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**ORIGINAL ARTICLE**

# Compare the Outcome of Endoscopic Endonasal versus Transcranial Approach for Cerebrospinal Fluid Leak Repair

MOHAMMAD MUSHTAQ[1], HAIDER ALI[2], NAEEM UL HAQ[3], MUHAMMAD ANWAR ULLAH[4], ANWAR SHAH[5], SAQIB ALI[6]
[1]*Assistant Professor Neurosurgery department, Frontier Medical and Dental College, Abbottabad*
[2]*Registrar Neurosurgery department, Lady Reading Hospital, Peshawar*
[3]*Assistant Professor Neurosurgery department, Mardan Medical Complex/ Bacha Khan Medical College, Mardan*
[4]*Neurosurgeon, DHQ Teaching Hospital, Timergara*
[5]*Associate Professor Neurosurgery, Khalifa Gul Nawaz Hospital, Bannu*
[6]*Assistant Professor, Data Analyst Department of Computer Science, University of Agriculture, Faisalabad*
*Corresponding author: Dr. Naeem ul Haq, Email: brainsurgeon1978@yahoo.com, Cell No: +92 335 9192492*

## ABSTRACT

**Objective:** The aim of this study is to compare the outcome of endoscopic endonasal verus transcranial approach for cerebrospinal fluid leak repair.

**Study Design:** Comparative study

**Place and Duration:** Conducted at department of Neurosurgery, Mardan Medical Complex/ Bacha Khan Medical College, Mardan during the period from 1st January 2020 to 31st December 2021.

**Methods:** Total eighty patients of both genders were presented in this study. Patients were aged between 20-65 years. Patients' detailed demographics age, sex and body mass were recorded after taking written consent. Patients had CSF leaks and the history of CSF leak was presented. Patients were equally divided into two groups, I and II. Group I received endonasal technique and group II received transcranial approach. All the patients underwent MRI and CT scan. Complete follow up among both groups were taken in the duration of 8 months for the assessment of efficacy. Complete data was analyzed by SPSS 24.0 version.

**Results:** Mean age of the patients in group I was 33.08±14.90 years with mean BMI28.4±3.12 kg/m$^2$ and in group II mean age was 31.66±4.84 years with mean BMI 27.45±1108 kg/m$^2$. Total 50 (62.5%) patients were males (25 in each group) and 30 (37.5%) patients were females (15 in each group). In group I recurrence rate was found in 3 (7.5%) cases and in group II recurrence rate was 6 (15%). 3 (7.5%) patients in group II developed infection but no infection rate was found in the endoscopic endonasal group. Satisfaction among patients in the endonasal group was greater than that of the transcranial group. Overall efficacy rate among both groups was 71 (88.8%).

**Conclusion:** We concluded in this study that for repair of cerebrospinal fluid leak endoscopic endonasal approach was effective and safe method as compared to transcranial approach. Minimum rate of recurrence and high rate of recovery was fund in endonasal approach.

**Keywords:** CSF, Endoscopic endonasal, Transcranial approach, Complications, Recurrence

## INTRODUCTION

The dura mater membrane surrounds the brain and spinal cord, allowing fluid to escape from the brain and spinal cord through any tears in this membrane. Known as CSF, this liquid causes a drop in pressure surrounding the brain and spinal cord when it leaks through a tear. A colorless and transparent, watery discharge is normally present in one nostril or ear, although it can also be present in both (Rhinorrhea). When the patient bends forward or strains due to constipation or coughing, the leak may become more severe, noticeable, and perhaps continuous. Eye and hearing problems are common symptoms of the disease. There are two main forms of CSF leaks: Surgical, traumatizing, or tumor-related leaks can occur spontaneously or as a result of trauma. [1]

A CSF leak (CSF Fistula) must be diagnosed and treated based on the reason. For cerebrospinal fluid, -2 transferrin is a particular test. To diagnose extracranial CSF fistula, 2-transferrin levels have been routinely employed.[ 2]Traumatic CSF leaks are usually handled conservatively by installing a lumbar drain to divert the flow of CSF until the tiny rip heals. Most CSF leaks heal on their own and do not require surgery. The correction of a CSF leak that occurs at the base of the skull after surgery is usually done surgically. [1] Localizing a CSF fistula involves the use of: To detect hydrocephalus, hydropneumocephalus and obstructive neoplasms. Including thin coronal incisions or reconstruction via the anterior fossa all the way back to the sellaturcica, among other options. 2) Water-soluble-contrast CTC isternography: may provide further information for localization and rule out. 3) Magnetic resonance imaging (MRI): may provide additional information for localization and rule out. It is possible to rule out hydrocephalus using a CT scan and an MRI scan. CSF flow has been seen using T2WI (T2 weighted images). Water soluble contrast CT cisternography is appropriate if the CSF leak cannot be located on a normal CT scan, if the patient is clinically leaking CSF, or if there are many bone defects present. If a bone defect visible on plain CT scan is not linked with aberrant elevation of nearby brain parenchyma, this is a cause for concern and should be investigated. There are two types of treatment: medical and surgical treatment. It is mainly reserved for CSF leaks in individuals who have suffered a brain injury or for spontaneous leakage. Coughing, sneezing, and weight lifting might raise intra-abdominal pressure, resulting in a repeat of CSF leak. As a diversion technique, lumbar drains may be required in a few patients. Spontaneous and delayed-onset traumatic or surgical CSF leaks require surgical correction because of their high prevalence and complications from recurrent meningitis. [3]

Surgical options for CSF leakage include transcranial and endoscopic. It's common for a primary repair or graft to be performed in both procedures. From the fascia lata or abdomen, the graft can be obtained (like fat). In addition to being a sealant, fibrin glue is also employed as a glue. Fibrin glue was employed in all but two cases of transcranial approach. In transcranial surgery, the frontal craniotomy and subfrontal approach are the two most commonly used transcranial methods. After surgery, if the frontal sinuses are exposed, they must be exsanguinated and maintained by a layer of pericranial, muscle patch, or fascia lata, followed by fibrin glue, which acts as an adhesive. It's replaced with a new bone flap and re-sutured. [4]

Compared to the transsphenoidal method, the transcranial approach has a higher rate of problems, such as hematoma formation and infection. There is a 3-4 percent risk of seizures with the transcranial technique because of the brain retraction. For roughly a year, these patients are recommended not to drive. However, it is not related to transsphenoidal surgery. Transcranial method has a failure rate of 25 percent, according to some sources. [5] As a result of the nasal cavity endoscope, a trans-sphenoidal repair of CSF leak is performed. Surgeons can employ Fluorescein dye if a CSF leak is not detected prior to surgery. [6] For mild defects, one layer of graft is sufficient, but for major defects many layers of graft are applied. For more information, see Lay and Inlay Graft.

In order to anchor the graft in place, fibrin glue is administered as a sealant. To provide time for the small defect to heal and medications to reduce intracranial pressure, some surgeons employ a lumbar drain to drain CSF from the brain. Almost all patients are encouraged to rest in bed. Over 90% of patients treated endoscopically had a positive outcome, according to the research. [7] Patients who undergo endoscopic correction of CSF leaks may experience moderate headaches and soreness at the surgical site, although these symptoms can be easily managed with analgesics. NSAIDS such as aspirin and ibuprofen should be avoided immediately after surgery to reduce the risk of bleeding. [8]

After 2-3 weeks following the operation, many patients have nasal congestion and slight nasal hemorrhage. By urging patients to keep their heads up, these adverse effects can be avoided. Most surgeons utilize nasal sprays and sinus rinse kits to decrease congestion, clear debris, and keep the sinuses wet during surgery. Walking and other mild activities are allowed for the majority of the patients, but they must wait one week before they may resume their normal routine activities and return to their offices. Constipation and weight lifting are among the most common things that doctors tell their patients to avoid.

## MATERIAL AND METHODS

This comparative experimental study was conducted at department of Neurosurgery, Mardan Medical Complex/ Bacha Khan Medical College, Mardan during the period from 1st January 2020 to 31st December 2021.

The study comprised of 80 patients of CSF leaks. Patients' detailed demographics were recorded after taking informed written consent. Patients had chronic renal failure, chronic liver disease, patients had wound infection and meningitis were excluded from this study.

Patients were aged between 20-65 years. Patients had CSF leaks and the history of CSF leak was presented. Patients were equally divided into two groups, I and II. Group I received endonasal technique and group II received transcranial approach.

Patients in group I received systemic antibiotics. General anesthesia was used to operate on patients. He had his head slightly cocked to the right (the side of the operating surgeon). Washing the face and nasal cavity with soap and Betadine solution was the next step. The endoscope utilized was a universal one (outer diameter of the operating sheath, 6.5 mm; 0-degree telescope). Endoscope was attached to TV monitor and camera for visual control and education. Three to five minutes before the surgical sheath was put into the nasal channel, the adrenaline in saline-soaked cottonoids was left to hemostasis. They put the operating sheath and telescope in front of a direct view. Fortunately, there was no mucosal harm to report. Patients were restricted to bed rest after surgery, with their heads elevated 30 degrees. Intermittent lumbar draining of CSF was conducted twice a day for 3 to 5 days. It took 48 to 72 hours for the nasal wrapping to be removed. After surgery, sneezing and coughing were discouraged.

For CSF leak closure, however, the sort of transcranial technique used is determined on where and how large the fistula is. Researchers have identified several surgical methods that range from the traditional frontal craniotomy to the suprasinustransfrontal approach with lateral extension, which can be bilateral or unilateral. There are additional alternatives to primary repair of the dura that can be employed if primary reconstruction is not possible, such as pericranial graft, fascia lata, temporalis muscle fascia or other autologous (preferable) or nonautologous grafts Techniques for repairing a leak are determined by circumstances and cannot be standardized algorithmically. Each fracture linked with a CSF leak has its own unique characteristics. The same can be true for the usage of graft materials. The choice of graft material is based on the defect's location and length, the amount of the dural laceration, and the availability of grafts.

All the patients were undergone for MRI and CT scan. Complete follow up among both groups were taken in the duration of 8 months for the assessment of efficacy. Standrd deviation and mean was used for numerical values. Categorical variables were assessed by percentages and variables. Complete data was analyzed by SPSS 24.0 version.

## RESULTS

Mean age of the patients in group I was 33.08±14.90 years with mean BMI28.4±3.12 kg/$m^2$ and in group II mean age was 31.66±4.84 years with mean BMI 27.45±11.08 kg/$m^2$. Total 50 (62.5%) patients were males (25 in each group) and 30 (37.5%) patients were females (15 in each group).(table 1)

In group I recurrence rate was found in 3 (7.5%) cases and in group II recurrence rate was 6 (15%).(table 2)

3 (7.5%) patients in group II developed infection but no any infection rate was found in endoscopic endonasal group. (table 3)

Table 1: Baseline details demographics of enrolled cases

| Variables | Group I (n=40) | Group II (n=40) |
|---|---|---|
| Mean age (years) | 33.08±14.90 | 31.66±4.84 |
| Mean BMI (kg/m$^2$) | 28.4±3.12 | 27.45±11.08 |
| **Gender** | | |
| Male | 25 (62.5%) | 25 (62.5%) |
| Female | 15 (37.5%) | 15 (37.5%) |

Table 2: Comparison of recurrence rate among both groups

| Variables | Group I (n=40) | Group II (n=40) |
|---|---|---|
| **Recurrence rate** | | |
| Yes | 3(7.5%) | 6 (15%) |
| No | 37 (92.5%) | 34(85%) |

Table 3: Prevalence of infection among both groups

| Variables | Group I (n=40) | Group II (n=40) |
|---|---|---|
| **Infection** | | |
| Yes | 0 | 3 (7.5%) |
| No | 40 (100%) | 37(92.5%) |

Satisfaction among patients in endoscopic endonasal group was greater than that of transcranial group. Overall efficacy rate among both groups was 71 (88.8%).(table 4)

Table 4: Comparison of satisfaction among both groups

| Variables | Group I | Group II |
|---|---|---|
| **Success rate** | | |
| Yes | 37 (92.5%) | 34 (85%) |
| No | 3 (7.5%) | 6 (15%) |
| **Satisfaction** | | |
| Yes | 38(95%) | 35 (87.5%) |
| No | 2 (5%) | 5 (12.5%) |

## DISCUSSION

Traumatic and non-traumatic fluid CSE can be distinguished from rhinorrhea (CSF). CSF From the frontal or ethmoid sinuses, traumatized CSF leaks normally originate from the cribriform platform, or the petrous part of the temporal bone, via the eustache tube to the nasal cavity. A piercing or blunt external injury can cause iatrogenic brain injury. Tumors, congenital and/or acquired hydrocephalus, as well as infections such as osteomyelitis or tuberculosis can induce non-traumatic increases in intracranial pressure.

In this comparative study total 80 patients of both genders were presented. Majority of the patients 50 (62.5%) were males and 30 (37.5%) were females. Patients were equally divided into 2-groups.Mean age of the patients in group I was 33.08±14.90 years with mean BMI28.4±3.12 kg/m$^2$ and in group II mean age was 31.66±4.84 years with mean BMI 27.45±11.08 kg/m$^2$. Our findings were comparable to the previous study.[9,10] In group I recurrence rate was found in 3 (7.5%) cases and in group II recurrence rate was 6 (15%).Our study showed a significantly lower hospitalization time in the endoscopic group and the duration of the surgical operation. Studies have shown a success rate of 76-97 percent.[11-13] It is similar to our study, we found success rate 88.8% among all cases.

An open and endoscopic approach to extracranial access is available. In addition, the endoscope provides a clear view of the nasal and paranasal sinus roof, which improves lighting and magnification, and allows the surgeon to correctly detect where a CSF leak is located[14]. Endoscopic procedures do not require external incisions, thus they do not leave scars, they reduce morbidity, they minimize intranasal mucosal damage and, as a result, late problems (e.g., mucoceles), and they allow for greater access in the long run. It's significantly easier to operate on the sphenoid sinus and higher clivus using endoscopic techniques [15]. Patients' hair is not shaved to minimize stigmatization, and the length of hospitalization is greatly reduced[16].

According to Stammberger et al [17], the largest study to date on the outcomes of endoscopic repair showed a 94.5 percent success rate with a single endoscopic surgery in 41 patients with CSF rhinorrhea In addition, an estimated 128 cases of endoscopic encephalocele correction have been recorded to far. Estimated success rates ranged from 93 to 97 percent on the first attempt. The average number of problems was 9.4% more than for leak repair, but the extent of the issues also appears to be larger, presumably due to the direct manipulation required for encephalocele repair of neurological tissue, according to the researchers. However, there haven't been any difficulties with long-term repercussions. CSF leaking is a well-known consequence of ventral and anterior skull base dural defect restoration. Irradiated patients, in particular, benefit greatly from the use of vascularized tissue for reconstruction. This technique was first used by Hadad and Bassagasteguy. The nasoseptal artery provides the blood supply. [18]

We found that 3 (7.5%) patients in group II developed infection but no any infection rate was found in endoscopicendonasal group. Satisfaction among patients in endoscopicendonasalgroup was greater than that of transcranial group in our study and this was comparable to the previous study. [19].Compared to transcranial surgery, endoscopicendonasal repair has less morbidity, a lower complication rate, and a greater overall success rate. In most circumstances, endoscopic repair of a CSF leak should be considered the standard method of choice because it is both safe and successful.

## CONCLUSION

We concluded in this study that for repair of cerebrospinal fluid leak endoscopic endonasal approach was effective and safe method as compared to transcranial approach. Minimum rate of recurrence and high rate of recovery was fund in endoscopic endonasal approach.

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