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Original Research Paper

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ENDOSCOPIC THIRD VENTRICULOSTOMY IN HYDROCEPHALUS-OUR INSTITUTIONAL EXPERIENCE

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ABSTRACT

Introduction: Endoscopic third ventriculostomy (ETV) is considered as a treatment of choice for obstructive hydrocephalus. It is done in hydrocephalus secondary to congenital aqueductal stenosis, third ventricle tumor, post infective, normal pressure hydrocephalus, multiloculated hydrocephalus, posterior fossa tumor and VP shunt dysfunction.

Materials and methods: This is study of 77 patients with hydrocephalus who were treated with endoscopic third ventriculostomy during the period of 2014-2018 in our neurosurgery department. Following the procedure of endoscopic third ventriculostomy with right pre coronal burr hole and neuroendoscope technic, postoperative clinical assessment and radiological indices were followed up at 48 hours, 1 week, 4 weeks, 3 months after surgery.

Results: The success rate in this study was 74.02%. The best effectiveness was observed in,Aqueductal stenosis (85.7%), brain tumors (77.7%), ventriculoperitoneal shunt, dysfunctions (75%), post TB meningitis hydrocephalus (66.7%). NPH had a success rate of 55.5%.The mean time for clinical and radiological improvement were 49.7 hours and 2.57 weeks.

Conclusion: Endoscopic Third Ventriculostomy(ETV) is a very safe and effective procedure and is a useful alternative to ventriculoperitoneal shunt.Shunt related complications can effectively be avoided. Careful preoperative evaluation and proper selection of cases results in a good success rate

KEYWORDS : Neuro endoscopy, endoscopic third ventriculostomy, hydrocephalus.

INTRODUCTION

Hydrocephalus has been successfully managed by Endoscopic Third Ventriculostomy throughout the world for various etiologies(1-4). With the introduction of SELFOC lens by Hopkins and Storz and modernisation of endoscopic instruments, Endoscopic Third Ventriculostomy is now frequently considered to be a successful alternative to Shunt procedures(5-10).

Numerous studies have been published with success rates ranging between 50-90% for various causes of hydrocephalus.

This is study of 77 patients with hydrocephalus who were treated with endoscopic third ventriculostomy during the period of 2014-2018 in Neurosurgery department of Stanley Medical College,Chennai.

MATERIALS AND METHODS

Following the procedure of endoscopic third ventriculostomy, postoperative clinical assessment and radiological indices were followed up at 48 hours, 1 week, 4 weeks, 3 months after surgery. Patients who failed to show any clinical improvement after endoscopic third ventriculostomy, underwent alternative cerebrospinal fluid drainage procedure.

Radiological indices analysed were Evans ratio, third ventricular width, temporal horn size and periventricular lucency.1. Patients with hydrocephalus secondary to posterior fossa lesions, CP angle tumours, pineal tumours and aqueductal stenosis. 2. Patients with hydrocephalus due to NPH and sequelae of meningitis.3. Patients with VP shunt dysfunction are included in this study.

Patients presenting to emergency department with very poor GCS irrespective of the etiology of hydrocephalus and those with IVH and remote head injuryare excluded from this study. ETV is performed in supine position with head flexed so that the burr hole site is at the highest point. Generally, the width of the third ventricle and foramen of Monro should be approximately 7 mm or greater.The optimal trajectory into the third ventricle through foramen of Monro and into the interpeduncular cistern is usually achieved with burr hole, placed at or just anterior to the coronal suture and about 2.5 cm – 3 cm lateral to the midline. Usually, right side burr hole is performed. An exact site of burr hole can be determined by a line, extending from interpeduncular cistern and foramen of Monro on to the skull. We use brain cannula to puncture ventricle and then introduce endoscope with sheath.Foramen of Monro can be identified by confluence of thalamo-striate vein, septal vein and choroid plexuses. Perforation in the third ventricle floor is made after negotiating endoscope through the foramen of Monro. Fenestration in the third ventricle floor should be in between mammillary bodies and infundibular recess, at the most transparent site. Location of basilar artery should be identified to avoid an injury and bleeding during procedure, and the fenestration should be made anterior to the artery complex. Microvascular. Position of dorsum sellae can be identified by gentle probing by the blunt instrument, such as bipolar forceps if the facility of Doppler is not available. Fenestration should be made just posterior to dorsum sellae. Water jet dissection technique can be used to prevent an injury to vessel and bleeding if the third ventricle floor is thick and opaque(11,12).The third ventricular floor should be penetrated bluntly to avoid the risk of vascular injury. Although we avoid thermal or electric energy for this technique, laser assisted third ventriculostomy was found to be safe and effective by earlier authors.(5) An initial fenestration is then dilated up to approximately 5 mm or more opening by using French Fogarty catheter. In some cases, an imperforate membrane of Liliequist can be identified, lying beneath the floor of the third ventricle. Such membrane, if present, should be opened under direct endoscopic visualization.If any hemorrhaging is encountered during the procedure, copious warm fluid irrigation should be used until all bleeding is visibly stopped and the ventricular CSF is clear. An external ventricular drain is kept if there was any oozing of blood.Any bleeding, from cortical surface if seen while the endoscope is removed, should be cauterised.

RESULTS

Age distribution & distribution of diagnosis OF 77 Cases are below 12 years 23 cases,13-30 years 19 cases,31-45 years,46-60 years 10 cases,above 60 years re nine cases. Regarding the dignosis 21 cases are queductal stenosis cases,18 cases are Tuberculous meningitis sequelae cases,nine cases are Normal Pressure Hydrocephalus cases,nine cases are brain tumour cases and VP shunt dysfunction cases are 20 cases.The success rate in this study was 74.02%. The best effectiveness was observed in,Aqueductal stenosis (85.7%), brain tumors (77.7%), ventriculoperitoneal shunt, dysfunctions (75%), post TB meningitis hydrocephalus (66.7%). NPH had a success rate of 55.5%. Various treatment related complications like injury to major neural structures, vascular injury, endocrinological abnormalities following ETV that have been described in literature were not found in this study._The mean time for clinical and radiological improvement were 49.7 hours and 2.57 weeks.

In this study, however, we found, extremely translucent third ventricular floors in 6 patients (7.7%), translucent third ventricular floors in 47 patients (61%) and normal thickness and opaque third ventricular floors in 24 patients (31.3%) which created difficulty in visualisation of the underlying vascular anatomy. And there was a less rate of success in patients with thick third ventricular floor.Change in the ventricular size is usually delayed and a radiological follow-up is needed for at least 3 months post-operatively is needed to observe a significant reduction in ventricular size. In this study, radiological parameters of hydrocephalus like width of the third ventricle, Evans ratio and size of temporal horns showed reduction in most of the cases, but they seldom returned to normal size. Periventricular low density was the earliest to resolve in the follow-up imaging. The clinical improvement has a greater value rather than the radiological reduction in ventricle size. ETV was declared a failure in 20 patients (24.7%). With the least success seen in NPH.Even in patients with VP shunt dysfunction, ETV could possibly be a successful alternative.No case of mortality related to the procedure occurred in our series

Figure 1. CT Image of Hydrocephalus

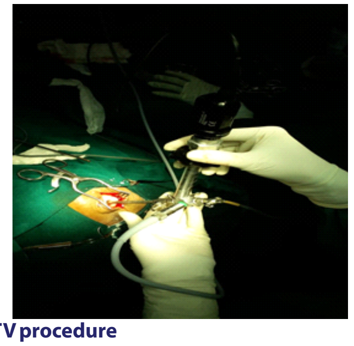

Figure 2. ETV procedure

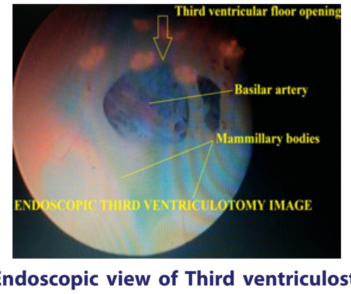

Figure 3. Endoscopic view of Third ventriculostomy, Mamm illary bodies and Basilar artery

DISCUSSION

Ventriculoscopy was introduced in the early 1900s. Walter E. Dandy used a primitive endoscope to perform choroid plexectomy in communicating hydrocephalus. He later introduced the sub-frontal approach for an open third ventriculostomy. The high mortality rate of this approach prompted Dandy to adopt a different treatment. Endoscopic management of hydrocephalus was attempted in 1910 when VL L Espinasse, an urologist, used the cystoscope to cauterize the choroid plexus.The first ETV was performed by William Mixter, an urologist, in 1923. He used a urethroscope to perform the third ventriculostomy in a child with obstructive hydrocephalus. Tracy J. Putnam made the necessary modifications in this urethroscope for cauterization of the choroid plexus. An advent of valve-regulated shunt systems and the simplicity of the shunt technique resulted in minimal advances in third ventriculostomies for next 30 years. In 1947, H. F. McNickle introduced a percutaneous method of performing third ventriculostomy that decreased the complication rate and improved the success rate. In the early 1970s, the leukotome was introduced to enlarge the perforation in third ventricle floor without an injury to the surrounding vascular structures. This percutaneous technique was further modified after the advent of stereotactic frames. This resulted in renewed interest in the use of ETV for the treatment of obstructive hydrocephalus. This was further supported by an advent of advanced fiber optic and lens technology. We now have small neuroendoscopes with deflectable tips, working ports, and good optic resolution, in addition to the rigid endoscopes with their excellent optic resolution. High definition camera has further improved visualizing and recording.An improvement in the success of third ventriculostomy in recent time could be due to better patient selection; improvements in endoscope, better imaging, advanced surgical technique and instruments. Endoscopic third ventriculostomy is increasingly used in the treatment of hydrocephalus. It is considered treatment of choice in obstructive hydrocephalus. It is also now advocated in some communicating hydrocephalus, such as normal pressure hydrocephalus by some authors. It is indicated in patients who demonstrate symptoms and signs of hydrocephalus and anatomical features amenable to a successful procedure. There should be an adequate space between the basilar artery and the clivus under the floor of the third ventricle to allow for a safe ventriculostomy.Hydrocephalus could be of 3 types. Although ETV is indicated in selected patients in all types of hydrocephalus, the success of ETV in obstructive hydrocephalus is better than in communicating hydrocephalus.

CONCLUSION

ETV is a very safe and effective procedure and is a useful alternative to ventriculoperitoneal shunt.Shunt related complications can effectively be avoided. Careful preoperative evaluation and proper selection of cases results in a good success rate.

Conflict of Interest: None declared.

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