Intraventricular Pilocytic Astrocytoma in an Adult Patient

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Abstract

Pilocytic astrocytoma’s are tumors of the central nervous system mostly during the first two decades of life. Although they are mostly common in the midline structures of children, pilocytic astrocytoma within the ventricular system of an adult is rare. To our knowledge, only one single histologically and molecularly confirmed case was documented in the literature up to this time. We report a case of a 38-year-old woman with obstructive hydrocephalus secondary to a brain tumor within the third ventricle. On histological examination, the tumor exhibited biphasic growth pattern comprising compacted cellular areas with Rosenthal fibers and loose textured microcystic areas with eosinophilic granular bodies. Mitosis or necrosis was not present. Immunohistochemical studies demonstrated glial fibrillary acid protein (GFAP) and Olig2 positivity as well as NeuN and EMA negativity. Ki67 labeling index was less than 1%. Molecular studies revealed that there is no isocitrate dehydrogenase (IDH) gene mutation. This clinical presentation along with the histologic and molecular findings is consistent with a pilocytic astrocytoma arising in the third ventricle of this adult brain, which further supports that pilocytic astrocytoma can occur intraventricularly in an adult patient.

Keywords

Pilocytic astrocytoma, Ventricle, Central nervous system, Adult

Introduction

Pilocytic astrocytoma’s are tumors of the central nervous system (CNS) most commonly occurring during the first two decades of life with a peak incidence between 8 and 13 years of age. Although these tumors are typically located in the midline structures of CNS, like posterior fossa, cerebellum, thalamus, hypothalamus, etc., they rarely arise within a cerebral ventricle of an adult patient [1]. Genetically, pilocytic astrocytoma’s are associated with absence of isocitrate dehydrogenase (IDH) gene mutation, and in most of cases, but not all cases, genomic changes in the mitogen-activated protein kinase (MAPK) pathway, particularly KIAA 1549/BRAF gene fusion, are present. Literature review indicates that only a single prior case of intraventricular pilocytic astrocytoma has been histologically and molecularly identified in an adult patient [2]. We report another histologically and molecularly confirmed case here to further support that pilocytic astrocytoma can occur intraventricularly in an adult patient.

Case Description

Clinical information

The patient was a 38-year-old woman with no significant medical history who reported a new brain mass and obstructive hydrocephalus recently diagnosed in another hospital. She presented to our institution for further evaluation and treatment. She described five months of intermittent diplopia, tremors, and clumsiness. She was previously treated with levetiracetam and acetazolamide. At our institution, computed tomography (CT) confirmed moderate hydrocephalus with dilation of the lateral and third ventricles, without dilation of the fourth ventricle.
The surgical specimen comprised multiple small fragments of soft, pink-tan tissue. Cytological preparation for intra-operative consultation exhibited bipolar piloid cells with long, hair-like processes and smaller cells with short, cobweb-like processes as well as a biphasic growth pattern composed of compacted cellular areas with Rosenthal fibers and loose textured microcystic areas with eosinophilic granular bodies. Mitosis was not identified. Histological examination of the paraffin-embedded tissue revealed a biphasic growth pattern composed of compacted cellular areas with Rosenthal fibers and loose textured microcystic areas with eosinophilic granular bodies were present. The resulting specimen was sent to our neuropathology laboratory for evaluation.

**Pathology**

The surgical specimen comprised multiple small fragments of soft, pink-tan tissue. Cytological preparation for intra-operative consultation exhibited bipolar piloid cells with long, hair-like processes and elongated, moderately pleomorphic nuclei as well as smaller cells with short, cobweb-like processes and round to oval nuclei. Rosenthal fibers and eosinophilic granular bodies were present. Mitosis was not identified. Histological examination of the paraffin-embedded tissue revealed a biphasic growth pattern composed of compacted cellular areas with Rosenthal fibers and loose textured microcystic areas with eosinophilic granular bodies.

**Figure 1:** Magnetic Resonance Imaging, T2-weighted, showed a mild to moderate heterogeneous contrast-enhanced mass in the third ventricle.

**Figure 2:** Histological examination observed two cell populations, bipolar piloid cells with long, hair-like processes and smaller cells with short, cobweb-like processes as well as a biphasic growth pattern composed of compacted cellular areas with Rosenthal fibers and loose textured microcystic areas with eosinophilic granular bodies. A) Smear preparation, H&E, 400x; B) Tissue section, H&E, 200x; C,D) Tissue section, H&E, 400x.
pattern comprising compacted cellular areas and loose textured microcystic areas with Rosenthal fibers and eosinophilic granular bodies. Immunohistochemical studies demonstrated that the tumor cells are positive for glial fibrillary acid protein (GFAP) and Olig2 with Ki67 labeling index of less than 1%, indicating glial nature of low-grade neoplasm. Molecular studies revealed that there is no isocitrate dehydrogenase (IDH) gene mutation. The above supports the diagnosis of pilocytic astrocytoma. This case further supports that pilocytic astrocytoma can occur in the cerebral ventricular system including the third ventricle and should be in the differential diagnosis of intraventricular tumors.

Pilocytic astrocytoma accounts for 1.3% of all central nervous system tumors. It is the most common glioma in the pediatric population during the first two decades of life with median age of 12-years-old, which declines dramatically from 14 years old to 15-19 years old. Approximately one third of gliomas in 0-14 years old patients are pilocytic astrocytoma [1, 7]. In adults, pilocytic astrocytoma is much less common. It usually occurs a decade earlier than diffuse astrocytoma and is rarely present in patients older than 50 years. It is worth noting that in contrast to another previously reported intraventricular pilocytic astrocytoma of an adult [2], this case does not harbor KIAA 1549/BRAF gene fusion. However, KIAA 1549/BRAF gene fusion is known to present much less frequently in adult patients with pilocytic astrocytoma, which suggests that the pathogenesis of intraventricular pilocytic astrocytoma may not necessarily be different from other ex-
intraventricular pilocytic astrocytoma’s [8].

Conflict of Interest Statement

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References