Original Article

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

Hameed Ullah Khan[1], Abdul Rauf[2] and Mubarak Hussain[2]

ABSTRACT

Objective: To determine the outcome of endoscopic endonasal versus transcranial approach for cerebrospinal fluid leak repair.

Study Design: Comparative study

Place and Duration of Study: This study was conducted at the Department of Neurosurgery, Indus Medical College Tando Muhamad Khan from January 2019 to December 2019.

Materials and Methods: Sixty patients of both genders and aged between 20-65 years were enrolled. Patient's details demographics age, sex and body mass were recorded. Patients had cerebrospinal fluid leaks and the history of cerebrospinal fluid leak was presented. Patients were equally divided into two groups, I and II. Group I treated by endonasal technique and group II treated by transcranial approach. All the patients were undergone for magnetic resonance imaging and computerized tomography scan. Complete follow up among both groups were taken in the duration of 10 months for the assessment of efficacy.

Results: Mean age of the patients in group I was 30.08±17.09 years with mean BMI 26.14±8.16 kg/m^2 and in group II, mean age was 29.74±6.48 years with mean body mass index 26.54±7.22 kg/m^2. Thirty six (60%) patients were males (18 in each group) and 24 (40%) patients were females (12 in each group). In group I recurrence rate was found in 4(13.3%) cases and in group II recurrence rate was (6.7%). 2 (6.7%) patients in group II developed infection but no any infection rate was found in endoscopic endonasal group. Satisfaction among patients in endonasal group was greater than that of transcranial group. Overall efficacy rate among both groups was 54 (90%).

Conclusion: For repair of cerebrospinal fluid leak both endoscopic endonasal and transcranial approach was effective and safe method. Minimum rate of recurrence and high rate of recovery was fund in this study.

Key Words: Cerebrospinal fluid, Endoscopic endonasal, Transcranial approach, Complications, Recurrence

Citation of article: Khan H, Abdul Rauf, Hussain M. Compare the Outcome of Endoscopic Endonasal versus Transcranial Approach for Cerebrospinal Fluid Leak Repair. Med Forum 2021;32(7):138-141.

INTRODUCTION

Cerebrospinal fluid (CSF) leaks are classified as traumatic (accidental and iatrogenic trauma) and spontaneous (idiopathic) leaks based on etiology. Patients with a CSF leak may present with a variety of symptoms ranging from clear nasal discharge and headaches to mental status changes, meningitis, or brain abscesses, or they may be asymptomatic.[1]

[1.] Department of Neurosurgery, Indus Medical College, Tando Muhamad Khan.
[2.] Department of Neurosurgery, Liaquat University of Medical & Health Sciences, Jamshoro.

Correspondence: Dr. Hameedullah Khan, Assistant Professor, Department of Neurosurgery, Indus Medical College, Tando Muhamad Khan.
Contact No: 0333-2667207
Email: drhameedkhan2581@gmail.com

Received: March, 2021
Accepted: May, 2021
Printed: July, 2021

Clinically a CSF leak can be diagnosed by asking the patient to lean forward (reservoir test) to check for wet rhinorrhea from the nose. A fluid sample can be sent to a lab for Beta-2 transferrin or Beta-2 trace protein testing.[2] Cerebrospinal fluids can enter the nose via deficiencies in the anterior cranial fossa such as the cribriform plate, frontal sinus, ethmoid sinus, and sphenoid sinus, or via a defect in the middle cranial fossa via the sphenoid sinus.[1]

Traumatic CSF leaking commonly happens after basilar skull fractures, however it can also occur as an iatrogenic side effect of surgical treatments.[3-6] Spontaneous leakage can occur with or without high intracranial pressure. On the other hand, spontaneous CSF leaks will always necessitate surgical intervention.[6] In the last 30 years, the advancement of CSF fistula repair has been tremendous, from craniotomy, which had a greater failure rate and severe morbidity, to endoscopic repair.[7]

Conservative treatment, particularly for post-accidental CSF leaks, consists of bed rest, elevation of the head, avoidance of straining activities, fluid restriction, and

diuretics. The majority of acute post-accidental CSF leaks recover with conservative treatment.[8]

The surgical technique chosen is determined by various criteria, including the extent and consistency of the tumor, the approach utilized in the original operation, and the surgeon's experience and preference.[9,10] Endoscopic trans sphenoidal techniques, transcranial approaches, and combinations of both have been documented for the management of these difficult cases with varying outcomes.

An extra cranial extradural approach is used for endoscopic CSF fistula repair. Because of its excellent visualization, precise graft placement, minimal damage to surrounding tissue, preservation of olfactory function in case of fistula leak through the cribriform plate, shortened operating time, and faster recovery time, it has been accepted worldwide as the method of choice.[11,12] We conducted present study with aimed to compare the outcomes of endoscopic endonasal versus transcranial approach for the management of cerebrospinal fluid leak.

MATERIALS AND METHODS

This comparative experimental study was conducted at Department of Neurosurgery, Indus Medical College Tando Muhamad Khan from 1st January 2019 to 31st December 2019 and comprised of 60 patients of cerebrospinal fluid leaks. Patient's details 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. Patient's details 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 were undergone for MRI and CT scan. Complete follow up among both groups were taken in the duration of 10months for the assessment of efficacy. Standard deviation and mean was used for numerical values. Categorical variables were assessed by percentages and variables. Complete data was analyzed by SPSS-22.

RESULTS

Mean age of the patients in group I was 30.08±17.09 years with mean body mass index 26.14±8.16 kg/m^2 and in group II mean age was 29.74±6.48 years with mean BMI 26.54±7.22 kg/m^2. Total 36 (60%) patients were males (18 in each group) and 24 (40%) patients were females (12 in each group) [Table 1].

In group I, recurrence rate was found in 4(13.3%) cases and in group II, recurrence rate was 2 (6.7%) [Table 2]. Two (6.7%) patients in group II developed infection but no any infection rate was found in endoscopic endonasal group (Table 3).

Overall efficacy rate among both groups was 54 (90%). Satisfaction among patients in endonasal group was greater than that of transcranial group (Table 4).

Table No.1: Baseline details demographics of enrolled cases (n=60)

Variable	Group I	Group II
Mean age (years)	30.08±17.09	29.74±6.48
Mean BMI (kg/m^2)	26.14±8.16	26.54±7.22
Gender		
Male	18 (30%)	18 (30%)
Female	12 (20%)	12 (20%)

Table No.2: Comparison of recurrence rate among both groups (n=60)

Recurrence rate	Group I	Group II
Yes	4 (13.3%)	2 (6.7%)
No	26 (86.7%)	28 (93.3%)

Table No.3: Prevalence of infection among both groups

Infection	Group I	Group II
Yes	0	2 (6.7%)
No	30 (100%)	28 (93.3%)

Table No.4: Comparison of satisfaction among both groups

Variable	Group I	Group II
Success rate		
Yes	26 (43.3%)	28 (46.7%)
No	4 (6.7%)	2 (3.3%)
Satisfaction		
Yes	29 (48.3%)	27 (45%)
No	1 (1.75)	3 (5%)

DISCUSSION

Cerebrospinal fluid rhinorrhea is a life-threatening problem. It results from a rupture of the dura and fractures at the base of the skull and can lead to severe consequences such meningitis and abcess of the brain.[13] Cerebrospinal fluid rhinorrhea management is contentious but can be categorized into conservative or operative therapy. For the first 1–2 months, the conservative treatment is indicated and surgery should start if it does not. The operation is classified into intracranial or extracranial treatments. A craniotomy was historically the first procedure utilized to treat anterior cranial fossa leaks in the intracranial approach. Extracranial techniques became more prevalent afterwards. More recently, a new approach for closure of CSF leaks has been offered with the introduction of endoscopic sinus surgery.[13]

In present study majority of the patients, 36 (60%) were males and 24 (40%) were females. Average mean age of the patients was 30.48±18.90 years with mean BMI

26.84±7.44 kg/m^2. Our findings were comparable to the previous studies.[9,14]

In our study recurrence rate was 13.3% in endonasal group and (6.7%) in transcranial group. A study conducted by Simair et al [9] reported that 10% patients and 5% patients had recurrence whom were treated with endonasal and transcranial approaches for CSF leak repair. Overall efficacy rate among both groups was 54 (90%). Our study showed a significantly lower hospitalization time in the endonasal group and the duration of the surgical operation. A study by Mansour et al[15] reported that the success rate of endoscopic approach was 90% at first attempt and after second attempt the success rate was 97.5%.

Nyquist et al[16] have investigated 28 individuals and reported an overall success rate of 93.8% endonasal closure (30 of 32 procedures). Lee and Colleagues[17] have examined a sample similar in size to Nyquist et al[16] reported a success percentage in the first attempt (86%) and in the second effort (93%). The overall success rate for Virk et al[18] following the second operation was of 93 percent and 100 percent. Lee and Colleagues[17] believe it depends mostly on the direct visualization of the lesion to succeed in endoscopic endonasal repair. Seth and Colleagues[19] stress fluorescein use, it was greater to locate the leaks when fluorescein-colored CSF was observed, 100% faults were detected compared to 81.3% without fluorescein and provided that the proper intrathecal solution of fluorescein is utilized, no adverse effects will occur at the right dose.[20,21]

Two (6.7%) patients in group II developed infection but no infection rate was found in endoscopic endonasal group. Satisfaction among patients in endonasal group was greater than that of transcranial group in our study and this was comparable to the previous study.[22].

CONCLUSION

For repair of cerebrospinal fluid leak both endoscopic endonasal and transcranial approach was effective and safe method. Minimum rate of recurrence and high rate of recovery was recorded.

Author's Contribution:

Concept & Design of Study:	Hameed Ullah Khan
Drafting:	Abdul Rauf, Mubarak Hussain
Data Analysis:	Mubarak Hussain, Abdul Rauf
Revisiting Critically:	Hameed Ullah Khan, Abdul Rauf
Final Approval of version:	Hameed Ullah Khan

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Anstead AS, Liu J. Cerebral spinal fluid leak repair: operative techniques in otolaryngology-head and neck surgery. Elsevier 2014;25(2): 187-93.
2. Martín-Martín C, Martínez-Capoccioni G, Serramito-García R, Espinosa-Restrepo F. Surgical challenge: endoscopic repair of cerebrospinal fluid leak. BMC Res Notes 2012;5(1):459.
3. Wigand ME, Haid T, Berg M. The enlarged middle cranial fossa approach for surgery of the temporal bone and of the cerebellopontine angle. Arch Otorhinolaryngol 1989;246(5):299-3025.
4. Prickett KK, Wise SK, Delgaudio JM. Choice of graft material and postoperative healing in endoscopic repair of cerebrospinal fluid leak. Arch Otolaryngol Head Neck Surg 2011;137:457-61.
5. Oberader S. Primary nontraumatic spontaneous CSF rhinorrhea with normal CSF pressure. Arch Neurol Neurochir Psychiatr 1972;111:369-76.
6. Ommaya AK, DiChiro G, Baldwin M, Pennybacker JB. Non-traumatic cerebrospinal fluid rhinorrhea. J Neurol Neurosurg Psychiatr 1968;31: 214-25.
7. Mathias T, Levy J, Fatakia A, McCoul ED. Contemporary approach to the diagnosis and management of cerebrospinal fluid rhinorrhea. Ochsner J 2016;16(2):136-42.
8. Simair IA, Ali J, Khattak A, Qureshi A, Salah-ud-Din T. Outcome comparison of endoscopic (endonasal trans-sphenoidal) repairs of CSS leak. Pak J Neurol Surg 2021; 25(1): 18-28.
9. Martin TJ, Loehrl TA. Endoscopic CSF leak repair. Curr Opin Otolaryngol Head Neck Surg 2007;15: 35-9.
10. Christoforidou A, Tsitsopoulos PP, Selviaridis P, Vital V, Constantinidis J. Endonasal endoscopic repair of cerebrospinal fluid leaks versus craniotomy: comparison of the outcomes. Hippokratia 2016;20(4):299-302.
11. Saafan ME, Albirmawy OA, Tomoum MO. Sandwich grafting technique for endoscopic endonasal repair of cerebrospinal fluid rhinorrhoea. Eur Arch Otorhinolaryngol 2013; 271(5):1073-9.
12. Anand VK, Murali RK, Glasgold MJ. Surgical decisions in the management of cerebrospinal fluid rhinorrhoea. Rhinol 1995;33:212-18.
13. Khan R, Zarak MS, Munir U, Ahmed K, Ullah A. Thrombolysis in myocardial infarction (TIMI) risk score assessment for complications in acute anterior wall ST elevation myocardial infarction. Cureus 2020;12(6):e8646.
14. Mansour MH, Abdelgelil AS, Ibraheem MK, Dawood YM. Surgical outcome of endoscopic repair of cerebrospinal fluid rhinorrhea. Al-Azhar Assiut Med J 2018;16:247-54.

15. Nyquist GG, Anand VK, Mehra S, Kacker A, Schwartz TH. Endoscopic endonasal repair of anterior skull base non-traumatic cerebrospinal fluid leaks, meningoceles, and encephaloceles. J Neurosurg 2010;113:961-6.
16. Lee DH, Lim SC, Joo YE. Treatment outcomes of endoscopic repairs of sinonasal cerebrospinal fluid leaks. J Craniofac Surg 2011;22:1266-70.
17. Virk JS, Elmiyeh B, Saleh H. Endoscopic management of cerebrospinal fluid rhinorrhea: the charing cross experience. J Neurol Surg Br 2013; 74:61-7.
18. Seth R, Rajasekaran K, Benninger MS, Batra PS. The utility of intratecal fluorescein in cerebrospinal fluid leak repair. Otolaryngol Head Neck Surg 2010;143:626-32.
19. Felisati G, Bianchi A, Lozza P, Porfaleone S. Italian multicentre study on intratecal fluorescein for craniosinusal fistulae. Acta Otorhinolaryngol Ital 2008;28:159-63.
20. Turel MK, et al. Endonasal endoscopic transsphenoidal excision of tuberculum sellae meningiomas: a systematic review. J Neurosurg Sci 2016; 60: 463-75.
21. Dehdashti AR, Stofko D, Okun J, Obourn C, Kennedy T. Endoscopic endonasal reconstruction of skull base: repair protocol. J Neurol Surgery, Part B Skull Base 2016;77(3):271–278.