

Surgical Outcomes of Third Ventriculostomy in Patients of Obstructive Hydrocephalus

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ABSTRACT

Introduction: Hydrocephalus is the accumulation of excess cerebrospinal fluid (CSF) in the ventricular system of the brain.

Objectives: The main objective of this study is to find the surgical outcomes of third ventriculostomy in patients of obstructive hydrocephalus.

Material and methods: The data was collected through non-probability consecutive sampling technique. There were 60 patients which were included in the study. A flexible endoscopic telecamera and a Bugbee electrocautery wire and monitor were used for the procedure. The main causes of hydrocephalus have been identified. history of meningitis, ventriculitis, or illness prior to the development of hydrocephalus; x-rays indicating separation or septa within the ventricles; or postoperative residue of hemosiderin or the presence of yellowish deposits were all taken into consideration of post infectious hydrocephalus.

Results: There were 49 male and 11 female patients. The mean age of the patients was 39.38 ± 11.2 years. 27 (45%) patients had hydrocephalus due to tumors, 21 (35%) patients had aqueductal stenosis while 12 (20%) patients had benign cysts. Intraoperative bleeding occurred in 24 patients. ETV was successful in 54/60 – 90percent of the patients. A CSF leak was recognised in 09 patients. 07 patient developed a transient gaze palsy which had resolved when he came for his follow up visit on 10th post operative day.

Practical implication: Use effective method for treatment of hydrocephalus in hospitals

Conclusion: It is concluded that endoscopic third ventriculostomy, in general, is a very effective method of treatment for hydrocephalus.

Keywords: Obstructive Hydrocephalus, ETV, Outcome, CSF, Brain, Ventricular

INTRODUCTION

Hydrocephalus is the accumulation of excess cerebrospinal fluid (CSF) in the ventricular system of the brain. The causes can be obstructive or non-obstructive in nature. Obstructive reasons consist of space-occupying lesions, congenital lesions, and so forth. Non-obstructive causes include infection, bleeding¹. Placement of a ventriculoperitoneal shunt is the standard remedy, however contamination and blockage of the shunt are common complications. An alternative to ventriculoperitoneal shunt is endoscopic ventriculostomy (ETV)². the extended time period that the shunt is in situ can lead to infection of the implant system and even blockage. Patients may be treated without considerable morbidity using intracranial CSF diversion, i.e ventriculostomy. This technique uses the introduction of the endoscope through a burr hole created just anterior to coronal suture in mid pupillary line, that is completed by making a window in floor of the third ventricle, communicating the cisternal spaces with the ventricular system. Ventriculostomy, first advocated by Dandy, was deserted in want of extracranial strategies³.

Endoscopic ventriculostomy revolutionized the treatment of hydrocephalus. It drains cerebrospinal fluid (CSF) from the ventricle into the prepontine cistern, bypassing the nidus of obstruction⁴. This system is performed through use of an endoscope with proper lighting fixtures, magnification, and a monitor. It requires a know-how in coping with the endoscopic vision and orientation to endoscopic anatomy. Awareness and white stability are checked earlier before proceeding. One Bur hole is created in the Kocher tip. within the frontal horn, the thalamostriatal vein is used as a route to the foramen of monro⁵. A stoma is created inside the floor of the third ventricle, which permits flow between the ventricle and the prepontine cistern. The procedure gained interest with upgrades in endoscopic era in 1970s. It has low complication rate and does not contain any implant. common complications are bleeding, leakage of cerebrospinal fluid, infection, seizures and failure of the procedure.

Minor bleeding is treated with non-stop irrigation, focal strain or cauterization⁶.

The incidence of hydrocephalus follows a bimodal age curve. One peak occurs at some stage in childhood and is related to congenital abnormalities. every other onslaught comes in maturity, that's primarily because of NPH. Adult hydrocephalus accounts 40% of all hydrocephalus instances. Although a great deal has been found out about the lengthy-term and social outcomes of pediatric hydrocephalus, there's nevertheless a good deal to research. Hydrocephalus is commonplace in people with open neural tube defects (spina bifida cystica), however has only been suggested in human beings with closed neural tube abnormalities (spina bifida occulta)⁷. due to this unusual however possible affiliation, it's recommended that people with closed neural tube abnormalities be investigated for clinical signs and symptoms of hydrocephalus⁸.

ETV has lately received recognition amongst neurosurgeons. it is useful for patients with obstructive hydrocephalus and in cases of repeated shunt failures for other causes. ETV is the treatment of choice in instances of hydrocephalus, because it eliminates the necessity for a shunt⁹. Within the last few years, vast advances in neuroimaging, endoscopic technology, processing device, and stereotactic neuronavigation systems have led to the large use of endoscopy for some of interventions, particularly obstructive hydrocephalus as well as some selected non-obstructive hydrocephalus cases¹⁰.

Even though ETV has already been identified as an alternative to shunt placement, in particular in young patients with noncommunicating hydrocephalus, its efficacy stays questionable relying at the age and pathophysiology of the hydrocephalus¹¹.

MATERIAL AND METHODS

The study data was collected from 1st Oct to 1st Nov 2022, in the departments of Neurosurgery of Hayatabad Medical complex, Khyber Teaching Hospital, Lady Reading Hospital, Peshawar. The

data was collected with the permission of ethical committee of hospital.

Inclusion criteria

- All patients who underwent endoscopic third ventriculostomy were included in the study.
- Patients with obstructive hydrocephalus.

Exclusion criteria

- Those who do not want to participate.
- patients who have severe co-morbidities and Infections

Sampling technique: The data was collected through non-probability consecutive sampling technique.

Sample size: There were 60 patients which were included in the study.

Data collection: An informed consent was taken before surgery from all the selected patients. The surgical procedure is performed under general anesthesia. A flexible endoscopic telecamera and a Bugbee electrocautery wire and monitor were used for the procedure. The main causes of hydrocephalus have been identified. history of meningitis, ventriculitis, or illness prior to the development of hydrocephalus; x-rays indicating separation or septa within the ventricles; or postoperative residue of hemosiderin or the presence of yellowish deposits were all taken into consideration of post infectious hydrocephalus.

A conventional ETV was executed through the anterior horn, which includes fenestration of the floor of the third ventricle. the usage of an electrocautery for hemostasis and window creation, the window stretched by passing the Fogarty Catheter 4Fr in the floor. via gentle inflation of the balloon and stretching the tissues, a viable hole created, flow confirmed visually, a last look is given for ensuring the hemostasis. Early surgical outcome was assessed within 14 days of the procedure. A complete physical and clinical assay was entered into a standardized form for data analysis by the primary surgeon. Preoperative and postoperative records of head size, fontanelle laxity and bulge, frequency of vomiting and, postoperative complications, performance failure, and mortality were cautiously recorded. The data was collected and analyzed using SPSS version 21.0. All the data is represented in mean and standard deviation.

RESULTS

The data was collected from 60 patients of both male and female. There were 49 male and 11 female. The average age of the pateints was 39.38 ± 11.2 years. 27 (45%) patients had hydrocephalus due to tumors, 21 (35%) patients had aqueductal stenosis, and 12 (20%) patients had benign cysts. Intraoperative bleeding was noted in 24 patients. CSF leakage was detected in 09 patients. 07 patients developed a brief visible palsy that resolved whilst they came for a post op visit at 10th postoperative day. No deaths were recorded.

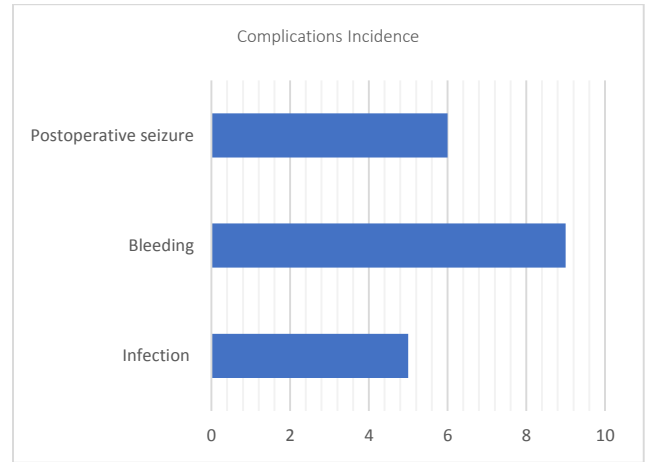
Table 1: Demographic and Disease Related Characteristics of Selected Patients

Characteristics		Number (%)
Gender	Male	49 (81.66%)
	Female	11 (18.34%)
Etiology	Tumor	27 (45%)
	Aqueductal stenosis	21 (35%)
	Cysts	12 (20%)
Outcomes	Successful	54 (90%)
	Failed	06 (10%)
Complications	Intra operative bleeding	24 (40%)
	CSF leak	09 (15%)
	Transient neurological deficit	7 (11.67%)

Table 2: Post-Operative Complications in Patients

Complication	Incidence
Infection	5 (8.3%)
Bleeding	9 (15%)
Postoperative seizure	6 (10%)

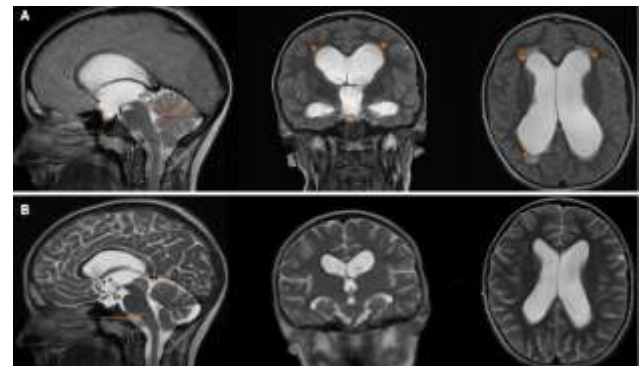
In our study, the postoperative infection was detected in 8.3% of cases (05/60). Postoperative bleeding occurred in 9 (15%) cases while 6 (10%) patients had a seizure.



We could not find a statistically significant association between gender and outcomes (p value = 0.687). Similarly, there was no statistically significant association between etiology and outcomes in our case series (p value = 0.431).

Table 3: Etiology of Successful and Failed ETC

Etiology	Successful ETV	Failed ETV	P Value
Tumor	21 (35%)	6 (10%)	0.431
Aqueductal Stenosis	19 (31.66%)	2 (3.33%)	
Cysts	7 (11.66%)	5 (8.33%)	
Male	41 (68.33%)	8 (13.33%)	0.687
Female	8 (13.33%)	3 (5%)	



The MRI substantiated the diagnosis by showing hypointensive modality in the right part of the mesencephalic tectum, which was highly suspectful for a tectal low-grade astrocytoma. It was completely obstructing aqueduct of Sylvius, causing extensive supratentorial hydrocephalus with some reliable findings, such as enlarged third ventricle that was bulging into the sella turcica.

DISCUSSION

ETV has been generally accepted as the direct procedure of choice for the treatment of noncommunicating hydrocephalus. This procedure is considered simple, rapid and safe. ETV has been thoroughly reported in literature as a success story, but there is greater variation based on different case series for its success ranging from approximately 50% to greater than 90%¹². Majid et al in his study reports a success rate of 69% which is a lower success rate than ours (54 out of 60) – 90%. The reason being the non-similarity of our patient population and outcome of ETV with

regards to the underlying pathology and age at the time of surgical procedure¹³. Khan et al in his series of obstructive hydrocephalus due to aqueductal stenosis, the authors achieved a complete resolution of signs in 73% of the cases, which is in line with the published literature on this etiology. Endoscopic aqueductoplasty was proposed by some studies and institutions as an alternative operative approach, specifically for membranous stenosis¹⁴. However, a higher recurrence was reported in a sequel of aqueductoplasty in long-term follow-up. Additionally, the complications of ETV may be very low in comparison to the threat of brainstem injury from balloon inflation within the aqueduct¹⁵. The authors consequently endorse standard ETV for primary aqueductal stenosis. Endoscopic aqueductoplasty is reserved for unique cases where standard ETV isn't feasible¹⁶.

Treatment strategies for obstructive hydrocephalus have been thoroughly explored, and numerous studies have investigated exclusive treatment strategies and their effectiveness. ETV is a preferred technique for obstructive hydrocephalus rather than traditional shunting procedures in selected patients at neurosurgical centers in developing countries with neuro-endoscopy facility and expertise¹⁷. This growing popularity is because of the fact that ETV affords the patient with shunt-free functionality and is successful remedy for hydrocephalus no matter etiology, patient age, and other elements¹⁸.

CONCLUSION

It is concluded that endoscopic third ventriculostomy, in general, is a very effective method of treatment for hydrocephalus. It is proven to be better in terms of infection, length of hospital stays, cost-effectiveness, and complication rate.

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