history of trauma, and no

signs of neck rigidity or photophobia. Fundus examination was normal. CT revealed osseous defects in the roof of sphenoid sinus with mucosal thickening filling the sphenoidal sinus (Figure 1a and 1b). Coronal contrast enhanced cisternogram shows contrast medium extending through the dural defect over left medial temporal dura into the left lateral wall sphenoid sinus (Figure 2). MRI and MR cisternography confirmed the dural defect and presence of CSF fistula. Pituitary stalk and gland were displaced to contralateral side (Figure 3).

Patient was subjected to left pterional craniotomy which revealed multiple holes in the medial temporal dura. A piece of temporal fascia along with fibrin glue was used to plug the fenestrated medial temporal dura with endoscope assistance. Post operative phase was uneventful and the patient is under regular follow up.

Case 2

Our second case is of a 51-year-old lady complaining of headache and watery discharge from nose off and on since 2-3 years. Headaches had worsened in the last six months. They were aggravated on forward bending or from supine to prone position. There



was no accompanying fever, neck stiffness, photophobia, or trauma. Rest of the medical history was unremarkable. On examination, clear fluid spilled from the left nostril. Fundus examination was normal with normal cup-to disc ratio and no papilledema. Conventional MRI and MRI cisternography revealed the osteodural defect along left inferolateral recess of the sphenoid sinus with a continuous column of CSF seen from the left medial temporal region to the sphenoid sinus with features of encephalomalacia in adjacent left temporal lobe. Empty sella was noted (Figure 4). Patient was managed conservatively as she refused surgical treatment.

a

b

Figure 4

Discussion

First described by St Clair Thompson as a separate pathological entity in 1899; the presence of CSF rhinorrhea implies the presence of an osseous defect with breach of dura matter and resultant abnormal communication of intracranial cavity with nasal cavity [1]. Ommayas most widely accepted classification system classifies them according to etiology and presentation as traumatic, nontraumatic and spontaneous [2]. Skull base fractures and postoperative or iatrogenic defects due to neurosurgical or otolaryngologic procedures are classified as traumatic causes. Presence of underlying skull base tumor, radiation or chemotherapy for skull base tumors, untreated aqueductal stenosis, developmental skull base defects with meningocele and arachnoid granulations are all included in the nontraumatic causes. Spontaneous group in one in which there is no underlying etiology [3].

CSF fistulae are commonly seen in floor of anterior cranial fossa, cribriform plate and ethmoid sinus [4]. Sphenoid sinus is a relatively rare site of CSF leak; of which the junction of the anterior portion of the lateral wall of the sphenoid sinus and the floor of the middle cranial fossa which is probably structurally weak; is most prone to CSF leaks and resultant anteromedial encephalocele [5].

In their exclusive study of spontaneous sphenoid sinus leaks Shetty, *et al.* speculated the role of extensive pneumatization of lateral wall of sphenoid sinus, outward concave orientation of the inferior portion of the lateral wall of the sphenoid sinus, arachnoid pits, and empty sella for increasing susceptibility of sphenoid sinus as site of leak [6]. Arachnoid granulations are implicated as precursors of CSF rhinorrhea while an effective leak occurs when there is bone erosion and osteodural defect at site of pneumatized parts of skull base [7]. Other predisposing factors are presence of a persistent lateral craniopharyngeal canal between the middle cranial fossa and inferolateral recess of sphenoid sinus and idiopathic intracranial hypertension [8].

Clinically the increased CSF egress on forward bending can be related to the fact that sphenoid ostium lies anterosuperior to the sinus floor which becomes more accessible on forward bending-teapot sign [6].

Accurate localization of the site of leak is the key for a successful dural repair and reduces chances of negative exploration [6]. Multidetector CT due to its ability to resolve osseous structures is the initial examination of choice and detects not only the skull base defects but is also helpful in evaluation of additional causes like meningocele or meningoencephalocele [3,9]. CT cisternography which involves the intrathecal administration of contrast material combines the best of both worlds as it identifies active leak in addition to the osteodural defect however it is no more sensitive to non-contrast CT in intermittent or nonactive leaks, adds to expense and has an inherent risk of infection and lumbar CSF leak [3]. MRI imaging techniques are indicated in conditions where CT reveals an osseous defect and opacification of adjacent sinus with inspissated secretions; as herniation of brain parenchyma or meninges is difficult to detect. Heavily T2 weighted fast spin sequences that have reduced susceptibility artifacts at air-bone interface, coupled with fat suppression and subtraction of background signals, are used in MR cisternography which starkly increases the conspicuousness of the fistulous tract and makes it more detectable. This technique is however reserved for complex cases where multiple osseous defects, fractures are present or cases with suspected encephalocele or meningoencephalocele [3,9].

Sphenoid sinus fistulas are approached with great difficulty surgically and may be inaccessible through intracranial approaches because of adjacent neural and vascular structures [10]. Endonasal endoscopic approach are increasingly being used for CSF rhinorrhea and various other midline skull base lesions in the sphenoid sinus region [11,12]. Accurate site of CSF leak is the basic requirement for successful treatment of CSF leak which depends upon the adequate imaging studies. Forer B., *et al.* recommend the obliteration of sphenoid sinus without directly repairing skull base defect when transnasal endoscopic approach to lateral recess of sphenoid is difficult due to proximity optic nerve and carotid artery [13].

Successful treatment in one case by intracranial approach was opted due to accurate site of leak which appeared accessible through intracranial approach more easily than endonasal endoscopic approach due to lateral location of the communication in the sphenoid sinus.

Conclusion

We conclude that spontaneous sphenoid sinus CSF leaks are rare. They should be suspected in patients of persistent unilateral nasal discharge. Multidetector CT, CT cisternography, MRI with

high resolution, MR cisternography are the imaging modalities that have an important role in localization of the skull base defects and thereby dictate the surgical approach and planning. Surgical repair of the fistula has a high success rate in treatment of these leaks. Conservative treatment, repeated lumbar punctures, and/or CSF diversion to lower intracranial pressure are additional procedures that help treat spontaneous CSF rhinorrhea in addition to surgical repair.

Funding

No funding was received for the study.

Ethical Approval

There was compliance of ethical standards.

Conflict of Interest

There is no conflict of interest among the authors.

Informed Consent

Informed consent was obtained from individuals in the study.

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