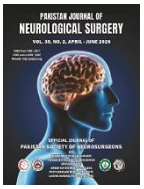

PAKISTAN JOURNAL OF NEUROLOGICAL SURGERY (QUARTERLY) – OFFICIAL JOURNAL OF PAKISTAN SOCIETY OF NEUROSURGEONS

Original Research

Clinical Outcomes of Endoscopic Third Ventriculostomy in Obstructive Hydrocephalus: A Single-Center Observational Study

Kamran Ullah,[1] Muhammad Irfan Javed,[2] Saddiq Ullah,[3] Muhammad Shafiq[4]

[1]Department of Neurosurgery, Rizwan medical Center and general hospital, Peshawar – Pakistan
[2]Neurosurgery Department Jinnah Teaching Hospital, Peshawar – Pakistan
[3]Neurosurgery Department, Changi General Hospital, Singapore
[4]Department of Neurosurgery, Hayatabad Medical Complex, Peshawar – Pakistan

ABSTRACT

Introduction: Endoscopic third ventriculostomy (ETV) is a well-established treatment for obstructive hydrocephalus and provides a more physiologic alternative to shunt surgery. But there is variability in clinical outcomes.

Objective: To perform an exploratory analysis of factors associated with treatment success.

Methods: We conducted a retrospective observational study of 36 patients who received ETV for obstructive hydrocephalus between February 2023 and December 2025. Patient characteristics, etiology, clinical presentation, and outcomes were reviewed. ETV was considered successful if there was clinical improvement without requiring further cerebrospinal fluid diversion. Chi-square and independent t-tests were used for statistical analysis.

Results: The mean age range was 15 ± 10 years, and 66.7% were men. The most common diagnosis was aqueductal stenosis (50%). The success rate was 80.6% and the complication rate 13.9%. There was no significant correlation between success and age ($p = 0.18$), sex ($p = 0.34$), or etiology ($p = 0.21$), but a trend towards higher rates of success was observed in patients with aqueductal stenosis.

Conclusion: ETV is a safe, successful method of treating obstructive hydrocephalus with good short-term results. Although no statistically significant associations were found, a trend towards superior outcome in certain etiologies was noted. Further research with larger cohorts and longer follow-up is needed to better characterize factors associated with the outcome.

Keywords: ETV; obstructive hydrocephalus; aqueductal stenosis; CSF; neurosurgery; outcome.

Corresponding Author: Muhammad Irfan Javed
Designation: Senior Registrar, Neurosurgery Department, Jinnah Teaching Hospital, Peshawar – Pakistan
Email: *mijdr1210@gmail.com*

Date of Submission: 20-02-2026
Date of Revision: 11-06-2026
Date of Acceptance: 12-06-2026
Date of Online Publishing: 16-6-2026
Date of Print: 30-6-2026

DOI: 10.36552/pjns.v30i2.1250

INTRODUCTION

Obstructive hydrocephalus is a potentially crippling brain disorder that causes the cerebrospinal fluid (CSF) circulation to be disrupted in the ventricular system. This interference contributes to rising intracranial pressure, dilatation of the ventricles, which progresses and compromises the system.[1] In the clinical setting, the patient can have a headache, cognitive impairment, gait, visual, or developmental delay in children. Obstructive hydrocephalus has a heterogeneous etiology and may also involve congenital anomalies (aqueductal stenosis, intracranial tumors, arachnoid cysts, and post-infectious or post-hemorrhagic sequelae).[2] It is important to diagnose early and intervene promptly to avoid neurological damage that cannot be reversed and maximize long-term outcomes.

Historically, the primary treatment of hydrocephalus has been a vascular-peritoneal (VP) shunt. Despite their effectiveness in the diversion of CSF and the reduction of intracranial pressure, VP shunts are linked to a range of well-known shortcomings, among which are a dependence on a device throughout the lifespan, potential infection, mechanical and mechanical breakdown, obstruction, and a high rate of revision surgeries.[3] These disadvantages have raised the desire to find alternative treatment modalities capable of reestablishing physiological CSF dynamics with minimization of long-term complications.[4]

Endoscopic third ventriculostomy (ETV) has proven to be a less-invasive and physiologically restorative procedure in the treatment of obstructive hydrocephalus. It includes the making of a hole in the floor of the third ventricle, which enables the CSF to circumvent the point of obstruction and flow directly to the subarachnoid space.[5] Compared to shunting, ETV has several benefits, such as elimination of implanted devices, minimization of the risk of infection, and maintenance of more natural CSF circulation. The success rates have been reported to be inconsistent, with a range of 70% to 90%, with better results in some patient groups, especially those with aqueductal stenosis.[6]

Although there is an increasing amount of evidence that ETV can be effective, its results have been known to be variable, based on a variety of clinical factors, such as age of the patient, underlying etiology, and ventricular anatomy. It is important to understand factors associated with outcomes of success to select patients properly and to maximize the results of surgery. Nonetheless, the information on these predictors is still scarce in some clinical contexts, especially in real-life cohorts in developing healthcare systems.[7]

Besides the analysis of the general efficacy, the safety profile of ETV should be measured, and the frequency of postoperative complications (infection, hemorrhage, etc.) should be evaluated. Moreover, statistical correlations between clinical variables and treatment outcomes can help to obtain some meaningful insights into the factors that can lead to the success or failure of the procedure.[8]

This research will help analyze the clinical outcomes of ETV in obstructive hydrocephalus patients, and, in particular, the exploration of factors associated with treatment outcomes. In particular, it evaluates the demographic factors, the underlying etiologies, the success and failure rates of the procedure, postoperative complications, and the connection between the main clinical variables and treatment outcomes.[9,10] This research seeks to assess the efficacy and safety of endoscopic third ventriculostomy (ETV) in patients with obstructive hydrocephalus in a clinical setting. It also aims to explore the relationship between some clinical factors and the success of treatment.

MATERIALS AND METHODS

Design and Setting of the Study

This retrospective cohort study was carried out in Rizwan Medical Center and General Hospital. The participants of the study were patients with obstructive hydrocephalus who underwent endoscopic third ventriculostomy (ETV) between February 2023 and December 2025.

The Ethical Review Board of Rizwan Medical Center & General Hospital reviewed and approved the study in line with the Declaration of Helsinki (2013) (Approval No. 11; dated 20 January 2026). Since the study was retrospective, informed consent was not required, but patient confidentiality was preserved, and all data were analyzed anonymously.

Study Population

The study included 36 patients with obstructive hydrocephalus who had ETV during the study period. To reduce selection bias, all successive patients who fulfilled the inclusion criteria during the specified study period were enrolled. The patients were aged between 1 and 35 years and were diagnosed using clinical presentation and radiological results.

Inclusion Criteria

Inclusion criteria were that patients had radiologically proven (non-communicating) hydrocephalus and received endoscopic third ventriculostomy within the study period. The inclusion criteria were restricted to the patients who had a complete clinical history, details of their operation, and follow-up data.

Exclusion Criteria

Patients were not included in cases of communicating hydrocephalus, incomplete medical records, or lack of follow-up data. Moreover, the patients undergoing alternative or combined cerebrospinal fluid diversion procedures were not considered in the study.

Preoperative Evaluation

Each patient was thoroughly pre-operated, with a thorough neurological examination and neuroimaging with computed tomography (CT) and/or magnetic resonance imaging (MRI) of the brain. The following clinical manifestations were reported: headache, vomiting, visual impairment, gait disorders, and developmental delay. The underlying etiology of hydrocephalus was determined based on radiological findings.

Surgical Technique

The techniques described were performed under general anesthesia with routine neuroendoscopy. A Kocher's point burr hole was created, and a rigid neuroendoscope was inserted into the lateral ventricle. The neuroendoscope was then passed through the foramen of Monro into the third ventricle. The infundibular recess, mammillary bodies, and tuber cinereum were carefully identified. The best ventriculostomy site was chosen in the midline, anterior to the mammillary bodies and posterior to the infundibular recess. A blunt instrument was used to penetrate the floor of the third ventricle, and a balloon catheter was used to dilate the stoma to a diameter of 3-5 mm. The arachnoid membranes in the prepontine cistern were opened to allow free flow of cerebrospinal fluid (CSF). We confirmed the patency of the stoma intraoperatively by visualizing pulsatile CSF flow through the stoma and recognition of the basilar artery and its branches in the prepontine cistern. Care was taken to avoid injury to adjacent neurovascular structures. Any bleeding was cauterized, and the endoscope was removed.

Outcome Measures

The success of ETV was defined as persistent

improvement in presenting symptoms without the requirement of further cerebrospinal fluid (CSF) diversion surgery during the follow-up period. Success was defined by the resolution or improvement in symptoms, including headaches, vomiting, visual disturbances, ataxia, and developmental delay. Failure of ETV was defined as persistence or recurrence of symptoms related to hydrocephalus, necessitating further surgical treatment, such as ventriculoperitoneal (VP) shunting or repeat ETV.

Preoperative CT/MRI was done in all cases, and postoperative CT/MRI was done as per clinical need. However, the use of standardized radiological measures, such as ventricular indices or CSF flow void through the stoma, was not routinely assessed and so not included as an outcome measure. The Endoscopic Third Ventriculostomy Success Score (ETVSS) was not used in this study because it was retrospective, and not all variables were available. The second outcome measure was complications, which were documented and graded according to severity.

Follow-up

The mean follow-up duration was 6 ± 2 months. The follow-up assessment was primarily clinical, focusing on symptom resolution and neurological status. Radiological imaging was performed selectively based on clinical indications rather than as a standardized protocol.

Statistical Analysis

The Statistical Package of the Social Sciences (SPSS) was used to perform statistical analysis. Continuous variables were measured in terms of normality and were expressed in mean and standard deviation, whereas categorical variables were expressed in terms of frequencies and percentages.

The chi-square test was used to compare clinical variables and outcomes on the categorical variables, whereas the independent sample t-test was used to compare clinical variables and outcomes on the continuous variables. The correlation between the patient characteristics (age, gender, and etiology) and the ETV outcome was assessed with the help of the corresponding statistical tests.

A p-value of < 0.05 was considered statistically significant. Where possible, confidence intervals (95% CI) were determined.

Due to the limited sample size, multivariable regression analysis was not performed, and the results should be interpreted as exploratory.

RESULTS

Demographic and Clinical Characteristics

A total of 36 patients with obstructive hydrocephalus were included in the study. The cohort comprised 24 males (66.7%) and 12 females (33.3%), with a mean age of 15 ± 10 years (range: 1–35 years) (Table 1).

Two patients (5.6%) had a prior history of ventriculoperitoneal (VP) shunting and subsequently underwent endoscopic third ventriculostomy (ETV).

Table 1: *Demographic Profile of Patients Undergoing Endoscopic Third Ventriculostomy.*

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	24	66.7%
	Female	12	33.3%
Age (years)	Mean ± SD	15 ± 10	—
Age range	—	1–35	—

Etiological Characteristics

Aqueductal stenosis was the most common etiology, observed in 18 (50%) patients, followed by tumors in 11 (30.6%) patients. Other causes included arachnoid cysts and post-infectious hydrocephalus, accounting for 7 (19.4%) cases (Table 2).

Clinical Outcomes of Endoscopic Third Ventriculostomy

Successful outcomes were achieved in 29 patients (80.6%; 95% CI: 67.7–93.5), while 7 patients (19.4%) experienced treatment failure (Table 3).

The two patients with prior VP shunting underwent ETV and did not require additional intervention during the follow-up period.

The mean follow-up duration was 6 ± 2 months.

Table 3: *Clinical Outcomes of Endoscopic Third Ventriculostomy*

Outcome	Frequency (n)	Percentage (%)
Success	29	80.6%
Failure	7	19.4%

Postoperative Complications

Five patients (13.9%) experienced complications. Three patients (8.3%) had an infection, and 2 patients (5.6%) had an intracranial hemorrhage. None of the patients had more than one complication.

The complications were ranked in terms of their severity. All complications were deemed minor to moderate and were treated conservatively or with conventional medical care. No patient needed a reoperation for complications, and there were no deaths or permanent deficits.

A total of 31 patients (86.1%) experienced no complications.

Table 2: *Etiology of Obstructive Hydrocephalus.*

Etiology	Frequency (n)	Percentage (%)
Aqueductal stenosis	18	50%
Tumor	11	30.6%
Arachnoid cyst / Post-infectious	7	19.4%

Table 4: *Postoperative Complications.*

Complication	Frequency (n)	Percentage (%)
Infection	3	8.3%
Bleeding	2	5.6%
None	31	86.1%

Factors Associated with Clinical Outcome

An exploratory analysis was performed to assess the relationship between selected clinical variables and ETV outcomes (Table 5).

A higher proportion of successful outcomes was observed in patients with aqueductal stenosis (83.3%) compared to tumors (72.7%) and other etiologies (75%). However, this difference did not reach statistical significance ($\chi^2 = 3.12$, $p = 0.21$).

Similarly, no statistically significant association was observed between gender and clinical outcome ($\chi^2 = 0.91$, $p = 0.34$). The mean age of patients with successful outcomes was slightly lower than that of those with failure (14 ± 9 vs. 16 ± 11 years); however, this difference was also not statistically significant ($t = 1.36$, $p = 0.18$).

Given the relatively small sample size, these findings should be interpreted as exploratory, and the study may be underpowered to detect

Table 5: *Association of Clinical Factors with ETV Outcome.*

Variable	Success (n=29)	Failure (n=7)	Test Used	Test Value	p-value
Etiology			Chi-square	3.12	0.21
Aqueductal stenosis	15	3			
Tumor	8	3			
Others	6	1			
Gender			Chi-square	0.91	0.34
Male	19	5			
Female	10	2			
Age (years)	14 ± 9	16 ± 11	Independent t-test	1.36	0.18

statistically significant differences between groups.

DISCUSSION

Endoscopic third ventriculostomy (ETV) is an established treatment for obstructive hydrocephalus, and the findings of the present study reflect its effectiveness in a real-world clinical setting. The total success rate of 80.6% in our cohort is in the range of the literature (approximately 70% to 83%), indicating that the success of ETV in our environment is as high as in environments with more resources. This similarity can probably be explained by Stachura et al, (2014) through the selection of patients and the prevalence of genuine obstructive pathologies in our study group.[11] Bouras et al, (2012) specifies the large percentage of aqueductal stenosis, a condition that is known to have good CSF flow dynamics after stoma creation, could be the reason behind the strong success rate with such procedures, since a restoration of near-physiological CSF circulation is more reliably done when it is affected by stoma creation.[12] These results should be interpreted within the context of a single-center observational cohort.

Our study has further supported the existing evidence and provided a context-specific understanding of the distribution of etiologies and their association with the outcomes. Aqueductal stenosis was the most frequent etiology and also the one that showed the best percentage of successful results. This is consistent with Martinoni M et al, (2022) and García-Milan et al, (2024), who have consistently been associated with favorable ETV outcomes in previous studies.[13,14] The rationale behind this is the simple obstructive nature of the pathology, with the distal mechanisms of CSF absorption intact, and ETV can effectively circumvent the obstruction. Conversely, our cohort of patients with tumor-related hydrocephalus reported relatively low success rates, which is also consistent with the existing literature. This disparity could be described by the fact that the pathophysiology of tumors is multifactorial, with the distortion of normal ventricular anatomy, changes in the absorption of CSF, and possible influences of related inflammation or adjuvant therapies. In our analysis, the association between etiology and outcome did not reach statistical significance in our cohort, likely due to the limited sample size; this is likely attributable to the limited sample size rather than the absence of a true effect, as demonstrated in larger studies. Therefore, these findings should be interpreted as observational trends rather than definitive predictors.

Another factor often involved in the determination of ETV success is age, especially when considering worse outcomes in young patients because of immature CSF absorptive capacity. Interestingly, the age and outcome were not found to be statistically related in our study, even though there was a slight trend in which younger patients had better outcomes. This observation differs from findings reported in a number of large series of Kulkarni et al, (2016) and Kulkarni et al, (2018), which could be attributed to the relatively small size of our cohort of infants and a more extended age range into adulthood. It is thus reasonable that the age effect was watered down in our analysis, emphasizing the need to think of age in relation to other variables like etiology and not as a predictor by itself.[15,16] The absence of statistical significance in our study likely reflects limited statistical power rather than a true lack of association.

Similarly, no statistically significant association was observed between gender and clinical outcome, which is also consistent with general literature and promotes the notion that anatomical and pathophysiological factors determine the success of ETV more than demographic factors. This similarity in studies enhances the external validity of our results.

The safety profile, which was observed during this study, also adds to the benefits of ETV. The complication rate, 13.9 overall, is not inferior to the rates in modern literature of Legaspi et al, (2021), and, most importantly, all complications were treated successfully, with no mortality rate.[17] All complications were minor to moderate in severity and were managed without the need for reoperation. No mortality or permanent neurological deficit was observed. The fact that several complications are absent in single patients indicates that, when done with proper technique, ETV is a relatively riskless procedure. Compared to ventriculoperitoneal shunting, which has well-reported risks of infection, mechanical complications, and lifelong dependence, as Kong et al, (2023) mention, ETV has a considerable clinical benefit because it does not require implanted devices, and there is less risk of long-term morbidity.[18] This is especially true in resource-constrained environments, with repeated surgical operations possibly being limited and the cost of shunt-related complications potentially being high.

Another significant finding in our paper is the effective use of ETV in patients who had VP shunts previously. Both of these patients were symptom-free and did not need further intervention, which endorses the idea that ETV may be an effective method of restoring physiological CSF pathways even once the dependency of the shunt has developed. The discovery is congruent with previous reports of Isaacs et al, (2015) and has significant clinical implications, indicating that ETV can be used as a primary treatment, as well as a salvage procedure in case of shunt failure, which would decrease the long-term dependency on shunt systems.[19]

Although these are the strengths, some limitations are to be noted. The retrospective design presents the risk of selection and reporting bias, and the sample size is relatively small to have the necessary statistical power to establish significant associations between variables. Additionally, the 6 ± 2 months follow-up period might not be sufficient to identify the occurrence of late failures, which are also known to happen after ETV because of stoma closure or changing CSF dynamics. An important strength of this study is its reflection of outcomes in a real-world, resource-limited clinical setting. In such environments, ETV offers a significant advantage over shunt-based procedures by avoiding lifelong device dependency and reducing the burden of shunt-related complications and revisions. The favorable outcomes observed in this cohort support the feasibility and effectiveness of ETV when performed with appropriate patient selection and surgical expertise. These limitations emphasize the necessity of larger, prospective, multicenter studies with long-term follow-up to clarify long-term outcomes and hone prediction models of ETV success. The relatively small sample size limits the statistical power of the study and precludes reliable identification of independent predictors. The follow-up duration of 6 ± 2 months may not capture late ETV failures. The Endoscopic Third Ventriculostomy Success Score (ETVSS) was not applied due to the retrospective design.

CONCLUSION

Endoscopic third ventriculostomy is a safe and effective procedure for obstructive hydrocephalus, with good short-term clinical outcomes in this single-center study. Our findings suggest it can be an effective alternative. Our findings support its role as a potential alternative to cerebrospinal fluid diversion through shunts, especially when performed in the right candidates.

While no significant associations were found between clinical factors and results, the trends seen in patients with aqueductal stenosis are in line with published reports. However, these results should be considered a preliminary exploration because of the small sample size and

retrospective nature of the study.

Multicenter prospective studies with consistent radiologic evaluation and extended follow-up are needed to further characterize long-term outcomes and optimize patient selection for endoscopic third ventriculostomy.

REFERENCES

1. Zhang M, Hu X, Wang L. A review of cerebrospinal fluid circulation and the pathogenesis of congenital hydrocephalus. Neurochemical research. 2024;49(5):1123-36. Doi:10.1007/s11064-024-04113-z
2. Ahmad SJ, Zampolin RL, Brook AL, Kobets AJ, Altschul DJ. A case of hydrocephalus confounded by suprasellar arachnoid cyst and concomitant reversible cerebral vasoconstriction syndrome. Surgical Neurology International. 2022;13:331. Doi: 10.25259/SNI_313_2022
3. Paff M, Alexandru-Abrams D, Muhonen M, Loudon W. Ventriculoperitoneal shunt complications: a review. Interdisciplinary Neurosurgery. 2018;13:66-70. Doi: 10.1016/j.inat.2018.04.004
4. Nishiyama K, Mori H, Tanaka R. Changes in cerebrospinal fluid hydrodynamics following endoscopic third ventriculostomy for shunt-dependent noncommunicating hydrocephalus. Journal of neurosurgery. 2003;98(5):1027-31. Doi: 10.3171/jns.2003.98.5.1027
5. Munda M, Spazzapan P, Bosnjak R, Velnar T. Endoscopic third ventriculostomy in obstructive hydrocephalus: A case report and analysis of operative technique. World Journal of Clinical Cases. 2020;8(14):3039. Doi: 10.12998/wjcc.v8.i14.3039
6. Jain R, Jha VC, Ramesh A, Verma G, Ajaya A, Sinha VS, Kumar N, Karthikeyan V, Dhage N. Outcomes of endoscopic third ventriculostomy in comparison to ventriculoperitoneal shunt in obstructive hydrocephalus–A randomized controlled trial. Surgical Neurology International. 2025;16:387. Doi: 10.25259/SNI_702_2025
7. Lam S, Harris DA, Lin Y, Rocque BG, Ham S, Pan IW. Outcomes of endoscopic third ventriculostomy in adults. Journal of Clinical Neuroscience. 2016;31:166-71. Doi: 10.1016/j.jocn.2016.03.004
8. Møen EN, Helland CA, Mahesparan R. Complications and risk factors for endoscopic third ventriculostomy: A 10-year single-centre study and systematic literature review. Brain and Spine. 2025;5:104291. Doi: 10.1016/j.bas.2025.104291
9. Feng H, Huang G, Liao X, Fu K, Tan H, Pu H, Cheng Y, Liu W, Zhao D. Endoscopic third ventriculostomy in the management of obstructive hydrocephalus: an outcome analysis. Journal of neurosurgery. 2004;100(4):626-33. Doi: 10.3171/jns.2004.100.4.0626
10. Sistiaga IL, Catalán-Uribarrena G, Pérez-Fernández S, Carrasco A, Iglesias J, de Gopegui ER, Pomposo I. Combined Predictive Model for Endoscopic Third Ventriculostomy Success in Adults and Children. World Neurosurgery. 2024;185:e721-30. Doi: 10.1016/j.wneu.2024.02.119
11. Stachura K, Grzywna E, Kwinta BM, Moskała MM. Endoscopic third ventriculostomy–effectiveness of the procedure for obstructive hydrocephalus with different etiology in adults. Videosurgery and Other Miniinvasive Techniques. 2014;9(4):586. Doi: 10.5114/wiitm.2014.46076
12. Bouras T, Sgouros S. Complications of endoscopic third ventriculostomy: a systematic review. Springer, Vienna; 2012. Doi: 10.1007/978-3-7091-0923-6_30
13. Martinoni M, Miccoli G, Riccioli LA, Santoro F, Bertolini G, Zenesini C, Mazzatenta D, Conti A, Cavallo LM, Palandri G. Idiopathic aqueductal stenosis: late neurocognitive outcome in ETV operated adult patients. Frontiers in neurology. 2022;13:806885. Doi: 10.3389/fneur.2022.806885
14. García-Milán V, Moreno-Madueño G, Juárez GU, Rivero-Garvía M, Márquez-Rivas J. Long-term success of endoscopic third ventriculostomy in the pediatric population with aqueductal stenosis. World Neurosurgery. 2024;189:e364-9. Doi: 10.1016/j.wneu.2024.06.056
15. Kulkarni AV, Sgouros S, Constantini S, Iihs Investigators. International Infant Hydrocephalus Study: initial results of a prospective, multicenter comparison of endoscopic third ventriculostomy (ETV) and shunt for infant hydrocephalus. Child's Nervous System. 2016;32(6):1039-48. Doi: 10.1007/s00381-016-3095-1
16. Kulkarni AV, Sgouros S, Leitner Y, Constantini S, International Infant Hydrocephalus Study

Investigators. International Infant Hydrocephalus Study (IIHS): 5-year health outcome results of a prospective, multicenter comparison of endoscopic third ventriculostomy (ETV) and shunt for infant hydrocephalus. Child's Nervous System. 2018;34(12):2391-7. Doi: 10.1007/s00381-018-3896-5

17. Legaspi GD, Espiritu AI, Omar AT. Success and complication rates of endoscopic third ventriculostomy for tuberculous meningitis: a systematic review and meta-analysis. Neurosurgical Review. 2021;44(4):2201-9. Doi: 10.1007/s10143-020-01396-y
18. Kong W, Yin C, Lv Y, Zhao W, Tang G, Wang Y. Endoscopic third ventriculostomy vs. ventriculoperitoneal shunt for obstructive hydrocephalus: a meta-analysis of randomized controlled trials. Turk Neurosurg. 2023;33(6):960-6. Doi: 10.5137/1019-5149.JTN.40204-22.2
19. Isaacs A, Urbaneja G, Hamilton M. Endoscopic third ventriculostomy (ETV) for treatment of adult hydrocephalus: long-term followup with 163 patients. Fluids and Barriers of the CNS. 2015;12(Suppl 1):O8. Doi: 10.1017/cjn.2015.187

Additional Information

Disclosure: The authors report no conflict of interest.

Ethical Review Board Approval: This study was approved by the Institutional Review Board (IRB) of Rizwan Medical Center and General Hospital, Peshawar. Approval no: 11.

Human Subjects: Informed consent was obtained from all participants included in the study.

Conflicts of Interest: The authors declare no conflicts of interest in accordance with the ICMJE uniform disclosure form.

Financial Disclosures: The authors have no financial relationships to disclose relevant to this study.

Funding: This study received no external funding.

Data Availability: Data supporting the findings of this study are available from the corresponding author upon reasonable request.

AUTHORS' CONTRIBUTION

Author's Full Name	Contribution
Kamran Ullah	Concept and design of the study, data acquisition, and manuscript drafting
Muhammad Irfan Javed	Data analysis, critical revision of the manuscript, and corresponding author responsibilities
Saddiq Ullah	Interpretation of surgical data, literature review, and manuscript revision
Muhammad Shafiq	Data collection and final approval of the manuscript