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Age Related Role of Endoscopic Third Ventriculostomy in Treatment of Hydrocephalic Children

F.H.Elnoss, M.M.Elmaghrabi, M.M.Wahdan and A.M.Abdelmoniem
Neurosurgery,Dept., Faculty of Medicine, Benha Univ., Benha, Egypt
E-mail: Abdelmoniem@yahoo.com

Abstract

Goal: To understand endoscopic third ventriculostomy (ETV) surgical result in the hydrocephalus. Setting: Benha University Hospitals Department of Neurosurgery. Between January 2016 to February 2020. Materials and processes: A total of 58 hydrocephalus patients were included in this research, regardless of gender prejudice. CSF loculation or tumour hydrocephalus was excluded. Hydrocephalus CT scan brain and MRI were diagnosed. Information on patient specifics, causes of hydrocephalus and operation problems were recorded in Performa patient. The data were examined in version 26 of SPSS. Frequency and percentage for categorical variables were computed. Mean ± SD for age has been computed. Results were presented as tables. Results: The research comprised a total of 58 individuals with hydrocephalus. Of the 58 patients, 32 were male (55.2 per cent) and 26 were female (44.8 percent). The average age was 22.86 months. The most frequent cause of hydrocephalus was congenital aqueductal stenosis. CSF leaking was observed in 20 individuals after surgery (34.5 percent). 6 individuals have postoperative infection (10.3 percent). Conclusions: third ventriculostomy endoscopic is safe and effective. Patients who fulfil the requirements are offered the option of freeing themselves from shunt dependence via endoscopic third ventriculostomy.

Key words: Children, Endoscopic Third Ventriculostomy, Hydrocephalus.

1. Introduction

Endoscopic third ventriculostomy (ETV) is a suitable option for shunt dependency; the third ventricle is opened with an endoscope inserted via a burr hole in the ventricular system. This enables the moval from the blocked ventricular system of cerebrospinal fluid (CSF) into the interpenduular cistern (a normal CSF-space) circumventing CSF blockage. ETV is utilised for the treatment of Hydrocephalus obstructive, such as aqueductal stenosis. The aim of this technique is to normalise cerebral pressure without shunting.

[1, 2, 3] While open ventriculostomies were done as early as 1922, with the advent of shunt devices they became a less frequent technique to treat Hydrocephalus in the sixties. However, in many instances shunts remain insufficient, despite recent improvements in shunt technology and surgical methods. In particular, extracranial shunts are susceptible to problems, such as blocking, infection and overdrainage, which frequently need recurrent surgical overhauls(1,4,5). ETV's ultimate aim is to make a shunt unnecessary. ETV is preferably a once treatment, however data indicates that some patients need more than one operation to keep the aperture and drainage sufficient (3,6,7). The aim of this research was to know the surgical result of ETV in non-communicating hydrocephalus patients.

2. Materials and Methods

This study was done at neurosurgery department of Benha university hospitals. From January 2016 to February 2020. from A total of 58 patients with hydrocephalus, irrespective of gender discrimination were included in this study. Age of patients ranged from 2 months to 10 years with mean age of 22.86 months and Hydrocephalus with CSF loculations or tumour was excluded. Hydrocephalus was diagnosed by CT scan Brain and MRI. Carl Storz endoscope with lenses of 0 and 30 degrees with 6mm outer diameter wesusedin ETV.

Clinical Outcome of ETV was evaluated by the time of discharge and on subsequent follow up visits. Base line CT brain was done to all patients post operatively. The treatment was recorded as a success or failure. Success of the ETV was defined as partial or complete relief of symptoms. Any patient who subsequently needed VP shunting after the ETV procedure was described as having treatment failure. The information regarding patient details, causes of hydrocephalus and complications of procedure was documented in patient's data. The data was analyzed by SPSS version 26. Frequency and percentage was calculated for categorical variables. Mean +- SD was calculated for various results were presented as tables.

3. Results

58 patients were operated during our study period. Age of patients ranged from 2 months to 10 years with mean age of 22.86 months. 51.7% of cases were above 1 year of age (30 cases). In succeeded cases (34 cases) the median age was 19 months, (IQR): 11.75-33.75. In failed cases (24 cases) the median age was 6.5 months, (IQR): 3.25-15.25. which is statistically highly significant. The relation between age groups that are shown in table (1) and success is also statistically highly significant.

There were 32 males (55.2%) of patients and 26 females (44.8%). 40 patients (69%) have congenital aqueductal stenosis. 18 patients (31%) have Chiari type I malformation. ETV surgery is successful in 34 patiens (58.6%) and failed in 24 patients (41.4%).

As shown in table (2), History of Previous shunt was present in 12 patients (20.7%). Vomiting was present in 40 patients (69%). Previous History of infection was present in 4 patients (6.9%). Head

circumference had a mean of 47.5 cm ranging from 39 to 57 cm, (±SD 4.62 cm).

Complications noted after ventriculostomy were noted as follows: Post-operative CSF leak was present in 20 patients (34.5%). Post-operative CSF leak was present in 6 of 34 succeeded cases (17.6%) and in 14 of 24 failed cases (58.3%), which is statistically highly significant.

Fits occurred post-operative in 12 patients (20.7%). Post-operative haemorrhage occurred in 6 patients (10.3%). Post-operative infection was present in 6 patients (10.3%). Mortality occurred in 4 patients (6.9%).

ETV surgery was successful in 34 patiens (58.6%) and failed in 24 patients (41.4%).

As shown in table (3) when ETVSS is 70, success rate is 90%. And when ETVSS is low at 40, the failure rate is 75%.

In succeeded cases ETV success score has a mean value of 68.24 (SD 12.18) and a median value of 70 (IQR 67.5-72.5), as shown in figure(1).Relation between ETV success score mean and median values and results of ETV surgery is statistically highly significant.

Table (1) Relation between success of ETV and age distribution of patients.

ETV	Succeed (34)		Failed (24)		Statistical test	P value
	No	%	No	%		
Age						
Mean ±SD	27.0±27.58		17.0±24.38		St t= 1.43	0.16
Median (IQR)	19.0 (11.75-33.75)		6.5 (3.25-15.25)		MWU= 3.19	0.001**
1m-	4	11.8	10	41.7	FET= 14.94	0.001**
6m-	4	11.8	8	33.3		
1y-	24	70.6	6	25.0		
≥10y	2	5.9	0	0.0		

Table (2) Relation between pre-operative findings and ETV success.

ETV	Succeed (34)		Failed (24)		Statistical test	P value
	No	%	No	%		
Previous shunt						
Yes	10	29.4	2	8.3	FET= 2.63	0.097
No	24	70.6	22	91.7		
Vomiting pre-op						
Yes	26	76.5	14	58.3	X2= 2.16	0.14
No	8	23.5	10	41.7		
Fits pre-op						
Yes	14	41.2	4	16.7	X2= 3.95	0.047*
No	20	58.8	20	83.3		
Infection pre-op						
Yes	2	5.9	2	8.3	FET= 0.0	1.0
No	32	94.1	22	91.7		
Cranial nerve affection						
Yes	18	52.9	2	8.3	X2= 12.39	<0.001**
No	16	47.1	22	91.7		
Head circumference						
Mean ±SD	49.35±4.03		45.0±4.25		St t= 3.96	<0.001**

Table (3) Relation between ETV success score values and results of ETV surgery.

ETV	ETV score					
	40	50	60	70	80	90
Succeed (34)	2(25.0)	4(33.3)	2 (33.3)	18 (90.0)	6 (60.0)	2 (100)
Failed (24)	6 (75.0)	8 (66.7)	4 (66.7)	2 (10.0)	4 (40.0)	0 (0.0)
Total	8	12	6	20	10	2

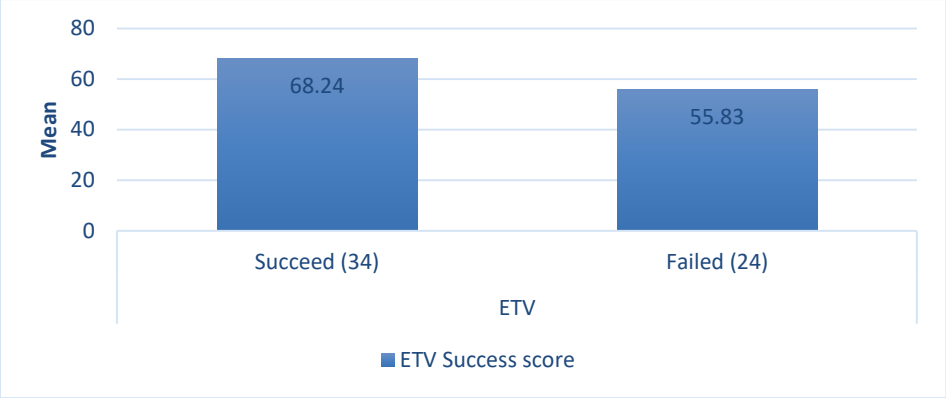

Fig. (1) Relation between ETVSS mean, median and results of ETV surgery.

4. Discussion

Endoscopy is now extensively used either alone or in conjunction with other procedures in neurochirurgy. ETV is widely established as an obstructive hydrocephalus therapy option. and in other situations may also be helpful, like the VPS failure [8].

The research was conducted on 58 patients. The patient's age was a consistent criteria for patient selection in this research. All of our patients were under 18 years old (58 cases). The total success was 58.6% in patients older than 1 year, while 81.2%. There was a statistically significant relationship between age groups and achievement.

This shows that age is a significant factor for ETV patients, coinciding with the findings of many other authors who think age is a major deciding factor for their outcomes and the most important independent risk factor for surgical efficacy and long-term functional outcomes [9].

Our patient success rate in 2005 was 58.6% and the outcomes of B Warf in 2005 were 53%, whereas Kadrian et al. reported the success of 58% in children younger than 2 years [10, 11].

In our research, the success rate in aqueductal stenosis patients was (70 percent). These findings cope with most literature research as [12, 13]. However, several writers found the values much higher (70-90%) (14, 15). Other writers have reported results below 40% with younger age groups in particular [16].

In our research the success rate in Chiari patients was (30 percent).

It was reported by Ray et al. (0 percent) [17].

Our findings in the V-P malfunctioning group were 70% and are close to the work of Gupta and his other authors (70%) (18 Gupta et al., 2017) and others as well [19].

Like other operations, ETV may have different degrees of difficulties.

In our research, 58.6% of patients were successful in ETV and 41.4% failed. Complications occurred generally as follows: Post-operative CSF leaks occurred in 17.6% of successful cases and 58.3% of failure cases (34.5 percent of all cases). This is very significant statistically. CSF leaking is seen as an ETV failure indicator. 10.3% of patients experienced bleeding. 10.3% of patients have been infected. Mortality occurred in 4 (7%) of all 58 cases.

In our research, the success rate of etv is greater, particularly when the success rate is increased by 70 or higher. This is comparable to the findings of Labidi et al who have shown that over 70 ETVSS success is linked to greater success. [20] Distinction in the complication rate may be caused by the variation in number of cases; 58 patients, Seung-Ki Kim and 32 colleagues have been studied. [21] However, additional investigations were carried out on a number of individuals ranging from 155 to 450.

In our research, there were no vascular injuries, but only mild bleeding caused by tiny blood vessel damage during the neuroendoscopic operations. Continuous irrigation with lactating ring solution reduced the bleeding.

The mortality rate of ETV is 0–1%, and normally occurs immediate after a vascular damage during the operation. However, following ventriculostomy closure, deaths may sometimes be delayed due to secondary infection or acute hydrocephalus [22].

The third criterion for selection of ventriculostomy endoscopy continue to extend to include infected individuals. [23], neural tube abnormalities [24] and various hydrocephalus types (25) These individuals were traditionally thought to be at increased risk of ETV failure. Ideal parameters for patient selection are further established using long-term follow-up data on these high-risk patients [26].

5. Conclusions

Endoscopic third ventriculostomy is an useful and reasonably safe technique for hydrocephalus therapy in previously shunted patients with mechanical shunt dysfunction, which is designed to prevent shunting dependence from long-term consequences. More success rates were above the age of one year.

Outpatient monitoring is still required due to the potential of early or delayed failure. Furthermore, it is essential to educate the parents about the nature of the operation, the anticipated problems and long-term follow-ups, particularly when failure is predicted.

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