



## CSF RHINORRHEA: MANAGEMENT MODALITIES AND OUTCOME: A REVIEW OF 10 CASES.

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### ABSTRACT

**Background:** It is a combined retrospective and prospective study of 10 cases of CSF Rhinorrhea presented to our hospital analyzed on the basis of Age, Sex, Incidence and Prevalence, Clinical features, Medical management and surgical outcome. **Methods:** Detailed history along with clinical examination was done and these cases are investigated with the help of CT Cisternogram scan and treated with surgical CSF leak repair with tissue glue. **Results:** The study shows that CSF rhinorrhea was seen more commonly in females with spontaneous etiology being common (60%) and very few associated with post-traumatic events. CSF rhinorrhea is most commonly presented in 3<sup>rd</sup> and 4<sup>th</sup> decades of life. 90% of the time cribriform plate is the commonest site of CSF leak, it is believed so because of its thin and fragile nature. Defects usually ranges from 4mm to 10mm in our study. Also an association was made between BMI of the patient and CSF leak and was found that maximum number was having obesity. Beta 2 Transferrin Test was also performed which was detected in all the patients (100%). CT Cisternography was helpful in detecting the site and size of defect in 90% of the cases as per our study. **Conclusion:** CSF rhinorrhea is less likely to occur very commonly, thus it's incidence ranges from 5 or less in every 100000 people. Common amongst females in 3<sup>rd</sup> 4<sup>th</sup> decades, spontaneous and occasionally traumatic with cribriform plate being the commonest site of leak for which beta 2 transferrin can be considered as confirmatory test and CT Cisternography helps in locating site, size and allows in deciding plan of management. Recurrence rate is very less approx 10 percent which is affected by postoperative care taken by patient itself. Anosmia is most common complication.

### KEYWORDS

CSF (cerebrospinal fluid) Rhinorrhea, CSF leaks, CT Cisternography, Tissue Glue, Beta 2 transferrin Test.

### INTRODUCTION

Cerebrospinal fluid (CSF) Rhinorrhoea is the leakage of cerebrospinal fluid from the anterior cranial skull base subarachnoid space into the nasal cavity due to a defect in duramater, bone and mucosa. CSF Rhinorrhoea involves breach of number of anatomical structure, viz. duramater, arachnoid, the skull base and the mucosa of the nasal cavities and paranasal sinuses<sup>[1]</sup>.

CSF leak can be managed medically as well as surgically. Medically patient is managed with acetazolamide (prescribed orally) helpful as an adjuvant as it decreases the intracranial pressure. Surgical intervention is must in patients who are refractory to medical and conservative treatment. Two approaches are there: Extracranial and Intracranial.

Endoscopic guided approach for the repair of CSF Rhinorrhoea offer the benefit of both panoramic and detailed image of site of surgery. The 10 subjects included in our study were treated with this approach only.

Endoscopic approach is a type of extracranial approach. Benefit of endoscopic approach is that, it is possible to inspect the circumference of the operating field at 360 degree and has no external surgical scar, site specific, less invasive with short duration stay in hospital and with preservation of surrounding anatomy<sup>[2]</sup>. These technical features enable direct endonasal access to anatomical structures at the skull base without need for cutaneous incisions or cutting through bony segment and without any dislodgement of bony structures, hence preferred widely nowadays.

### AIMS AND OBJECTIVES:

To analyse the incidence and distribution of cases according to age, sex and aetiology of the disease.

To study the various investigations available to identify the leaks in CSF rhinorrhoea and thus identify the site and size of the defect.

To discuss the role and outcome of both medical and surgical management of CSF leak.

To study outcomes obtained through endoscopic closure of CSF leaks and also our experience obtained during the management, through our patients under study.

To study the complications observed after repair of CSF leak and its

management.

### METHODOLOGY:

A prospective and retrospective study is done on patients who came to G.G Hospital, Jamnagar with complain of CSF Rhinorrhoea. The study includes 10 patients with CSF rhinorrhoea from year 2017 to 2021.

### Inclusion Criteria

1. Failure of conservative management.
2. Anterior and middle cranial fossa leaks that can be easily approached endoscopically.
3. Size of defect- small size defect as determined using direct endoscopic visualization and radiological evaluation.
4. Etiology- traumatic, iatrogenic, spontaneous.

### Exclusion Criteria

1. Defect not localized by radiological and other CSF leak studies.
2. Multiple injuries in case of accidental injury requiring intracranial approach.
3. Pneumocephalus.
4. Tumour related CSF leaks.

- All the patients were admitted and evaluated for CSF rhinorrhoea.
- Detailed history was taken and clinical examination along with biochemical tests like glucose levels and beta transferrin 2<sup>[4]</sup> tests from the nasal secretions (? CSF) was done for confirmation.
- Evaluation and data analysis was done on the basis of: age, sex, aetiology, CSF leak site and size.
- All patients were treated medically first followed by surgical management with the help of different grafting techniques and complications were looked for if any.

### Medical/ Conservative Management Included:

- 30 degree head end elevation and strict bed rest.
- Azetazolamide (carbonic anhydrase inhibitor) to reduce intracranial pressure.
- Prophylactic injectable antibiotics to reduce the chances of meningitis.
- Stool softener and cough suppressant as and when required to reduce the straining.
- Surgically, we have done various grafting methods along with the use of tissue glue (figure 6). Fat and fascia lata was harvested from

- the thigh.
- Endoscopic repair was done and leaks were sealed in the following manner<sup>[8]</sup>.
    - 1.Fat- Tissue Glue-Fascia lata-Tissue Glue- Hadad flap<sup>[2]</sup>-Tissue Glue in 8 patients.
    - 2.Septal cartilage-Tissue Glue-Fascia lata-Tissue Glue- Hadad flap<sup>[2]</sup>. Tissue Glue in 2 patients.
  - Lumbar drain was inserted in all the patients preoperatively and kept for 5 post operative days, this helps in draining the CSF out to maintain the intracranial pressure and allow the site to heal.

### OBSERVATION AND RESULTS:

CSF Rhinorrhoea was seen in 7 (70%) females and 3 males (30%) out of the total 10 patients we have treated in our hospital which shows that the overall incidence is more in female than male.(table 1)

Most common affected age groups are from 3<sup>rd</sup> and 4<sup>th</sup> decades of life.

Etiologically 6 (60%) patients were having spontaneous onset of the complaint whereas 4 (40%) were having history of trauma prior to CSF leak. (table 2)

Traumatic etiology was seen in 31- 40 years of age group where as spontaneous 41- 50 years of age group (table 3)

Majority (90%) of patients have cribriform plate as the commonest site of CSF leak, followed by lateral recess of sphenoid which was seen in only 1 patient out of 10.

Size of the defect was ranging from 4 mm to 10 mm, (figure 1) also an association was made between BMI of the patient and CSF leak resulted as majority, 50% of the patients had a BMI range of (25-29.9) and belongs to pre obese group while 20% belong to Obesity category I and normal BMI (18.5-24.9) was seen in 20% patients. (table 4a and b)

Biochemical studies were also performed for CSF assessment which showed that glucose levels (>50mg/dl) were detected in the fluid collected from nose similar to that of CSF in 6 (60%) patients out of 10 and Beta 2 Transferrin Test<sup>[4]</sup> was also performed which was detected in all the patients (100%) thus can be labelled as a confirmatory test with 92% sensitivity and 100% specificity<sup>[4]</sup>. (table 5)

CT Cisternography<sup>[5]</sup> showed the site and size of leak in 9 (90%) patients where as in 1 patient it wasn't giving a clear idea. (figure 3)

Post operatively, anosmia was noted in 9 (90%), 3 (30%) showed synechia in nasal cavity at different sites and 2 (20%) presented with wound infection at facia lata graft harvesting site. Recurrence was found only in 1 (10%) patient after approximately 3 years for which revisional surgery was performed. Meningitis wasn't found in a single patient(may be because of the antibiotic coverage pre as well as post operatively in such patients). (figure 4)

### DISCUSSION AND CONCLUSION:

The most common complaint in rhinological practice being nasal discharge, one must differentiate that and rule out CSF Rhinorrhea. Patient usually complaints of watery nasal discharge which increases on bending forwards, some also give history of trauma prior to the onset of the symptom.

In our study most common presentation was spontaneous (60%) followed by traumatic (40%) similar to study carried out by **Singh et al<sup>[6]</sup>**, **Alexander et al<sup>[5]</sup>** and **Avani jain et al<sup>[13]</sup>**, **James A Burns et al<sup>[3]</sup>**.

Anyone can get affected whether male or female, our study showed that the condition was seen more commonly amongst females (70%) than males (30%) similar to that reported by **Singh et al<sup>[6]</sup>** and **Sajid Nazir Bhatti et al<sup>[7]</sup>** but contradicted to that carried out by **Avani Jain et al<sup>[13]</sup>**.

Most common site of leak was found to be the cribriform plate in our study, similar to results showed by **Avani et al<sup>[13]</sup>** and **Paolo Castelnovo et al<sup>[10]</sup>** but **Alexander et al<sup>[5]</sup>** concluded that in their study fovea ethmoidalis was most common.

An association was made between BMI and CSF rhinorrhea which showed that majority of the patients were having a BMI of >25 similar to a study by **P.Sathaporntheera et al<sup>[11]</sup>**.

Confirmation of watery discharge from nose as CSF is must, which was done by Beta 2 transferrin test, in our study all subjects showed the presence of beta 2 transferrin similar to the study of **Danny TM Chan et al<sup>[12]</sup>**. also they showed that maximum number patients (66.6%) showed glucose level >50% in the nasal secretion confirming it to be CSF which is also seen in our study (60%).

CT Cisternography was helpful for 9 patients (90%) showed the site and size of leak but failed for details for 1 patient (10%) similar to that by **Danny TM et al<sup>[12]</sup>**. (80%).

Anosmia was reported as the most common post operative complication (100%) in our study followed by synechia formation (30%) and wound infection at surgical site in thigh (20%). **Singh et al<sup>[6]</sup>** showed meningitis as most common post operative complication.

Recurrence was seen in 1 patient who presented with the complaint after approximately 3 years of 1<sup>st</sup> surgery giving the recurrence rate of 10% to our study and rest 90% showed complete improvement. Second stage surgery was done for that patient and success rate was 100%. This was similar to the study carried by **Chaban MR et al<sup>[9]</sup>**, **Alexander et al<sup>[5]</sup>** and **Avani jain et al<sup>[13]</sup>**. (table 6).

Thus it can be concluded that:

- The study shows that CSF Rhinorrhea isn't a very common condition.
- Most commonly it starts spontaneously and affects the individual in its 3<sup>rd</sup> and 4<sup>th</sup> decades more commonly the one with obesity and hypertensive.
- Endoscopic surgical repair of CSF leaks is a game changer in the outcome, increasing the success rate and decreasing the post operative care and complications.
- Tissue glue and Lumbar drain placement plays a major role in success rate of the 1<sup>st</sup> stage surgery.
- Anosmia was most commonly seen post operatively.
- If proper post operative care is taken including the medical management and complete rest, recurrence can be avoided.

**Funding:** none

**Conflict Of Interest:** none

**Ethical approval:** All procedures in this study were performed in accordance with the ethical standards of the institution and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

### TABLES:

**Table 1: Sex Distribution**

| SEX    | NUMBER | PERCENTAGE (%) |
|--------|--------|----------------|
| MALE   | 3      | 30             |
| FEMALE | 7      | 70             |
| TOTAL  | 10     | 100            |

**Table 2: Etiology**

| ETIOLOGY    | NUMBER | PERCENTAGE (%) |
|-------------|--------|----------------|
| SPONTANEOUS | 6      | 60             |
| TRAUMATIC   | 4      | 40             |
| TOTAL       | 10     | 100            |

**Table 3: Age Distribution**

| AGE GROUP(YEARS) | NUMBER | PERCENTAGE |
|------------------|--------|------------|
| 11-20            | 0      | 0          |
| 21-30            | 1      | 10         |
| 31-40            | 4      | 40         |
| 41-50            | 4      | 40         |
| MORE THAN 50     | 1      | 10         |
| TOTAL            | 10     | 100        |

**Table 4a: Percentage Distribution By BMI**

| BMI       | NO. OF PATIENTS | PERCENTAGE |
|-----------|-----------------|------------|
| <18.5     | 1               | 10         |
| 18.5-24.9 | 2               | 20         |
| 25-29.9   | 5               | 50         |
| 30-34.9   | 2               | 20         |
| TOTAL     | 10              | 100        |

**Table 4b: BMI Interpretation**

| BMI       | INTERPRETATION         |
|-----------|------------------------|
| <18.5     | UNDERWEIGHT            |
| 18.5-24.9 | NORMAL                 |
| 25-29.9   | OVERWEIGHT (PRE-OBESE) |
| 30-34.9   | OBESE CLASS 1          |

Table 5: Investigations

| INVESTIGATIONS     | DETECTED | PERCENTAGE | NOT DETECTED | PERCENTAGE |
|--------------------|----------|------------|--------------|------------|
| GLUCOSE LEVELS     | 6        | 60%        | 4            | 40%        |
| BETA 2 TRANSFERRIN | 10       | 100%       | 0            | 0%         |
| CT CISTERNOGRAPHY  | 9        | 90%        | 1            | 10%        |

Table 6:

| DIFFERENT STUDIES                | SUCCESS RATE AFTER 1 <sup>ST</sup> SURGERY | SUCCESS RATE AFTER 2 <sup>ND</sup> SURGERY |
|----------------------------------|--------------------------------------------|--------------------------------------------|
| OUR STUDY                        | 90%                                        | 100%                                       |
| ALEXANDER ET AL <sup>[5]</sup>   | 97%                                        | 100%                                       |
| AVANI JAIN ET AL <sup>[13]</sup> | 94.3%                                      | 100%                                       |
| CHAABAN MR ET AL <sup>[9]</sup>  | 93%                                        | 100%                                       |

Figures:

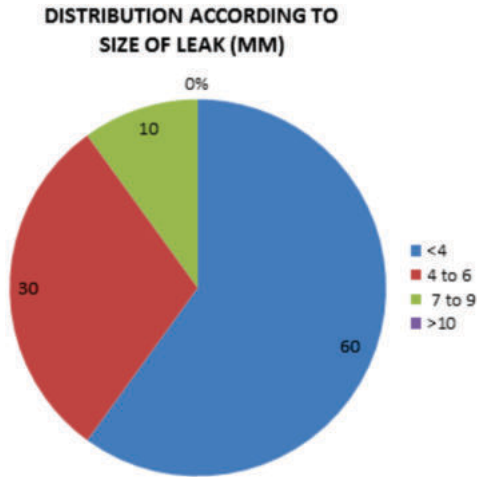


Figure 1



Figure 2: CT Cisternogram Showing CSF Leak

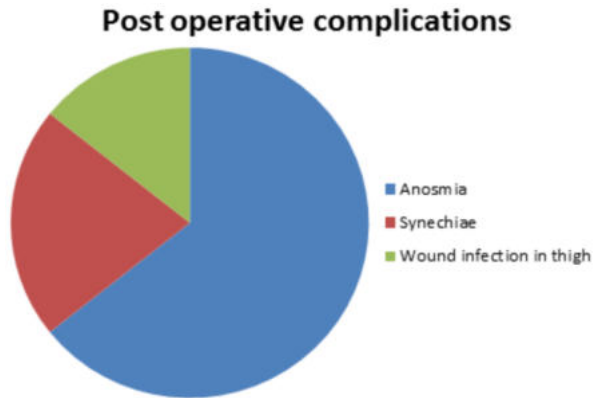


Figure 3: Post Operative Complications:

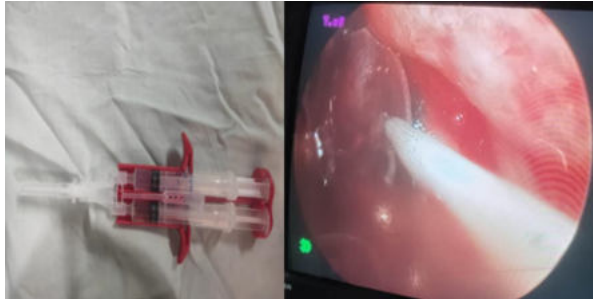


Figure 4: Tissue Glue And Fascia Lata Placement At Site Of Leak

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