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Spontaneous Ethmoid Osteo-Dural Breach: Pre- and Postoperative Imaging Perspectives

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Abstract **Case Report**

Spontaneous osteo-dural defects of the anterior skull base are rare and often linked to idiopathic intracranial hypertension (IIH) [1]. They typically present as cerebrospinal fluid (CSF) rhinorrhea, most frequently at the cribriform plate. We report a case of a 55-year-old woman with chronic headaches and clear nasal discharge. CT and MRI confirmed an ethmoid bone defect consistent with an osteo-dural breach. Endoscopic repair using the bath-plug technique was successful, with postoperative imaging confirming resolution.

Keywords: MRI, CT scan, Osteo-Dural Breach, rhinorrhea.

INTRODUCTION

Spontaneous osteo-dural defects of the anterior skull base represent a rare but clinically significant cause of cerebrospinal fluid (CSF) rhinorrhea [1]. Unlike traumatic or iatrogenic leaks, these defects occur in the absence of an external trigger and are increasingly recognized as manifestations of chronically elevated intracranial pressure, most notably idiopathic intracranial hypertension (IIH) [2]. Anatomically, they tend to arise in thin, structurally vulnerable regions of the skull base—particularly the cribriform plate and ethmoid bone—where the dura is closely apposed to fragile bony partitions. These leaks may present subtly, often with intermittent clear nasal discharge or nonspecific symptoms such as chronic headaches, and are frequently misdiagnosed or overlooked [1,2]. Diagnostic imaging plays a central role in evaluation, with high-resolution CT allowing precise localization of the osseous defect, while MRI is instrumental in detecting associated encephaloceles or meningoceles [3]. If untreated, these breaches can serve as a portal for ascending infections, including life-threatening meningitis. Minimally invasive endoscopic repair techniques, particularly the bath-plug method, have demonstrated high success rates and low morbidity, making early diagnosis and timely intervention crucial. In this report, we describe the case of a spontaneous ethmoid osteo-dural breach, diagnosed through CT and MRI and managed successfully with endoscopic surgical repair [4].

CASE PRESENTATION

A 55-year-old female presented with several months of chronic headaches and intermittent episodes of clear, watery rhinorrhea from the left nostril. She denied any history of head trauma, sinonasal surgery, or prior neurological illness. Clinical examination revealed no signs of meningeal irritation or visual deficits.

A craniofacial computed tomography (CT) scan demonstrated two osseous defects at the level of the middle cranial base, involving the region of the spheno-temporal suture bilaterally, with a mild left-sided encephalocele. Additionally, a 2 mm osteo-dural breach was noted at the level of the left cribriform plate of the ethmoid bone (Figure 1).

Magnetic resonance imaging (MRI) confirmed these findings, revealing a hyperintense signal extending through the ethmoidal breach, consistent with an osteo-dural defect. No associated signal abnormalities or vascular anomalies were identified (Figure 2).

The patient underwent endoscopic endonasal repair via the bath-plug technique. The osteo-dural defect at the cribriform plate was sealed using autologous fat harvested from the abdominal wall, reinforced with a bone fragment obtained from the middle nasal concha. Postoperative imaging was performed to confirm anatomical closure of the breach (Figure 3).

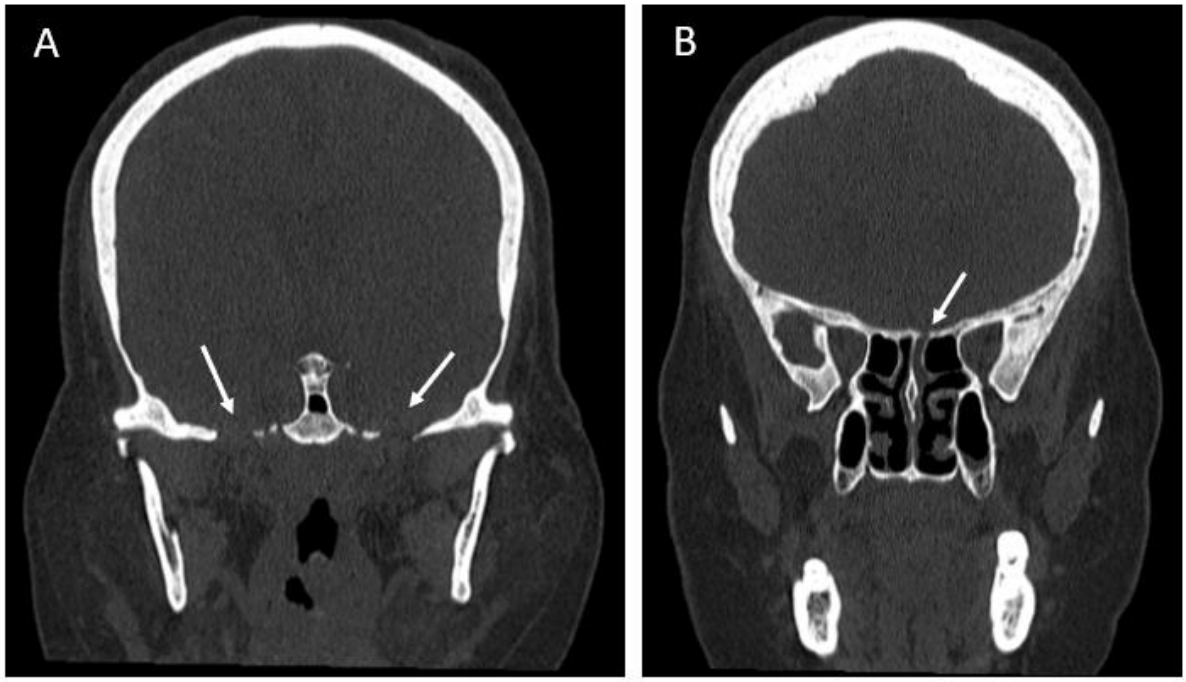

Figure 1: Coronal CT images (bone window) showing two skull base defects: one at the spheno-temporal suture with a subtle left encephalocele (A), and a second 2 mm defect in the left cribriform plate of the ethmoid bone (B)

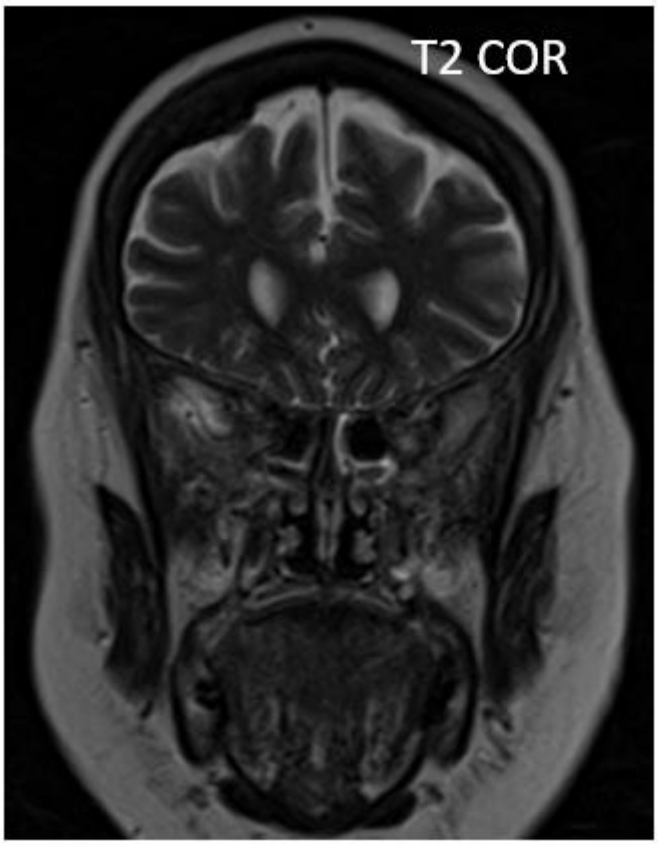

Figure 2: Coronal T2-weighted MRI showing a 2 mm osteo-dural defect in the left cribriform plate of the ethmoid bone, extending over 15 mm, with homogeneous T2 hyperintense signal

Figure 3: Coronal postoperative CT (bone window) demonstrating the bath-plug repair technique at the site of the left cribriform plate defect, with autologous fat graft in place and a bone fragment used for reinforcement

DISCUSSION

Spontaneous osteo-dural defects of the anterior skull base are a rare cause of cerebrospinal fluid (CSF) rhinorrhea, typically presenting without a history of trauma or prior surgical intervention [1]. Clinical symptoms are often subtle, with intermittent clear nasal discharge being the most common presentation. Chronic non-positional headaches may also occur and are sometimes the only reported symptom, delaying diagnosis. In some cases, recurrent bacterial meningitis may be the initial indicator of an unrecognized CSF leak [5].

Risk factors for spontaneous anterior skull base leaks include female sex, middle age, and elevated body mass index—all of which correlate strongly with idiopathic intracranial hypertension (IIH). IIH is increasingly recognized as a major underlying etiology, with sustained elevation of intracranial pressure leading to progressive thinning and erosion of structurally vulnerable areas like the cribriform plate and lateral lamella of the ethmoid bone. Imaging studies frequently reveal associated findings such as empty sella, meningoencephaloceles, or venous sinus stenosis [5].

Imaging plays a central and irreplaceable role in diagnosis and surgical planning. High-resolution computed tomography (CT) with sub-millimetric coronal and axial cuts is the gold standard for identifying bony defects of the skull base [3]. CT allows precise localization of the breach, identification of bilateral or multiple defects, and evaluation of pneumatization patterns that may predispose to dehiscence. In our case, CT confirmed a 2 mm bony defect in the left cribriform plate, along with symmetric temporal skull base thinning and a minor encephalocele. Magnetic resonance imaging (MRI) adds critical soft tissue resolution, enabling detection of associated meningoencephaloceles and assessment of brain parenchyma, cisterns, and any signs of elevated intracranial pressure. Sequences such as T2-weighted images and CISS 3D are particularly useful. MRI also rules out differential diagnoses and provides a noninvasive method to track postoperative healing.

When conservative management fails or when the risk of meningitis is high, surgical repair is indicated. Endoscopic endonasal repair has become the standard approach, offering superior visualization, reduced morbidity, and a high success rate—up to 95–100% in experienced hands. Several closure techniques have been described [4]. The “bath-plug” method, used in our case, involves plugging the defect with autologous fat (harvested here from the abdominal wall), which is then reinforced with fascia or bone to ensure a watertight seal. In this case, a bone fragment from the middle nasal concha was used for additional support. Other approaches include multilayer repair using combinations of fascia lata, cartilage, synthetic grafts, or mucosal flaps such as the Hadad-Bassagasteguy nasoseptal flap [4]. The choice of material depends on the size and location of the defect, presence of elevated CSF pressure, and surgeon preference. Intraoperative fluorescein or intrathecal contrast agents may be employed to confirm leak localization, especially in cases with multiple or occult defects [4].

CONCLUSION

Spontaneous osteo-dural defects of the anterior skull base, though rare, should be considered in patients presenting with unexplained clear rhinorrhea and chronic headaches, even in the absence of trauma or surgical history. High-resolution CT and MRI are essential for accurate localization and characterization of the defect, guiding effective surgical management. Endoscopic endonasal repair, particularly the bath-plug technique, offers a minimally invasive, high-success option for closure of small ethmoidal breaches. Early diagnosis and appropriate intervention are key to preventing complications such as recurrent leaks or meningitis.

Conflict of Interest: The authors declare no conflicts of interest.

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