

Original Research Article

Clinical study and management of hydrocephalus in children

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ABSTRACT

Background: Hydrocephalus is a condition in which an accumulation of cerebrospinal fluid (CSF) occurs within the brain. Hydrocephalus can occur at any age, but it is more common in infants. Long-term complications of hydrocephalus can vary widely and are often difficult to predict and may result in significant intellectual, developmental and physical disabilities. Ventriculoperitoneal shunt remains mainstay of treatment even today as it is easily available and inexpensive.

Methods: The study was conducted in Dr. V. M. Government Medical College and Hospital located in Solapur (Maharashtra) from September 2016 to 2018. It was a prospective descriptive study. 30 cases up to the age 14 years with diagnosis of hydrocephalus undergoing VP (ventriculo-peritoneal) shunt surgery were included in the study.

Results: Aqueductal stenosis and tuberculous meningitis were the commonest causes of congenital and acquired hydrocephalus in children respectively. Shunt infection and shunt obstruction were the commonest post-operative complications required shunt revision. Low birth weight and other associated congenital anomalies increased the mortality rate.

Conclusions: VP shunt placement has been the main treatment modality for hydrocephalus. VP shunts procedures are associated with complications and morbidity. Number of revision shunt procedures, low birth weight, associated congenital anomalies adversely affected the final surgical outcome.

Keywords: Hydrocephalus, Chhabra's shunt, Children

INTRODUCTION

The term hydrocephalus comes from Greek and means 'Water head'.¹ Hydrocephalus is defined as the abnormal accumulation of cerebrospinal fluid (CSF) within the ventricles and/or subarachnoid spaces, leading to an increase in intracranial pressure.² Hydrocephalus is a relatively common neuropediatric condition, with an incidence of about 0.9 per 1,000 births.^{3,4}

Hydrocephalus can be classified into non-communicating and communicating depending on whether the fluid pathway is obstructed or not.²

According to etiology it can be classified as congenital or acquired. Congenital hydrocephalus is present at birth, and can be caused by Dandy Walker malformations, porencephaly, spina bifida, Chiari I and II malformations, arachnoid cysts, and most commonly aqueductal stenosis. Acquired hydrocephalus may be caused by subarachnoid haemorrhage, intraventricular haemorrhage, trauma, infection (meningitis), tumour, surgical complications or severe head injury at any age.

The clinical features of hydrocephalus are variable and depends on the rapidity of onset and age of the patient. There is currently no definitive cure for hydrocephalus. Most patients are managed by shunting using a silicone

tube and valve system, where CSF is diverted from the cerebral ventricles to another body site.⁵ Hydrocephalus is a notorious disease that carries the adage ‘once a shunt always a shunt’.⁶ There are variable success rates for VP (ventriculo-peritoneal) shunt across the globe. The Present study is undertaken to know the etiology of hydrocephalus, clinical presentation of patient, post-operative complications, mortality and factors affecting final surgical outcome in these patients in our institute.

METHODS

After obtaining the institutional ethics committee approval, present prospective descriptive study was carried out in the department of surgery at Dr. V. M. Government Medical College and Hospital located in Solapur (Maharashtra) from September 2016 to 2018.

Inclusion criteria

Patients up to 14 years of age, irrespective of sex, with diagnosis of hydrocephalus treated with ventriculoperitoneal shunt.

Exclusion criteria

Patients above the age of 14 years. Patients unfit for general anaesthesia, not willing for surgery and discharged against medical advice.

On admission detailed history regarding age, sex, weight, head circumference, time of appearance and duration of symptoms, eye signs, delivery (pre-term or full-term), Presence or Absence of associated congenital anomaly were noted. Thorough clinical examination was done. General condition of patient was assessed and noted down. Necessary radiological and laboratory investigations were performed. After thorough investigations patients were subjected to Ventriculoperitoneal shunt insertion surgery under general anaesthesia. If patients have associated anomalies they were also corrected by surgery. Post-operatively patients were either monitored in surgical ward or neonatal ICU if required.

Postoperatively patients were given IV fluids, antibiotics, analgesics. Patients were observed for post-operative complications. Data collected, analysed and compared with other available literature.

Statistical analysis

Data from each patient collected and tabulated using microsoft excel. All the statistical analysis was carried out by SPSS (Statistical Package for Social Sciences) version 16. Microsoft word and excel have been used to generate graphs, table etc. Statistical method used was Z test, p<0.05 considered statistically significant.

RESULTS

In our study majority of patients 16 (53.33%) presented within first 6 month of age. Male to female ratio is 1.7:1, thus males clearly out numbers the females. Majority of patients 26 (86.66%) had birth weight more than 2.5 kg, 3 (10%) patients had birth weight between 2-2.5 kg and 1 (3.33%) patient had birth weight less than 2 kg. Progressive enlargement of head circumference and bulging fontanelle were the commonest signs and symptoms observed in our study. Majority of patients 18 (60%) had communicating type of hydrocephalus.

Table 1: Age distribution.

S. no	Age distribution	Number of cases (%)	Mean age
1	0-6 months	16 (53.33)	11.96 months
2	7-12 months	7 (23.33)	
3	1-5 years	5 (16.67)	
4	6-14 years	2 (6.67)	
Total		30 (100)	

Table 2: Gender distribution.

S. no	Gender distribution	Number of cases (%)	Male to female ratio
1	Male	19 (63.33)	1.7:1
2	Female	11 (36.67)	
Total		30 (100)	

Table 3: Distribution according to aetiology of hydrocephalus.

S. no	Type of hydrocephalus	Aetiology	Number of cases (%)
1	Congenital hydrocephalus	1 Aqueductal stenosis	12 (40)
		2 Chiari type 2 malformation with meningocele	7 (23.33)
		3 Dandy walker malformation	2 (6.67)
		Total cases	21(70)
2	Acquired hydrocephalus	1 Post tubercular meningitis	5 (16.67)
		2 Posterior fossa tumor	2 (6.67)
		3 Post trauma	2 (6.67)
		Total cases	9 (30)

Table 4: Distribution according to birth weight.

S. no	Birth weight (in kg)	No. of patients (%)
1	Less than 2	1 (3.33)
2	2-2.5	3 (10)
3	More than 2.5	26 (86.67)
Total		30 (100)

Table 5: Clinical presentation of patients with hydrocephalus.

S. no.	Clinical presentation (signs and symptoms)	No. of patients (%)	
1	Symptoms	1 Enlargement of head	25 (83.33)
		2 Convulsions	18 (60)
		3 Nausea and vomiting	12 (40)
		4 Fever	10 (33.33)
		5 Irritability	6 (20)
		6 Altered consciousness	5 (16.66)
		7 Headache	3 (10)
		8 Refusal of feeds	2 (6.66)
2	Signs	1 Bulging of fontanelle	24 (80)
		2 Widening of cranial sutures	22 (73.33)
		3 Setting sun sign	18 (60)
		4 Meningomyelocele	7 (23.33)
		5 Altered sensorium	4 (13.33)
		6 Papilloedema	4 (13.33)

Table 6: Communicating and non-communicating hydrocephalus.

S. no.	Type of hydrocephalus	No. of patients (%)
1	Communicating	18 (60)
2	Non-communicating (obstructive)	12 (40)
Total		30 (100)

Table 7: Associated anomalies with hydrocephalus.

S. no.	Associated anomalies	No. of patients (%)
1	Meningomyelocele	7 (23.33)
2	Arachnoid cyst	1 (3.33)
Total		8 (26.66)

Table 8: Post-operative complications.

S. no.	Post-operative complications	No. of patients (%)
1	Shunt infection	16 (53.33)
2	Shunt obstruction	7 (23.33)
3	Shunt migration:	5 (16.66)
4	CSF varix	2 (6.66)
5	Shunt over drainage	30 (100)
Total		11(36.66)

Table 9: Post-operative hospital stays.

S. no.	Post-operative hospital stays (days)	No. of patients (%)	Average hospital stays
1	10	10	15 days
2	15	14	
3	20	2	
4	25	2	
5	30	2	
Total		11(36.66%)	

Table 10: Patients requiring revision surgery.

S. no.	No of cases operated for VP shunt	No of cases requiring revision of VP shunt	Percentage (%)
1	30	11	36.66

Most common associated congenital anomaly observed in our study was meningomyelocele, in 7 (23.33%) patients in whom repair of meningomyelocele was done. 1 (3.33%) patient had arachnoid cyst which was small in size so managed conservatively and hydrocephalus was managed by VP shunt insertion.

Shunt infection and shunt obstruction were the commonest post-operative complications. The average

post-operative hospital stay in our study was 15 days. 11 (36.66%) patients required revision of VP shunt surgery due to one or other post-operative shunt related complications.

DISCUSSION

Most of the patients 16 (53.33%) in our study presented within first 6 month of age with mean age 11.96 months. The mean age of the patient in the study conducted by Pan et al is 20.7 months.⁷ The mean age of the patient in the study conducted by Kyalo et al and Warf et al is 12.12 months and 9.5 months respectively.^{8,9} In the Tambo et al study the mean age is 6.69 months.¹⁰ while that in the Gathura et al. and Waluza et al. is 8.5 and 3 months respectively.^{11,12} From above studies it is evident that the majority of the patients are below 1 year of age. Findings in our study are comparable with above studies. In present study male to female ratio is 1.7:1. Males are more commonly affected by hydrocephalus than females. Several studies show similar results.¹³⁻¹⁵ In present study enlargement of head, bulging of fontanelle, setting sun sign are the commonest presenting signs and symptoms. Similar type of presentation is seen in various other studies also.⁸⁻¹⁷ Commonest cause of hydrocephalus in our study is Aqueductal stenosis (40%) followed by Arnold Chiari type 2 malformation (23.33%) with meningomyelocele. Similar aetiology is seen in various other studies also.¹⁸⁻²² In our present prospective study the most common post-operative complication observed is shunt infection followed by shunt obstruction. Similar findings were also observed in other studies.¹⁷⁻²³ VP shunt infection rate in our study is 13.33%. Incidence of shunt infection rate is high in our study as compared to Fitzgerald and Connolly et al and McCullough et al study.^{24,25} This may be because of small sample size in our study, also all the faculty members were involved in the admission and treatment of the patients as it is a teaching institute. Shunt infection rate in our studies is comparable with Mancao et al, and study and George et al, study.^{26,27} And the difference is statistically insignificant ($p > 0.05$).

Overall mortality rate in our study is 6.66%. Mortality rate is less as compared to Pan et al, Kyalo et al, Warf et al, study.⁷⁻⁹ This may be because of expert neurosurgical facilities, improved anaesthesia techniques and availability of neonatal intensive care unit (NICU) facilities for post-operative management of patients in our set up.

CONCLUSION

Aqueductal stenosis and Tuberculous Meningitis were the commonest causes of congenital and acquired hydrocephalus observed respectively in our study. Progressive enlargement of head circumference and bulging fontanelle was the commonest mode of presentation. Shunt infection and shunt obstruction were the commonest post-operative complications with post-operative mortality of 6.66%. Prolonged hospital stays,

number of revision shunt procedures, low birth weight, associated congenital anomalies adversely affected the final surgical outcome in our study.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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