



CEREBROSPINAL FLUID RHINORRHEA DIAGNOSIS AND MANAGEMENT - A STUDY.

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ABSTRACT

A cerebrospinal fluid rhinorrhoea occurs when there is a fistula between dura and the skull base and discharge of CSF from the nose . CSF rhinorrhoea commonly occurs following head trauma, as a result of intracranial surgery or destruction lesions. A spinal fluid leak from the intracranial space to the nasal respiratory tract is potentially very serious because of the risk of an ascending infection which could produce fulminant meningitis.

KEYWORDS

Rhinorrhoea, cerebrospinal fluid ,head injury.

INTRODUCTION

CSF Rhinorrhea is defined as the presence of CSF within the nasal cavity as a result of abnormal communication between the subarachnoid space and the extracranial space. See Figure 1. This communication can be as a result of each of the following:

- Traumatic: Trauma (80-90%) is the most common cause of CSF leak either due to head injury or iatrogenic.
- Spontaneous leaks either secondary to raised intracranial pressure or with normal intracranial pressure.
- Congenital: Encephaloceles
- Miscellaneous causes include erosion of the skull base by tumors, infection, mucocoele, and following radiation. The diagnosis of CSF Rhinorrhea is established on 3 main aspects

Clinical

- History: duration, characters of the leaking fluid (taste & consistency, aggravating factors), meningeal symptoms, trauma, previous surgery.
- Physical examination: Complete ear, nose, throat, head and neck examination, cranial nerves assessment, and Fiberoptic evaluation of the nasal cavity looking for the site of the leak (commonly in cribriform plate, ethmoid roof, sphenoid sinus wall, frontal sinus posterior table).

Laboratory

- CSF analysis of the fluid.
- Glucose concentration is $>30\text{mg/dl}$. Neither sensitive nor specific.¹²
- Beta-2 transferrin is the gold standard (sensitivity of 94% to 100%, and specificity of 98% to 100%), unfortunately not available in many centers, needs 5-7 days.
- Beta trace protein is an even better test than beta -2- transferrin in detecting CSF leaks.

Imaging

This can be classified into primary and secondary:

Primary (helpful in the detection of most of the leaks).

- MRI cisternography: heavily T2-weighted, fast spin-echo, fat-saturated sequences. Better in prone position with Valsalva manoeuvre. It requires that CSF leak is active at the time of scan .MRI cisternography is performed if fine cuts CT scans and beta-2-transferrin testing do not provide a diagnosis.
- HRCT: Can show the bony defect and, if there is, any protruding soft tissue through it, and also accumulating fluid if any. And in some cases pneumocephalus may be seen. It is sensitivity is 88.25 to 93%.¹⁵ It is less sensitive in detecting the exact site of the leak when there are multiple fractures.¹⁶
- Combination of both HRCT and MRI-cisternography provide higher sensitivity and specificity, but usually it is not cost effective and sometimes its time consuming to wait for both to be ready. So, starting with HRCT is advised.

Secondary (useful if primary modalities failed to show the site of the leak):

- CT-Cisternography with an intrathecal injection of nonionic iodinated myelographic contrast medium usually localizes the CSF leak. Pre- & post-cisternography images Hounsfield scale units should be compared. If more than 50% increase, it is leak. It can be a single investigational modality.¹⁸ It is better to have direct coronal cuts rather than reconstructed cuts.
- Intrathecal fluorescein where 0.1 ml of 10% fluorescein is diluted in 10ml of CSF and injected into the subarachnoid space over a period of 10 minutes, then nasal endoscopy to be done 30 minutes later, fluid can be seen by routine xenon light. If not, use blue-light filter setting. Sensitivity 57.7-85.6%, specificity is 100%.²² There is risk of developing seizures due to fluorescein.²³ So, the use of low concentration of fluorescein, slow administrations, and 24 hours supervision are advised as prophylactic measures.
- Nasal endoscopy²⁵. The last choice is to explore the nasal cavity and paranasal sinuses via endoscopic sinus surgery looking for the leak and the defect site. Valsalva manoeuvre and jugular compression could improve detection rate.

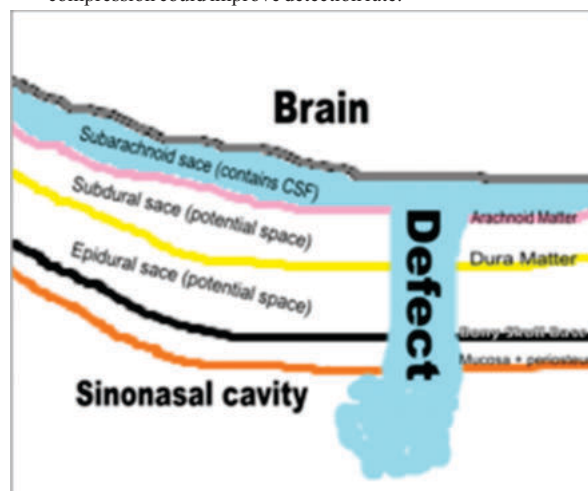


Figure 1 Content of the anterior skull base and the defect site where CSF leaks to sinonasal cavity.

Management

Management can be classified as conservative and interventional:

- Conservative management, for 2-4 weeks,²⁶ especially for traumatic leaks. In form of Acetazolamide,²⁷ laxatives, and the prophylactic antibiotics. As well as bed rest with head elevated, avoidance of sneezing, heavy lifting and straining. Lumbar drain can be useful.
- Interventional Management is used in spontaneous leaks and in cases where conservative measures failed. It has a varying success rate according to the technique:

Intracranial Approach

70 to 90% success rate. Combined intracranial extradural and intradural approach allows the visualization and repair of the entire anterior skull base. The intracranial approach is indicated in the following conditions:^{2,28-30}

- 1) Extensive bone defects in the cranial base.
- 2) Multiple fractures of the ethmoid bone and the posterior wall of the frontal sinus.
- 3) Associated intracranial lesions requiring surgery.

Extracranial Approaches

- i. Open sinus surgery² where the defect site can be approached via external ethmoidectomy or frontal sinusotomy. This approach is useful for larger defects (> 5cm) and frontal sinus posterior wall defects.
- ii. Endoscopic Technique: This approach has a much less morbidity,³³ therefore less hospital stay. It has a higher success rates, 87-100% in first attempt, 94-100% in second attempt.^{4,34-36} Also it carries much less risk of injury to olfactory fossa. With the help of the endoscope, this approach has easy access, precision, and accuracy of the surgery. For all of this advantages, nowadays, it is the procedure of choice,³⁷⁻³⁹ especially in cases where there is small defects in the sphenoid sinus, cribriform plate, anterior and posterior ethmoid sinus. Control of intracranial pressure is helpful for success of this procedure.

Preparations

Use navigation.⁴⁴ 30cm length scope is better. If using intraoperative fluorescein, a blue filter for the light source may aid in the identification of the defect. The mucosa is completely stripped away from the defect for at least 5mm in all the directions. Encephaloceles need to be reduced by using bipolar electrocautery at the stalk. Several graft materials can be used; cartilage, bone, mucoperichondrium, septal mucosa, turbinate, fascia, abdominal fat, conchal cartilage, free tissue, pedicle tissue or composite grafts. Composite mucochondrial flap for larger defects, Middle turbinate, composite bone or mucosa for moderate and large defects, Inferior turbinate graft for defects greater than 2 cm.

Complications of endoscopic techniques include meningitis (0.3%), brain abscess (0.9%), subdural hematoma (0.3%), smell disorders (0.6%), and headache (0.3%). These possible complications are much less when compared to Craniotomy.⁶⁰

The recurrence of CSF rhinorrhea occurs in up to 50%.⁶² Causes include spontaneous CSF rhinorrhea, elevated body mass index, extensive skull base defects, middle age, female gender, diabetic patients, in cases of multiple leaks, those with high intracranial pressure.^{63,64,65} Frontal sinus leak and the lateral sphenoid leaks repair have the highest failure rate (44%).⁶⁶ In order to prevent recurrence, exact localization of the defect and proper technique, graft choice and Differentiating between high and low flow leaks are essential.⁶⁷⁻⁷⁰ Also, early detection of high ICP, (20 cm H₂O), and applying a lumbar drain will decrease the risk of recurrence.

CONCLUSION

CSF rhinorrhea⁷¹⁻⁷⁷ most commonly due to trauma where conservative measures are useful and the chance of spontaneous healing is high. In cases of iatrogenic and spontaneous leaks, it is less likely to heal with conservative measures. So, treating these cases early is recommended to prevent life-threatening sequelae. Beta-2 transfer in is the gold standard in the diagnosis of a CSF leak. MRI with FLAIR sequence is very useful and specific diagnostic and localizing technique without risk of contrast or radiation exposure, and therefore can be the first single diagnostic⁷⁹ modality. Endoscopic management is the most useful approach for most of the cases. Conservative measures are advised to be utilized postoperatively for most of the cases to avoid failure, which is commonly attributed to inadequate exposure intraoperatively and non appropriate care postoperatively.

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