Epidemiology of ventriculoperitoneal shunt complications in pediatric age group in medina region: Observational study

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Abstract

Background: Complications of VP shunt are presented elsewhere. Worldwide centers competitively published their incidence, type, and severity of VP shunt complication

Purpose: The aim of this study is to review the rate, nature, and distribution of complications in pediatric patients with VP shunt.

Study design: Retrospective analysis.

Methods: This study was a retrospective analysis of children registry between 2011 and 2019. Hydrocephalus (HCP) was then divided into congenital, post-meningitis, post-intraventricular (IVH) and syndromic HCP. The patient’s registry data were retrieved including demographics, symptomatology, investigations, complications, and finally necessity to revision surgery.

Results: There was 65 (43.62%) patients developed shunt complications. All data described are for complication nest rather than the total population. In general, there were 42 males and 23 females in this study. The mean age at shunt insertion was 18.7±4.2 months, the mean and SD of age at emergence of complication was 27.6±2.1 months. The frequency of obstruction and infection was 25/65 (38.46%) and 8/65 (12.3%) respectively. Revision of ventricular end was done 14 times, revision of peritoneal end was done 10 times, and the entire shunt system revision was done 8 times while shunt removal and new shunt insertion were done 4 times. The mortality was found to be 12.3% (8 cases out of 65).

Conclusions: The development of shunt complication is variable universally and depends on the etiology of hydrocephalus itself. Age and gender were found to offer no effects on the incidence, type, and severity of complication.

Introduction

Hydrocephalus is a serious complication that involves cumulative enlargement of the ventricular system with subsequent increment of intracranial pressure [1-4]. Congenital hydrocephalus incidence is 3-4 per 1000 births. The cerebrospinal fluid diversion was a sole strategy working for management of hydrocephalus [5-7]. Ventriculoperitoneal (VP) shunt is a method of CSF diversion from ventricular system to peritoneal organ to be absorbed there [8-10]. The operation itself is not technically demanding, however complications due to this surgery are frequent and mentioned many times in literatures. These complications may be as easy to be dealt with while others are hazardous and life-threatening [11,12].

In general, complications of VP shunt are divided into (1) mechanical and (2) infective complications [9,13]. Mechanical complications are obstruction, disconnection or migration of either end from its target. Infective complications are shunt tract abscess, ventriculitis, and over-valve skin necrosis [4,14]. There are group of complications can be listed under the name of rare complications. These complications are perforation of a viscus, inguinal hernia, hydrocele, pseudocyst formation, and subdural collection [6].

The aim of this study is to review the rate, nature, and distribution of complications in pediatric patients with VP shunt.

Methods

This study was a retrospective analysis of children registry between 2011 and 2019. Hydrocephalus (HCP) was then divided into congenital, post-meningitis, post-intraventricular (IVH) and syndromic HCP. The patient’s registry data were retrieved including demographics, symptomatology, investigations, complications, and finally necessity to revision surgery.

Causes of revision surgery were subdivided into infection, malposition, obstruction, distal problems. The causes of shunt revision were divided according to age, time interval of first surgery and revision. All cases received VP shunt using medium pressure slit valve (pediatric size). Complications were analyzed according to time interval between surgery and appearance of complications; those occurred prior to 6 months were regarded as early complication and those who occurred thereafter were regarded as late complications.

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Results

Hydrocephalic patients' registry data were retrieved. The study retrieved 149 patients who underwent VP shunt. There was 65 (43.62%) patients developed shunt complications. All data described are for complication nest rather than the total population. In general, there were 42 males and 23 females in this study. The mean age at shunt insertion was 18.7±4.2 months, the mean and SD of age at emergence of complication was 27.6±2.1 months. In Table 1, etiologies of HCP in sample of complications are illustrated.

Revisions for complicated cases were not done for all cases. Forty-nine cases (75.38%) require surgical intervention either single or multiple times thereafter while 16 (24.62%) cases developed complications require no surgical intervention by neurosurgeons. Table 2 illustrates revision times for complicated cases.

Distribution of shunt revision according to etiology and time of revision is illustrated in Table 3. Obstruction and infection were the most common complication in our series. The frequency of obstruction and infection was 25/65 (38.46%) and 8/65 (12.3%) respectively. Revision of ventricular end was done 14 times, revision of peritoneal end was done 10 times, and entire shunt system revision was done 8 times while shunt removal and new shunt insertion were done 4 times. The mortality was found to be 12.3% (8 cases out of 65).

Non-surgical complications are those complications that not require shunt revision treatment and best illustrated in Table 4.

Discussion

Hydrocephalus is a common neurological complication for many diseases (vascular, neoplastic and post-inflammatory) at pediatric age groups(1). The traditional classification of hydrocephalus is based on causes (vascular, neoplastic and post-inflammatory) at pediatric age

Table 1. Distribution of HCP etiologies in complication samples

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Number</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congenital</td>
<td>15</td>
<td>1.4-8 months</td>
</tr>
<tr>
<td>Post-Menigitis</td>
<td>22</td>
<td>3.5-7.8 months</td>
</tr>
<tr>
<td>Post-IVH</td>
<td>13</td>
<td>2.1-8 months</td>
</tr>
<tr>
<td>Syndromic</td>
<td>15</td>
<td>4-8 months</td>
</tr>
</tbody>
</table>

Table 2. Revision times frequency

<table>
<thead>
<tr>
<th>Revision</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st-time revision</td>
<td>27</td>
<td>41.53</td>
</tr>
<tr>
<td>2nd-time revision</td>
<td>15</td>
<td>23.07</td>
</tr>
<tr>
<td>3rd-time revision</td>
<td>7</td>
<td>10.76</td>
</tr>
</tbody>
</table>

Table 3. Cause of revision and time interval

<table>
<thead>
<tr>
<th>Etiology</th>
<th>&lt;6</th>
<th>6-12</th>
<th>12-24</th>
<th>&gt;24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstruction</td>
<td>13</td>
<td>10</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Infection</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Disconnection</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Under drainage</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Extrusion</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4. Non-surgical complications

<table>
<thead>
<tr>
<th>Complications</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subdural collection</td>
<td>3</td>
<td>4.6</td>
</tr>
<tr>
<td>Wound infection</td>
<td>5</td>
<td>7.7</td>
</tr>
<tr>
<td>Hernia/hydrocele</td>
<td>6</td>
<td>9.23</td>
</tr>
<tr>
<td>Ascites</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
In conclusion, the development of shunt complication is variable universally and depends on the etiology of hydrocephalus itself. Age and gender were found to offer no effects on the incidence, type, and severity of complication.

**Conflict of interest**

There was no conflict of interest.

**References**

5. Erol FS, Öztürk S, Akgun B, Kaplan M (2017) Ventriculoperitoneal shunt malfunction caused by fractures and disconnections over 10 years of follow-up. Childs Nerv Syst 33: 475-481. [Crossref]

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