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TRANSNASAL ENDOSCOPIC REPAIR OF CSF RHINORRHOEA AND ITS OUTCOMES

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ABSTRACT

Transnasal endoscopic repair (TNER) of skull base defect is the standard of care for CSF rhinorrhoea with few exceptions. This study aims to describe the outcomes of TNER of 35 cases of CSF rhinorrhoea done at NRI general hospital over a period of 6 years. Majority of patients in this study are middle aged obese or overweight females with spontaneous CSF rhinorrhoea as the most common aetiology. Ninety percent of patients with Idiopathic intracranial hypertension (IIH) had spontaneous CSF Rhinorrrhoea in our study. Site of skull base defect, aetiology and type of graft material used for skull base defect may not influence outcome of TNER of CSF rhinorrhoea as long as the skull base repair is done using sound surgical principles with multilayered closure of skull base defect and proper addressal of the co-morbid conditions like obesity, IIH. Successful outcome with TNER of CSF Rhinorrhoea was seen in 97% of patients in this study.

Key words- CSF Rhinorrhoea, Outcomes of CSF Rhinorrhoea, Endoscopic repair of CSF Rhinorrhoea, Idiopathic intracranial hypertension.

COMPLIANCE WITH ETHICAL STANDARDS:

Conflicts of interest – The authors declare that they have no conflicts of interest

Introduction: Cerebrospinal fluid (CSF) leakage from subarachnoid space into the nose through a defect in the skull base, dura and mucosa is called CSF Rhinorrhoea. It can be due to congenital, traumatic, spontaneous / idiopathic causes [1–4]. Transnasal endoscopic approach is the preferred method of repair for majority of these cases with few exceptions where transcranial repair is preferred[5–7]. Technique of repair, graft material used for reapir of skull base defect, patient co-morbities may affect the outcome of transnasl endoscopic repair (TNER) of CSF Rhinorrhoea.

Aims & Objectives: To describe the 6 year outcomes of TNER of CSF Rhinorrhoea done at NRI general hospital (NRIGH), a tertiary care hospital, and to analyze the factors affecting the outcomes of TNER of CSF Rhinorrhoea with emphasis on site of skull base defect, technique of repair, type of graft materials used, patient co-morbidities like obesity, chronic obstructive pulmonary disease (COPD), idiopathic intracranial hypertension (IIH) [8–11].

Methodology: Retrospectively charts of all the patients with CSF rhinorrhoea who underwent TNER of CSF rhinorrhoea at NRIGH from September 2016 to February 2023 were studied. Data pertaining to demographic characteristics like age, sex, occupation; patient co-morbidities like hypertension, diabetes, bronchial asthma, COPD, IIH; past history of sinonasal surgery, head injury; technique of repair, type of graft material used were studied. Body mass index (BMI) was also collected for each patient. Follow up data from all these patients was collected within one month, 3 months, 6 months and 1year after repair to know if there is any recurrence of CSF Rhinorrhoea. The data was analyzed by statistical methods to know if there is any association between techniques of

repair, type of graft materials used, patient co-morbdities with outcome of repair.

Study design**:** Retrospective study

Study setting: NRIGH

Study population: All the patients who were admitted at NRIGH with the diagnosis of CSF Rhinorrhoea from September 2016 to February 2023.

Inclusion criteria: All patients with CSF rhinorhoea admitted at NRIGH who underwent TNER of CSF Rhinorrhoea

Exclusion criteria: Patients whose data is incomplete or follow up is less than 1 year after TNER of CSF rhinorrhoea.

Method of Collection of Data: Retrospective data from medical records.

RESULTS:

Transnasal endoscopic repair of CSF Rhinorrhoea was done in **38** patients during the study period. Due to insufficient data **3** patients were excluded from the study. The association between age, gender, BMI, co-morbidities, IIH, aetiology, site of skull base defect, technique of repair, type of graft used for repair and recurrence was assessed for the remaining 35 patients. Most common age group seen was 31-40 years in 13(37.14%), followed by 41-50 years in 9(25.71%). Majority of the patients were females 24(68.57%), whereas 11 were males 11(31.42%) (Table1).

Co-morbities (Table 2) were present in 17(48.57%) patients with most common co-morbidity being hypertension; others were diabetes mellitus, hypothyroidism, bronchial asthma, ischaemic heart disease, epilepsy. Majority of the patients had multiple co-morbidities. Most common BMI group is obese category, seen in 20(57.14%) patients. Radiological signs and symptoms of IIH were seen in 10(28.57%) patients. Most common aetiology is spontaneous. Twenty eight (80%) out of 35 patients had spontaneous CSF rhinorrhoea, whereas the remaining patients had other aetiologies like

accidental trauma (8.57%), iatrogenic trauma (5.71%) or congenital 2(5.71%) (Table 3).

Table -1: Age, Sex distribution N=35

Age distribution

Age group	n (%)
< 10	2 (5.71%)
10-20	1(2.85%)
21-30	2(5.71%)
31-40	13(37.14%)
41-50	9(25.71%)
51-60	6(17.14%)
61-70	2(5.71%)

Sex distribution

Sex	n (%)
Female	24(68.57%)
Male	11(31.42%)

Nine out of 10 patients with IIH had spontaneous CSF rhinorrhoea, whereas only one patient with IIH had post traumatic aetiology. Most common side is right side. Twenty (57.14%) patients had right sided CSF rhinorrhoea, whereas 14 (40%) had left sided CSF rhinorrhoea and one (2.85%) had bilateral CSF rhinorrhoea.

Table - 2: Co-morbidities N= 35

Co-morbidities	n (%)
Hypertension and Diabetes	4(11.42%)
Hypertension, diabetes and bronchial asthma	2(5.71%)
Hypertension alone	5(14.28%)
Hypothyroidism alone	2(5.71%)
Hypothyroidism and hypertension	1(2.85%)
Hypothyroidism and diabetes	1(2.85)
Ischemic heart disease and hypertension	1(2.85)
Epilepsy	1(2.85)
Nil	18(51.42)

BMI

Normal	7(20%)
Obese	20(57.14%)
Overweight	7(20%)

Underweight	1(2.85%)
IIH	
Yes	10(28.57%)
No	25(71.42%)

Skull base defect was seen in cribriform plate of ethmoid in 28(80%), fovea ethmoidalis in 4(11.43%) and sphenoid sinus in 3(8.57%) (Table 4). All the 35 patients underwent transnasal endoscopic repair of CSF Rhinorrhoea with multilayered closure after reducing the meningocoele or meningo-encephalocoele with bipolar diathermy flush with the level of skull base defect and removal (for fovea ethmoidalis and sphenoid sinus defects) or cauterization (cribriform plate defect) of mucosa around the skull base defect.

Table -3: Aetiology of CSF Rhinorrhea

Aetiology	**n (%)**
Congenital	2(5.71%)
Spontaneous	28(80%)
Accidental trauma	3(8.57%)
Iatrogenic Trauma	2(5.71%)

Fat (F) and fascia lata(FL)was used as graft for surgical repair in 23(65.71%) patients, fat with fascia lata and pedicled mucosal flap (PMF)of middle turbinate (MT)/inferior turbinate (IT) is used in 7(20%) patients**,** fat with fascia lata and pedicled posterior septal flap is used in 5(14.28%) patients (Table 4). Tissue glue was used after placing the graft in all the patients. Nose was packed for 5 days after surgery. Lumbar drain was placed prior to surgery and kept for 5 days after surgery in all the patients. Acetazolamide 250 mg thrice daily was used for 6 months in all cases of spontaneous CSF Rhinorrhoea. Mean duration of follow up was one year for all the patients. Recurrence is noted after 3 months in only one patient with spontaneous CSF Rhinorrhoea with signs and symptoms of IIH, who didn't use Acetazolamide regularly after surgery.

Successful outcome (no recurrence of CSF rhinorrhoea) was seen in 34(97.14 %) out of 35 patients even after 1 year of follow up.

(middle/inferior turbinate)	
Recurrence	**n (%)**
No	34(97.14%)
Yes	1(2.85%)

Table - 4: Site of defect & type of graft

Site of skull base defect	
Site	n (%)
Cribriform plate	28(80%)
Fovea Ethmoidalis	4(11.43%)
Sphenoid sinus	3(8.57%)
Type of graft used for repair of skull base defect	
Type of graft	**n (%)**
Fat and fascia Lata	23(65.71%)
Fat, fascia Lata and pedicled flap from posterior septum	5(14.28%)
Fat, fascia Lata and mucosal flap from turbinate	7(20%)

Discussion:

Most common age group of CSF Rhinorrhoea in our study is between 31 - 50 years accounting for 62.85% of total cases. Majority of the patients were females (68.57%) in this study similar to the study by Alexander etal [12]. Majority of the patients had multiple co-morbidities. Most of the patients had high BMI (>30kg/m^2) with obese and overweight category together accounting for 77.14 % of cases. Radiological signs of IIH were seen in 10(28.57%) patients in our study. Nine out of these 10 patients (90%) had spontaneous CSF Rhinorrhoea whereas only one patient had traumatic cause for CSF Rhinorrhoea. There are several reports in the literature suggesting that

primary spontaneous CSF leaks may be due to IIH [13–19].

Majority of patients had spontaneous CSF rhinorrhoea in our study similar to other studies [20–22]. There are several reports in the literature suggesting that spontaneous CSF rhinorrhoea is seen most commonly in middle aged, obese females with BMI of >30kg/m^2 [15,23,24] .Our study findings are also in accordance with these studies. Cribriform plate of ethmoid was the most common site of skull base defect followed by fovea ethmoidalis and sphenoid sinus in our study similar to the study by Castelnuovo etal [25]. Fat and facia lata was the most commonly used graft material (65.71%), although pedicled middle turbinate or inferior turbinate or posterior septal flaps were also used in some cases. Irrespective of the type of graft used, recurrence of CSF rhinorrhoea was noted in only one case in our study, indicating type of graft used for repair may not be significant in preventing recurrence after surgical repair. Our study results support the results of metanalysis by Hegazy etal that showed that aetiology, site of defect, type of graft used for repair may not influence outcome of TNER of CSF rhinorrhoea as long as the skull base repair is done using sound surgical principles [22]. Fibrin glue was used after putting the graft in all the cases in our study. Fibrin glue helps in wound healing by triggering inflammatory response and stimulates coagulation cascade and also acts as sealant [26]. Some authors reported that fibrin glue forms a thick layer between graft and skull base defect preventing adhesion of graft to the defect [15], but in our series of cases we used fibrin glue over the graft as a second layer thereby not interfering with graft adhesion to skull base. Continuous lumbar drainage of CSF was done for 5 days after surgery in our study. Continuous lumbar drainage of CSF after surgical repair of skull base defect helps in reducing the CSF pressure and thereby improving graft adhesion[27,28]. Acetazolamide was used for 6 months after

surgical repair of skull base defect in majority of patients in our study. Acetazolamide is a carbonic anhydrase inhibhitor which reduces intracranial pressure by reducing CSF production. There were studies which suggest that interventions to lower intracranial pressure including medical therapy(weight loss, Acetazolamide) or a CSF diversion procedure may be performed before or at the time of surgical repair of skull base defect in spontaneous CSF rhinorrhoea to prevent recurrence [29,30] . Successful reapir without any recurrence even after 1 year follow up was seen in 97% of cases similar to study by Alexander etal [12]. Several other studies also showed success rates of close to 90% after TNER of skull base defect for CSF rhinorrhoea [31,32].

Conclusions:

CSF rhinorrhoea is most commonly seen in middle aged, obese or overweight people, predominantly in females. Most common aetiology of CSF rhinorrhoea is spontaneous / idiopathic. IIH could be a risk factor for spontaneous CSF rhinorrhoea. Multilayered closure of the skull base defect, placing of lumbar drain till 5 days after surgery and management of co-morbidities like IIH may help in preventing recurrence of CSF Rhinorrhoea after TNER, irrespective of the site of defect and type of graft material used.

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