

Introduction

Sinus retention cysts (RCs)

- RCs are the most common incidental finding within the paranasal sinuses, particularly the maxillary sinus.¹⁻²
- These cysts form when the secretory ducts of the sinus mucosa are blocked and secretions accumulate.³
- The prevalence is estimated at around 12.3% in the general population, and RCs are often found on dental or sinus images.¹⁻³
- They are most often asymptomatic, but can be a cause of chronic rhinosinusitis, headache or facial pain, or nasal obstruction.¹
- The etiology is unclear, although factors that may contribute to their development include anatomic variations, allergies, and inflammation.^{1,2,4}

Cerebrospinal fluid (CSF) rhinorrhea

- CSF rhinorrhea is the most concerning diagnosis in patients with unilateral acute-onset watery rhinorrhea.^{4,5}
- CSF rhinorrhea presents as continuous and profuse watery discharge, often with recent head trauma or craniofacial surgery. Also can be spontaneous if caused by intracranial hypertension, skull base tumors, or congenital defects.^{5,6}
- The most common associated symptom is headache, as well as dizziness, tinnitus, ear fullness, nausea, or neck stiffness.⁶
- It is best diagnosed by CT of the paranasal sinuses and skull base, and can also be seen with MRI, nasal endoscopy, or laboratory analysis of secretions.⁶
- This diagnosis can be fatal if missed, and can also cause meningitis, intracranial abscess, or pneumocephalus if treatment is delayed.^{5,6}

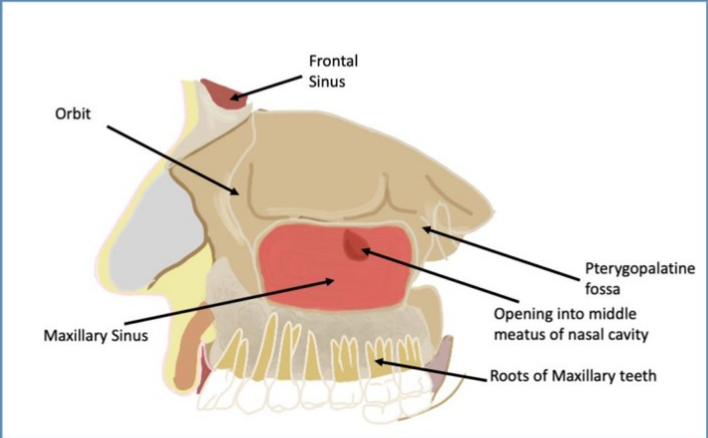


Figure 1: An overview of maxillary sinus anatomy⁷

References

1. Aghaee F, Moudi E, Vahdani N, Bijani A, Haghanifar S. Evaluation of anatomical variations of the maxillary sinus in patients with and without mucous retention cyst. *Ear Nose Throat J*. 2023. doi:10.1177/01455613231206284
2. Bhattacharyya N. Do maxillary sinus retention cysts reflect obstructive sinus phenomena? *Arch Otolaryngol Head Neck Surg*. 2000;126(11):1369–1371. doi:10.1001/archotol.126.11.1369
3. Dogan ME, Uluoglu N, Yuvarlakbay SD. Retrospective analysis of pathological changes in the maxillary sinus with CBCT. *Sci Rep*. 2024;14(1):15529. doi:10.1038/s41598-024-66527-7
4. Hoang JK, Smith EO, Barboriak DP. Ruptured maxillary retention cyst: cause of unilateral rhinorrhea after trauma. *AJNR Am J Neuroradiol*. 2009 Jun;30(6):1121-2. doi: 10.3174/ajnr.A1457
5. Choi YS, Lee Y, Park MJ. Sudden-onset projectile rhinorrhea from the right nostril. *Hong Kong J Emergency Med*. 2024;31:267–271. doi.org/10.1002/hkj2.12042
6. Minak J, Carmody K. The man with a persistently runny nose. *Am J Emerg Med*. 2014;32(1). doi:10.1016/j.ajem.2013.08.021
7. Maxillary sinus. *The Nasal Cavity*. Published August 14, 2020. Accessed December 3, 2024.
8. Moon U, Kim SW, Han DH, et al. Mucosal cysts in the paranasal sinuses: long-term follow-up and clinical implications. *Am J Rhinol Allergy*. 2011;25(2):96-102. doi:10.2500/ajra.2011.25.3567

Case Presentation

Chief complaint:

 "My nose had a leak."

HPI – 17 y/o female presents to her pediatrician for an hour-long episode of spontaneous, unilateral, clear-yellow nasal discharge. She had leaned over to sign her attendance sheet at school when her right nostril started pouring out clear fluid "like a faucet." She caught this discharge on a tissue which appeared clear-yellow and serous. The patient reported this has happened twice previously, once in January 2023 and again in July 2024, and recorded a video of one instance where the right nostril can be seen dripping continuously. All instances spontaneously started and stopped. At an ENT visit in September 2024, nasal endoscopy was performed and revealed no abnormalities. A head CT was recommended at that time, which was declined by her parent due to concerns for radiation. Recently she had also been experiencing intermittent headaches that made her "head feel swollen." She has not noticed a pattern to the headache but they have been significant enough to occasionally keep her home from school. She denies all other URI symptoms, neurologic changes, or recent trauma.

History

- ROS**
 - Constitutional** – denies fever, chills, fatigue.
 - Neuro** – headaches, per HPI. Denies visual changes, dizziness, loss of consciousness.
 - Ears** – denies ringing in the ears, ear discharge, ear pain.
 - Nose** – unilateral nasal discharge, per HPI. Denies congestion, trauma to the nose, changes in sense of smell.
 - Mouth/throat** – denies sore throat, difficulty swallowing, salty or metallic taste.
 - Neck** – denies neck rigidity.
- PMH**
 - Mononucleosis, resolved
 - Palpitations, anxiety-induced
- PSH**
 - None
- Medications**
 - None
- Allergies**
 - Seasonal
- Family history**
 - Unremarkable
- Social history**
 - High school senior
 - Moderate stress levels
 - Lives at home with family
 - Denies EtOH, smoking, or drug use

Physical Exam

- Vitals** – 98 °F | 16 breaths/min | 80 bpm | 110/76 mmHg
- General** – Alert and oriented. Speech fluent and appropriate. Anxious but no apparent distress.
- Neuro** – Normal gait. 5/5 grip strength bilaterally.
- Head** – Normocephalic, atraumatic.
- Eyes** – PERRLA. Extraocular movements intact.
- Nose** – External nose midline, symmetric, and free of swelling or bruising. Nostrils patent bilaterally. Nasal mucosa is pink and free of discharge bilaterally, free of visible trauma or lesions.
- Cardio/Pulm** – S1/S2 appreciated. Lungs clear and equal bilaterally, no increased work of breathing.

Workup and Diagnostics

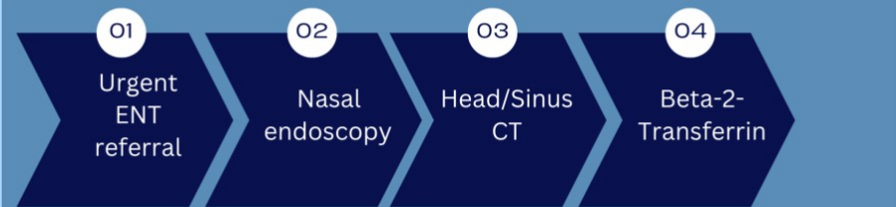


Figure 2: Stepwise diagnostic workup

- Urgent ENT consult and appointment scheduled for the following morning
- Nasal endoscopy
 - Right nasal passage with normal inferior, middle, and superior turbinates. Nasal passage patent with clear middle meatus and sphenoethmoid recess.
 - Left nasal passage with normal inferior, middle, and superior turbinates. Nasal passages patent with clear middle meatus and sphenoethmoid recess.
 - No mucopurulence or polyps appreciated.
 - Nasopharynx clear.
- Head / sinus CT
 - Maxillary sinuses: A 2.2 cm retention cyst involves the floor of the right maxillary sinus. A 1.8 cm retention cyst involves the floor of the left maxillary sinus.
 - No focal bony defects are noted along the floor of the anterior cranial fossa.
- Beta-2-transferrin sent to lab with sample of nasal discharge
 - Negative

Differential Diagnosis

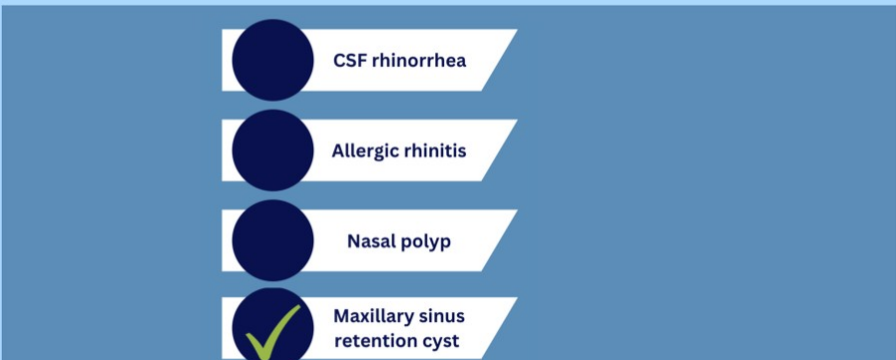


Figure 3: Differential diagnosis

Outcome and Treatment Plan

Final diagnosis – **bilateral maxillary sinus retention cysts with rupture of the right cyst**

- A subsequent episode of rhinorrhea occurred the night of her pediatrician visit, and a sample of the discharge was caught in a sterile urine cup to be sent for culture
- Neurology referral for headaches
- Expectant management vs surgical intervention – opted for expectant management at this time pending subsequent episodes of rhinorrhea or continuity of headaches

Discussion

- RCs are best seen on CT as homogenous, round or dome-shaped, well-circumscribed lesions originating from the wall or floor of the sinus.^{1,6}
- Choi et al⁵ reported a similar case of a healthy 42 y/o male with projectile unilateral discharge with no other symptoms or trauma. Urgent CT with contrast revealed a retention cyst with scalloped edges indicating it had ruptured, as seen in Figure 4.

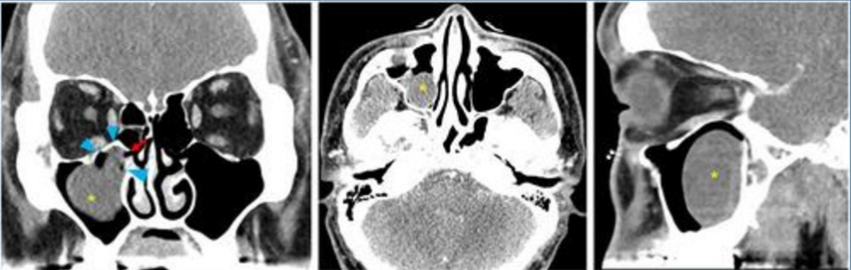


Figure 4: CT sinus imaging showing a maxillary retention cyst with signs of rupture, as indicated by its scalloped edges⁵

- This presentation was also reported by Hoang et al⁴ in an 18 y/o female, but in the setting of head trauma after a cheerleading maneuver. She happened to have imaging the day prior which revealed a RC, and imaging after the trauma revealed a fluid-level consistent with rupture.
- Minak and Carmody⁶ presents the case of a 67 y/o M with a one month history of a dripping nose and band-like that was found to have a meningoencephalocele projecting into the ethmoid sinus and causing a CSF leak.
- Beta-2-transferrin is a protein that is a highly specific biomarker for CSF in secretions, but results can take 1+ weeks.^{5,6}
- Endoscopic removal is an option for symptomatic RCs, although its efficacy is debated given RCs often spontaneously resolve and often recur after intervention.^{1,8}
- Risk factors for RC progression include bilateral cysts and cysts >20 mm at initial diagnosis.⁸

Conclusion

- Sinus RCs are common and often incidentally found, but their presentation may be more variable and problematic than previously documented.
- CSF rhinorrhea is a “can’t miss” diagnosis, but can be promptly and accurately worked up in both emergency and outpatient settings.