Primary Fourth Ventricular B-cell Lymphoma: Case Report and Literature Review

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Abstract:

Background: Primary central nervous lymphoma (PCNSL) is a rare variant of extranodal non-Hodgkin's lymphoma with a especially poor prognosis. The diagnosis is usually encountered in immunodeficient patients but is also encountered, albeit uncommonly, in the immunocompetent. The finding of PCNSL in the fourth ventricle is very unusual. Case Description: A 23-year-old woman had a 7 months history of intermittent vertigo, nausea, vomiting, and progressively unsteady gait. MRI of the brain revealed a 4.5 cm enhancing tumor in the fourth ventricle. Metastasis or high-grade glioma was suspected. The neuropathological findings -after surgery- were compatible with a diffuse large B-cell lymphoma. A slit lamp examination, bone marrow biopsy, and imaging studies for extracranial lesions were unremarkable. Conclusions: We suggest that PCNSL be listed in the differential diagnosis of fourth ventricle tumors with well-circumscribed margins and homogenous contrast enhancement.

Keywords: Central nervous system; Diffuse large-cell lymphoma; Fourth ventricle tumor; Immunocompetence

Abbreviations

PCNSL = Primary Central Nervous System Lymphoma
CNS = Central Nervous System
CT=Computed Tomography
MRI = Magnetic Resonance Image
1. Introduction

Primary central nervous lymphoma (PCNSL) is a rare form of non-Hodgkin lymphoma accounting for 1–4% of all brain neoplasms [1–8]. It is usually associated with immunodeficiency (most commonly HIV) but is increasingly observed in immunocompetent patients with no known etiology or risk factors [16]. Therefore, it is an important consideration in the differential diagnosis of intracranial mass lesion. PCNSL almost always presents as a cerebral parenchyma lesion whereas secondary CNS lymphoma tends to present as leptomeningeal metastasis [13]. Isolated intraventricular lymphoma is rare. Herein, we report a case of primary isolated lymphoma of the fourth ventricle in an immunocompetent patient.

2. Presentation of case

A 23-year-old woman presented with a 7-month history of headache, dizziness and progressively unsteady gait. On examination, he was found to have mild cerebellar ataxia. Four months before his admission in our department, Magnetic resonance imaging (MRI) of his brain showed infiltrative dumbbell-shaped avidly lesion in the caudal portion of the fourth ventricle (Figure 1), treated as a neurosarcoidosis in another hospital without any clinical improvement. A new MRI was performed demonstrated a homogeneously enhancing, well defined mass lesion occupying almost the entire fourth ventricle (Fig. 2). The mass lesion was homogeneously enhanced and lack of necrosis or hemorrhage. Neither cystic appearance nor calcifications was found. The radiologist’s impression was that of a metastasis or ependymoma. Initial blood testing was unremarkable. An additional work-up with HIV
testing and computed tomography (CT) scans of the neck, chest, abdomen, and pelvis showed negative results. We performed a suboccipital craniotomy and the tumor was accessed through a transvermian approach. The tumor was exophytic, grayish in color, soft and slightly vascularized. Clear tumor-brainstem interface but invasion of left vermis was noted intraoperatively. Complete resection of the intraventricular lesion was achieved. The frozen section showed tumor cells of unknown origin. The permanent section showed diffuse infiltration of a typical lymphocytes with irregular nuclei. Immunohistochemistry stains showed that the cells were positive for CD20 and CD10. The morphology and immunohistochemistry profile were consistent with a diffuse large B-cell lymphoma (Fig. 3). Our patient died on the seventh postoperative day because of massive pulmonary embolism in the intensive care unit.

3. Discussion

PCNSL is a rare tumor, and only a few case reports have addressed PCNSL in fourth ventricle (Table. 1) [3,4,5,10-16]. Since the brain is an immunologically privileged site which does not contain lymphatics or lymphoid tissue. The origin of such a primary tumor is unclear. Hochberg et al. [6] suggested that the clone of malignant systemic lymphocytes which displaying specific adhesion molecules and bind to the specific proteins only presented in the CNS might be pathogenesis. Significant risk factor is acquired or congenital immunodeficiency [1]. However, It has increased incidence in immunocompetent patients over the past few decades. This increase is independent of advances in neuroimaging or the general aging of the
population [11]. Therefore, it is an important consideration in the differential diagnosis of intracranial mass lesions. Despite the image diagnosis of PCNSL is challenging, there are several key imaging characteristics of CNS lymphoma. PCNSL typically shows intermediate to low signal intensity on T1-weighted images and a isointense or hyperintense signal on T2-weighted images. Contrast uptake is usually avid and homogenous. Because of its high cellularity, it tends to be hyperintense on a diffuse weighed image and hypointense on apparent diffusion coefficient images. MR spectroscopy may show a high choline-to-creatine ratio [9]. The diagnosis of lymphoma in our case serves to reinforce the previous reports-to include it in the differential diagnosis of an homogenously enhanced lesion in the fourth ventricle. Given the good responsiveness of CNS lymphoma to chemoradiation, the PCNSL are considered non-surgical tumors and attempt to resection or decompression has been shown of no benefit due to its diffuse infiltration and often deep seated locations [2]. The surgical consensus is minimally invasive biopsy for tissue diagnosis. However, survival outcomes mentioned for PCNSL have been uniformly disappointing despite recent advanced and the often initial dramatic response to chemoradiation. Recent investigators are challenging this conservative surgical manner [12,14]. The German Primary CNS Lymphoma Study Group 1 (G-PCNSL-SG-1) found that the overall survival and progression-free-survival were significant shorter in the biopsied group compared with subtotal and total resection group [14]. There are also reports suggested that surgical debulking may provide not only significant clinical benefit but also elimination the cell populations with drug resistance potential. It is also correlated with better progression-free survival and overall survival [12]. In addition, the unusual location in surgically accessible fourth ventricle in posterior fossa, the isolation of the tumor may present a compelling
indication for surgical resection [15]. It can provide the possibility for the patient to be shunt independent and also prevent from intraabdominal tumor seeding.

4. Conclusions

We suggest that PCNSL be listed in the differential diagnosis of fourth ventricle tumors with a well-circumscribed margin and homogenous contrast enhancement, and that gross total resection of the lesion be achieved whenever possible.
Table 1: Summary of the reported cases of 4th ventricular PCNSL in the literature.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Age (y)</th>
<th>Presenting Symptom</th>
<th>Radiology Imaging</th>
<th>CSF Cytology</th>
<th>Adjacent Tumor</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vygantas et al. [4]</td>
<td>11</td>
<td>Headache</td>
<td>Imaging study revealed enhancement in the cerebellar peduncle</td>
<td>NS</td>
<td>Negative</td>
<td>N/A</td>
</tr>
<tr>
<td>Hopf et al. [5]</td>
<td>52</td>
<td>Headache, vomiting</td>
<td>Tumor Suppressed with MRI</td>
<td>NS</td>
<td>Negative</td>
<td>Open biopsy and chemotherapy and follow-up MRI</td>
</tr>
<tr>
<td>Bill et al. [6]</td>
<td>43</td>
<td>Headache, vomiting</td>
<td>Imaging revealed enhancement in the cerebellar peduncle</td>
<td>Surgery</td>
<td>N/A</td>
<td>Radiation and MTX</td>
</tr>
<tr>
<td>R. B. Bhatia et al. [7]</td>
<td>60</td>
<td>Headache, vomiting and diplopia</td>
<td>Imaging revealed enhancement in the cerebellar peduncle</td>
<td>(IT)</td>
<td>Negative</td>
<td>(IT) and MTX</td>
</tr>
<tr>
<td>A. Wilken et al. [8]</td>
<td>58</td>
<td>Headache, vomiting and diplopia</td>
<td>Imaging revealed enhancement in the cerebellar peduncle</td>
<td>(IT)</td>
<td>Negative</td>
<td>(IT) and MTX</td>
</tr>
<tr>
<td>C. R. L. et al. [9]</td>
<td>79</td>
<td>Headache, vomiting and diplopia</td>
<td>Imaging revealed enhancement in the cerebellar peduncle</td>
<td>(IT)</td>
<td>Negative</td>
<td>N/A</td>
</tr>
<tr>
<td>Enzinger et al. [10]</td>
<td>56</td>
<td>Headache, dizziness and altered mental status</td>
<td>Imaging revealed enhancement in the cerebellar peduncle</td>
<td>(IT)</td>
<td>NA</td>
<td>Chemotherapy with Bevacizumab and MTX</td>
</tr>
<tr>
<td>Current case</td>
<td>67</td>
<td>Headache and diplopia</td>
<td>Imaging revealed enhancement in the cerebellar peduncle</td>
<td>IT</td>
<td>Negative</td>
<td>N/A</td>
</tr>
</tbody>
</table>

GTR: gross total resection; NS: intravenous; IT: intrathecal; MTX: methotrexate; N/A: not available.
**Fig. 1:** Brain MRI showing a 3 cm tumor in the fourth ventricle. On contrast-enhanced T1-weighted sagittal (A) and coronal (B) images, the tumor was dumbbell-shaped and homogeneously enhanced.

**Fig. 2:** MR images obtained from a 23-year-old woman with midline cerebellar ataxia. Sagittal T1-weighted images without (A) and with (B) contrast enhancement demonstrate a solitary, contrast-enhancing a 4.5 cm mass lesion within the fourth ventricle. On the axial diffusion-weighted image, the tumor showed mild restricted diffusion, which suggests high tumor cellularity. (C)
Fig. 3: Permanent section shows cerebellar cortex and diffuse proliferation of round cells. (HE, Gx50) (A). The cells are discohesive and showing hyperchromatic and irregular nuclei. (HE, Gx400) (B). Immunohistochemistry stains show the cells positive for CD20 (C).

References


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