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Characteristics of Patients with VP Shunt Malfunction in Dr. Mohammad Hoesin General Hospital between May 2018 and July 2019

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Abstract

Introduction: Hydrocephalus may occur when the production of cerebrospinal fluid (CSF) is excessive or, the most common cause when, the absorption of CSF is decreased. The VP Shunt is most commonly performed worldwide as the primary treatment for hydrocephalus. The complications of VP Shunt are shunt infection, mechanical malfunction and over or under-drainage. This study aims to see the characteristics of patients affected by post VP shunt infection who are treated at dr. Mohammad Hoesin Palembang

Methods: This research was a cross-sectional descriptive study. Using secondary data from the medical records of Mohammad Hoesin Hospital, Palembang. Performed in the from May 2018 to July 2019. Samples were all patients diagnosed with malfunction and infection with VP Shunt.

Results: There were 23 subjects participated who met study critera. VP shunt infections were mostly male (82.6%). The largest age distribution is less than 1 year old (39.1%). The most incidence occured at the age of 1-6 months (60.9%). The most common type of surgery was emergency surgery (60.8%). The most common malfunctions were caused by shunt malfunctions (69.6%).

Conclusion: Male patients, patients age <1 year old with onset of 1-6 months, and shunt malfunctons were the most common characteristic of patients diagnosed with malfunction and infection with VP Shunt.

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Keyword: hydrochepalus, VP shunt, malfunction, infection

1. Introduction

Hydrocephalus may occur when the production of cerebrospinal fluid (CSF) is excessive or, the most common cause is, the absorption of cerebrospinal fluid (CSF) is decreased. There are generally two approaches to managing hydrocephalus. The most common operative measures are shunts in the form of ventriculoperitoneal shunt, ventriculo-pleural or ventriculo-atrial. In the management of hydrocephalus, the ventriculo-gallbladder shunt is performed in situations where the ventriculoperitoneal shunt is ineffectual because of peritoneal involvement and / or because the ventriculo-atrial shunt and ventriculo-pleural shunt are contraindicated. Another procedure is Endoscopic Third Ventriculostomy (ETV) which involves making an opening in the third ventricle to allow the drainage of CSF into the tube. The VP Shunt is most commonly performed worldwide as the primary treatment for hydrocephalus. The complications of VP Shunt are shunt infection, mechanical malfunction and over or under-drainage. Intra-abdominal complications can include cases of intestinal obstruction, bowel perforation, and pseudocyst formation. Other complications reported in the literature include CSF ascites, inguinal hernia, and intestinal volvulus.[1-3]

A malfunction of VP shunt insertion is called shunt failure, which is the inability to achieve the goal of the operation. In CSF shunting, failure refers to the inability to achieve proper hydrocephalus control which can lead to revision, replacement, or removal of the shunt. VP shunt insertion malfunction may stem from problems related to the valve, patient, or surgery. In many cases, the terms failure and complication are interchangeably used in the literature.[3-5]

Mechanical malfunction is the most frequent cause of CSF shunt failure. The incidence was 50% in pediatric cases. Shunt damage most commonly caused by proximal catheter obstruction, valve obstruction, distal catheter occlusion, shunt section rupture, tubing fracture, or proximal or distal catheter migration. Debris from the brain, choroid plexus, blood, or tissue reactions often clog the proximal catheter. Ventricular clefts and incorrect placement of a catheter in the ventricle can also interfere with flow through the catheter. The valve on the VP Shunt is a very rare part and usually occurs in some cases, and is almost always produced by a blood clot. Valve damage in the VP Shunt itself may occur for no apparent reason or may follow cranial traumatism. Distal catheter obstruction generally occurs in

systems with a distal gap valve and very rarely in open-ended catheters. Under unique circumstances, the distal tube may become blocked with feces, indicating bowel perforation. In the abdomen, the distal catheter may become blocked with the growth of mesothelial cells and fibroblasts. Tube kinking is also very rare and commonly due to faulty placement.[5-8]

Infection is one of CSF shunt surgery complications, and its rates vary widely from studies, partly related to differences in study design, operational definition of shunt infection, and time needed to diagnose infection. Patient factors considered in relation to CSF shunt infection included chronological age, gestational age, post-conception age, gender, birth weight, weight at surgery, indications for shunt placement including myelomeningocele and IVH, comorbidities, and length of stay in the hospital before shunt placement.[3-5] Infection remains a serious complication of shunt surgery with mortality rates ranging from 1.5-22%. Survivors were at risk for intellectual, cognitive, and neurological disabilities. Infection had been reported to occur in 5–15% of shunt procedures. However, several studies describe lower infection rates as ranging from 0.3-5%. Most of the studies which use prophylactic antibiotics have been inconclusive, and there is yet no definite evidence that prophylactic antibiotics reduce the rate of shunt infection.[3-5]

Mechanical shunt complications can occur anywhere from the recovery room immediately after surgery to many years. The most common period for shunt failure is the first 6 months after its insertion. The most common mechanical complications are obstruction of CSF flow and the accompanying increase in cranial pressure. Increased intracranial pressure most often causes headache, nausea, vomiting and lethargy. Examination of the location of the shunt placement can provide confirmatory evidence of shunt dysfunction. Removal of the shunt with internal antibiotic treatment (usually with external ventricular drainage) brings the highest shunt infection cure rates and the lowest mortality rates. Developmental delays, poor cognitive function, visual and hearing disabilities may persist after treatment.[3-5] This study aims to see the characteristics of patients affected by post VP shunt infection who are treated at dr. Mohammad Hoesin Palembang in the period of May 2019 - July 2019.

2. Method

The design is cross-sectional descriptive study, using secondary data from the medical records of Mohammad Hoesin Hospital, Palembang. The study was conducted in the outpatient and inpatient installation of dr. Mohammad Hoesin Palembang between period of May 2018 - July 2019. The study

samples were all patients diagnosed with malfunction and infection with VP Shunt who were undergoing treatment at dr. Mohammad Hoesin Palembang between the time frame. Patients with incomplete medical record data were excluded. Variables researched were age, gender, onset of events, type of operation, and complications. The data that has been collected will be processed in statistical form using the spss program

3. Results

We found 23 subjects from 248 VP Shunt operations who met the study criteria. The age distribution of research subjects can be seen in table 1. In the age distribution of research subjects, there are 39.1% of subjects aged 0 - <1 year, 21.7% of subjects aged 1-5 years, 8.7% of subjects aged 6-11 years, 8.7% of subjects aged 12-17 years, and 21.7% subjects aged 26-45 years.

Table 1. Age distribution of research subjects

Variables	%	(n)
Age		
0 - <1 year	39.1	9
6 - 11 Years	8.7	2
12-17 years	8.7	2
15 years	21.7	5
18-25 years	0.0	0
26 - 45 Years	21.7	5
Gender		
Male	82.6	19
Female	17.4	4
Event onset		
1 - 6 months	60.9	14
7 - 12 months	17.4	4
12-24 months	4.3	1
> 24 Months	17.4	4
Type of surgery		
Emergency	60.8	14
Elective	39.2	9
Malfunctions		
Shunt malfunction	69.6	16
Shunt infection	30.4	7

Gender distribution of research subjects can be seen in table 1. In the Gender Distribution of research subjects, there are as many as 82.6% of subjects with male gender and 17.4% of subjects with female gender.

The distribution of the subjects' onset can be seen in table 1. In the onset distribution of study subjects, there are 60.9% of subjects with incident onset 1 - 6 months, 17.4% of subjects with an event onset of 7 - 12 months, 4.3% of subjects with an event onset of 12 - 24 months, 17.4% of subjects with an onset of events> 24 months.

The distribution of the type of operation can be seen in table 1. In the distribution of the type of operation of the research subject, there are as many 60.8% of subjects with emergency type of surgery and 39.2% of subjects with elective type of surgery.

The distribution of VP Shunt complications in research subjects can be seen in table 4.5. We found 69.6% of subjects with malfunctioned Shunt, and 30.4% of subjects with infection.

4. Discussion

Our study revelaed that the largest age distribution was less than 1 year, amounting to 9 people (39.1%), followed by age group of 1-5 years and 26-45 years with a total of 5 people respectively (21.7%). The results are in accordance with research conducted by Agung Muda Patih[29] in 2014 at RSCM Jakarta which implied that the age group under 1 year was the most dominant age group having VP shunt, with a percentage of 36% (9 of 25 cases). Age is a risk factor for VP-shunt infection. In some literature it is said to be premature and at the age of the child is more at risk for infection. In a study conducted at Kenyan Hospital, it was found that 49.6% of shunt infections occurred in patients with a duration of less than 6 months, there was a positive correlation between VP-shunt complications, age and length of shunt use. It can occur because the development of the immune and humoral systems is still low in children aged less than 1 year and the immature skin defense against intravenous tissue, thus allowing infection to occur.[27]

Distribution of complication and VP shunt infections were male dominated, which was up to 19 people (82.6%). The results of this study are in accordance with the research conducted by Yeon Kyung[26], which stated that there were 56.4% male subjects and 43.6% female subjects in the pediatric patient population. It also was in line with Fernandez[27]'s research, which states that VP shunt

complication cases in men were more than cases in women. Moreoever, our finding also was in accordance to McGirt et al in Reddy et al[28], who claimed that the male gender has a more dominant percentage (52%). However, there was a contrast finding found by Agung Muda Patih[2] at the RSCM Jakarta in 2014 which stated that women were more dominant with a percentage of 56% (14 of 25 cases). Research reported by Kesava et al in Reddy et al found that age, sex, and etiology of hydrocephalus were independent factors on the occurrence of infection, from his research, it was found that the risk of sex for the occurrence of infection in men increased 1.67x higher than the infection that occurred in women.[28]

Our study found the distribution of the onset of the most incidence was at the age of 1-6 months with a total of 14 people (60.9%). The results were in accordance with the research by Bokhary Aly and Kamal HM[35], which states that the onset of events under 1 year is the most dominant onset with a percentage of 86% (19 of 23 cases). Our findings were also in accordance with the study by Agung Muda Patih[29] in 2014 at RSCM which stated that early infection (<6 months) was the most cases with an incidence percentage of 68% (17 of 25 cases).

Most malfunctions were caused by Shunt malfunctions with 16 cases (69.6%). The results of this study are in accordance with the Fernandes study, which claimed that in the infant group aged <1 year, there were 64.9% subjects with functional malfunctions were in the form of underdrainage, 18% subjects were with mechanical malfunctions and 17.1% subjects were with infections and 6.1% subjects with more than 1 reason. On the other hand, there were as many as 66.3% subjects with functional malfunctions, 21.7% subjects with mechanical malfunctions and 12.0% subjects with infections in the group of children 1 year - 17 years, and there were 57.2% subjects with functional malfunctions, 30.3% subjects with mechanical malfunctions and 12.5% subjects with infection in the adult group> 17 years.[26.27]

5. Conclusion

VP shunt infections were mostly male (82.6%). The largest age distribution is less than 1 year old (39.1%). The most incidence occured at the age of 1-6 months (60.9%). The most common type of surgery was emergency surgery (60.8%). The most common malfunctions were caused by shunt malfunctions (69.6%).

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