Distribution of Factors Causing Ventriculoperitoneal Shunt Infection in BSMMU Hospital - A Study of Thirty Cases

Kaisar Haroon1, Tania Taher2, Kanak Kanti Barua3

Abstract:
Background: VP shunt surgery is a commonly performed operation in neurosurgery. But sometimes the shunt becomes infected and causes much morbidity to the patient. In this study we have analyzed some factors related to VP shunt infection.

Methods: This is an observational study. The study was done from September 2008 up to January 2010 in BSMMU. Thirty patients were operated on. They were followed up to 15 days after surgery. The risk factors taken into account for shunt infection were: a) age group b) sex of patients c) nutritional status d) socioeconomic condition e) duration of surgery and f) routine or emergency surgery.

Result: Seven patients of the thirty patients treated with ventriculoperitoneal shunt surgery had VP shunt infection. That is 23.33% of patients. This is more in the young and elderly age group. It was also more at the lower socioeconomic age group and after emergency surgery.

Conclusion: VP shunt infection is more common in the male, young and elderly from poorer social status and after emergency surgery.

Key Words: Hydrocephalus, shunt infection, headache, ventriculoperitoneal shunt, meningitis, ventriculitis.

Introduction

Hydrocephalus is defined as an abnormal enlargement of the ventricles due to an excessive accumulation of CSF from a disturbance of its flow, absorption or, uncommonly, secretion.

Ventriculoperitoneal shunt catheter placement is a relatively common neurosurgical procedure performed for the treatment of hydrocephalus as well as for associated conditions in which the natural flow of cerebrospinal fluid is obstructed. Trojanowski had commented that between 5 and 15% of the devices become infected, of which more than a half within the rest month after surgery. Of these 6 (12%) patients had shunt infection. Drake and lantosca reported that the incidence of shunt infection is approximately 5% - 10%. Bokhary and Kamal incidence rate is nearly 10%. Kinasha et al. in their study in Tanzania reported the shunt infection rate about 24.6%. McGirt et al. had concluded from their observation that shunt infection occurred in 11% of cases (92 of 820). Leach and Kerr had reported that shunt infection should be within 1% and 7% of shunt insertions. Shunt infection rates per patient range from 10% to 22% and around 6.0% per procedure, with 90% of infections occurring within 30 days of surgery.

Eymann et al. has suggested the following risk factors:

- Duration of surgery, skill and experience of neurosurgeon, number of preceding shunt operations, young age of children, suppressed immune system (such as in the elderly with diabetes mellitus type II or patients undergone radio- and/or chemotherapy).

Vinchen and Dhellemmes (2006) has found that the age of shunt insertion, prematurity, myelo-meningocele and post-haemorrhagic hydrocephalus as a risk factor of shunt infection.
McGirt et al. (2003) has described the cause of infection as follows:

- Male sex
- Age, mean months, premature birth
- Receipt of chemotherapy
- Etiology of hydrocephalus:
  - Intraventricular hemorrhage
  - Myelodysplasia
  - Tumor
  - Idiopathic/congenital

Leach and Kerr (2008) has described the risk factors to be very young children, open myelomeningocele, longer operative time and excessive staff movement into and out of theatre.

Materials and method:
This is an observational study. This was conducted from 01-07-2008 to 17-05-2010. All patients were admitted in the BSMMU Hospital for ventriculoperitoneal shunt surgery. Patients who met the inclusion criteria from all age groups were included in the study.

Number of patients were thirty ($n=30$). The following factors were considered for this study:

a) Age group
b) Sex of patients
c) Nutritional status
d) Socioeconomic condition
e) Duration of surgery
f) Routine or emergency surgery.

Shunt infection was defined if at least one of the following criteria was present:

1. Presence of non-remitting fever in the absence of other causes
2. Indication of infection along the shunt tract or incision site
3. Signs of meningeal irritation or peritonitis.
   - Shunt system used: In all patients we used Chhabra medium pressure ventriculoperitoneal shunt system (Surgiwear Inc.)
   - Inclusion criteria:
     All patients with ventriculomegaly in imaging and signs of hydrocephalus undergoing ventriculoperitoneal shunt surgery were selected.

- Exclusion criteria:
  - Patients with preoperative fever or any other focus of infection
  - Patients with other medical problems e.g., diabetes mellitus, valvular heart disease, renal impairment and ruptured meningocele.
  - Patients who had previous CSF diversion surgery (e.g. ETV, EVD)

Results:
After proper collection and processing of samples, the data was analyzed. The results and observations from the analysis were presented in tables and figures. Data were expressed in numbers or percentage as appropriate.

### Table I

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shunt infection</td>
</tr>
<tr>
<td>0-2</td>
<td>2</td>
</tr>
<tr>
<td>2-12</td>
<td>1</td>
</tr>
<tr>
<td>12-30</td>
<td>1</td>
</tr>
<tr>
<td>30-50</td>
<td>1</td>
</tr>
<tr>
<td>&gt;50</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7</strong></td>
</tr>
</tbody>
</table>

From this table we can see that shunt infection is more in the below 12 years (3 cases) and more than 50 years (2 cases).

![Fig.-1: Distribution of the patients by sex](image)

In this Figure we can see that 4 male patients (13.33%) and 3 female patients (10%) had shunt infection.
Table-II

*Distribution of the patients by socioeconomic conditions: (n=7)*

<table>
<thead>
<tr>
<th>Social condition</th>
<th>No. of patients</th>
<th>Percentage of total pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low socioeconomic condition</td>
<td>5</td>
<td>16.66%</td>
</tr>
<tr>
<td>Middle socioeconomic condition</td>
<td>2</td>
<td>6.66%</td>
</tr>
<tr>
<td>Upper socioeconomic condition</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>23.22%</td>
</tr>
</tbody>
</table>

From this table we observe that most of the patients are from lower socio-economic condition (5 patients about 16.66%). 2 patients (6.67%) were in the middle class and none were from upper class.

Table-III

*Distribution of patients by duration and type of surgery (n=7)*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency (n)</th>
<th>Shunt infection</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency</td>
<td>6</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>1</td>
<td>3.33%</td>
<td></td>
</tr>
<tr>
<td>Duration of surgery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;45 min</td>
<td>6</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>&gt;45 min</td>
<td>1</td>
<td>3.33%</td>
<td></td>
</tr>
</tbody>
</table>

From this table we can see that 6 (20%) emergency patients had shunt infection and 1 (3.33%) elective patient had shunt infection. We can also see that 6 patients (20%) had shunt infection with long duration of surgery.

From this above figure it is seen that shunt infection occurred in seven patients of all the patients. This was about 23.33%.

Discussion:

In this study seven patients had shunt infection of which 3 were below 12 years. According to George et al, there were 59 cases of shunt infection out of 89 patients below 4 years of age. But in Forward’s series 32 patients were above 20 years. In Kinasha’s series of 65 pts, 47 (72%) were less than 12 months old. According to Pople the difference in operative infection rates between patients under 6 months old (28 of 178 procedures, 15.7%) and those over 6 months old was significant.

It is also more in male patients (4 pts) than in female patients (3 pts.). This also so in the study by Choksey and Malik. Kinasha mentioned that male pts were 42 (64.6%) and female were 23 (35.4%). In Kontrny’s series, male were 15 pt and female were 10 pt.

In this study it is more in low socioeconomic group. The exact cause is not known, but may be due to poorer nutrition and skin condition. Kulkarni had suggested factors such as a poorly developed immune system, generally poorer skin condition, and high skin bacterial density.

According to Mcgirt et al. there was no association between duration of operation and infection. According to Conen et al, most patients were operated as emergency basis (25 pts), on the right side (27 pts) with high CSF pressure (25 pts) and took more than 45 minutes (24 pts). These patients had fever. Five patients had surgical site infection and shunt tract infection.

The mean time for VP shunt surgery was very important for shunt infection. In the present study it was less than 45 minutes in cases 3.33%, and more than 45 minutes in 23.33% cases. Kulkarni et al. (2001) reported that operation time ranged from 11 to 133 minutes. However, regarding the duration of surgery some authors did not observe any significant difference in infection rates (Kontrny et al. 1993). Mollman found no association between operation duration and infection risk.

Conclusion:

Shunt infection carries much morbidity for the patient. If we can identify the factors causing these infection, then we can take adequate preventive measures and
prevent VP shunt infection. Therefore, the knowledge of these factors will help us to decrease rate of shunt infection.

References: