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ORIGINAL ARTICLE

Outcome of Endoscopic Third Ventriculostomy: An Experience of 80 Treated Patients

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ABSTRACT

Objective: *To examine the outcome of Endoscopic Third Ventriculostomy in 80 consecutive patients operated in Irfan General Hospital and Prime Teaching Hospital Peshawar.*

Materials and Methods: *Prospective observational study was conducted in the neurosurgery department of Prime Teaching Hospital and Irfan General Hospital Peshawar. 80 patients (48 male and 32 female) were followed for 3 months. The inclusion criteria all patients with Third ventricular hydrocephalus were included in this study and the exclusion criteria unwilling patients and those who opted for VP shunting rather than ETV. Data was analyzed using SPSS version 22.*

Results: *ETV was performed in 80 patients. With highest success rate inAqueductal stenosis and posterior fossa tumors 88% and 87% respectively. ETV had a lowest success score of 50% in patients with Hydrocephalus TBM. Common post-operative complications were seizures and CSF leakage.*

Conclusion: *ETV is less invasive and effective treatment for non-communicating hydrocephalus.ETV is most effective in treating aqueductal stenosis and posterior fossa tumors. The overall success rate of ETV is 74%. Based on these findings, it is recommended that ETV should be attempted as first line treatment for patients with triventricular hydrocephalus due to various pathologies.*

Keywords: *ETV (Endoscopic Third Ventriculostomy), communicating hydrocephalus, Posterior fossa tumors, Aqueductal stenosis.*

INTRODUCTION

Hydrocephalus is one of the commonest neurological entity .[1] It is the dilatation of ventricular system due to the imbalance of cerebrospinal fluid production and absorption.[2] The common causes of hydrocephalus are congenital, infectious, post-traumatic and tumors. Congenital hydrocephalus is common due to aqueductal stenosis.[3] In developing countries tuberculous meningitis (TBM) is one of the common cause of hydrocephalus.[1] The common signs and symptoms of hydrocephalus are those of raised Intracranial pressure (ICP). That is headache, vomiting, blurring of vision or in severe causes decreased levels of conciseness.[4] Commonly diagnosed on CT brain and MRI where dilation of ventricular system.[5]

For a long time, the only treatment for Hydrocephalus was ventriculoperitoneal shunting and other diversion procedures.[6] Endoscopic Third Ventriculostomy is a surgical procedure used to treat hydrocephalus. In this procedure a stoma is made in the floor of third ventricle tuber cinereum using an endoscope.[6,7] The first choice of non-communicating hydrocephalus is ETV. Endoscopic Third Ventriculostomy is successful in patients with less elevated intracranial pressure and patients having success score.[8-10]

MATERIALS AND METHODS

Study Design

A prospective observational study was conducted in

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the neurosurgery department of Prime Teaching Hospital and Irfan General Hospital Peshawar. Study duration was from January 2017 to December 2018.

Inclusion Criteria

80 patients were considered in this study. 76 were with obstructive hydrocephalus and 4 cases of communicated hydrocephalus brain tuberculosis.

Exclusion Criteria

Recurrent cases and those who refused consent due to were excluded from the study.

Data Collection

After taking consent from the patients, data was analyzed for all patients who underwent Endoscopic Third Ventriculostomy irrespective of the etiological type of hydrocephalus.

After admitting the patient procedure and prognosis based on Endoscopic Third Ventriculostomy success score written informed consent is taken. Under general anesthesia patient is positioned supine. After scrubbing and draping, a single burr hole was made over theKocher's point (3 cm lateral to the midline and 1 cm anterior to the coronal suture). The dura was opened in linear fusion. Endoscopetrocar was introduced and an endoscope was inserted. Following choroid plexus of the lateral ventricles foramen of Monro was reached Tuber cinereum and mammillary bodies were identified. A stoma was made at tuber cinereum with ventriculostomy catheter and kept the patient with a ballooned Fogarty catheter. After this, an endoscope was removed and the dura was closed with silk 4/0 interrupted stitches. Pericranium and wound were also closed with interrupted 2/0 Vicryl and 2/0 Prolene respectively.[1,6,11]

ETV also has some complications, the most common of which are neurovascular injury, cerebrospinal fluid leakage, fever and superficial wound infection, intra cerebral hematoma, seizures altered consciousness and memory disturbance.[12,13]

The data was analyzed for signs/symptoms, diagnosis, MRI/CT brain pre-operative findings and early post-operative course was studied. These patients were followed for 3 months for any improvement in signs and symptoms. CT brain was done to see improvement in resolutionof hydrocephalus. All patients with Third ventricular hydrocephalus due to idiopathic aqueductal stenosis, most of the posterior fossa tumor, pineal tumor and ICH who were treated in this period were included in this study. All unwilling patients and those who opted for VP shunting rather than ETV were excluded from the study.

Data Analysis

Data was analyzed using SSPS version 22 and presented in form tables and charts.

RESULTS

Gender Distribution

In this study total 80 patients were included out of which 48 were male and 32 were female.

Age Incidence

Age of patients ranged from 6 months to 60 years. Most posterior fossa tumor patients were young having age range from 4 to 16 years. Pineal tumor patients were from 50 to 65 years. 2 patients with subarachnoid hemorrhage had the age of 47 and 60 respectively (Table 2).

Clinical Presentation

All patients were diagnosed with raised ICP due to HCP and were considered for ETV surgery. The patients presented with common signs and symptoms were mostly that of raised ICP. 72 patients (90%) were presented with headache and vomiting, 36 patients (45%) had papilledema , 4 patients (5%) had lower cranial nerve palsy, 2 patients (2.5%) had abducens nerve palsy, only 1 patients (1.25%) had confusion, 3 patients (3.75%) had optic nerve compression and 20 patients (25%) had ataxia (Table 1).

Table 1: *Clinical Features.*

Clinical Features	Number & % of Patients
Headache/Vomiting	72 (90%)
Papilledema	36 (45%)
Lower Cranial Nerve palsy	4 (5%)
Abducent Nerve Palsy	2 (2.50%)
Confusion	1 (1.20%)
Optic nerve compression	3 (3.75%)
Ataxia	20 (25%)

Table 2: *Individual success percentage of ETV.*

Etiology		No. of Patients	Male	Female	Age	Clinical Features	CT/MRI Brain	Success %
Aqueductal stenosis		26	15	11	1.5 years	Raised ICP	10 CT, 19 MRI	88
Posterior fossa tumors	Cerebellar astrocytoma	3	2	1	25.5 years	Raised ICP	3 CT	87
	Brain Stem astrocytoma	4	3	1	19 years	Raised ICP	1 CT, 3 MRI	
	Ependymoma post, fossa	8	5	3	14.5 years	Raised ICP	2 CT, 6 MRI	
	Medulloblastoma	15	9	6	7 years	Raised ICP	5 CT, 10 MRI	
CP angle Tumors		10	7	3	24.5 years	Raised ICP	2 CT, 5 MRI	70
Pineal Tumors		6	2	4	56 years	Raised ICP	1 CT , 2 MRI	70
Hydrocephalus TBM		4	2	2	4.5 years	Raised ICP	4 MRI	50
Intraventricular Hemorrhage	Subarachnoid hemorrhage	2	1	1	55 years	Raised ICP	3 CT, 4 MRI	70
Colloid cyst		2	2	0	23 years	Raised ICP	2 CT	80

The major tool of investigation as radiological investigation in 47% patients was the Brain CT and in 85% of patients, the MRI brain alone or after CT brain was done. Majority of Patients were diagnosed with Hydrocephalus (26 patients) due to aqueductal stenosis and post fossa tumor (30 patients) while CP angle Tumors were 14 patients and 6 patients had pineal tumor.

All patients were operated on the elective list except 10 patients who were operated in an emergency. 1.2% (10 patients) had a low level of consciousness. All cases had triventricular Hydrocephalus except 4 patients who had communicating hydrocephalus due to tuberculous meningitis.

Simple ETV was performed in majority of the cases. In all patients with pineal tumor, the biopsy was taken along with ETV.However, in one patient with pineal tumor biopsy could not be taken due to bleeding, while in 2 patients with colloid cyst ETV was performed along with septum pellucidotomy. CSF for R/E and culture was sent for patient with TBM. In pineal tumor patients CSF was taken for tumor markers.

Table 3: *Peri-operative Complication.*

Peri-operative Complication		N. of Patients
Bleeding clinically insignificant		6
Bleeding clinically significant		1
Insignificant trauma to neural structures	Mammillary body	2
	Fornix	1

During surgery, total 7 patients had bleeding 2 patients were of pineal tumor where bleeding started after taking biopsy, 2 patients had colloid cyst, 2 with aqueductal stenosis and one having an intraventricular hemorrhage. In one patient, an extra ventricular drain was placed. In event of bleeding we thoroughly irrigate with a ringer lactate solution and usually

bleeding subsides. Post operatively 3 patients had a memory problem due to fornix injury in one and mammillary body injury in 2 patients (Table 3).

Post-operatively, 4 patients had CSF leakage, while 5 patients had seizures, 2 patients had superficial infection of wound and one patient had an intra-cerebral hematoma. One patient could not be attempted due to excessive bleeding (Table 4).

Table 4: *Post-operative Complications.*

Post-operative Complications	No. of patients (%)
Seizures	5 (6%)
CSF leakage	4 (5%)
Superficial Infectious Wound	2 (2%)
Intra Cerebral hematoma	1 (1%)

All these patients were followed for 3 months. 71 patients (88%) were symptomatically improved post operatively. The patients not improved include 2 patients of TBM and 4 patients of posterior fossa tumor with previous VP shunting. 3 patients were those of aqueductal stenosis having age of 3 to 7 months. Overall, the ETV procedure was successful in 71 patients (88%) and in 9 patients (11%) it was unsuccessful with no improvement.

DISCUSSION

Mostly preferred surgical procedure for non-communicating hydrocephalus is ETV. In this procedure an endoscope is introduced into the ventricular system and the floor of the third ventricle is perforated to make a communication with prepontine cistern.[6,14,15]

In our study, the ETV was performed for different pathologies causing hydrocephalus. Patient having aqueductal stenosis ware 32% (26 patients) posterior fossa tumor patient were 37% (30 patients) and few other conditions mention in table 2. In our study the success rate of ETV for aqueductal stenosis is 88% as compared to a study done in the neurosurgery department, university of MAINZ, Germany having success rate of 81%.[6] The slight difference is due to patient population with our study, we attempted ETV in patients with aqueductal stenosis, posterior fossa, Pineal tumor, etc. while in their study, the spectrum of disease is wide including cerebellum infarction, vein of galen malformation, metastasis and lymphomas etc.

In our patients, the success rate of ETV in pineal tumor patients was 70% as compared to the success rate of 100% in a study done at the university hospital of Toulouse.[16] The difference in result is because our patients were less in number as compared to their study.In all these patients ETV was followed by biopsy of the tumor during which two patients had bleeding. In one of these patients extra ventricular drain was placed. These factors have affected the outcomes in these patients.

The success rate of posterior fossa tumor in our study was 87% as compared to study done at The Children Hospital, Pittsburgh which was 84%, which is comparable.[17] In the department of Neurosurgery, University of Utah, School of Medicine, 3% (1 patient) have CSF leakage as compared to our study having patients with CSF leakage 5% (4 patients) which is acceptable.

The incidence of infection in the above study is 3% (1 patient) while in our study it is 2% (2 patients) which is comparable. The overall complications in the above study are 14% as compared to our study 15%. In our study, one patient could not be attempted due to excessive bleeding, while in the comparable study, there is 1 unsuccessful ETV procedure.[18]

CONCLUSION

ETV is less invasive and effective treatment for non-communicating hydrocephalus.The success rate of ETV is highest in aqueductal stenosis and posterior fossa tumors while lowest in Hydrocephalus TBM. The overall success rate of ETV is 74%. The most common post-operative complications are seizures and CSF leakage. Based on these findings, it is recommended that ETV should be attempted as first line treatment for patients with triventricular hydrocephalus due to various pathologies.

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Additional Information

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