

Differentiation Between Spontaneous Cerebrospinal Fluid Rhinorrhea and General Rhinorrhea

Vincent Honrubia, MD, FACS¹; LeRoy Garza Jr; Victor Espinoza, Andrea Morrison; Blake Hensler, MPAS, PA-C¹

¹South Texas Sinus Institute

ABSTRACT

Introduction

Spontaneous CSF rhinorrhea can be mistaken for general rhinorrhea, or a runny nose, leading to false diagnosis and prolonging symptoms. This study attempts to establish a diagnostic tool to better differentiate between spontaneous CSF and non-CSF rhinorrhea to improve early diagnosis rates and reduce the morbidity of CSF leaks.

Methods

Data was collected using Google Scholar and PubMed databases. Inclusion criteria encompassed case reports and case series on spontaneous CSF leak with rhinorrhea between 2014 and 2024. Patients were excluded if they had a history of trauma and prior nasal surgeries. A total of 128 patients met the inclusion criteria.

Results

One hundred and three patients (80.5%) were female and twenty-five (19.5%) were male. The average age of the patients was 46.1. Of the one hundred and thirteen patients (88.3%) with a recorded BMI index, the average was 32.2. Twenty-nine (22.7%) patients presented with headaches. Forty-three patients (33.6%) presented with empty sella syndrome. Sixty (46.9%) patients had a skull defect in the cribriform plate, eighteen (14.1%) in the ethmoid, twenty (15.6%) in the central sphenoid, seventeen (13.3%) in the sphenoid lateral recess, seven (5.5%) in the clivus, and two (1.6%) in the sphenoid-ethmoid region.

Conclusions

This case series supported previously suggested diagnostic criteria and analyzed "high risk" characteristics to expand the criterion. The major indicators of spontaneous CSF rhinorrhea should include (1) unilateral nasal leakage of clear fluid, (2) skull defects in the cribriform plate, ethmoid bone, sphenoid bone, or clivus, (3) empty sella syndrome, and (4) headaches. Additional indicators include (1) being female, (2) middle age or older, and (3) clinically overweight or obese (BMI \geq 25).

CONTACT

Vincent Honrubia, MD, FACS
South Texas Sinus Institute
American Sinus Institute
vhonrubia@aol.com
(956) 661.8200

INTRODUCTION

Cerebrospinal fluid (CSF) supports the cranium by cushioning the skull against external forces and maintaining intracranial pressure (ICP). Weaknesses in the skull potentiate cranial CSF leaks which manifest as CSF otorrhea or rhinorrhea. Current literature suggests idiopathic intracranial hypertension (IIH) and elevated ICP play a significant role in weakening the skull creating spontaneous CSF leaks. Symptoms of cranial CSF leaks include headaches, hearing loss, a metallic taste in the mouth, and, in severe cases, meningitis. By identifying common indicators in spontaneous CSF cases, primary care physicians can diagnose CSF earlier and reduce the frequency of symptoms.

METHODS

A review of the literature was conducted to identify reported cases of spontaneous cerebrospinal fluid (CSF) rhinorrhea. Relevant publications between 2014 and 2024 were retrieved through Google Scholar and PubMed databases. Cases were included if they provided demographic data, body mass index (BMI), presenting symptoms, and anatomical location of the skull base defect. Instances of empty sella syndrome were also recorded. Descriptive statistics were used to summarize patient demographics and skull base defect distribution. Results were then compiled to identify recurrent patterns that support the development of diagnostic criteria for spontaneous CSF rhinorrhea.

RESULTS

A total of 128 patients were included in this review. The majority were female (80.5%, n=103), with males comprising 19.5% (n=25). The mean age was 46.1 years. Among the 113 patients with documented BMI, the average was 32.2. Headaches were reported in 22.7% (n=29) of patients, while 33.6% (n=43) presented with empty sella syndrome. Analysis of skull base defects revealed that the cribriform plate was the most frequently affected site (46.9%, n=60), followed by the central sphenoid (15.6%, n=20), ethmoid (14.1%, n=18), sphenoid lateral recess (13.3%, n=17), clivus (5.5%, n=7), and the sphenoid-ethmoid junction (1.6%, n=2).

Gender Distribution

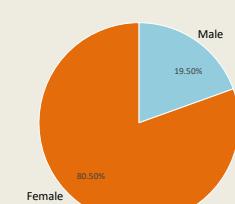


Chart 1. Gender distribution of all patients (n=128).

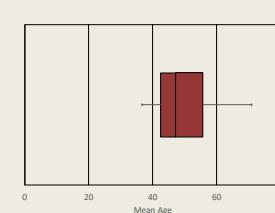


Chart 2. Mean age distribution of all patients (n=128).

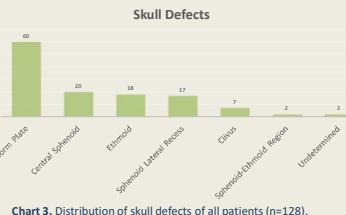


Chart 3. Distribution of skull defects of all patients (n=128).

DISCUSSION

This review highlights the demographic and clinical patterns strongly associated with spontaneous CSF rhinorrhea. Prominent risk factors reported in the literature include middle-aged, overweight females with elevated BMI and history of idiopathic intracranial hypertension. In addition, chronic fluctuations in intracranial pressure may weaken the skull base, resulting in meningocele/meningoencephalocele formation. These herniations generate leakage sites leading to spontaneous CSF leaks. The major involvement of skull base defects in spontaneous CSF leaks underscores the necessity of targeted imaging in suspected cases. Empty sella syndrome is a radiologic finding uniquely associated with CSF infiltration and serves as a prominent indicator of CSF leak.

CONCLUSIONS

These findings suggest that patients presenting with unilateral clear rhinorrhea and any combination of skull base defects, empty sella syndrome, headaches, or high BMI should be evaluated for spontaneous CSF leak to reduce diagnostic delays and prevent complications. While this data strengthens the evidence for diagnostic criteria, this review is limited by reliance on case reports and series, which may introduce publication bias and reduce generalization of spontaneous CSF cases. Further studies with larger sample sizes are needed to validate this criteria and clarify the link between IIH and ICP in spontaneous CSF pathogenesis.

REFERENCES

- Alzahr, B. S., Alzahr, H. A., Alzahr, A. R., & Blal, I. H. (2023). Case report: Recurrent spontaneous cerebrospinal fluid (CSF) leak. *Surgery Case Reports*, 100, 107739. <https://doi.org/10.1016/j.scr.2022.107739>
- Attye, A., Righini, C., Roy, E., Gual, J., Schmetter, S., Karkas, A., & Quatra, F. (2019). Spontaneous cerebrospinal fluid leak: A case report and review of the literature. *Journal of Clinical Neuroscience: The Official Journal of the International Society for Clinical Neurosciences*, 26, 1045-1048. <https://doi.org/10.1016/j.jocn.2018.09.030>
- Bastani Vouragh, S., Agha, A., Lawler, M., Fraser, C., & Gotsis, M. (2024). Non-invasive assessment of intracranial pressure through the eyes: current developments and future directions. *Journal of Clinical Neurology*, 21(1442811). <https://doi.org/10.3892/jcn.2024.1442811>
- Chakrabarti, N., Illing, E., Riley, P., & Woodward, B. A. (2023). Spontaneous cerebrospinal fluid leak: A review of the literature. *The Laryngoscope*, 134(1), 19-27. <https://doi.org/10.1002/lary.24421>
- Chen, Y., Li, Y., Li, Y., & Guo, Y. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442811). <https://doi.org/10.3892/jcn.2023.1442811>
- Deb, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442812). <https://doi.org/10.3892/jcn.2023.1442812>
- Deb, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442813). <https://doi.org/10.3892/jcn.2023.1442813>
- Jiang, Z. Y., McLean, C., Perez, C., Barnett, S., Friedman, D., Tajeihian, B., & Batra, P. (2021). Surgical Outcomes and Postoperative Management in Spontaneous CSF Leaks. *Journal of Clinical Neurology*, 18(1442814). <https://doi.org/10.3892/jcn.2021.1442814>
- Keshri, A., Jain, A., Mangrulkar, R., Behari, S., Khatri, D., & Mathur, A. (2018). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 15(1442815). <https://doi.org/10.3892/jcn.2018.1442815>
- Li, S., Lu, T., Wang, Y., Guo, M., Ma, R., Li, S., & Bi, B. (2023). Spontaneous Cerebrospinal Fluid Rhinorrhea and Headache: A Case Report and Literature Review. *Journal of Clinical Neurology*, 20(1442816). <https://doi.org/10.3892/jcn.2023.1442816>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442817). <https://doi.org/10.3892/jcn.2023.1442817>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442818). <https://doi.org/10.3892/jcn.2023.1442818>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442819). <https://doi.org/10.3892/jcn.2023.1442819>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442820). <https://doi.org/10.3892/jcn.2023.1442820>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442821). <https://doi.org/10.3892/jcn.2023.1442821>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442822). <https://doi.org/10.3892/jcn.2023.1442822>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442823). <https://doi.org/10.3892/jcn.2023.1442823>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442824). <https://doi.org/10.3892/jcn.2023.1442824>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442825). <https://doi.org/10.3892/jcn.2023.1442825>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442826). <https://doi.org/10.3892/jcn.2023.1442826>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442827). <https://doi.org/10.3892/jcn.2023.1442827>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442828). <https://doi.org/10.3892/jcn.2023.1442828>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442829). <https://doi.org/10.3892/jcn.2023.1442829>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442830). <https://doi.org/10.3892/jcn.2023.1442830>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442831). <https://doi.org/10.3892/jcn.2023.1442831>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442832). <https://doi.org/10.3892/jcn.2023.1442832>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442833). <https://doi.org/10.3892/jcn.2023.1442833>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442834). <https://doi.org/10.3892/jcn.2023.1442834>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442835). <https://doi.org/10.3892/jcn.2023.1442835>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442836). <https://doi.org/10.3892/jcn.2023.1442836>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442837). <https://doi.org/10.3892/jcn.2023.1442837>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442838). <https://doi.org/10.3892/jcn.2023.1442838>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442839). <https://doi.org/10.3892/jcn.2023.1442839>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442840). <https://doi.org/10.3892/jcn.2023.1442840>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442841). <https://doi.org/10.3892/jcn.2023.1442841>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442842). <https://doi.org/10.3892/jcn.2023.1442842>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442843). <https://doi.org/10.3892/jcn.2023.1442843>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442844). <https://doi.org/10.3892/jcn.2023.1442844>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442845). <https://doi.org/10.3892/jcn.2023.1442845>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442846). <https://doi.org/10.3892/jcn.2023.1442846>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442847). <https://doi.org/10.3892/jcn.2023.1442847>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442848). <https://doi.org/10.3892/jcn.2023.1442848>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442849). <https://doi.org/10.3892/jcn.2023.1442849>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442850). <https://doi.org/10.3892/jcn.2023.1442850>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442851). <https://doi.org/10.3892/jcn.2023.1442851>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442852). <https://doi.org/10.3892/jcn.2023.1442852>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442853). <https://doi.org/10.3892/jcn.2023.1442853>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442854). <https://doi.org/10.3892/jcn.2023.1442854>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442855). <https://doi.org/10.3892/jcn.2023.1442855>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442856). <https://doi.org/10.3892/jcn.2023.1442856>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442857). <https://doi.org/10.3892/jcn.2023.1442857>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442858). <https://doi.org/10.3892/jcn.2023.1442858>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442859). <https://doi.org/10.3892/jcn.2023.1442859>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442860). <https://doi.org/10.3892/jcn.2023.1442860>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442861). <https://doi.org/10.3892/jcn.2023.1442861>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442862). <https://doi.org/10.3892/jcn.2023.1442862>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442863). <https://doi.org/10.3892/jcn.2023.1442863>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442864). <https://doi.org/10.3892/jcn.2023.1442864>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442865). <https://doi.org/10.3892/jcn.2023.1442865>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442866). <https://doi.org/10.3892/jcn.2023.1442866>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442867). <https://doi.org/10.3892/jcn.2023.1442867>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442868). <https://doi.org/10.3892/jcn.2023.1442868>
- Malik, S., Bhattacharya, S., & Bhattacharya, S. (2023). Spontaneous cerebrospinal fluid leak: A case report. *Journal of Clinical Neurology*, 20(1442869). <a href="https://doi.org/10.3892/jcn.