

## To Determine Frequency of Cerebrospinal Fluid (CSF) Rhinorrhoea after Trans-sphenoidal (TSS) Surgery

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### ABSTRACT

**Introduction:** *Trans-sphenoidal approach has been a major technique for surgical treatment of sellar pathology since the 1960s. With the development of technical possibilities and increase in surgeons' expertise, mortality and morbidity after such interventions have decreased. Postoperative cerebrospinal fluid (CSF) rhinorrhoea, however, remains the most serious and life – threatening complication. The purpose of this study was to determine the magnitude of cerebrospinal fluid rhinorrhoea after trans-sphenoidal surgery, so that proper protocols could be taken for its prevention and management in order to reduce the morbidity of these patients.*

**Materials and Methods:** *A total of 116 patients, 20 to 60 years of age with sellar and supra-sellar tumours of any size were included. Patients with Rathke's cleft cyst, meningoceles, recurrent pituitary adenomas and h/o previous surgery and radiation were excluded. All the patients had undergone trans-sphenoidal removal of the tumour and were followed after 24 hours, one week and one month post-operatively and noted for presence of any cerebrospinal fluid rhinorrhoea.*

**Results:** *Mean age was  $45.23 \pm 8.71$  years in our study. Out of the 29 patients, 44.82% were male and 55.72% were females with ratio of almost 1:1. According to type of tumour, 56.90% were sellar and 43.10% were suprasellar. Cerebrospinal fluid (CSF) rhinorrhoea was found in 3 (10.34%) patients, whereas there was no Cerebrospinal fluid (CSF) rhinorrhoea in 26 (89.65%) patients.*

**Conclusion:** *This study concluded that frequency of CSF rhinorrhoea after trans-sphenoidal surgery (TSS) is 10.34% in our population.*

**Keywords:** *Pituitary tumours, endoscopic removal, CSF leakage.*

**Abbreviations:** *CSF: Cerebrospinal Fluid. TSS: Trans-sphenoidal Surgery.*

### INTRODUCTION

Trans-sphenoidal (TSS) surgery remains the mainstay of diagnostic and therapeutic management for many types of pituitary and sellar lesions, because of its high success rate and low rate of morbidity and mortality.<sup>1</sup> Schloffer and Harvey Cushing proposed a transseptal trans-sphenoidal approach to the pituitary gland in the beginning of 1900s.<sup>2</sup> The trans-sphenoidal surgery is safe and effective for removing pituitary adenomas.<sup>3,4</sup> Pituitary adenomas originate under the sellar diaphragm and thus out of the arachnoid membrane and subarachnoid space.<sup>5</sup> This allows the resection of many tumors without the risk of disrupting the arach-

noid.<sup>6</sup> After removing the tumor, a strategy is needed to avoid the postoperative cerebrospinal fluid (CSF) fistula and related complications like meningitis, abscess, subdural hematoma and pneumoencephalus.<sup>7</sup>

The main non-endocrine postoperative potential complication with Trans-sphenoidal approach is cerebrospinal fluid leak.<sup>8,9</sup> Cerebrospinal fluid (CSF) rhinorrhoea occurs when there is a communication between the subarachnoid space and the sinonasal mucosa due to meningeal and osseous defects in the cranial base, leading to discharge of CSF from the nose.<sup>10</sup>

A tear in the arachnoid may be an unavoidable complication of removing pituitary tumor through a

transsphenoidal approach. A large pituitary tumor may press against the arachnoid causing thinning and weakness in such that when the tumor is removed the pressure of CSF behind the arachnoid is sufficient to rupture a pathologically rarefied membrane. The opening in the dura allows CSF to drain through the nose.<sup>11</sup> Cerebrospinal fluid leak is recognized immediately after surgery when the patient feels a salty taste in his throat or by dripping of clear fluid from one or both nostrils.<sup>12</sup> Delayed CSF leak following trans-sphenoidal surgery is occasionally apparent only weeks or months after surgery. In these cases there is often a slowly enlarging defect in the arachnoid.<sup>13</sup> Romero et al<sup>14</sup> has reported frequency of CSF rhinorrhoea as 8.2% after trans-sphenoidal surgery. The risk of CSF rhinorrhoea after TSS is largely related to surgical experience of operator and tumor characteristics. Immediate post-operative CSF leak usually results from inadequate repair of intra-operative leaks or occult dural injury.<sup>12</sup>

The purpose of this study was to determine the magnitude of cerebrospinal fluid rhinorrhoea after transsphenoidal surgery in local population, so that proper protocols could be taken for its prevention and management in order to reduce the morbidity of these patients.

### Objectives

The objective of the study was:

- “To determine the frequency of cerebrospinal fluid leakage after trans-sphenoidal surgery.”

### Operational Definitions

- **Trans-sphenoidal Surgery:** Trans-sphenoidal surgery is a type of surgery in which surgical instruments were inserted into part of the brain by

going through the nose and the sphenoid bone.

- **Cerebrospinal Fluid (CSF) Rhinorrhoea:** Post-operatively 24 hours and on follow-up up to 1 month, any discharge of cerebrospinal fluid (CSF) from the nose was deemed as positive.

## MATERIALS AND METHODS

### Study Design

Descriptive, Case Series study.

### Setting

Department of Neurosurgery, Bahawal Victoria Hospital, Bahawalpur.

### Duration of Study

May 2014 to April 2015.

## RESULTS

Age range in this study was from 20 to 60 years with mean age of  $45.23 \pm 8.71$  years. Majority of the patients 12 (41.36%) were between 41 to 50 years of age as shown in Table 1. Out of the 29 patients, 13 (44.82%) were male and 16 (55.17%) were females with ratio of almost 1:1 (Figure 1).

Cerebrospinal fluid (CSF) rhinorrhoea was found in 3 (10.34%) patients, whereas there was no Cerebrospinal fluid (CSF) rhinorrhoea in 26 (89.65%) patients as shown in Figure VII. When Stratification was done on age groups, it was found that there was no significant difference of CSF rhinorrhoea frequency between different age groups as shown in Table 2 while the stratification of gender has shown in Table 3 which also showed no significant difference of CSF rhinorrhoea frequency between male and female. Table IV has shown the type of tumour stratification.

**Table 1:** Age distribution according to gender (n = 29).

| Age (years) | Male            |            | Female          |            | Total           |            |
|-------------|-----------------|------------|-----------------|------------|-----------------|------------|
|             | No. of patients | Percentage | No. of patients | Percentage | No. of patients | Percentage |
| 20 – 30     | 2               | 6.90       | 2               | 6.90       | 4               | 13.79      |
| 31 – 40     | 4               | 13.79      | 5               | 17.24      | 9               | 31.03      |
| 41 – 50     | 5               | 17.24      | 6               | 20.68      | 12              | 41.36      |
| 51 – 60     | 2               | 6.90       | 3               | 10.38      | 4               | 13.79      |
| Total       | 13              | 44.82      | 16              | 55.20      | 29              | 100.0      |

➤ Mean  $\pm$  SD =  $45.23 \pm 8.71$  years

**Table 2:** Stratification of age groups with respect to CSF Rhinorrhea.

| Age (Years) | CSF Rhinorrhea |             | p-value |
|-------------|----------------|-------------|---------|
|             | Yes            | No          |         |
| 20 – 30     | 0 (0%)         | 4 (100%)    | 0.366   |
| 31 – 40     | 02 (22.22)     | 7 (77.77%)  |         |
| 41 – 50     | 1 (8.33%)      | 11 (91.66%) |         |
| 51 – 60     | 0 (0%)         | 4 (100%)    |         |

**Table 3:** Stratification of Gender with respect to CSF Rhinorrhea.

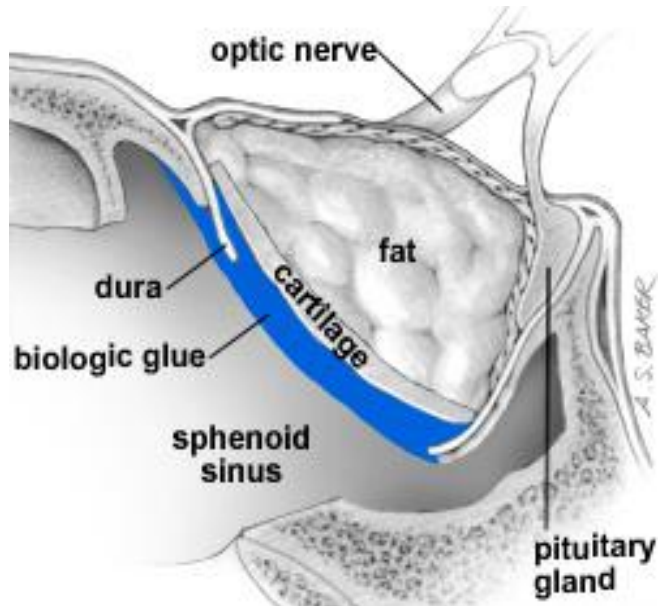
| Gender | CSF Rhinorrhea |             | p-value |
|--------|----------------|-------------|---------|
|        | Yes            | No          |         |
| Male   | 1 (7.69%)      | 12 (92.60%) | 0.092   |
| Female | 2 (12.50%)     | 14 (87.50%) |         |



**Fig. 1:** The surgeon passes instruments through the other nostril to remove the tumor.

**DISCUSSION**

Transsphenoidal approach has been a major technique for surgical treatment of sellar pathology since the 1960s. With the development of technical possibilities and increase in surgeons’ expertise, mortality and morbidity after such interventions have decreased. Postoperative cerebrospinal fluid (CSF) leakage, however,



**Fig. 2:** A fat graft is placed in the area where the tumor was removed. A cartilage graft is placed to close the hole in the sella. Biologic glue is applied over the area.

remains the most serious and life - threatening complication. Its rate has been reported to vary from 1 to 6%.<sup>15</sup> Frequent occurrence of intraoperative CSF leakage also poses an important problem, being reported in 15 to 30% of cases.<sup>16</sup> There is a high risk of developing meningitis, with all the associated morbidity and potential mortality with reported rates varying between 5.6% and 60%,<sup>17</sup> and the annual risk of developing meningitis of 9.8% per year has been estimated.<sup>18</sup> It is for this reason that successful closure of these defects is an important issue in both neurosurgical and otorhinolaryngological practice.

Cerebrospinal fluid leakage is noted at the time of surgery following resection of the pituitary adenoma or other sellar lesions, as the arachnoid descends to fill in the sometimes a large empty space around the tumor. Sometimes, CSF leak is recognized immediately after surgery when the patient feels a salty taste in his throat or by dripping of clear fluid from one or both nostrils. Nasal packing usually mask CSF leak for few days. Postoperative CSF leak may not be evident until after the nasal packs are removed and the patient is sent home. Delayed CSF leak following TSS surgery is occasionally apparent only weeks or months after surgery. In these cases there is often a slowly enlarging defect in the arachnoid.<sup>19</sup>

The mean age of patients in our study was 45.23 ±

8.71 years which was very much comparable with Amasauskas A et al<sup>8</sup> study who had a mean age of 47 but much higher than Tahir MZ et al<sup>10</sup> who had a mean age of 40 years. Pituitary tumour is a disease that is known to predominantly affect females. In the present study, we have found a female predominance (44.82% were male and 55.17% were females with ratio of almost 1.1:1) as was also observed in many previous studies.<sup>10,12</sup>

In our study, Cerebrospinal fluid (CSF) rhinorrhoea was found in 3 (10.34%) patients, whereas there was no Cerebrospinal fluid (CSF) rhinorrhoea in 26 (89.65%) patients. Marshall AH et al<sup>20</sup> in his study has also found the similar rate of cerebrospinal fluid rhinorrhoea (13.89%) after trans-sphenoidal surgery for pituitary adenomas as in our study. Tahir MZ et al<sup>10</sup> and Ismail AS in their studies had found the frequency of CSF rhinorrhoea after trans-sphenoidal surgery as 16.28% and 14.3% which were also very much comparable to the results of our study. But Romero et al<sup>22</sup> has reported much lower frequency of CSF rhinorrhoea as 8.2% after trans-sphenoidal surgery as compared to our study. Amasauskas A et al<sup>8</sup> in his study has found prevalence of CSF rhinorrhoea after transsphenoidal surgery as 1.1% which was very much lower as compared to our study.

In another study by Elgamal EA et al<sup>21</sup>, cerebrospinal fluid rhinorrhoea was found in only 2.7% patients who had undergone trans-sphenoidal surgery for mainly pituitary adenomas, or other lesions such as craniopharyngioma, Rathk's cleft cyst, meningioma or chordoma in the sella turcica.

van Aken MO et al<sup>22</sup> in a study has shown the intraoperative CSF leakage in 70/278 (25.2%) trans-sphenoidal operations and out of these 70 cases, only 1 (1.4%) patient developed meningitis.

## CONCLUSION

This study concluded that frequency of CSF rhinorrhoea after trans-sphenoidal surgery (TSS) is 10.34%. So, we recommend that surgeons should pay a special attention when dealing with large tumours expanding the sella or recurrent tumours in order to reduce the risk of cerebrospinal fluid rhinorrhoea after trans-sphenoidal surgery (TSS) which will not only reduce the devastating complications of CSF rhinorrhoea but also reduce the patient's morbidity.

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