Histopathological Profile of Posterior Cranial Fossa Midline Tumors in Children

Md. Arif Reza¹, Kaisar Haroon², Rawzatul Zannat³, Prof. K. K. Barua⁴

Abstract:
Introduction: A brain tumor is one of the most devastating forms of human illness especially when they occur in the posterior cranial fossa. Posterior fossa midline tumors are more common in children than in adults. The histological picture cannot be predicted with a high degree of accuracy if the exact tumor location and the imaging characteristics are not taken into consideration.

Methods and Materials: This cross sectional type observational study was carried out at the Department of Neurosurgery in Bangabandhu Sheikh Mujib Medical University (BSMMU) from June, 2014 till November, 2015. Study population was children up to 18 years of age undergoing posterior fossa midline tumor surgery. Sample size was 38. Preoperative diagnosis was made by plain and contrast MRI of brain and confirmed by postoperative histopathology.

Results: Medulloblastomas were found in 16 (42.1%) cases. Pilocytic astrocytomas were found in 13 (34.2%) cases. Ependymomas were 6 (15.8%) cases and brain stem gliomas were found in 3 (7.9%) cases. Medulloblastomas and pilocytic astrocytomas constituted the most bulk 76.3% of the posterior fossa midline tumor in children.

Conclusion: In this study medulloblastoma was the commonest posterior cranial fossa midline tumor in children 16 (42.1%), followed by pilocytic astrocytomas 13 (34.2%). Ependymomas are the third most common 6 (15%) and fourth is the brainstem glioma 3 (7.9%).

Keywords: Posterior fossa, midline tumours, childhood tumours, medulloblastoma, astrocytoma.


Introduction:
A brain tumor is one of the most devastating forms of human illness especially when occurring in the posterior cranial fossa. Posterior fossa tumors are more common in children than in adult. Between 54-70% of all childhood brain tumors originate in the posterior fossa¹.

Tumors in the posterior cranial fossa are considered as some of the most critical brain lesions, primarily due to the limited space within the posterior fossa as well as the potential for involvement of the vital brainstem nuclei. Brainstem compression, hemiation and death are all risks in this critical location². In developed countries, it is the second most common cause of death, next only to trauma³.

Common posterior fossa tumors in children include medulloblastoma, juvenile pilocytic astrocytoma (JPA), ependymoma, and brainstem/pontine glioma; atypical teratoid rhabdoid tumor (ATRT) is an additional rare but important primary brain tumor of early childhood⁴.

Materials and Method:
It was a cross sectional type of observational study. The study was carried out at the Department of Neurosurgery, Bangabandhu Sheikh Mujib Medical University. The study was conducted during the period from June, 2014 to November, 2015. Thirty eight children having posterior cranial fossa midline tumor undergoing surgery admitted in the Department of Neurosurgery of BSMMU, DMCH, NINS&H were included. Their post-operative histopathological report was analyzed in this study.

Result:

<table>
<thead>
<tr>
<th>Age (year)</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 - 5</td>
<td>11</td>
<td>28.9</td>
</tr>
<tr>
<td>6 - 10</td>
<td>14</td>
<td>36.8</td>
</tr>
<tr>
<td>11 - 15</td>
<td>11</td>
<td>28.9</td>
</tr>
<tr>
<td>16 - 18</td>
<td>2</td>
<td>5.3</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>100.0</td>
</tr>
</tbody>
</table>

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The age distribution of 38 patients of posterior fossa tumors is shown in Table-I. The age range of this study was 0.5 - 18 years. The lowest age of the patient in this study was 0.5 years and highest one was 18 years. The mean age was 8.1 years with SD (Standard deviation) was ± 4.55. The peak incidence of posterior fossa tumors was found in 6 – 10 years which was 36.8%, followed by 0.5-5 and 11-15 years of age groups both of which were 28.9%.

In this figure all the tumors were predominant in the male except brain stem glioma, which was more in females.

**Table-I**

<table>
<thead>
<tr>
<th>Histopathological diagnosis</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medulloblastoma</td>
<td>16</td>
<td>42.1%</td>
</tr>
<tr>
<td>Pilocytic astrocytoma</td>
<td>13</td>
<td>34.2%</td>
</tr>
<tr>
<td>Ependymoma</td>
<td>6</td>
<td>15.8%</td>
</tr>
<tr>
<td>Brainstem glioma</td>
<td>3</td>
<td>7.9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>38</td>
<td>100%</td>
</tr>
</tbody>
</table>

In this study, histopathologically, medulloblastomas were the commonest posterior cranial fossa midline tumor in children. 16 (42.1%) were medulloblastomas followed by pilocytic astrocytomas 13 (34.2%). Ependymomas was the third most common 6 (15%) and fourth is the brainstem glioma 3 (7.9%).

**Discussions:**

In this study, the mean age of the patient was 8.1 years ranging from 0.5 years to 18 years. The highest incidence of posterior fossa midline tumors in pediatric patients was found 6-10 years age group which was 36.8%, followed by 0.5-5 and 11-15 years of age groups both of which 28.9%.

In the series of Mahmud M et al, 33 patients were included. The age range of the patients was 2 to 18 years. The mean age (±SE) was 8.64 (±3.51) years and the maximum number of patients was between 6-10 years age group2, 2008). In one study, it was shown that the most common primary brain tumor in children is PNETs / medulloblastoma in ages 5-10 years, astrocytoma in ages 10-14 years3. This figure is comparable to our study.

In our study, the incidence of pediatric posterior fossa midline tumors is common in males than females. Male was 68.4% and female was 31.6%. Male to female ratio was 2.16:1. In Wilkins and Rengachary, 1996 the ratio is 1.0-3:1. In our study, male to female ratio is within this range5. In one study, out of all 33 patients 20 (60.6%) were male and 13 (39.4%) were female with a male to female ratio of 1.35:12. Another study included 84 patients where 52 males, 32 females; M/F ratio, 1.62; Mean age 8.6 years and range 1-14 years6.
Medulloblastoma is the most common pediatric posterior fossa tumor, accounting for up to 40% of cases\textsuperscript{4}. Medulloblastoma is the most common pediatric central nervous system malignancy and the most common (38%) primary tumor of the posterior fossa in children\textsuperscript{7}.

In this study, histopathologically medulloblastomas were the commonest posterior cranial fossa midline tumor in children. 16 (42.1%) were medulloblastomas followed by pilocytic astrocytoma 13 (34.2%). Ependymomas were the third most common 6 (15%) and fourth was the brainstem glioma 3 (7.9%). Medulloblastomas and pilocytic astrocytomas constituted the most bulk 76.3% of the posterior fossa midline tumor in children. A study showed that the most common histology was medulloblastoma (42.8%) followed by cerebellar astrocytoma (28.6%), ependymoma (14.3%), brainstem glioma (7.2%) and miscellaneous pathologies (such as dermoid and tuberculoma) (7.2%)\textsuperscript{6}.

In a study by Koeller et al, pilocytic astrocytoma accounts for 85% of all cerebellar astrocytomas\textsuperscript{7} and by Golham cerebellar pilocytic astrocytomas comprise about 33% of all posterior fossa tumors\textsuperscript{1}. The results of our study are comparable to these studies.

Ependymomas are the 3\textsuperscript{rd} most common tumors after medulloblastoma and astrocytoma. They comprise about 5-10% of pediatric intracranial tumors\textsuperscript{8}. Our result is also comparable to this standard study.

In our study, 7.9% of brainstem gliomas were found among 38 posterior fossa midline tumors of pediatric patients. Brainstem gliomas account for 25% of tumors arising in the posterior fossa in children; however, in one series only 7.2% of the patients had this pathology\textsuperscript{6}. Our result is also comparable to this standard study.

**Conclusion:**
Medulloblastomas and pilocytic astrocytomas constituted the most bulk 76.3% of the posterior fossa midline tumor in children. It is more common in the males than the females. Careful knowledge about the tumours can help us to reach a more accurate diagnosis and better treatment.

**References:**