

## CASE REPORT

# A Rare Case of Pediatric Self-inflicted Meningoencephalocele

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## ABSTRACT

Cerebrospinal fluid (CSF) rhinorrhea is common in traumatic penetrating nasal injuries. In the pediatric age group, we often encounter self-inflicted foreign body injuries of blunt type, which rarely leads to any complications. We came across a case of CSF rhinorrhea due to self-inflicted penetrating nasal injury, after 7 years of initial injury. In this case, the sharp end of a screw nail had injured the fovea ethmoidalis and caused a meningoencephalocele on removal, which had been asymptomatic until 4 years ago, when the patient came with CSF rhinorrhea. Miraculously, there were no complications in the period before presentation and after surgical correction.

**Keywords:** Cerebrospinal fluid rhinorrhea, Endonasal approach, Pediatric trauma, Screw nail trauma

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## INTRODUCTION

Meningoencephalocele (Latin – cranium bifidum)<sup>1,2</sup> is the protrusion of meninges and brain tissue with cerebrospinal fluid (CSF) rhinorrhea through a skull base defect. Congenital meningoencephaloceles are due to neural tube defects. There are two main types of meningoencephalocele, which are named according to the location of the sac. The frontoethmoidal type is located at the frontal and ethmoidal bones, while the occipital type is located at the occipital bone. The condition is typically congenital (present at birth), but has been reported to develop by chance in older individuals in rare cases. The underlying cause of the condition is uncertain, but environmental factors are thought to play a role. Treatment depends on the size, location, and severity of the defect, but mainly includes magnetic resonance imaging to determine the severity of the defect, followed by surgery to repair it.<sup>3</sup>

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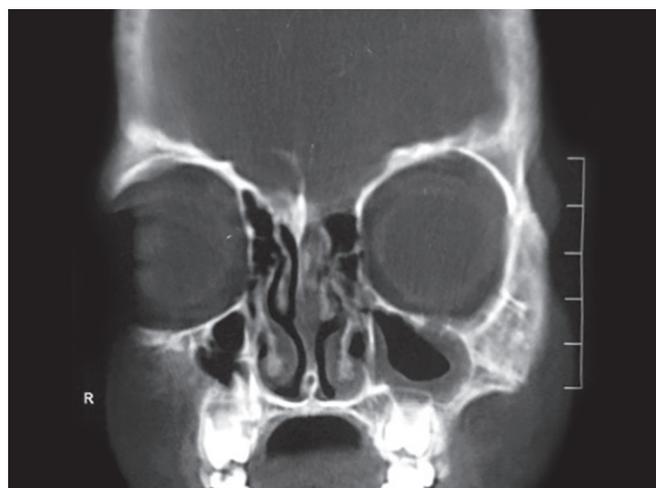
Here we report on a patient with posttraumatic meningoencephalocele who presented 7 years after trauma with CSF rhinorrhea due to condition being rare in pediatric age group, wherein it is generally congenital mode of presentation.

## CASE REPORT

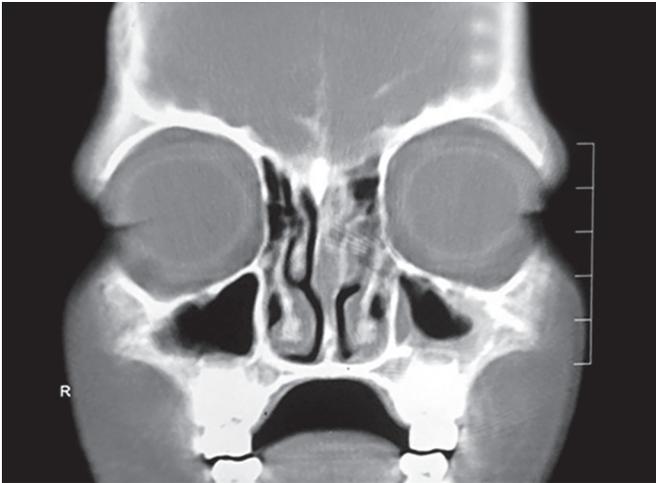
An 11-year-old male child came to the outpatient department with complaints of watery nasal discharge from the left side of nose for the last 3 years, with increase in discharge in the mornings. The mother gave a history of trauma to the child's nose 7 years earlier: The child had inserted a screw nail into his left nostril when he was 3 years old; there was some bleeding when it was removed. There were no major complaints until 3 years ago when he started having nasal discharge on and off. It progressed to increased nasal discharge with noticeable nasal drip (reservoir sign) in the early mornings when the child woke up from sleep.

The child was admitted and workup proceeded. The nasal fluid was confirmed as CSF with biochemical analysis. Computerized tomogram of paranasal sinuses with anterior skull was taken, which showed a defect in the left fovea ethmoidalis. Computed tomography cisternography was done to confirm the leak site (Figs 1 to 3).

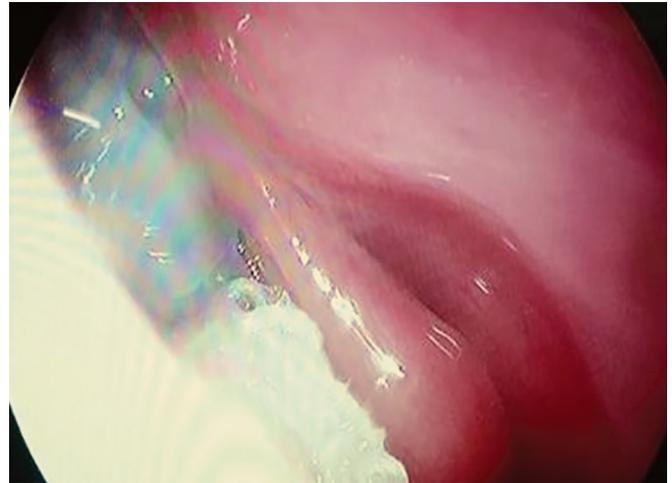
Under aseptic conditions and under general anesthesia diagnostic nasal endoscopy revealed a nonviable



**Fig. 1:** Computed tomography paranasal sinus showing left-sided fovea ethmoidal defect with meningoencephalocele



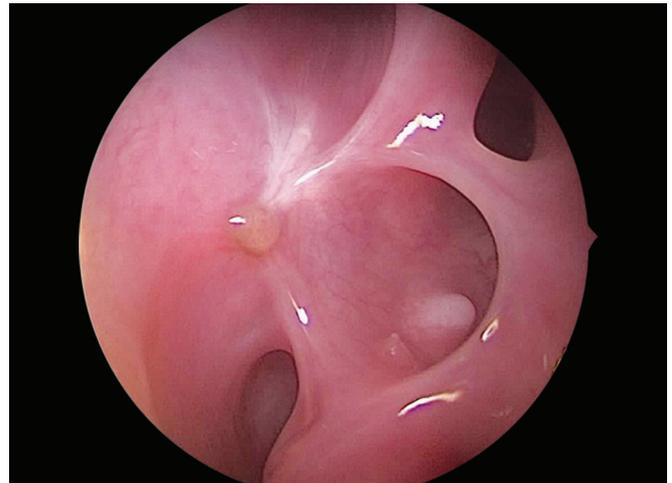
**Fig. 2:** Computed tomography cisternography showing fovea ethmoidalis leak on the left



**Fig. 3:** Preoperative diagnostic nasal endoscopic view of meningoencephalocele medial to middle turbinate on the left nasal cavity



**Fig. 4:** Preoperative diagnostic nasal endoscopic view of meningoencephalocele medial to middle turbinate on the left nasal cavity



**Fig. 5:** Preoperative diagnostic nasal endoscopic view of meningoencephalocele medial to middle turbinate on the left nasal cavity

meningoencephalocele medial to left middle turbinate with CSF leak from its site of defect.

Transnasal endoscopic leak closure of defect<sup>4</sup> was done with the help of Hopkins Rigid Rod II endoscope. The nonviable brain tissue was cauterized with radiofrequency bipolar cautery and defect closure done using septal cartilage, fascia lata, and muscle and fat tissue. In addition, tissue glue was used in a sandwich manner to reinforce the layered closure (Fig. 4).

Follow-up diagnostic nasal endoscopy was done at 3 weeks and at 4 months in the postoperative period. The graft had taken up well and there was no active leak (Fig. 5).

## DISCUSSION

Until the 1940s, Dandy's bifrontal craniotomy<sup>4</sup> was the procedure of choice for CSF leak repairs, the main disadvantage of it being its permanent anosmia and

morbidity. Approaches described by Dohlman and Chandler through ethmoidal sinus externally posed the middle turbinate resection as a disadvantage. With the advent of straight and angle scopes and fiber optic camera cable system, transnasal closure was possible, which eliminated the disadvantages of anosmia and external incision.

The etiology of CSF leaks<sup>1</sup> is shown in Table 1.

Cerebrospinal fluid is produced by choroidal plexus in the lateral, 3rd, and 4th ventricles of brain. The intracranial CSF volume has been estimated at 123 mL. It is secreted at the rate of 0.35 to 0.4 mL/minute; 50% is replaced in 5 to 6 hours. Historically, the most common cause of CSF leak was trauma. Spontaneous leaks and

**Table 1:** The etiology of CSF leaks

Iatrogenic	17%
Trauma	3%
Spontaneous	7%

Table 2: Causes

<i>Congenital</i>	<i>Idiopathic</i>	<i>Surgical trauma</i>	<i>Nonsurgical trauma</i>	<i>Inflammatory</i>	<i>Neoplasm</i>
Meningocele (or) meningoencephalocele	Unknown cause	Intranasal injury Endoscopic sinus surgery	Skull base fractures	Erosive lesions – mucocoeles, polypoid disease, cystic fibrosis, fungal sinusitis, osteomyelitis	Neoplasms invading skull base
Congenital skull base defects		Transcranial approaches to middle and posterior cranial fossa	Open or penetrating injuries	Postinfective hydrocephalus	Intracranial abnormalities causing hydrocephalus
Congenital hydrocephalus			Posttraumatic hydrocephalus		

congenital causes are rare. The risk of developing one or more episodes has been quoted between 5.6 and 60%. Time of onset of CSF rhinorrhea and meningitis can vary from 2 to 2,285 days (Table 2).<sup>4</sup>

Encephaloceles are generally congenital.<sup>2</sup> Incidence (1 in 12,500) in live births does not reflect true statistics as may occur in stillborns. There has been no reported familial association or sex predilection; 40% have other associated anomalies. Based on their presentation, encephaloceles have been divided into occipital, sincipital, and basal types. Embryological encephalocele is believed to be due to faulty closure of foramen cecum in the 3rd week of fetal development, leading to potential extranasal/nasofrontal path of herniation of brain tissue covered with meninges. Sincipital encephaloceles (nasal dorsum, orbits, forehead with external mass), basal encephaloceles (nasal cavity, nasopharynx, or posterior aspect of orbits). Encephaloceles may be subdivided with respect to their contents as meningoceles, encephalomeningocele, and encephalomeningocystocele.<sup>2</sup>

A viable meningoencephalocele is smooth, gray pink, glistening, and pulsating in nature. When herniated brain tissue is necrotic, it is yellow-white and nonpulsatile. The nonviable tissue is resected without shearing force, and the defect is closed by graft with its epithelial layer facing the cranial vault.<sup>4</sup>

Cerebrospinal fluid leak management lies in the identification of dural tear. In cases of blood with CSF, the fluid appears dark due to CSF not being reflective as the surrounding blood.<sup>5</sup> Cribriform leaks with or without meningoceles pose the challenge of accessibility due to narrow olfactory groove and immobility of middle turbinate. The mucosa surrounding the defect is elevated

for at least 5 mm in all directions to create a circumferential raw surface for graft and provide a flat recipient surface by removing redundant ethmoidal mucosa. Small lesions (of meningoceles and meningoencephaloceles) are cauterized at base and excised. Larger lesions are managed by resetting mucosa of the surface and reducing with debrider or radiofrequency cautery and supported with bone or cartilage graft.<sup>5,6</sup>

## CONCLUSION

Screw nail and such penetrating foreign bodies penetrating the nose should always be carefully handled to prevent inadvertent morbidity in terms of complications. Smooth and gentle extraction followed by examination of site of injury is the need of the hour.

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