

Endoscopic Repair of Spontaneous CSF Rhinorrhoea: Results from 21 Cases

Swapan Kumar Ghosh,¹ Indranath Kundu,¹ Mukesh Kumar Singh,¹ Rajarshi Chakraborty,¹ Suyash Banerjee¹

ABSTRACT

Introduction

Surgery to close the skull base defect is the treatment of choice in persistent spontaneous cerebrospinal fluid rhinorrhoea with endoscopic endonasal repair being the method of choice. This study analysed the demographics of presentation, optimal diagnostic and localisation strategies and the effectiveness of transnasal endoscopic treatment strategies with post-operative follow-up of CSF rhinorrhoea patients in a tertiary care institution.

Materials and Methods

A prospective longitudinal study was conducted on 21 CSF rhinorrhoea patients operated on between August 2014 and August 2018 and results documented.

Results

CSF rhinorrhoea was found most commonly in middle aged female patients in our study. HRCT PNS was capable of identifying a leak site in 66% of the cases. All patients were operated endoscopically with no major intra-operative or post-operative complications. Resolution of CSF leak occurred in 85% of cases.

Conclusion

CSF rhinorrhoea can be diagnosed and endoscopic repair can be effectively performed in our existing tertiary care set-ups with good results.

Keywords

Cerebrospinal Fluid Rhinorrhea; Endoscopy

Cerebrospinal fluid (CSF) rhinorrhoea is a relatively rare but potentially dangerous condition characterised by the discharge of CSF from the nasal cavities. CSF is a clear watery fluid that circulates in the central nervous system in between the arachnoid and the pial layers and helps to cushion the brain and spinal cord from external shocks. Approximately 90 to 150 mL of CSF circulates in the CNS at any time.¹

CSF rhinorrhoea can be spontaneous, traumatic, iatrogenic, or secondary to nasal and intracranial neoplasms.² Spontaneous cases of CSF rhinorrhoea are now considered to be a manifestation of benign intracranial hypertension (BIH), and hence present most commonly in obese middle aged women; however, they may be due to focal atrophy and rupture of arachnoid tissue associated with olfactory nerves and persistence of an embryonic olfactory lumen.³

The underlying aetiology in all kinds of CSF rhinorrhoea is thus a disruption of the fibres of the dura and the arachnoid, coupled with an osseous skull base defect.

This defect also forms the route of entry of pathogens into CNS, and thus may cause significant morbidity in patients due to recurrent episodes of meningitis.

Surgery to close the skull base defect is often the treatment of choice in more severe cases with endoscopic endonasal repair the method of choice. Wigand in 1981 reported the first case of endoscopic repair of CSF rhinorrhoea.⁴

The aim of the present article is to describe the demographics of presentation, optimal diagnostic and localisation strategies and the effectiveness of transnasal endoscopic treatment strategies with post-operative follow-up of CSF rhinorrhoea patients in the setting of a single tertiary care institution.

1 - Department of ENT, R G Kar Medical College and Hospital, Kolkata

Corresponding author:

Dr Rajarshi Chakraborty
email: rctua29@gmail.com

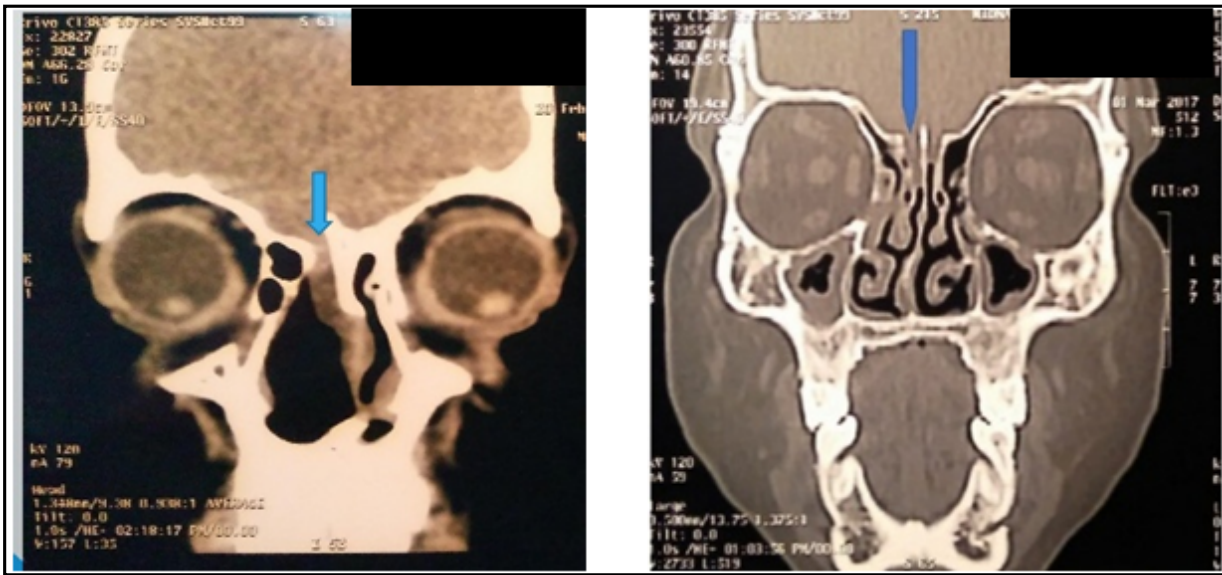


Fig. 1. Representative HRCT PNS images showing medial lamellar leak in two different patients.

Materials and Methods

We included 21 patients of spontaneous CSF rhinorrhoea diagnosed based on clinical, biochemical and radiological work-up and treated by endoscopic repair, in a single tertiary care institution between August 2014 and August 2018. Cases of traumatic, iatrogenic, neoplastic and congenital origin were excluded from the study.

Clinical work-up: All demographically important details of the patients including age, sex, place of residence, etc. were recorded. This was followed by a thorough history taking and complete ENT and head and neck examination. Important clinical features included unilaterality, reservoir sign and exacerbation with straining. CSF rhinorrhoea could be precipitated by Valsalva manoeuvre and Queckenstedt test (application of digital pressure on bilateral internal jugular vein at the root of the neck) in many cases.

Biochemistry: CSF collected in test tubes were sent for biochemical analyses such as glucose and chloride content and beta-2-transferrin assay. Typical range for glucose level is 45 to 80 mg/dL while that for chloride level is 116 to 127 mmol/L. Beta-2-transferrin assay facility was unavailable for all cases due to infrastructure problems. Hence, with a thorough clinical and radiological workup, CSF glucose and chloride

levels were considered enough for diagnosis.

Radiological work-up: High resolution computed tomographic (HRCT) scan of paranasal sinuses (PNS) with 1 mm section was done in all cases (Fig. 1). CT cisternography was done in cases where CSF leak site could not be located on HRCT PNS. Magnetic resonance imaging (MRI) PNS was done to identify meningoencephaloceles. Additionally, MRI brain was also done in cases of suspected intracerebral neoplasms as is usually the practice.

Operative interventions and post-op care: All patients were treated endoscopically with an endoscopic nasal examination used to determine the site of leak followed by repair with fat and fascia graft (Figs. 2, 3). An underlay technique was used in all cases. Surgicel® packing was used to stabilise site of repair. Post-operatively, patients were put on laxatives, antitussives, diuretics and mannitol. All patients were followed up at 1 month and 6 months.

Results

Age-sex distribution:

In our study, patients were classified based on sex (male, female, other) and age group (0-20 years, 20-40 years, 40-60 years and >60 years). A salient finding of

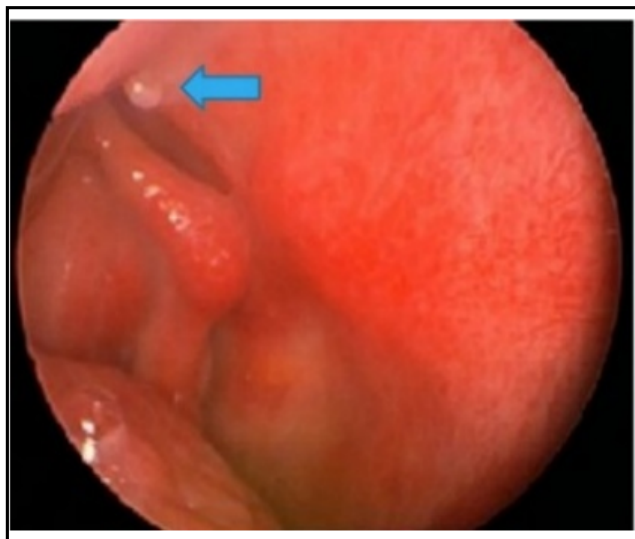


Fig 2. Endoscopic image showing the site of a meningocele

this study is that majority of the patients were middle-aged female patients. Female patients in 20-40-year group formed 28.57% while female patients in 40-60-year group formed 23.60% of the total study population (n=21) (Table I).

Diagnostic results of different imaging modalities: HRCT PNS with 1mm cuts was done in all cases and was able to identify a leak site in 66.67% of the cases. MRI PNS and CT cisternography were done in only select cases and had diagnostic yield of 14.28% and 28.57% respectively. The various sites of CSF leak identified are shown in Table II. Cribriform plate was the most common site at 57.14%.

Post-operative findings:

Post-operative follow-up was done at 1 month and 6 months. Recurrence of CSF leak was noted in 4.76% at 1 month and 14.28% at 6 months. Thus 85.72% of patients in our case series were deemed to be free of recurrence at 6 months follow-up.

Discussion

This is a descriptive study involving 21 patients of CSF rhinorrhoea over a 4-year period from 2014 to 2018 at

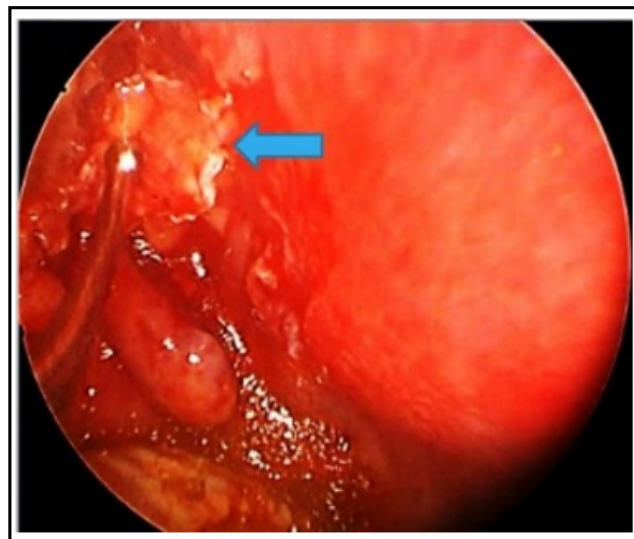


Fig 3. Endoscopic image of CSF leak site after repair with a fat graft.

a tertiary care hospital in eastern India. While the study suffers from the limitation of a relatively small sample size, the results obtained were compared to similar studies in scientific literature.

Women in 20-60-year age group accounted for about 52% of the patients in our study. This is in accordance with the well-known association of CSF rhinorrhoea with middle aged women. A systematic review of existing literature by Lobo et al found similar increased incidence in the middle age group women compared to men.⁵

As far as diagnosis and localisation of CSF leak site was concerned, various imaging modalities including HRCT PNS, CT cisternography, and radionuclide imaging studies have been recommended by authorities. However, a consensus is emerging that HRCT PNS followed by operative exploration in active cases, and MR cisternography additionally in inactive cases form the safest and most cost-effective strategies for diagnosis and localisation.^{6,7} In our study, HRCT PNS with 1 mm cuts was able to localise a leak site in 66.67% of the cases. A study by Stone et al, in 1999, reported identification of CSF leak site on HRCT PNS in 71% of cases and suggested that CT cisternography may be reserved for patients in whom HRCT could not identify the leak site.⁸ Our study thus shows a comparable result

Table I: Age-sex distribution of the study population

AGE GROUP/ SEX	<20Y	20-40Y	40-60Y	>60Y
Male	1(4.76%)	1 (4.76%)	2 (9.52%)	2 (9.52%)
Female	2(9.52%)	6 (28.57%)	5 (23.80%)	2 (9.52%)

as far as diagnosis and localisation is concerned.

Endoscopic transnasal repair with fat and fascia lata graft harvested from the thigh was used in all cases. Patients were then asked to follow up in outpatients regularly at 1 month and 6 months, as well as on emergent basis, if required.

Our study on 21 patients had a success rate of 85.72% at 6 months' follow-up. This was comparable with case series published by many authors. Lee et al, in 1994, reported a success rate of 92% in a case series of 39 patients with the endoscopic endonasal technique.⁹ A large number of other single institution based studies^{10,11} as well as a meta-analysis by Hegazy et al¹² have shown similar high efficacy rates using the endoscopic transnasal repair technique.

Conclusion

While the efficacy and high success rates of endoscopic transnasal repair technique of CSF rhinorrhoea have been established beyond doubt by many studies, the optimal diagnostic and treatment strategies for CSF

rhinorrhoea is still a topic of active research. As most of these studies are single institution-based experiences with small sample sizes, there is a need for further research in this area focusing on comparative outcomes in terms of cost-effectiveness, long-term safety and efficacy of various treatment modalities. The present study also suffers from similar limitations.

However, several systematic reviews and meta-analyses are now available focusing on epidemiologic factors, co-morbidities, diagnosis and localisation as well as treatment strategies for CSF rhinorrhoea. Based on these studies, it may be safely concluded that spontaneous CSF rhinorrhoea can be easily diagnosed in any modern tertiary care ENT outpatients setting on clinical and radiologic grounds with HRCT-PNS as the first-choice radiological investigation. Furthermore, this clinical entity can also be safely treated by an ENT surgical team using an entirely endoscopic transnasal approach. Endoscopic transnasal repair has proven to be highly successful and should now be considered as the standard of care in spontaneous CSF rhinorrhoea for cases not responding to conservative methods.

Table II: Distribution of site of CSF leak localised by radiographic studies

SITE OF CSF LEAK	NUMBER OF PATIENTS (N=21)
Medial lamella	12 (57.14%)
Lateral lamella	7 (33.33%)
Frontal sinus	1 (4.76%)
Sphenoid sinus	1 (4.76%)

References

- Han CY, Backous DD. Basic principles of cerebrospinal fluid metabolism and intracranial pressure homeostasis. *Otolaryngol Clin North Am.* 2005; 38:569-76
- Har-El G. What is "spontaneous" cerebrospinal fluid rhinorrhea? Classification of cerebrospinal fluid leaks. *Ann Otol Rhinol Laryngol.* 1999; 108:323-6
- Rodney J, Wilensky, Maloney E, Grady MS, Bolger, William E. Elevated intracranial pressures in spontaneous cerebrospinal fluid leaks. *Am J Rhinol.* 2003; 17:191-5
- Wigand ME. Transnasal ethmoidectomy under endoscopic control. *Rhinology* 1981; 19:7-15
- Lobo BC, Baumanis MM, Nelson RF. Surgical repair of spontaneous cerebrospinal fluid (CSF) leaks: A systematic review. *Laryngoscope Invest Otolaryngol.* 2017; 2(5):215-

24

6. Vemuri NV, Karanam LS, Manchikanti V, Dandamudi S, Puvvada SK, Vemuri VK. Imaging review of cerebrospinal fluid leaks. *Indi-an J Radiol Imaging*. 2017; 27: 441
7. Pool CD, Patel VA, Schilling A, Hollenbeak C, Goyal N. Economic implications of localization strategies for cerebrospinal fluid rhinorrhea. *Int Forum Allergy Rhinol*. 2019 Dec 12.
8. Stone JA, Castillo M, Neelon B, Mukherji SK. Evaluation of CSF leaks: high-resolution CT compared with contrast-enhanced CT and radionuclide cisternography. *AJNR Am J Neuroradiol*. 1999; 20:706-12
9. Lee TJ, Huang CC, Chuang CC, Huang SF. Transnasal endoscopic repair of cerebrospinal fluid rhinorrhea and skull base defect: ten-year experience. *Laryngoscope* 2004; 114:1475-81
10. Kirtane MV, Gautham K, Upadhyaya SR. Endoscopic CSF rhinor-rhoea closure: Our experience in 267 cases. *Otolaryngol Head Neck Surg*. 2005;132:208-12
11. Banks CA, Palmer JN, Chiu AG, O' Malley BW Jr, Woodworth BA. Endoscopic closure of CSF rhinorrhoea: 193 cases over 21 years. *Otolaryngol Head Neck Surg*. 2009;140:826-33
12. Hegazy HM, Carrau RL, Snyderman CH, Kassam A, Zweig J. Transnasal endoscopic repair of cerebrospinal fluid rhinorrhea: A meta-analysis. *Laryngoscope* 2000;110:1166-72.