

Original Research Article

Endoscopic trans nasal intervention in cerebrospinal fluid rhinorrhea: a one and half-year pilot study

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ABSTRACT

Background: Cerebrospinal rhinorrhea from the anterior and middle skull base was repaired through the inferior intra-nasal corridor under high resolution endoscopic visualization. The sites, tissues utilized and the surgical outcome have been critically analyzed.

Methods: 47 subjects of skull base lesions underwent surgical intervention jointly in the Departments of Otolaryngology and Neurosurgery, Dayanand Medical College and Hospital, Ludhiana during a period of 1.5 year.

Results: Trans-nasal endoscopic intervention for cerebrospinal fluid rhinorrhea was undertaken in 1 male (14.3%) and 6 female (85.7%) patients. The minimum age in our study was 28 years and maximum 68 years with mean age 49.9 years. 6 (85.7%) patients had a history of spontaneous cerebrospinal fluid leak while 1 (14.3%) had a history of trauma prior to the leak. The body mass index (BMI) of 6 (85.7%) was in the range of 30.0–34.9. Total 6

(85.7%) patients of cerebrospinal fluid leak presented with rhinorrhea or watery nasal discharge as the chief complaint. The cribriform plate, as seen in 5 (71.4%) patients, was the predominant site of cerebrospinal fluid rhinorrhea, followed by the sphenoid, 2 (28.6%) and the fovea ethmoidalis 1 (14.3%). The tissue utilized as graft were fascia lata (7 patients), nasoseptal flap also known as the Hadad-Bassagasteguy flap (5 patients) and middle turbinate mucosa (1 patient).

Conclusions: Spontaneous leaks from the cribriform plate outnumbered traumatic leaks male to female ratio was higher 1:6 in the 5th decade. Hadad-Bassagasteguy flap (in isolation or with fascia lata graft) as reconstructive material is used more commonly as compared to fascia lata.

Keywords: CSF leak, Skull base, Endoscopic repair, Fascia lata

INTRODUCTION

Cerebrospinal fluid rhinorrhea presents to the rhinologist, neurologist and the neurosurgeon with anterior or posterior salty nasal drip, that exacerbates on straining during cough or passing stools, and in particular on flexion of the head. Recurrent meningitis or the potential for the same is the necessity of reconstructive intervention to seal off the defect. The latter may be

spontaneous or traumatic. Trans-nasal neuro-endoscopic surgery is finding increasing application for various clinical conditions as this trans-nasal modality minimizes intranasal trauma and preserves the bony framework supporting the frontal recess and other critical areas. It cuts down operative time and hospital stay, reduces cost and results in a faster turnover of the patients. It is a versatile and useful tool for a busy skull base-neurosurgical department.¹ A 4mm telescope is used to perform transnasal endoscopic treatment of CSF

rhinorrhea. The endoscope, which is not fixed, is usually held in the non-dominant left hand while the right hand guides the instrument. This configuration risks injury to the nasal mucosa. A system with a working sheath, which is fixed with an endoscope holder, eliminates unwanted movement and frees both hands for surgical maneuvering. Working channels in the sheath allow other instrumentation to be inserted without causing injury. The field and lens can also be irrigated when obscured by bleeding or cauterization. Once inserted, the working sheath remains until the procedure is completed. the non-holder modality, the endoscope must be withdrawn multiple times for cleaning and surgical maneuvers.¹

Tissues from vicinity of the skull base defect, mucosa, bone lobule fat and cartilage or the temporalis fascia or the lateral thigh, fascia lata maybe utilized as free grafts to seal off the defect. Often in large defects, intranasal septal or lateral nasal wall rotation flaps are harvested and used to plug or carpet the breach.

Aim and objectives

The study was undertaken with the under mentioned objectives: to analyze i) the profile of patients presenting with cerebrospinal fluid rhinorrhea ii) determine commonest site of leak iii) critically evaluate the tissue utilized for repair.

METHODS

In this prospective study, 47 subjects of skull base lesions underwent surgical intervention jointly in the Departments of Otolaryngology and Neurosurgery, Dayanand Medical College and Hospital, Ludhiana during a period of 1.5 year. (June 2013- December 2014)

The patients of cerebrospinal rhinorrhea fulfilling the selection criteria were taken up for transnasal endoscopic surgical intervention, utilizing free or pediceled flaps.

Inclusion criteria

Inclusion criteria was patients with CSF leak from the nose.

Exclusion criteria

Exclusion criteria were CSF leak from the ear, bed ridden patients, and patients within 2 weeks of trauma.

Statistical analysis

All statistical analysis was performed using Microsoft Excel and statistical package of social sciences (SPSS) version 17 for Microsoft windows (SPSS Inc. Released 2008. SPSS statistic for windows, version 17.0, Chicago).

RESULTS

The observations in the patients taken up for endoscopic trans nasal intervention have been analyzed and tabulated. Trans-nasal endoscopic intervention for cerebrospinal fluid rhinorrhea was undertaken in 1 male (14.3%) and 6 female (85.7%) patients. The distribution of cases is statistically not significant (p=0.059) (Table 1).

Table 1: Gender wise distribution of patients of cerebrospinal leak (n=7).

Gender	Number of cases (n)	Percentage (%)	P value
Male	1	14.3(%)	0.059
Females	6	85.7(%)	

The minimum age in our study was 28 years and maximum were 68 years with mean age 49.9 years. The patients of cerebrospinal fluid leak were aged between 28 and 68 years, with 1 patient in the age-group of 21-40 years, 4 between 41-60 years and 2 patients in the 61-80 years age-group. The distribution of cases is statistically not significant (p=0.368) (Table 2).

Table 2: Age-wise distribution of cases of cerebrospinal fluid leak (n=7).

Age range (years)	Number of cases (n)	Percentage (%)	P value
21-40	1	14.3	0.368
41-60	4	57.1	
61-80	2	28.6	

Total 6 (85.7%) of the 7 patients of cerebrospinal fluid leak were from urban areas and 1 (14.3%) was residing in a rural area. The distribution of cases is statistically not significant (p=0.059) (Table 3).

Table 3: Topographical distribution of the patients (n=7).

Area	Number of cases	Percentage (%)	P value
Rural	1	14.3	0.059
Urban	6	85.7	

Total 6 (85.7%) patients had a history of spontaneous cerebrospinal fluid leak while 1 (14.3%) had a history of trauma prior to cerebrospinal fluid leak. None had an iatrogenic etiology (Table 4).

The body mass index (BMI) of 6 (85.7%) was in the range of 30.0–34.9, including both males and females. One patient had BMI in the range of 25.0–29.9. Out of 7 patients with cerebrospinal fluid leak, 1 (14.29) was overweight, 4 (57.14) were obese and 2 patients (28.57) had BMI>35. Out of the 6 female patients of spontaneous

cerebrospinal fluid leak 5 females were having BMI>30. The distribution of cases is statistically not significant (p=0.368) (Table 5).

Table 4: Etiology of cerebrospinal fluid leak (n=7).

Etiology	Number of cases	Percentage (%)
Spontaneous	6	85.7
Traumatic	1	14.3
Iatrogenic	-	-
Miscellaneous	-	-

Table 5: Distribution of the subjects on the basis of BMI (Kg/M²) (n=7).

BMI (kg/m ²)	Number of cases	Percentage (%)	P value
20-24.9	-	-	0.368
25-29.9	1	14.29	
30-34.9	4	57.14	
35-39.9	2	28.57	

Total 6 (85.7%) patients of cerebrospinal fluid leak presented with rhinorrhea or watery nasal discharge as the chief complaint. One patient (14.3%) gave history of multiple attacks of meningitis and 2 patients (14.3%) had complaints of pulsatile tinnitus along with rhinorrhea. The distribution of cases is statistically not significant (p=0.097) (Table 6).

Table 6: Distribution of patients of cerebrospinal fluid leak according to presentation (n=7).

Presentation	Number of cases*	Percentage (%)	P value
Rhinorrhea	6	85.7	0.097
Meningitis	1	14.3	
Pulsatile tinnitus	2	28.6	

*Multiple responses

Left sided leak was predominantly seen 4, (57.1%) patients. Bilateral leak was found only in 1 patient (14.3%) (Table 7).

Table 7: Laterality of cerebrospinal fluid leak (Kg/M²) (n=7).

	Number of cases	Percentage (%)	P value
Left	4	57.1	0.368
Right	2	28.6	
Bilateral	1	14.3	

Comorbidities

Two patients with spontaneous cerebrospinal fluid leak had co morbid conditions. One patient had a history of hypertension while one had a history of hypertension,

type 2 diabetes mellitus and chronic obstructive pulmonary disease (COPD).

In all the 7 patients of cerebrospinal fluid rhinorrhea (spontaneous and traumatic) computed tomographic cisternography was used as the radiological modality to localize the defect. Intrathecal fluorescein dye was not used in our study (Table 8).

Table 8: Radiological modality adopted for diagnosis of site of leak (n=7).

Radiological modality	Number of cases	Percentage (%)
Computed tomography cisternography	7	100.0
Magnetic resonance imaging	7	100.0
Intrathecal Fluorescein	-	-

Magnetic resonance imaging (MRI) findings

On MRI in 7 patients of cerebrospinal fluid rhinorrhea, empty sella (partial and complete) was noted in 2 cases.

Table 9: Site of cerebrospinal fluid leak in the skull base (n=7).

Site of CSF	Number of cases	Percentage (%)
Cribriform plate	5	71.4
Spontaneous	5	100.0
Traumatic	-	-
Sphenoid bone	2	28.6
Spontaneous	1	50.0
Traumatic	1	50.0
Fovea ethmoidalis	1	14.3
Spontaneous	-	-
Traumatic	1	100.0
Frontal bone	-	-

The cribriform plate, as seen in 5 (71.4%) patients, was the predominant site of cerebrospinal fluid rhinorrhea, followed by the sphenoid, 2 (28.6%) and fovea ethmoidalis 1 (14.3%). The size of the bony defect causing the cerebrospinal fluid leak was less than 2 cm in some cases. In 2 patients, mining encephalocele was found intra-operatively (Table 9).

The tissues utilized as graft were fascia lata (7 patients), nasoseptal flap Hadad-Bassagasteguy flap (5 patients) and middle turbinate mucosa (1 patient). Fascia lata was placed in underlay position along with fat in 4 patients. Bone harvested from septum was used to wedge and seal the defect in the region of the fovea ethmoidalis. Surgical was utilized to fix the tissue to the defect. Fibrin glue was initially utilized but in later cases Hadad-Bassagasteguy flap was used with better coverage and uptake (Table 10).

Table 10: Tissue used for reconstruction of the skull base defect (n=7).

Tissue utilized*	Number of cases
Fascia lata	7
Naso-septal flap (Hadad flap)	5
Middle turbinate mucosa	1
Fat	4
Bony septae	1
Fibrin glue	1
Surgical	4
Gelfoam	7

*Multiple materials used for reconstruction

DISCUSSION

The present study was compared with global studies with respect to various parameters.

Gender and age distribution

In our study the female gender outnumbered the males in ratio of 6:1. The mean age of the subjects was 53.5 years and the median 53. In the Hussain et al series, male to female ratio was 1:1.2 and the mean age of patients 21.6 years, while Gilat et al reported male female ratio of 1:2.2 and mean age as 48 years.^{1,2} Dunn et al found slight male predominance i.e. male is to female ratio of 1.4:1 and the median age to be 50 years.³

Complaints on presentation

The presentation in our subjects was rhinorrhea (100%), headache (14%) and pulsatile tinnitus with spontaneous leak (28%) in that frequency. Citardi et al observed rhinorrhea as the most common complaint while Rudnick et al noted pulsatile tinnitus and spontaneous leaks as indicators of benign intracranial hypertension.^{4,5}

Etiology of cerebrospinal rhinorrhea

Spontaneous leak was reported in 85.71% who were all females, while traumatic was observed more in males (14.29%). Basal metabolic rate of patients of cerebrospinal rhinorrhea.

The basal metabolic was less than 30 in 14.29%, more than 30 in 85.71%, (females 71.42%, males 14.29%) Sannareddy et al reported too spontaneous leak to be common in females and traumatic leak in males.⁶ Schlosser documented 81% of spontaneous leaks in obese, middle aged females. Dunn et al found 60% cases of spontaneous CSF leak had BMI greater than 30.³

Co-morbidities

Total 33.33% of our patients with spontaneous leaks had co-morbidities. Rudnick et al emphasized benign intracranial hypertension is associated with obesity and

obesity- associated with co morbidities like type 2 DM, CAD, Osteoarthritis.⁵

Radiological modalities for diagnosis

In CT and MRI leaks could be identified in all, 100% of our patients 100%. While on CT cisternography only in 85.7%. 57.14% had an empty or partial empty sella. Gilat et al found CT cisternography to be diagnostic in 86% of the patients.² Schlosser et al reported empty sella in 62.5% and a partially empty sella in 31.25%.⁷

Site of leak

In our series we detected spontaneous leak from the cribriform plate in 71.4% and from the wall off the sphenoid sinus in 28.6%. Traumatic leak was noted only from the fovea-ethmoidalis of the ethmoid bone in 14.3%. Gilat et al too noted in 85.7% of their patients a spontaneous leak from the cribriform plate.² Sannareddy et al series of 11 cases had a spontaneous leak from the cribriform plate in 45.45% and wall of the sphenoid sinus wall in 36.36. Traumatic leak was observed from the ethmoid sinus in 14.3%.⁶

Reconstructive material

Fascia lata in all 100%, Hadad flap in 71.42% and turbinate mucosa in 14.2%, were the tissues used for reconstruction in our patients. Fascia lata was the preferred tissue in Gilat et al series, while Hegazy et al utilized the nasoseptal flap frequently followed by osteoperiosteal flap from the middle turbinate.^{2,8}

Lumbar drain

We used a postoperative lumbar drain in all cases of spontaneous leak (85.7%) Hegazy et al recommended lumbar drain in idiopathic and post traumatic leaks, while Sannareddy et al in only the spontaneous CSF leaks.^{8,6}

Duration of hospitalization

Our admission protocol was for 6-9 days with an average of 7.4 days. Gilat et al admitted for an average of 6.7 days and Sautter et al for 6.5 days.^{2,9}

Recurrence

We noted recurrence in 1 patient i.e. 14.33% which was treated conservatively with a success rate of 100%. Hegazy et al had a success rate of 90% at first attempt, Cassano et al 94.4% and Wagenmann et al 88-94%.^{8,10,11}

Comparison of trans nasal endoscopic repaired cases of cerebrospinal fluid leak with western studies

Hadad-Bassagasteguy flap (in isolation or with fascia lata graft) as reconstructive material was used more commonly as compared to fascia lata which was the

dominant choice for defect closure by Gilat et al 2 to obtain water tight seal. In the present study, male to female ratio was higher 1:6 in the 5th decade as compared to 1.4:1 by Dunn et al and 1:2.2 by Gilat et al.^{2,3}

In the present study, spontaneous leaks outnumbered (85.7%) as traumatic leaks in western studies.

CONCLUSION

Spontaneous leaks from the cribriform plate outnumbered traumatic leaks Male to female ratio was higher 1:6 in the 5th decade. Hadad-Bassagasteguy flap (in isolation or with fascia lata graft) as reconstructive material is used more commonly as compared to fascia lata.

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