

## Original Research Article

# Trans-nasal endoscopic repair of cerebrospinal fluid rhinorrhoea: a retrospective analysis

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### ABSTRACT

**Background:** The purpose of present study was to assess the management and surgical outcomes of trans-nasal endoscopic repair of CSF rhinorrhoea.

**Methods:** A retrospective study was conducted on the basis of medical records of 8 patients (6 males and 2 females) who had undergone trans-nasal endoscopic reconstructive surgery for CSF leak in a tertiary care hospital. Data so collected was analyzed to determine the demographic and diagnostic factors with surgical outcomes. Rate of success achieved was also assessed.

**Results:** Majority of patients were in the age group of 21-40 years with mean age of 28.50 years. Main cause of leak was trauma (75%) and most common site of defect was found to be the cribriform plate of ethmoid bone (75%). 38% patients suffered from recurrent episodes of meningitis. Repair of dehiscence was done by variety of graft material like fat, fascia, middle turbinate mucosa, septal bone, cartilage or mucosa and fibrin glue. Success rate of 100% was observed. No post-surgical complications were encountered in this series.

**Conclusions:** Trans-nasal endoscopic surgical technique is an effective and atraumatic procedure for repair of CSF rhinorrhoea with minimum morbidity and low post-operative complications.

**Keywords:** Cerebrospinal fluid rhinorrhoea, Trans-nasal endoscopic approach, Multilayer repair

### INTRODUCTION

CSF rhinorrhoea is a rare but potentially devastating condition resulting from disruption of all the barriers which separate the subarachnoid space from the upper part of aero digestive tract which include arachnoid mater, duramater, skull base, mucosa of nasal cavity and paranasal sinuses.<sup>1</sup>The resulting communication with CNS can result in multitude of infectious complications which can lead to significant morbidity and disastrous long term deficits for the patient. Main goal of treatment is to prevent ascending meningitis.<sup>2</sup> Etiologically, CSF rhinorrhoea is classified as traumatic or non-traumatic. Traumatic rhinorrhoea is further classified as accidental or iatrogenic. Accidental trauma is responsible for 90%

cases of CSF rhinorrhoea of which 80% are due to motor vehicle accidents. Iatrogenic rhinorrhoea can follow transcranial endoscopic surgery via skull base.<sup>3</sup> Few cases of CSF rhinorrhoea have been reported where neoplastic lesions are the causative factors.<sup>4</sup> Presenting symptoms in CSF rhinorrhoea vary from clear nasal discharge and headache to changes in mental status. Most acute post-traumatic cases resolve with conservative treatment. In the event of chronic or prolonged leaks, surgical intervention becomes mandatory.<sup>5</sup> While considering surgery, it becomes important to identify the etiology of leak, its location and size, shape of bony and meningeal defects and presence of concomitant intracranial hypertension or meningo-encephalitis.<sup>3,5</sup> Since these patients stand at high risk of complications such as

brain abscess, meningitis or pneumo-encephalitis, therefore all persisting CSF leak cases should be repaired.<sup>6</sup> Purpose of the present study is to review the management and outcomes of various cases of CSF rhinorrhoea in a tertiary care hospital.

## METHODS

A retrospective study was conducted on the basis of medical records of 08 patients (6 males and 2 females) who had CSF rhinorrhoea and underwent trans-nasal endoscopic repair in Department of Otorhinolaryngology, Christian Medical College and Hospital, Ludhiana, Punjab (India) during the period from August 2016 to September 2017. Patients were assessed for demographic profile, etiology of CSF leak and its duration, endoscopic findings, radiographic findings, location of leak, surgical repair and post-operative outcome. Retrieved data was represented in frequency and proportion in tabulated form for evaluation of results.

### Inclusion criteria

Inclusion criteria were cases with defect size less than 1.5 cms; cases involving cribriform, ethmoid, sphenoid or frontal recess region of skull base.

### Exclusion criteria

Exclusion criteria were CSF leaks with duration less than two weeks; defect size more than 1.5 cms; cases involving posterior table of frontal sinus; leaks associated with multiple skull base fractures; leaks associated with tumour.

### Procedure

All surgical procedures were done under general anesthesia, with patient lying supine and head end elevated 30 degrees. Left thigh was prepared to harvest fat and fascia graft when required. Nasal decongestion was achieved with 4% xylocaine with adrenaline 1:30000 packs. Middle turbinate was lateralized or resected to gain access to the cribriform area in case of leaks from the cribriform area. In case of defect in the fovea ethmoidalis, complete ethmoidectomy was done. Site of leak was visualized and confirmed by Valsalva manoeuvre. Nasal mucosa around the site of leak was partially removed. Meningocele/meningoencephalocele was cauterized at the stump and removed. Fat plug was placed in all cases by bath plug method and placed in underlay manner. Further, layered reconstruction was done with a combination of cartilage, fibrin glue, septal bone, middle turbinate mucosa, septal mucosa or fibrin glue. Bilateral nasal packs were placed which were removed on 3<sup>rd</sup> postoperative day. Lumbar drain was placed in cases with larger defects and/or increased intracranial pressure. Patients were put on acetazolamide 250 mg 8 hourly for 1 week postoperatively.

## RESULTS

In present study 08 patients (6 males and 2 females) were assessed. Mean age of patients was 28.50 years with range of 08-50 years (Table 1). Etiological factor for CSF leak was found to be accidental trauma in 63% cases. In one patient cause was iatrogenic resulting from polypectomy. Spontaneous rhinorrhoea was observed in 25% subjects. Majority of patients (75%) presented with intermittent leaks whereas 25% were suffering from continuous type of leakage. Thirty eight percent of cases had 1-2 episodes of meningitis (Table 2).

**Table 1: Demographic profile of patients.**

Variables	Frequency	Percentage (%)
<b>Age (in years)</b>		
0-20	02	25
21-40	04	50
41-60	02	25
>61	00	00
<b>Gender</b>		
Males	06	75
Females	02	25

**Table 2: Clinical characteristics.**

Variables	Frequency	Percentage (%)
<b>Etiology of leak</b>		
Traumatic		
Accidental	05	63
Iatrogenic	01	13
Spontaneous	02	25
<b>Nature of leak</b>		
Intermittent	06	75
Continuous	02	25
<b>Pre-operative episodes of meningitis</b>		
Present	03	38
Absent	05	63

Radiographic examination revealed bony defects in all these cases with concurrent meningocele and meningoencephalocele in 13% and 50% cases respectively. Most common location of defect in this cohort was cribriform plate of ethmoid (75%) whereas it was fovea ethmoidalis in 25% patients. Cysternography was carried out in 25% patients to delineate the defect because of doubts in defining the lesion by HRCT/MRI in these cases (Table 3). All leaks were repaired with an underlay multilayered technique to restore the original anatomy layer by layer. Fat, middle turbinate (MT) mucosa and septal bone were used as graft to fill the defects in 50% cases. 13% of patients were treated by fat, MT mucosa and inferior turbinate mucosa. Fat, MT mucosa and septal cartilage were used in 13% and in 25% cases fat, septal mucosa and fibrin glue were used as grafts to seal the dehiscence. Post-operatively, lumbar drain was used in 38% cases only. No post-surgical complications were encountered in

this study. Hospital stay in most of the cases (75%) was less than 2 weeks and in 25% of patients it was up to 4 weeks (Table 4). Mean follow up period was 12 months.

**Table 3: Investigative procedures and observations.**

Variables	Frequency	Percentage (%)
<b>HRCT/MRI findings</b>		
Bony defects	08	100
Meningocele	01	13
Meningo-encephalocele	04	50
Cysternography required	02	25
<b>Site of CSF leak</b>		
Cribriform plate	06	75
Fovea ethmoidalis	02	25
Sphenoid	00	00

**Table 4: Surgical repair and post-operative outcomes.**

Variables	Frequency	Percentage (%)
<b>Graft used for repair</b>		
Fat, MT* mucosa, septal bone	04	50
Fat, MT mucosa, Inf turbinate mucosa	01	13
Fat, MT mucosa and septal cartilage	01	13
Fat, septal mucosa and fibrin glue	02	25
<b>Post-operative lumbar drain</b>		
Yes	03	38
No	05	63
<b>Post-operative complications</b>		
No complication	08	100
<b>Successful surgery</b>		
Yes	08	100
No	00	00
<b>Hospital stay (weeks)</b>		
0-2	06	75
3-4	02	25
<b>Follow up period (months)</b>		
0-6	01	13
>6	07	88

\*MT: Middle turbinate

## DISCUSSION

Extracranial approach for CSF leak was initiated by Dohlman in 1948 using naso-frontal incision which offered success rate of 60-80% with considerable reduction in risk of complications.<sup>4,7</sup> It was not until 1981 that Wigand described endoscopic repair of CSF rhinorrhoea which led to success rate of 90%.<sup>4</sup> Since then this technique has gained popularity. It has been suggested that endoscopic repair be limited to gaps less

than 1.5 cms in size but other authors have found no correlation between the success rate and size of the defect.<sup>6</sup> Recent studies have reported success rate of 93% at first and 100% at second surgery.<sup>8</sup> In present study, mean age of patients was found to be 28.50 years which is lower than the results presented by some authors.<sup>3</sup> Lower mean age is related to the fact that majority of patients had traumatic leaks resulting from road traffic accidents and assaults which tend to involve the younger demographic.<sup>8</sup> Preponderance of males over females has been observed in the present series. Traumatic leaks outnumber the non-traumatic leakages similar to the results presented by Safavi et al.<sup>3</sup> An important aspect of success in such cases is identification of the exact site of CSF leak.<sup>5,9</sup> HRCT plays an essential role in identifying even the smallest defect and provides important information about the anatomical variations and guiding the surgeon in planning surgical repairs. MRI scanning was done to detect co-existing meningocele or meningo-encephalocele in cases where causative factor was trauma. In present study 50% patients had meningo-encephalocele and 13% had meningocele. These figures are higher than those observed by Ismail et al.<sup>6</sup> Cysternography was done only in those cases where there was doubt in defining defect on CT/MRI scan. Commonest site of anatomical defect in majority (75%) of cases in our study was cribriform plate of ethmoid bone because of its inherent weakness due to presence of sieve like apertures for passage of olfactory nerve fibers. A variety of graft material was used ranging from fat, fascia lata, MT mucosa, septal cartilage or bone and fibrin glue depending upon the aetiology of leak, location and dimensions of bony dehiscence. Post-operative lumbar drain was used in cases that had larger defects and those with raised intra-cranial pressure. No post-operative complication was observed in any of patients in our study. These results are in concurrence with the earlier reports discussed in literature.<sup>3,4,6,10</sup> Success rate of 100% was recorded in this study similar to the results published by Ismail et al.<sup>6</sup> Hospital stay was less than 2 weeks in majority of cases. Mean follow up period was 12 months with no recurrence in any of these cases.

## CONCLUSION

Endo-nasal endoscopic closure is a safe and effective technique for repair of CSF rhinorrhoea. There is minimal intranasal trauma. An overall rate of successful repair was 100%. No surgical complications were encountered in present series. Etiology of leak and size of defect did not have any adverse effect on surgical outcome.

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