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ENDOSCOPIC THIRD VENTRICULOSTOMY USING FREE HAND TECHNIQUE

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ABSTRACT Endoscopic third ventriculostomy (ETV) has emerged as the procedure of choice for an extensive range of indications with high success rates. It is the preferred treatment for the management of obstructive hydrocephalus due to various causes. The Objectives of this study is to make out the advantages of the free hand technique of ETV. The study includes 40 patients with hydrocephalus who were ideal candidates for ETV and had undergone free hand ETV over a duration of 24 months from Jan 2017 till Dec 2019 with age range between 1-60 years with obstructive hydrocephalus including chronic post TB meningitis hydrocephalus and other indications. ETV with free hand technique vastly reduces the duration of anaesthesia and surgery, average blood loss, Hospital stay and hence cost, while being equally effective or even better with good success rates at times due to the fact that lillequiste's membranes if present are opened 100% of the times.

KEYWORDS : Endoscopic Third Ventriculostomy, Hydrocephalus, Obstructive, Ventriculoscope.

1.INTRODUCTION

Hydrocephalus is one of the most common surgically treatable neurological diseases. It has a higher prevalence in developing than developed countries.[1] In recent times Endoscopic third ventricul ostomy (ETV) has emerged as the procedure of choice for an extensive range of indications with high success rates. It is the preferred treatment for the management of obstructive hydrocephalus due to various causes.[2,3] As a result of recent advances in technology, neuroendoscope is also used for treatment of moderate pathologies like communicating hydrocephalus and shunt malfunction cases with good results. The procedure involves bypassing stenotic aqueduct or fourth ventricular outlet obstruction by perforating the floor of third ventricle and diverting the CSF into the inter peduncular and pre pontine cisterns.

2.OBJECTIVES

The Objectives of this study is to make out the advantages of the free hand technique of ETV

3.MATERIALS AND METHODS

The study includes 40 patients with hydrocephalus who were ideal candidates for ETV and had undergone free hand ETV over a duration of 24 months from Jan 2017 till Dec 2019 with age range between 1-60 years with obstructive hydrocephalus including chronic post TB meningitis hydrocephalus and 2 patients with normal pressure hydrocephalus. Patients with other co-morbid factors like systemic infections, post CNS infection with hydrocephalus , hydrocephalus secondary to intracranial haemorrhage were excluded . Preoperative Patients with signs and symptoms of raised intracranial pressure and radiographic evidence (CT/MRI) of hydrocephalus were included in this study.

TECHNIQUE

Under general anaesthesia, patients were placed on the table with the head anteflexed and tilted to 30 degrees to minimise CSF leak and pneumocephalus. Hair is clipped and incision marked centering the Kocher's point on the right side usually excepting for the few patients in whom the left lateral ventricle / foramen of Monro is asymme trically dilated or if on the right it is narrow/closed respectively. Kochers burr hole is made. Inner table is bevelled anteriorly using a Kerrison punch. Dura is opened in a cruciate fashion/C shaped fashion with base towards midline if the AF is open. Pia arachnoid is cauterised. Using free hand technique trocar with the sheath is used to tap the ventricles. The trajectory is planned with the help of pre op MRI studies. Care is taken to avoid the sulci. Trocar is exchanged for the karl storz lotta ventriculoscope with the right hand while holding the sheath steady with the left hand. Prior assembly of the endoscope system including a running saline for continuous irrigation is checked for. Once into the ventricle orientation and anatomy is made out using the routine landmarks like septal/thalamostriate veins ,choroid plexus and foramen of monro. After ensuring that the ipsilateral ventricle is entered the scope is negotiated past the foramen of monro into the third ventricle. As with the standard technique the floor of third ventricle is punctured midway between the mamillary bodies and infundibular recess using a bipolar cautery. Stoma is dilated using a 3 or 4 Fr Fogarty balloon catheter and then the Lilliquist membrane is opened if present . Free flow of CSF across the stoma as evidenced by the pulsatile third ventricular floor indicates adequacy of the procedure.

4.RESULTS

Out of 40 cases ,18 were adult males , 12 were adult females and were 10 children. Commonest etiology was Tb meningitis(12) followed by congenital aqueductal stenosis(8) , adult aqueductal stenosis(5), post traumatic biventricular hydrocephalus(2), pineal region tumour(1), shunt failure patients(5) , posterior fossa tumours(5) and normal pressure hydrocephalus(2). Mean time for the procedure from skin incision to closure was 35 min. Estimated blood loss ranges from 30-50 ml. Hospital stay ranged from 2-6 days depending on pre-operative neurological status of the patient.Clinical improvement in neurol ogical status and radiological reduction in ventricular size were considered as markers of good outcome. Immediate success rate varied according to pre op pathology .Post Tb meningitis (9/12) 75% ,Congenital aqueductal stenosis (7/8)87.5%, Adult aqueductal stenosis (4/5)80% ,Post shunt failure (for all causes)(4/5)80%, pineal region 100% ,posterior fossa tumours(5/5) 100% ,posttraumatic biventr icular tumours 100% and normal pressure hydrocephalus (1/2)50%. Average success rate for all causes was 82.5%.All cases were followed up at 1 month post op most at 3 months some at 1 year. In our series we didn't have any intraoperative complications like torrential bleeding . Immediate post op complications were CSF leak in 2 pediatric cases, post op meningitis in 2 cases . They were managed conservatively. All patients were covered with adequate antiepileptic and hence no seizure complications in our series.

5.DISCUSSION

The commonest etiology in our study was Tuberculous meningitis (TBM). It is characterized by the exudates in the basal cisterns and obstruction could be at the level of the aqueduct, fourth ventricular outlet or at the basal cisterns. ETV has a role in the chronic phase of the disease, where hydrocephalus is due to an aqueductal block due to a small tuberculoma or ependymitis or basal exudates causing fourth ventricular outlet obstruction, preventing CSF flow over the cortical surface.[4,5,6] ETV is technically difficult and decreases the chance of success in acute phase due to the presence of inflammation in the ependymal lining, presence of tubercles within the ventricle and subarachnoid spaces. Basal exudates can be washed out during ETV[7] Hence ETV may be attempted in chronic phase of the disease than in the acute phase. The tubercles tend to heal and the basal exudates disappear to a large extent with adequate medical therapy. The overall success rate for ETV in patients with TBM associated hydrocephalus is around 70% reported in large series [6,8] comparable to our success rate of 75%. Well-nourished patients with a thin-to-transparent third ventricular floor, without any exudates in the cisterns have a higher success rate of 87%.Patients with aqueductal stenosis ,congenital or acquired, as in tumors involving the posterior third ventricle and tectal gliomas have been consistently reported to have good outcomes in many studies following ETV[9,10] Preoperative observation of a closed aqueduct is an important predictor of the success of ETV. Reported success rates for ETV in aqueductal stenosis ranges from 70% to 90% in the long term compared to our study with success rate ranging from 80- 87.5%.Overall Success rates ranged up to > 90% in patients with posterior fossa tumors and brain stem gliomas with hydrocephalus. In our study success rate in pineal region and posterior fossa tumours was 100%. Success rate of ETV was 80% in our study in patients with previous shunt failure. According to Woodworth *et al.* after ETV for shunt dysfunction, only 25% remained symptom-free at the two-year follow-up[11]Complication rates reported in other series is around 8-9%. Complications ranged from permanent neurological complications like hemiparesis, gaze palsy, memory disorders, and altered sensorium and others related to ETV including intraoperative hemorrhage from the ependymal veins, choroid plexus or basilar artery and its branches. Postoperative mortality due to sepsis and hemorrhage was reported in other studies as 0.21%[13] Intraventricular hemorrhage, bradycardia during fenest ration and inflation of the balloon of the Fogarty catheter, and damage to the hypothalamus and fornix are other intraoperative complications. Intraoperative hemorrhagic as well as cranial nerve-related complications is most often due to misplacement of fenestration in third ventricular floor which can be avoided by staying in midline and recognising important structures like mamillary bodies, foramen of munro, infundibular recess and dorsum sellae.[16] Bradycardia has been reported during fenestration of the third ventricular floor possibly due to stimulation of the preoptic area with associated hypotension. Intraoperative tachycardia with hypertension can occur due to stimulation of posterior hypothalamus.[12,18] Hyperkalemia-induced bradycardia can be reduced by using normal saline instead of ringer lactate for irrigation. We did not have any intraoperative bleeding complications in our study.Post-operative complications following ETV includes CSF leak, ventriculitis, subdural fluid collection, and restenosis of the stoma[14,15] The risk of complication was higher with repeat ETV procedures and in patients with prior shunts.[17] In our study we had CSF leak in 2 patients and post operative meningitis in 2 patients.

Sudden excessive release of CSF or a large cortical puncture allowing egress of CSF into the subdural space leading to subdural hygromas and chronic subdural hematomas are reported in few cases.[12] We have not encountered such complications since meticulous technique is followed throughout the procedure. Singh *et al.*, have reported tachycardia as the most frequently encountered intraoperative complication, fever as the most common immediate postoperative complication and massive intraoperative bleeding as the most serious complication.[19]

6.CONCLUSION

ETV with free hand technique vastly reduces the duration of anaesthesia and surgery, average blood loss ,Hospital stay and hence cost, while being equally effective or even better with good success rates at times due to the fact that lillequiste's membranes if present are opened 100% of the times.

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