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Endoscopic Third Ventriculostomy in the Treatment of Obstructive Hydrocephalus Due to Posterior Fossa Tumour: A Comparative Analysis study

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Abstract **Review Article**

Background: Hydrocephalus is a clinical condition characterized by increased amount of cerebrospinal fluid in the brain. It results in dilatation of ventricles, increase intracranial pressure, brain atrophy, neurological impairment and even death. The management of hydrocephalous needs diversion, either intracranial or extracranial. The traditional treatment for all kind of hydrocephalous has been the implantation of ventricular shunt system. Endoscopic third ventriculostomy has been accepted as the procedure of choice for the treatment of obstructed hydrocephalous in adults and children. ***Methods:*** In this study, a total of 94 patients diagnosed with posterior fossa tumor and obstructive hydrocephalus were selected in a consecutive manner from the outpatient department and subjected to ETV. Glasgow coma scale (GCS) at baseline & follow up were recorded to determine good or bad clinical outcome. ***Objective***: To determine the outcome of Endoscopic Third Ventriculostomy in the treatment of Obstructive hydrocephalus secondary to Posterior fossa tumour in dhq hospital Mardan out of 94 patients. ***Results:*** The mean age of the patients was 10.82 + 4.49 years. Of the whole sample, we had 64.9% of males and 35.1% females. The mean GCS on baseline of our group of patients was 9.4 + 1.2 which was improved to 12.7 + 1.3 after Endoscopic third ventriculostomy. (p value 0.000). Good clinical outcome was observed in 71.3% of patients while bad clinical outcome in 28.7% of patients the mean age of the patients was 10.82 + 4.49 years. Of the whole sample, we had 64.9% of males and 35.1% females. The mean GCS on baseline of our group of patients was 9.4 + 1.2 which was improved to 12.7 + After Endoscopic third ventriculostomy. (p value 0.000). Good clinical outcome was observed in 71.3% of patients while bad clinical outcome in 28.7% of patients. ***Conclusions:*** Endoscopic third ventriculostomy is a preferred treatment for patients who had obstructive hydrocephalus due to posterior fossa tumor. The outcome is terms of GCS are favorable in majority of patients. More research is recommended to identify factors which can lead to bad clinical outcome to improve the morbidity and mortality of patients who had posterior fosssa tumor and are having obstructive hydrocephalus.

Keywords: Posterior fossa tumor, hydrocephalus, Endoscopic third ventriculostomy, Glasgowcoma scale.

INTRODUCTION

The incidence of primary CNS Tumors has been estimated as 3.9 and 3.2 per 100,000 person-year worldwide in males and females, respectively [1]. However, the reported incidence of primary CNS tumors is higher in developed countries. Nevertheless, the incidence of primary malignant CNS tumors ranges from 2.1 to 5.8 per 100,000 populations in the world [2, 3]. Posterior fossa tumors constitute about two thirds of pediatric tumors in large scale studies. This pattern is seen especially in children younger than 10 years of age. This is in contrast with adult series. Due to the raised intracranial pressure caused by hydrocephalus or tumor mass, children with posterior fossa tumors

generally present with symptoms such as headache, nausea, vomiting, restlessness and poor feeding.

Hydrocephalus is a clinical condition characterized by increased amount of cerebrospinal fluid in the brain. It results in dilatation of ventricles, increase intracranial pressure, brain, atrophy, neurological mpairment and even death [4, 5]. Hydrocephalus is common problem with an estimated prevalence of 1-1.5%. It has amazed and challenged clinicians throughout the history of medicine [6]. The management of hydrocephalous needs diversion, either intracranial or extracranial [7]. The traditional treatment for all kind of hydrocephalous has been the implantation of ventricular shunt system. However these systems have inherent tendency towards complications such as malfunction and infection [8]. Despite great progress in shunt technology during past decades the treatment of hydrocephalus remains a challenge. Hence there has always been a search for alternative options [9].

The advent of neuroendoscopy has resulted in the significant modification of the approach to and surgical treatment of hydrocephalous in the last fifteen years [10]. Endoscopic third ventriculostomy has been accepted as the procedure of choice for the treatment of obstructed hydrocephalous in adults and children [11, 12]. It has become the preferred method to treat obstructive hydrocephalous because of the minimally invasive nature [13]. Endoscopic third ventriculostomy is a surgical procedure that allows the cerebrospinal fluid flow directly from the third ventricle to the basal cistern and thus bypassing the aqueduct and the posterior fossa [14].

In one study, the outcome of endoscopic third ventriculostomy in terms of Glasgow coma scale and it was recorded that in 68.4% of patients, the improvement was observed on a score of more than or equal to 3 from Baseline [15].

Endoscopic third ventriculostomy is practiced in developed population as a treatment of choice for obstructive hydrocephalus due to posterior fossa tumors. The aim of my study is to determine the clinical outcome in terms of Glasgow coma scale of this procedure in our population. Very rare studies have been conducted to determine its outcome in our local setup. So we designed this study to determine the outcome of endoscopic third ventriculostomy in our local population with obstructive hydrocephalus and the results of this study will be shared with other local neurosurgeons and to follow future research recommendations.

CONCLUSION

Endoscopic third ventriculostomy is a preferred treatment for patients who had obstructive hydrocephalus due to posterior fossa tumor. The outcome is terms of GCS is favorable in majority of patients. More research is recommended to identify factors which can lead to bad clinical outcome to improve the morbidity and mortality of patients who had posterior fosssa tumor and are having obstructive hydrocephalus.

Epidemiology

Posterior fossa tumors are more common in children than the adults. Central nervous system tumors are the most common solid tumors in children; between 54% and 70% of all childhood brain tumors originate in the posterior fossa [16]. About 15-20% of brain tumors in adults occur in the posterior fossa.

Certain types of posterior fossa tumors, such as medulloblastoma, pineoblastoma, ependymomas, primitive neuroectodermal tumors (PNETs), and astrocytomas of the cerebellum and brain stem, occur more frequently in children. Some glial tumors, such as mixed gliomas, are unique to children; they are located more frequently in the cerebellum (67%) and are usually benign.

Hydrocephalus is common in children with posterior fossa tumors, occurring in 71% to 90% of pediatric patients; approximately 10% to 40% demonstrate persistent hydrocephalus after posterior fossa tumor resection [17, 18].

Etiology

No specific causes for posterior fossa tumors exist. However, genetic factors, such as dysfunction of some tumor suppressor genes (p53 gene) and activation of some oncogenes, may play a role in their development [19]. Environmental factors such as irradiation and toxins may also play a role.

Table-1: Age wise distribution of the sample (n = 94)

	n	Range	Minimum	Maximum	Mean	Std. Deviation
Age of the patient	94	15.00	3.00	18.00	10.8298	4.49226
Age Groups			Frequency		Percent	
up to 6.00 years			17		18.1	
> 6 to 12 years			40		42.6	
>12 to 18 years			37		39.4	
Total			94		100.0	

Table-2: Gender wise distribution of the sample (n = 94)

Gender	Frequency	Percent
Male	61	64.9
Female	33	35.1
Total	94	100.0

Table-3: Baseline & follow up glasgow coma scale (n = 94)

GCS	Mean	Std. Deviation	P Value
Baseline GCS	9.4255	1.21363	0.000
Pair 1			
Follow up GCS	12.7872	1.37467	

Table-4: Gender wise stratification of outcome (n = 94)

	Outcome		Total
	Good	Bad	
Count	42	19	61
Male			
% within Gender of the patient	68.9%	31.1%	100.0%
Gender of the patient			
Count	25	8	33
Female			
% within Gender of the patient	75.8%	24.2%	100.0%
Count	67	27	94
Total			
% within Gender of the patient	71.3%	28.7%	100.0%

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i. Thalamostriate vein Entry into 3rd ventricle the endoscope is passed into 3rd ventricle through foramen of monro 3rd ventricle is inspected prior to perforate of the floor.

ii. Technique of operation Position Supine position with neck slightly flexed ideally in Mayfield's 3 pin fixator.

iii. Visual Endoscopic third ventriculostomy versus ventriculoperitoneal shunt in the treatment of obstructive hydrocephalus due to posterior fossa tumors in children

DISCUSSION

The use of cranial endoscope was started in the early 20th century by Dandy and others to treat hydrocephalus by cauterizing the choroid plexus. But due to high morbidity and mortality it was not encouraged. Moreover, in 1950's and 60's CSF shunt was popularized due to its simplicity in use. However, it has not solved all the aspects of the disease maintaining long-term favourable results[16] . To overcome the complications of shunt system; like over or under drainage, shunt infections, shunt dependency and foreign body reaction to the silicon catheter; endoscopic third ventriculostomy is really the solution of these problems and is the preferred option as an alternative to ventriculo-peritoneal and ventriculoatrial shunting. [17] Furthermore, because of high rate of complications after shunt use and further advancement in the endoscopic system, cranial endoscopy showed its safety and superiority in the field of neurosurgery; not only can we treat hydrocephalus but a variety of other procedures can also be performed with safety and excellent results. Endoscopic third ventricolostomy is a surgical procedure that allows the CSF to flow directly from the third ventricle to the basal cistern and subarachnoid spaces thus bypassing the aqueduct and the posterior fossa. The procedure is in fact a ventriculocisternostomy which is considered to be a simple internal shunt, creating CSF diversion providing physiological restoration of CSF pathway and CSF dynamics requiring patent subarachnoid spaces and adequate re-absorption into venous system [18].

Hydrocephalus associated with posterior fossa tumor could be managed by ventriculo-peritoneal shunt, tumor excision and ETV. ETV should be considered as an alternative procedure to VP shunt in controlling severe hydrocephalus, related to posterior fossa tumors while patients await their definite tumor excision. The use of pre-resectional ETV was found to be an effective and safe procedure with a high success rate [75]. ETV was found to be better than VP shunt [19]. However, ETV cannot always prevent post-operative hydrocephalus in all cases of posterior fossa tumor (range, 5–9 days) from posterior fossa tumour removal (Table 2; Fig. 1);

(2) Group 2 was made up of nine childrenwho presented borderline or inconstantly high post-operative ICP values in the first post-operative week. ICP

monitoringwas prolonged for up to 25 days (minimum—11 days;maximum 25 days) in these children who underwent ETV ata mean time interval of 14.4 days from posterior fossatumour removal (Table 3; Fig. 2).

CONCLUSION

Endoscopic third ventriculostomy is a preferred treatment for patients who had obstructive hydrocephalus due to posterior fossa tumor. The outcome is terms of GCS are favorable in majority of patients. More research is recommended to identify factors which can lead to bad clinical outcome to improve the morbidity and mortality of patients who had posterior fosssa tumor and are having obstructive hydrocephalus.

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