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ORIGINAL ARTICLE

Endoscopic third ventriculostomy in the management of obstructive hydrocephalus: Success and failure.

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ABSTRACT… Objective: To determine if endoscopic third ventriculostomy (ETV) is effective in the treatment of obstructive hydrocephalus. **Study Design:** Prospective study. **Setting:** Department of Neurosurgery, Hayatabad Medical Complex, Peshawar. **Period:** February 2018 to March 2021. **Material & Methods:** Eighty Five patients underwent endoscopic third ventriculostomy (ETV) for obstructive hydrocephalus all patients with obstructive hydrocephalus of any gender and age more than 6 months were included in the study. Patients age less than 6 months, recurrent cases and those refuse to opt for ETV were excluded from our study. The information regarding patient demographic, etiology, complications of procedure were documented in proforma. Data was analyzed using SPSS version 20.0 and presented in form of tables. **Results:** In the current study out of 85 patients, 48(56.4%) were male and 37(43.5%) were females with male to female ratio=1.23. ETV had successful outcome in 66(77.6%) patients. The sign and symptoms of raised intracranial pressure resolved in all patients after ETV. Overall complication rate in our study was 22(25.8%). The commonest complication was inadequate ventriculostomy in 10(11.7%), per operative significant bleeding in 4(4.7%) of patient, seizure in 3(3.5%) of patients, CSF leak and intraventricular hemorrhage in 2(2.35%) respectively. **Conclusion:** ETV is minimally invasive, safe, effective mode of treatment for obstructive hydrocephalus. Success rate is higher in children below 5 years of age. The overall success rate varies from 70-80% in various studies.

Key words: Complication, Endoscopic Third Ventriculostomy, Obstructive Hydrocephalus.

INTRODUCTION

The most frequent neurosurgical condition is hydrocephalus, which occurs when the production and absorption of cerebrospinal fluid (CSF) are out of balance, resulting in dilated ventricles.[1] There are many classifications but most commonly in use is the obstructive (non-communicating) and the communication type. The obstructive type develop as there is block in cerebrospinal fluid (CSF) proximal to arachnoid granulation and in communicating type there is defective in absorption at arachnoid granulation.[2]

Endoscopic third ventriculostomy (ETV) was introduce by Dandy in 1922, but the first successful procedure was done by urologist name William Mixter in 1923.[3] However due to lack of magnification, illumination and technical incompetency the procedure was considered as difficult and unreliable. In 1952 shunt was introduce which was simple and reliable procedure for the treatment of hydrocephalus. However, with the passage of time observed various complication such as blockage, infection, erosion, dislodgment and overdrainge which leads to repeated shunt revision. Both advancement in endoscopic technology and increase rate of shunt infection contended neurosurgeon to re consider the oldest way of treating Hydrocephalus.[4,5] Nowadays ETV is widely used in many Centre around the world to treat Obstructive hydrocephalus (OHC).

ETV is a procedure in which bur hole is made 1-2 cm anterior to coronary suture and 2-3 cm lateral to the midline. A rigid endoscope is passed through frontal lobe in to the lateral ventricle

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and small hole is made in floor of third ventricle allowing CSF to move out of blocked ventricular system in to the basal cistern thus bypassing the obstruction in the aqueduct of sylvius and relieve pressure.[6,7]

The success of this procedure is determined by improvement in clinical features, radiological picture and freedom from shunt. There are many factors which influence the outcome like age of the patient, etiology, past history of shunting, and validation of ETV success score.[8,9,10] This procedure has complications like bleeding, injury to surrounding neural structures, seizure, CSF leakage, intracerebral hematoma and superficial wound infection.[11,12]

ETV is the minimally invasive and effective treatment for obstructed hydrocephalus. Literature review shows that success rate is highest in aqueductal stenosis and posterior fossa tumor and lower in Post TBM hydrocephalus. The overall success rate varies from 70-80% in various studies.[13,14]

MATERIAL & METHODS

In this prospective study 85 patients underwent endoscopic third ventriculostomy (ETV) for obstructive hydrocephalus. The study was conducted in three years from February 2018 to March 2021 in the department of Neurosurgery Hayatabad Medical complex, Peshawar. All patients with obstructive hydrocephalus confirmed on CT-Scan brain of any gender and age more than 6 months having kornfsky score more than 60 were included in the study. Patients age less than 6 months, recurrent cases and those refuse to opt for ETV were excluded from our study.

The study was conducted after approval from hospital ethical and research committee (455/EC/HMC). All those patients meeting the inclusion criteria were admitted in ward for further workup. Informed written consent was taken from the patients or relative. All the surgeries were performed by single experienced neurosurgeon having minimum of 10 years' experience. The collected information was entered d in SPSS version 20.0, and presented in form of tables.

Operative Procedure

Endoscope (Aesculap) of 0 and 30 degree with 6mm outer diameter were used. This system is connected with light source, camera, monitor and working instruments. Under General anesthesia patients were positioned supine with head elevation up to 30degree. A burr hole was made 2-3cm lateral to the midline and 1-2cm anterior to coronal suture. Endoscope was passed in to the lateral ventricle and reaches the floor of third ventricle anterior to mamillary bodies and posterior to infundibular recess. Fenestration was done in the floor of third ventricle via Fogarty catheter 6FR balloon was inflated to widen the opening about 6-8mm.vibrant CSF flow can be visualized through the stoma. Identification of structure behind the membrane, such as basilar artery and posterior cerebral arteries is an important step. Meticulous hemostasis can be achieved by micro coagulation or long-lasting excessive washing with warm ringer solution.

RESULTS

In the current study out of 85 patients, 48(56.4%) were male and 37(43.5%) were females with male to female ratio=1.23. patient were divided in to four age groups. Group A ranges from 0-1 years, Group B, 1-2 Years, Group C 3-14 years and Group D more than 14 years. It was documented those 34(40%) patients were in group A, 24(28.2%) in group B, 16(18.8%) in group C and 11(12.9%) in group D of the patients.

The most common etiology in our study was posterior fossa tumor in 36(42.3%) and aqueductal stenosis in 21(24.7%) of cases. Tectal tumor in 12(14.1%), CP angle tumor in 8(9.4%), hydrocephalus secondary to tuberculous meningitis in 4 (4.7%), and colloid cyst in 2(2.35%) of cases.

ETV had successful outcome in 66(77.6%) patients. Ventriculoperitoneal shunt was performed in 10(11.76%) due to inadequate ventriculostomy. Ventricular drainage device (VDD) was inserted in 4(4.7%) cases for hemorrhagic CSF. In 5(5.85%) ETV and tumor biopsy was performed.

Only one patient in our study has superficial

wound infection. The sign and symptoms of raised intracranial pressure resolved in all patients after ETV. Overall complication rate in our study was 22(25.8%). The commonest complication was inadequate ventriculostomy in 10(11.7%), per operative significant bleeding in 4(4.7%) of patient, seizure in 3(3.5%) of patients, CSF leak and intraventricular hemorrhage in 2(2.35%) respectively.

The patients were sent home after ETV/VP shunt on 3rd post-operative day and advise to visit after 4 weeks for definitive surgery in cases of obstructive hydrocephalus secondary to tumors. Follow up CT-Brain was done in all patients showing reduction in ventricular size and resolution of sign of raised ICP in all patients. 3 patients died in our study, 2 due to reverse conning, 1 due to intraventricular bleed and one due to post-operative meningitis secondary to CSF leak.

Age Group in Years	No. of Patients (Frequency)
6 months -1 years	34 (40%)
1-2 years	24 (28.2%)
3-14 years	16 (18.8%)
more than 14 years	11 (12.9%)

Table-I. Age wise distribution (n=85)

Etiology	No. of Patients (Frequency)
Posterior fossa tumors	36 (42.3%)
Acquductal stenosis	21 (24.7%)
Tectal tumors	12 (14.1%)
CP angle tumors	8 (9.4%)
HCP secoundary to TBM	4 (4.7%)
Intraventricular cyst	2 (2.35%)
Colloid cyst	2 (2.35%)

Table-II. Etiology of obstructive hydrocephalus (n=85)

Complications	No. of Patients (Frequency)
Inadequate ventriculostomy	10 (11.76%)
Per op bleeding	4 (4.7%)
Seizure	3 (3.52%)
CSF leak	2 (2.35%)
Intracerebral hemorrhage	2 (2.35%)
Wound infection	1 (1.17%)

Table-III. Complication of ETV (n=85)

DISCUSSION

For the treatment of obstructive hydrocephalus, endoscopic third ventriculostomy (ETV) is a minimally invasive, safe, and successful operation. The success rate is higher in aqueductal stenosis and posterior fossa tumor and lowest in hydrocephalus secondary to tuberculous meningitis.[15]

In this study ETV was performed for different causes leading to obstructive hydrocephalus and the most common etiology in our study was posterior fossa tumor in 36(42.3%) and acquductal stenosis in 21(24.7%) of cases. Khanzada K and Rehman ZU also state that the commonest etiology is posterior fossa tumor 44% and acquductal stenosis in 25.9% of cases which co relate with our study.[16]

In the current study ETV had successful outcome in 66(77.6%) patients. Ventriculoperitoneal shunt was performed in 10(11.76%) due to inadequate ventriculostomy. Ventricular drainage device (VDD) was inserted in 4(4.7%) cases for hemorrhagic CSF. In 5(5.85%) ETV and tumor biopsy was performed. Hopf et al have reported ETV success rate of 76% for obstructive hydrocephalus secondary to posterior fossa tumors.[17] Similarly, Mumtaz Ali, et al. also reported the overall success rate of ETV was 74%. In experience of 80 treated patients. 88% success in aqueductal stenosis, 87% success in posterior fossa, 70% in CP angle tumor and pineal tumors. which correspond to over study.[18] Another study shows 9% of patients ventriculoperitoneal shunt was performed due to inadequate ventriculostomy which is comparable to our figure.[19]

Various studies revealed ETV failure rate ranges from 6% to 50%.[20] In our study the ETV failure occur in 11.7%. Study conducted by Brohi SR etal. On complication of ETV documented the overall complication rate 20.8% of which the most common complication was inadequate ventriculostomy in 9%,per operative bleeding in 5% seizure in 3%, CSF leak and intraventricular hemorrhage in 2% of patients which correspond to our study.[21]

CONCLUSION

ETV is minimally invasive, safe, effective mode of treatment for obstructive hydrocephalus. Success rate is higher in children below 5 years of age. The overall success rate varies from 70-80% in different studies. The success of this procedure is determined by improvement in clinical features, radiological picture and freedom from shunt. The most common complications are bleeding, injury to surrounding neural structures, seizure and CSF leakage which can be minimize by proper selection of the patient, skill full performance of surgery in experience hand and meticulous post-operative care.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Sohail Amir	Study design and methodology. Paper writing, Referencing and data calculations.	
2	Shahid Ayub	Analysis of data and interpretation of results etc, final proof reading of the article.	