CASE REPORT

More than just a 'runny nose': a rare diagnosis of spontaneous CSF rhinorrhoea for a common symptom

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SUMMARY

Primary spontaneous cerebral spinal fluid (CSF) rhinorrhoea is a rare disease associated with female gender, obesity and empty sella syndrome. The authors describe the case of a 59-year-old woman who presented to her primary care physician with a 2-week history of drainage of a clear fluid from her right nostril that was initially treated as allergic rhinitis. A non-contrast CT scan revealed mucosal thickening in the right sphenoid sinus and a possible defect in the adjacent skull base. The patient initially declined a CT cisternogram, which provides greater sensitivity in assessing for a CSF leak. Nasal secretions tested positive for β -2-transferrin, which is highly sensitive and specific for CSF. After conservative interventions failed, a pedicled septal mucoperichondrial flap was used to patch the skeletal defect. At her 5-month follow-up, the patient remains asymptomatic.

BACKGROUND

Spontaneous cerebral spinal fluid (CSF) rhinorrhoea can be easily mistaken for more common causes of rhinorrhoea, including allergic rhinitis or viral upper respiratory infections. If unrecognised, the disease can be complicated by ascending meningitis or encephalitis. Furthermore, the presence of CSF rhinorrhoea may coincide with an underlying intracranial abnormality, such as a pituitary adenoma or intracranial hypertension.^{1–7} As such, spontaneous CSF rhinorrhoea is a rare but important disease that should be recognised by the general internist and primary care physician. If CSF rhinorrhoea is suspected, nasal secretions should be tested for β -2-transferrin, which is highly sensitive and specific for CSF.⁸ Subsequent tests should include CT of the head to assess for skull base defects. Additional imaging with intrathecal radiocontrast may be required if initial studies are equivocal. The success rate of treatment with endoscopic repair in combination with intracranial pressure-reducing therapy approaches 95%.¹

CASE PRESENTATION

A 59-year-old woman with seasonal allergies presented to her primary care physician with a 1-week history of rhinorrhoea. Her symptoms began with a temperature of 37.8°C, headache and nuchal rigidity. These symptoms resolved the following day, but rhinorrhoea from her right nostril began. By the third day of her illness, she was soaking through cotton swabs placed in her right nostril every 30 min. The fluid drainage was exacerbated by Valsalva and neck flexion. She denied any recent

or past head trauma. At a local urgent care clinic on the third day of symptoms, she was diagnosed with allergic rhinitis and instructed to continue her regular antihistamine (cetirizine 10 mg orally four times a day) and begin pseudoephedrine 120 mg orally twice daily. She noted a modest reduction in fluid drainage with this treatment, but she still required cotton plugs to go about her daily activities. On the fifth day of her illness, she contacted the office of her primary care physician. She was instructed to try intranasal oxymetazoline and return to care if her symptoms did not improve. On the seventh day of her illness, she presented to her primary care physician without improvement of the drainage from her right nostril.

Her medical history is notable for obesity, asthma, hypertension, gout, osteoarthritis and depression. Medications on presentation included an albuterol inhaler PRN, acetaminophen 1000 mg Q8H PRN, allopurinol 300 mg twice daily, celecoxib 200 mg twice daily, cetirizine 10 mg four times a day, citalopram 40 mg once a day, gabapentin 300 mg twice daily, hydromorphone 2–4 mg Q4H PRN, pseudoephedrine 120 mg twice daily and oxymetazoline 0.05% intranasal 2–3 sprays per nostril twice daily.

Her family history includes coronary artery disease in her father, who required bypass grafting at age 67. Her father also had prostate cancer and her mother passed away with lymphoma.

The patient is single and lives alone in Massachusetts. She previously worked as a nurse, but she has not been employed for many years due to chronic joint pain. She is a previous smoker who quit 30 years ago and she occasionally drinks alcohol. She denies any current or previous illicit drug use.

On physical examination, the patient was a well appearing, obese (body mass index of 37.2) Caucasian woman with stable vital signs and normal temperature. Nasal examination revealed clear fluid draining from her right nostril. There was also septal deviation to the left and mild turbinate oedema. The nasal mucosa was not erythematous or dusky in appearance. No masses were visualised in the nasal cavity and there was no sinus tenderness. The eye, ear, throat and neck examinations were unremarkable. Her cranial nerves were found to be intact and her visual field was full to confrontation.

INVESTIGATIONS

The white cell count was 11 400/ μ L and the remainder of the complete blood count was within

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normal limits. A sample of her nasal secretion was sent to an outside laboratory for β -2-transferrin analysis. A CT scan on the day of her presentation to the primary care clinic demonstrated mucosal thickening in the right sphenoid sinus and a possible defect in the adjacent cranial wall (figure 1). Our radiology colleagues recommended correlation with a CT scan with intrathecal contrast (CT cisternogram) to confirm the presence of a skeletal defect. The patient declined to undergo this invasive study and instead wait for the results of the β -2-transferrin assay. A course of amoxicillin/clavulanic acid (875 mg/125 mg) was subsequently started as an outpatient to empirically treat for bacterial sinusitis and as prophylaxis against meningitis. Three days after her initial presentation, the results of the nasal secretion analysis returned positive for β -2-transferrin. We consulted our neurosurgical colleagues for an apparent CSF leak, and the patient was admitted for observation and management. A CT cisternogram confirmed the presence of a skeletal defect in the lateral wall of the right sphenoid sinus (figure 2). MRI with and without intravenous contrast was performed for operative planning and to assess for intracranial masses. No intracranial masses were identified and the sella turcica was found to be empty (figure 3).

DIFFERENTIAL DIAGNOSIS

The most common cause of rhinorrhoea is allergic rhinitis, which affects up to 30% of the adult population.⁹ The differential for rhinorrhoea is broad, however, and includes infectious, structural, hormonal, vasomotor and traumatic processes. Non-allergic rhinitis is a diagnosis of exclusion after negative allergen testing, including IgE and skin hypersensitivity tests.¹⁰ Our patient was initially managed with over-the-counter pharmaceuticals indicated for both allergic and non-allergic causes of rhinorrhoea. Topical anticholinergics or cromoglycate could have also been trialled before an extranasal source was pursued.¹¹ CSF rhinorrhoea was ultimately investigated without allergy testing or further empiric treatment due to the absence

Figure 1 Axial section of a maxillofacial CT without contrast shows a discontinuity in the lateral wall of the right sphenoid sinus (arrow) with associated mucosal thickening and fluid (arrowhead). Our radiology colleagues recommended correlation with a CT cisternogram to confirm the presence of a skeletal defect.

Figure 2 Coronal section of a maxillofacial CT with intrathecal radiocontrast (CT cisternography) is shown. A defect in the lateral wall of the right sphenoid sinus (black arrowhead) was demonstrated with a dense air-fluid level representing extracranial contrast, confirming the presence of a cerebral spinal fluid leak.

of associated nasal symptoms (sneezing, itching and congestion) and Valsalva-dependent nasal flow, which suggested a dependence on intracranial pressure.

TREATMENT

Three days after presentation to the primary care clinic, the results of the β -2-transferrin assay returned positive and the patient was admitted for conservative treatment with intracranial pressure-reducing therapy (lumbar drain, bed rest and acetazolamide 250 mg orally three times a day). These interventions failed to resolve her rhinorrhoea after 5 days. On the eighth day of admission, the otolaryngology and neurosurgery teams jointly performed an endoscopic repair of the cranial defect in the right sphenoid sinus with a pedicled septal mucoperichondrial flap. The patient received 2 mg of cefazolin intravenous Q8H for the entirety of her 14-day admission. The patient was

Figure 3 Sagittal MRI (fluid attenuated inversion recovery T1) shows an empty appearance in the sella turcica (arrow). This finding is likely the result of increased intracranial pressure causing dural herniation into the sellar space.¹⁹ This displaces the pituitary gland superiorly, giving the appearance of an empty sella, which is associated with spontaneous cerebral spinal fluid rhinorrhoea.^{11 14}

discharged without antibiotics or an agent for reducing intracranial pressure.

OUTCOME AND FOLLOW-UP

The patient was discharged on the 14th day of admission and the 6th day postoperation without nasal secretion, pain, headache, fever or nuchal rigidity. At 4 months postoperation, the patient remains asymptomatic and she has retained her sense of smell.

DISCUSSION

CSF rhinorrhoea is the result of an abnormal communication between the arachnoid space and the nasal sinuses. These defects are classified as congenital, traumatic, neoplastic and spontaneous. Trauma to the skull base creates sheared pieces of bone that can puncture the meninges and allow CSF drainage. Pituitary adenomas can erode through the sellar space, creating a CSF fistula.¹² Patients with spontaneous CSF leaks are generally middle-aged obese women with skull base defects and a complete or partially empty sellar space.^{1 3-5 7 13 14} Multiple case studies and case reports have demonstrated an association between spontaneous CSF rhinorrhoea and idiopathic intracranial hypertension (IIH).²⁻⁷ Some patients with CSF rhinorrhoea present with classic symptoms of IIH, including headache, pulsatile tinnitus, transient visual disturbances or retrobulbar pain. The cranial defects observed in spontaneous CSF rhinorrhoea likely result from chronic intracranial hypertension that imparts stress onto susceptible areas of the skull base. Data suggesting that long-term treatment of spontaneous CSF rhinorrhoea requires intracranial pressure-reducing therapy further support this aetiology.^{1 7 15} Furthermore, an empty sella, found in many patients with spontaneous CSF rhinorrhoea, is radiographic evidence of chronically elevated intracranial pressure.

Distinguishing CSF rhinorrhoea from other causes is important to prevent ascending meningitis or encephalitis. The initial diagnostic step is to confirm the identity of the nasal secretions as CSF. β -2-Transferrin is found within CSF, perilymph and the vitreous humour of the eye. Commercially available laboratory tests for β -2-transferrin are 87% sensitive and 94% specific for CSF in nasal secretions.⁸ In the event of a positive result, high resolution CT should be performed to evaluate the skull base and paranasal sinuses. Patients with spontaneous CSF leaks have broadly attenuated and thin skull bases, most commonly in the lateral recess of the sphenoid and ethmoid roof.¹⁶ MRI is helpful to identify pituitary defects, including adenomas or an empty sella turcica, and intracranial masses that can contribute to intracranial hypertension. Radiocontrast cisternography is an invasive procedure that involves an intrathecal injection of radiocontrast. As such, this test is indicated only in the event that CT and MRI are non-diagnostic and clinical suspicion for a CSF leak remains high. Finally, intrathecal fluorescein injection may aid in endoscopic identification of the mucosal defect in preparation for surgical repair.

Endoscopic repair with an autologous fat graft is the standard-of-care. A septal mucoperichondrial or fascia lata graft can be employed for more complex defects.¹⁷ Surprisingly, recurrence rate following surgical repair alone is variable and high, ranging between 25% and 87%.^{3 7 18} However, the recurrence rate is as low as 5% when surgical repair is combined with intracranial pressure-reducing therapy.¹ Long-term follow-up with the primary care team is necessary to survey for signs and symptoms of IIH, which may precede a recurrent CSF leak.

Learning points

- ▶ Spontaneous cerebral spinal fluid (CSF) rhinorrhoea should be recognised by the general internist and primary care physician to prevent ascending meningitis or encephalitis.
- ▶ Symptoms that raise concern for CSF rhinorrhoea include:
 - Non-response to antihistamines and mucosal vasoconstrictors.
 - Valsalva-dependent flow.
 - Symptoms of idiopathic intracranial hypertension (IIH), including headache, pulsatile tinnitus, visual disturbances or retrobulbar pain.
- ▶ Analysis of nasal secretions for β -2-transferrin is highly sensitive and specific for CSF, and a positive result warrants consultation with a neurosurgeon or otolaryngologist.
- ▶ If imaging studies without contrast are non-diagnostic, CT of the head with intrathecal radiocontrast (CT cisternogram) may be used to identify skull base defects.
- ▶ Long-term follow-up as an outpatient is necessary to survey for signs and symptoms of IIH, which may precede a recurrent CSF leak.

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