Infection related to the external ventricular shunt in a neurosurgery hospital

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RESUMEN
Objetivo: Identificar los factores co-responsables de infección relacionada con la derivación ventricular externa (DVE). Método: Esto es un estudio retrospectivo con análisis cuantitativo de datos desarrollado en el Servicio de Archivo Médico de un hospital público que es referencia en neurocirugía en Pernambuco, Brasil. La muestra consistió de 140 pacientes que se sometieron a inserción de una derivación ventricular externa. Los datos fueron recogidos a través de un cuestionario semiestructurado y analizados con el programa Statistical Package for the Social Sciences (SPSS), versión 13.0. Resultados: Predominancía del sexo masculino (39,7%); edad entre 20 y 39 años (52%); tiempo de internamiento acima de 60 días (72,7%); múltiples DVEs colocadas (100%); tiempo de uso de la DVE acima de 30 días (96,2%). Conclusión: Se encontró estadística significativa para los factores: tiempo de internación prolongado; número de DVEs colocadas; tiempo de uso de la DVE; y el desarrollo de infección. Las acciones de enfermería están surgiendo y tienen el fin de garantizar la seguridad del paciente en el ambiente hospitalario.

Descriptors: Infección, Cuidados de enfermería, Factores de riesgo, Derivaciones del líquido cefalorraquidiano.
External ventricular shunts (EVS) are crucial catheters for the neurosurgical treatment of patients with intracranial hypertension (ICH). Besides helping to measure intracranial pressure (ICP), they act in ICH treatment through cerebrospinal fluid drainage.1

EVS is often needed for treating emergencies in patients with fluid circulation disorders, subarachnoid hemorrhage, either intraventricular or intraparenchymal. ICP monitoring and concomitant cerebrospinal fluid (CSF) drainage have been more frequently reported in recent years.2 However, the indication of EVS should be careful because of the complications in this kind of system, which are: infection at the catheter insertion site; meningitis, encephalitis, and ventriculitis; and, finally, intracerebral or intraventricular hemorrhages. Among these the most serious and commonly observed are central infections.3

Infections of the central nervous system determine a 10% to 20% increase in mortality of neurosurgical patients; increasing the morbidity rate and consequent increase in the length of hospital stay and hospital expenses.3

Given the high infection rates in the surgical procedures of cerebrospinal fluid drainage in our healthcare practice and knowledge on the current problems in any neurosurgery center, this study aimed to: identify the factors co-responsible for infection related to external ventricular shunt.

RESULTS AND DISCUSSION

One obtained a total of 140 patients who underwent the insertion of EVS. The infection was found out after CSF culture. One emphasizes that, out of these, 5 cultures were inconclusive.

Table 1 displays the occurrence of EVS infection according to age group, where one finds 52% of infection between 20 and 39 years, 51.7% up to 19 years, 43.2% between 40 and 59 years, and 18.6% aged 60 years or over. One highlights as a risk factor for developing infection (p = 0.009).
Regarding sex, 39.7% of the occurrence of infection was related to being male and 38.9% to being female; no statistical difference was found (p = 0.92).

Table 1 - Evaluation of the occurrence of infection according to age group and sex of patients with EVS in a public hospital. Recife, Pernambuco, Brazil.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Yes</th>
<th>No</th>
<th>TOTAL</th>
<th>P value OR (CI = 95%)</th>
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<tbody>
<tr>
<td>*</td>
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<tr>
<td>Age group</td>
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</tr>
<tr>
<td>Up to 18 yrs</td>
<td>15</td>
<td>14</td>
<td>29</td>
<td>0.000</td>
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<td>20 to 24 yrs</td>
<td>13</td>
<td>18</td>
<td>31</td>
<td>0.000</td>
</tr>
<tr>
<td>26 to 29 yrs</td>
<td>16</td>
<td>21</td>
<td>37</td>
<td>0.000</td>
</tr>
<tr>
<td>&gt; 30 yrs</td>
<td>1</td>
<td>10</td>
<td>11</td>
<td>0.000</td>
</tr>
<tr>
<td>Total group</td>
<td>41</td>
<td>53</td>
<td>94</td>
<td>0.000</td>
</tr>
<tr>
<td>*</td>
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</tr>
<tr>
<td>Sex</td>
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<tr>
<td>Male</td>
<td>25</td>
<td>37</td>
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<tr>
<td>Female</td>
<td>16</td>
<td>16</td>
<td>32</td>
<td>0.000</td>
</tr>
<tr>
<td>Total group</td>
<td>41</td>
<td>53</td>
<td>94</td>
<td>0.000</td>
</tr>
</tbody>
</table>

(*): Significant difference at 5.0%.
(1): By means of Pearson’s chi-square test.

Regarding the occurrence of infection in patients with EVS, one highlights, in Table 2, that for 40.6% of the sample the indication for placing EVS was elective and for 32.4% it involves urgency. This doesn’t reveal a risk factor for developing an infection (p = 0.08).

In turn, with regard to the length of hospital stay over 60 days one obtained 72.3% of infection; 61.5% from 31 to 60 days; 40% from 16 to 30 days; and 7.5% up to 15 days. The placement of multiple EVS corresponded to 100% of infection and single EVS corresponded to 21.5%. Regarding the length of EVS use, infection was found over 30 days in 96.2%; from 16 to 30 days in 66.7%; and up to 15 days in 14.9%. Data presented above indicate statistical significance at p < 0.01.

One observes that death among these patients with EVS and infection corresponded to 32.3% of the sample, representing p < 0.02.

The diagnosis for EVS insertion and the development of infection were displayed in Table 3. Subarachnoid hypertension represented 38.1% of infections; hemorrhagic stroke accounted for 19.4%; hydrocephalus corresponded to 40%; and brain tumor corresponded to 47.7%. Age was highlighted as a risk factor for the development of infection in patients with EVS; however, studies show no relationship between age, sex, and infection; this contradicts the findings of this study.

Although the difference between urgent or elective EVS placement has no statistical relevance...
for infection, studies reveal that low infection levels are related to the technique of catheter insertion. First, there’s use of intravenous antibiotics before the procedure. The standard technique for skin preparation involves brushing and applying the PVPI solution with spontaneous drying to obtain an increased antimicrobial effect; tunneling of EVS catheter; and use of closed drainage and monitoring system which can reduce the contamination risk. Finally, there’re daily dressing changes and local wound care for the skin can decrease the bacterial flora in the catheter insertion site.4

The length of hospital stay and the emergence of infection behaved as an important factor. One observes that periodical handling of the system by professionals participating in the health team without proper training could be a probable reason for the increased infection rates related to the length of hospital stay.5,6

The length of hospital stay and multiple insertion of EVS predisposes to the development of infections related to the shunt, something which may occur due to increased handling, predisposition to catheter colonization and the drainage system. The longer the length of hospital stay, the higher the risk for meningitis and/or ventriculitis.7

There’re theories indicating periodical and the programmed replacement of shunt, regardless of the presence of infection.8 However, in 2002, this practice was criticized, demonstrating that the elective EVS review doesn’t produce any kind of benefit to the patient and that such a procedure, although not statistically significant, resulted in a higher infection rate.9 A more recent study in this domain proves that elective replacement of the catheter significantly increases infection rates in patients, constituting a procedure and a routine not indicated.10

REFERENCES

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CONCLUSION

The length of hospital stay; the number of placements; and the permanence of EVS statistically represented risk factors for infection in patients with EVS.

The limitations of this study were associated to failures of notes and information in the medical records, which may mask the actual results of the institution, but also the dearth of literature on the theme. Certainly, this study contributes to the knowledge and analysis of factors for infections related to EVS, besides the reflection on the quality of care provided by the nursing team in the intervention and prevention of this condition. One suggests the preparation of a protocol of nursing care for the patient with EVS, aiming to standardize the actions to be taken with shunt, thus ensuring assistance with greater patient safety in the hospital environment.

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