



Recent Advances in Cerebrospinal Fluid Rhinorrhoea Diagnosis and Treatment: An Overview

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Abstract:

In this article we mostly focused on the best approach and management of cerebrospinal fluid (CSF) leak or rhinorrhoea, Nowadays the best approach for cerebrospinal fluid rhinorrhoea management is the nasal endoscopy approach i.e., because of less morbidity and high success rate in this which is detailed explained in this review literature. CSF rhinorrhoea can be treated by various types of approaches but the most successful and less morbidity approach is the endoscopic method.

Keywords: Cerebrospinal fluid; Rhinorrhoea; Diagnosis; Treatment approaches

Introduction

It results from acquired communication /connections between the central nervous and the external environment. Cerebrospinal Fluid (CSF) production mostly occurs in the choroid plexus of the lateral ventricle and third and fourth ventricle. Whenever there is circulation through the subdural space, CSF is reabsorbed in the venous system by arachnoid granulation,

which is present in the Dural surface of the superior sagittal sinus. Hourly production of CSF is 20ml, and on basis of that daily production, the amount is at the rate of 400-600ml. It can be increased in chronic loss of CSF volume. The normal volume of CSF in adults is 150ml. [1]

Etiological factor

Most of the etiologic factor for CSF rhinorrhoea is trauma it can be both iatrogenic and non-iatrogenic CSF fistula contributes 80% to 90% in this. Spontaneous, traumatic, post-operative fees, meningocele, arachnoid cyst, astrocytoma, hemangiopericytoma. Head trauma (front-basal skull fractures), in some cases of intracranial surgery, destruction of lesions. [2]

Clinical features/symptoms

Runny nose (rhinorrhoea) with a thin consistency and clear fluid. Patients with a non-specific type of headache symptoms with unilateral clear fluids nasal discharge. Neck pain and stiffness, change in mental status, meningitis, photophobia (light sensitivity), Balance and gait problems, Changes in hearing/hearing loss, Seizures, Loss of appetite, Blurred or diplopia vision, Pulsatile tinnitus, Seizures due to severe hypotension, Anosmia (smell loss). [3]

Investigations

The gold standard investigation for diagnosing CSF rhinorrhoea is a beta -2-transferrin immunofixation. Diagnostic nasal endoscopy used in direct visualization of CSF leaks. Plain films, coronal computed tomography (CT) images, and MRI (Magnetic resonance imaging) can be used in radiological studies. Cisternography with intrathecal radioactive isotope is a type of method in which clinical suspicion of CSF rhinorrhoea is confirmed, CT cisternography is a technique which is evolved from metrizamide to water-soluble iodine contrast material, Different types of chemical tests are also involved in confirming the CSF leaks are beta transferrin and intrathecal fluorescein, Radionuclide cisternography, Nasal endoscopy helps in localizing the defects. [4]

Management/Treatment**Conservative management**

Conservative management has been approached whenever there is immediate-onset CSF rhinorrhoea after any accidental trauma.

Conservative management consists of 7-10 days of the trial of bed rest with the head of the bed elevated at 15-30 degrees. The inclination angle is enough to reduce the CSF pressure near the basal cisterns. Heavy lifting, coughing, sneezing, and nose bleeding must be avoided. Stool softeners are used to decrease the strain and increased intracranial pressure involved in bowel movements. [5]

Operative management

If conservative management fails then surgery is indicated to prevent different types of complications. Different types of success rates in different approaches are Intracranial approach ranges from 70-90%, the Morbidity rate is higher, Higher incidence of wound infection, severe headache, and anosmia. Transnasal endoscopic technique 87-100%, the Morbidity rate is lower. [6]

Intracranial approach

Without any neurological deterioration, this method is found to be the safest. This approach is mostly indicated in patients in patients with extensive bone defects in the cranium base, multiple fractures in the posterior wall of the frontal sinus, and ethmoid bone. Also indicated in leaks associated with separate intracranial lesions Intra-cranial hematomas, and post-traumatic intracranial infection. In cases of severe recurrent CSF leak and endoscopic treatment is not preferable their intra-cranial approach is indicated because of the advantage of allowing resection of any existing intracranial pathology. Results in hair loss with the incision line. In this approach, sphenoid sinus rhinorrhoea is difficult to approach. [7]

Extracranial approach

The extracranial approach can be divided into Open cranial technique, Endoscopic approach, and Less morbidity rate with a higher success rate. Provides a good exposure of posterior ethmoid, sphenoid, and parasellar regions. [8]

Surgical approach

In recent times there have been significant technological changes in the approach to cranial base via endonasal, endoscopic approach. These techniques are carried out with

an acceptable amount of morbidity. Anterior or posterior ethmoidectomy is required for the ethmoidal repair. There is also a need for adenoidectomy for any leak detected in the sphenoidal sinus while frontal sinus rhinorrhoea requires exploration of the frontal sinus. To get to the defects in the cribriform or roof of ethmoid a direct parasagittal approach can be used. If the rhinorrhoea is extending into the surrounding bone or is limited to the cribriform plate then a complete ethmoidectomy is indicated, in some cases, adjunctive procedures like frontal sinusotomies, sphenoidectomy, and middle superior turbinectomies may be needed. [9]

Techniques like bath plug or composite flap from the nasal septum or turninates can be used to repair the CSF leaks; the bath plug technique is a method in which a fat plug is inserted into the intradural space and secured with Vicryl suture, thereby providing traction to provide a tight plug. This method of management has been proven to be safe. Large defects in the anterior cranial fossa which are prone to CSF leakage require adjunctive techniques such as a composite mitochondrial flap from the nasal septum accompanied by the conventional method of management of such defects. Such a method of managing large defects has proven to be very beneficial.

Endoscopic approach

Nasal endoscopy has a high success rate than surgical management i.e., 87-100%, and has a reduced morbidity rate than surgical management. The most effective and safe method for CSF leaks is transnasal repair using an endoscope. In this technique, the sense of smell is almost preserved and duration of stay in the hospital is almost reduced and easy precision, access, and accuracy of surgery are very high. Now it is a choice of treatment for CSF rhinorrhoea. [10, 11]

Conclusion

Hence, CSF rhinorrhoea can be treated by various types of approaches but the most successful and less morbidity approach is the endoscopic method. The recurrence rate of CSF rhinorrhoea is high in patients with high-

pressure hydrocephalus, multiple CSF leaks, diabetes mellitus, increased intracranial pressure, middle age, obese women, High body mass index greater than 30, patients with spontaneous CSF rhinorrhoea, lateral sphenoid leaks and extensive skull base defects. Transnasal endoscopic surgery is the best and most effective management for CSF rhinorrhoea.

References

1. Lund VJ, Savy L, Lloyd G, Howard D. Optimum imaging and diagnosis of cerebrospinal fluid rhinorrhoea. *J Laryngol Otol* 2000; 114:988-92. 12.
2. Fu Y, Komiyama M, Nagata Y, Tamura K, Yagura H, Yasui T, et al. MR findings in traumatic cerebrospinal fluid leakage with special reference to indications of the need for dural repair. *No Shinkei Geka* 1993; 21:319-23.
3. Landeiro JA, Flores MS, Lazaro BC, Melo MH. Surgical management of cerebrospinal fluid rhinorrhoea under endoscopic control. *Arq Neurop- siquiatr* 2004; 62:827-31.
4. Chan DT, Poon WS, IP CP, Chiu PW, Goh KY. Rational use of CT and Beta-2 transferrin assay in detection of cerebrospinal fluid fistula. *Asian J Surg* 2004; 27:39-42.
5. Yadav YR, Parihar V, Janakiram N, Pande S, Bajaj J, Namdev H. Endoscopic management of cerebrospinal fluid rhinorrhea. *Asian J Neurosurg* 2016; 11:183-93
6. Calcaterra TC, Moseley JI, Rand RW. Cerebrospinal rhinorrhoeas: extra-cranial surgical repair. *West J Med* 1977; 127:279-83.
7. Landeiro JA, Flores MS, Lazaro BC, Melo MH. Surgical management of cerebrospinal fluid rhinorrhea under endoscopic control. *Arq Neurop- siquiatr* 2004; 62:827-31.
8. Bell RB, Dierks EJ, Homer L, Potter BE. Management of cerebrospinal fluid leak associated with craniomaxillofacial

- trauma. *J Oral Maxillofac Surg* 2004; 62:676-84.
9. Friedman JA, Ebersold MJ, Quast LM. Post-traumatic cerebrospinal fluid leakage. *World J Surg* 2001; 25:1062-6.
 10. Tosun F, Gonul E, Yetiser S, Gerek M. Analysis of different surgical approaches for the treatment of cerebrospinal fluid rhinorrhea. *Minim Invasive Neurosurg* 2005; 48:355-60.
 11. Liu P, Wu S, Li Z, Wang B. Surgical strategy for cerebrospinal fluid rhinorrhea repair. *Neurosurgery*. 2010;66(6 Suppl Operative):281-286.