

Ventriculo-Peritoneal Shunt Infection: Three Years Experience in Combined Military Hospital, Dhaka

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Abstract

Introduction: Treatment of Hydrocephalus by placement of Ventriculo-peritoneal (V-P) Shunt is a common neurosurgical practice. But presence of shunt predisposes to increased infection.

Objective: To focus on aetiological factors for developing shunt infection.

Methods: This prospective observational study was carried out at Neurosurgery Center, Combined Military Hospital, Dhaka during the period of June 2015 to May 2018. A total of 33 patients were included in the study, all of them underwent CSF shunt surgery at this centre. They were followed up for one month after surgery. Age, sex and socioeconomic condition of the patients, types (obstructive or communicating) of hydrocephalus (HCP), aetiology of HCP, duration of surgery, shunt type used and routine or emergency surgery were the factors that were analysed for possible association with infection.

Results: Eight (24.2%) patients developed shunt infection, among whom infants and male were predominate. Low socio-economic group, prolonged operation time and emergency surgery were found to have association with increased rate of infection.

Conclusion: V-P shunt insertions had unacceptably high infection rate despite the presence of a protocol for the procedure. A protocol should be developed for strict compliance and where possible, alternative procedure Endoscopic Third Ventriculostomy (ETV) or External Ventricular Drain (EVD) should be employed to minimize shunt infection.

Key-words: Hydrocephalus, V-P Shunt, shunt infection.

Introduction

Cerebrospinal Fluid Shunt is the mainstay of treatment of Hydrocephalus (HCP). Shunt failure due to infection is also a frequent occurrence in neurosurgical practice. Avoidance of such catastrophe is the dream of all neurosurgeons. Still V-P Shunt placement is associated with high complication and failure rates. Worldwide complication rates range from 1%–40%; shunt infections probably being the most frequent cause of failure¹. According to a Norwegian study, the incidence of infections was significantly correlated with age, type of operation and incidence of hydrocephalus infections being common during the first 6 months of life, following primary shunt insertions rather than

revisions and in children with Myelomeningocele related hydrocephalus². Among other possible factors that are related to shunt infections are poor condition of the skin, presence of inter current infection at the time of surgery, prolonged operation time as well as the education and experience of the neurosurgeon³⁻⁵. Shunt infection usually occurs within a few days of shunt surgery and is associated with substantial risks of morbidity, including increased risk of seizure disorder and decreased intellectual performance^{6,7}. The treatment of shunt infection requires removal of the shunt system, placement of a temporary external CSF drain, a course of appropriate antibiotic therapy, and eventual insertion of a new shunt system. This involves a minimum of two separate operations and a hospital stay lasting as long as 2 to 3 weeks⁸. In addition, shunt infection is associated with a long-term risk of mortality greater than 30%, which is nearly double that observed in children without infection⁹.

Materials and Methods

This prospective observational study was done at Neurosurgery Centre, Combined Military Hospital, Dhaka during the period of June 2015 to May 2018. A total of 33 patients were included in the study, all of them underwent CSF shunt surgery at this centre. Patients having preoperative source of infection (such as fever ect.), with co-morbid condition predisposing to increased rate of infection (like diabetes, congenital heart disease, open myelomeningocele, renal impairment etc.) and those had previous surgical intervention of brain were excluded. Shunt infection was considered if the patient develops un-remitting fever in the absence of any other causes, inflammation along the shunt tract or incision site, signs of meningeal irritation or peritonitis.

Peri-operative management: All patients were diagnosed pre-operatively by CT Scan or/and MRI brain. Routine laboratory investigations were also done. All patients received prophylactic antibiotics (Ceftriaxone 50-100 mg/kg) at least one hour prior to surgery or were already on prophylactic antibiotic.

All patients received ventriculo-peritoneal shunt. Hair was shaved in the evening before day of operation (routine surgery) or after induction (in case of emergency). Thorough cleaning of the surgical sites was made with Hexisrub (pre-wash), then after marking; adrenalin mixed local anaesthetic infiltration of incision sites was made. Again alcohol and iodine based anti septic

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solution were applied before draping. For shunt procedures, Chhabra or Codman shunts were used. The shunts were soaked in saline mixed with Gentamycin. The assistant flushed and checked for the functionality of the shunts before insertion. Free flow of CSF was checked before fixing the ventricular catheter with the shunt tube.

All patients continued antibiotics till stitch removal or changed if developed infection. All were followed-up routinely at ward, during discharge and after one month post-operatively at outpatient department for sign symptoms of shunt infection or shunt failure.

Following variables were considered for this study: Age, sex and socio-economic condition of the patients, types (obstructive or communicating) of HCP, aetiology of HCP, duration of surgery, shunt type used and routine or emergency surgery.

Results

The results and observations of the study are arranged in tabulated form. Infants were the most common age group that was affected by HCP (20 out of 33) and they also suffered from most shunt infections (5 of 8 cases). Total number of Shunt infection was 8 (24.2%) in this Study.

Table-I: Age, sex and socio-demographic characteristics of patients (n=33)

Characteristics		Shunt Infection		
		Yes n (%)	No n (%)	Total n (%)
Age	<6 months	3 (9.1)	7 (21.2)	10 (30.3)
	6 months to 1 year	2 (6.1)	8 (24.2)	10 (30.3)
	2-12 years	1 (3.0)	4 (12.1)	5 (15.2)
	>12 years	2 (6.1)	6 (18.2)	8 (24.2)
Sex	Male	6 (18.2)	14 (42.4)	20 (60.6)
	Female	2 (6.1)	11 (33.3)	13 (39.4)
Socio-economic Status	Low	5 (15.2)	11 (33.3)	16 (48.5)
	Middle	3 (9.1)	8 (24.2)	11 (33.3)
	Upper	0	6 (18.2)	6 (18.2)

Most of the cases were infants (20 out of 33) and shunt infection were also common to this age group (5 versus 3). Male patients were just under double than female, but shunt infection were only slightly more than female patients. Shunt infection were more common (15.2%) in patients of low socio-economic condition group and there were no infection in upper socio-economic group (Table-I).

Table-II: Shunt infection status by types and aetiology of hydrocephalus, duration of surgery, type of shunt used (n=33)

Characteristics		Infection Status		
		Yes n (%)	No n (%)	Total n (%)
Types of hydrocephalus	Obstructive	5 (15.2)	13 (39.4)	18 (54.5)
	Communicating	3 (9.1)	12 (36.4)	15 (45.5)
	Total	8 (24.2)	25 (75.8)	33 (100)
Aetiology of Hydrocephalus	Post Meningitic	2 (6.1)	4 (12.1)	6 (18.2)
	Post traumatic	1 (3.0)	2 (6.1)	3 (9.1)
	Congenital	1 (3.0)	7 (21.2)	8 (24.2)
	HCP with MMC	1 (3.0)	3 (9.1)	4 (12.1)
	Unconfirmed (Misc.)	3 (9.1)	9 (9.3)	12 (36.4)
	Total	8 (24.2)	25 (75.8)	33 (100)
Duration of Surgery	< 1 Hour	3 (9.1)	11 (33.3)	14 (42.4)
	> 1 Hour	5 (15.2)	14 (42.4)	19 (57.6)
	Total	8 (24.2)	25 (75.8)	33 (100)
Type of Shunt used	Codman	5 (15.2)	20 (60.6)	25 (75.8)
	Chhabra	3 (9.1)	5 (15.2)	8 (24.2)
	Total	8 (24.2)	25 (75.8)	33 (100)

In Table-II it is observed that obstructive type (18) predominates to communicating type of HCP (15). Infection rate is also higher in this type. The predominant Aetiology of HCP was unconfirmed, but otherwise congenital HCP were more prevalent. Most patients had operation duration of >1hour (19 vs 14) and most cases of infection is also prevalent in patients underwent longer surgery (15.2% vs 9.1%). Types of shunt system used most commonly were Codman type (25 vs 8) but shunt infection was only slightly higher in this group (5 vs 3).

Table-III: Shunt infection status in routine and emergency surgery (n=33)

Type of Operation	No of patients (n=33)	No of Patients with Shunt Infection	Percentage
Routine	15	2	6.1
Emergency	18	6	18.2
Total	33	8	24.2

As per data in Table-III emergency surgery slightly outnumbers routine operations for HCP (18 patients vs 15 patients), but is associated with most of Shunt infections (18.2% vs 6.1%).

Discussion

In this study we intended to observe the infection rate and aetiology of Ventriculo-peritoneal shunt treatment among Hydrocephalus patients in a Tertiary Level Military Hospital in Bangladesh by conducting a prospective observational study. We found that most infections occurred in infants than older children and adults. Some previous studies also concur with us¹⁰⁻¹². Under-developed immune system, malnourishment, poor skin condition, absent bowel bladder control and subsequent soiling and difficulty maintaining hygiene may contribute to increased infection rate in younger patients^{12,13}.

Of course some authors did not find any association of age with Shunt infection^{14,15}. In this series most patients were male (20 out of 33) and 6 of (total) 8 infections occurred in males. A recent study in Bangladesh also found male preponderance¹⁶. Some authors found duration of shunt operation of > 45 minutes was associated with increased number of shunt infection. In this series operation time of >1 hour and emergency surgery were found to be associated with more shunt infection¹⁷.

Conclusion

Shunt infection is a devastating complication of Hydrocephalus treatment and caused much to the hardship of the family and embarrassment to the treating surgeons. Identifying the exact causes of such failure is desirable for every institution. More study should be carried out including other variables like surgeon's

factor, prematurity of the patients, number of revision shunts in the study, in order to develop a protocol for safer shunt surgery.

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