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CASE REPORT

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Anaplastic Pleomorphic Xanthoastrocytoma, WHO Grade 3, Located on the Hippocampal Region: A Case Report

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Abstract

Anaplastic pleomorphic xanthoastrocytoma (APXA) is a rare and aggressive brain tumor that requires a multidisciplinary approach for proper diagnosis and treatment. This case report presents the case of a 15-year-old male patient diagnosed with APXA in the left temporal region. The patient underwent a combination of imaging studies, including MRI, followed by a biopsy of the tumor tissue and surgery. The patient was then closely monitored for recurrence and progression of the tumor, and further received six cycles of chemotherapy and radiation therapy.

This report aims to provide detailed information about the diagnostic process for APXA, which can be challenging due to its similarity to other tumors, such as pilocytic astrocytoma. Additionally, the report highlights the varying treatment options and outcomes for patients with APXA, as well as the importance of close monitoring for the recurrence and progression of the tumor. More research is needed to fully understand the best treatment options for APXA and to improve outcomes for patients diagnosed with this rare and aggressive brain tumor.(**International Journal of Biomedicine. 2023;13(1):172-176.**)

Keywords: anaplastic pleomorphic xanthoastrocytoma • brain tumor • hippocampus • MRI • biopsy

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Introduction

Anaplastic pleomorphic xanthoastrocytoma (APXA) is a rare and malignant brain tumor characterized by its pleomorphic cells and xanthomatous material. First described in 1979,[(1)] it was later recognized as a separate entity from pleomorphic xanthoastrocytoma (PXA) in 1993 and classified as a World Health Organization (WHO) grade III tumor in 2016.[(2)] APXAs are more commonly found in adults and typically occur in the brain's cerebral hemispheres.

Despite aggressive treatment, the prognosis for APXA is generally poor, with a 5-year overall survival rate of around

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42% due to its infiltrative nature and the difficulty of treating it. Additionally, there is limited data on the incidence of APXA as it is a rare type of brain tumor. Studies have shown that PXA and APXA together make up less than 1% of all astrocytomas, and the majority of cases are found in children and adolescents, with a median age of onset at 22 years old.[3] However, more research is needed to fully understand the incidence and prevalence of APXA in the world.

Clinicians need to be familiar with the clinical and pathological characteristics of APXA to make an accurate diagnosis and provide appropriate treatment. Treatment options for APXA may include surgery, radiation therapy, and chemotherapy. However, due to the rarity of this type of tumor, there is limited data and research available on it. Therefore, it is important to consult with experts in the field and to participate in clinical trials to improve the knowledge and the outcomes for APXA patients.

This case report aims to share in-depth information about the diagnosis, treatment, and outcome of a patient with APXA, a rare and aggressive type of brain tumor. Additionally, this report aims to bring attention to the rarity of this type of tumor, the difficulty in differentiating it from pilocytic astrocytoma, and the aggressive nature of APXA. It also emphasizes the importance of close monitoring and exploring various treatment options for patients with APXA.

Case Presentation

This case report presents a 15-year-old male patient admitted to the hospital with a left temporal lobe lesion. He had no prior medical history but had recently been experiencing episodes of speech aphasia and loss of consciousness, which had become more frequent in the past few weeks. His parents reported that the patient has been experiencing these symptoms for over a year and they had become increasingly aggressive in the past 2-3 months. The patient was prescribed antiepileptic therapy but was not compliant. The neurologist requested a brain MRI, which revealed a mass in the left mesial-temporal region that appeared hypointense on T1 and hyperintense on T2. The lesion enhanced heterogeneously after intravenous contrast injection. The radiological features favored a diagnosis of pilocytic astrocytoma, but other possibilities, such as APXA and gangliocytoma were also considered, based on the location of the mass.

On December 2022, the patient underwent surgery, which was performed through neuron navigation, with a left temporal basal mini craniotomy and a subtemporal approach. The lesion was infiltrative, white-gray, aspirable, and had no cleavage plain. A gross total resection (GTR) was achieved. The initial diagnosis was pilocytic astrocytoma.

Further examination of the tissue (Figure 1) revealed features of APXA, a highly malignant tumor with a high potential to recur and progress despite initial treatment. The patient had been experiencing headaches, vertigo, nausea, behavioral changes, and aphasia for some time.

Treatment for APXA typically involves a combination of surgery, radiation therapy, and chemotherapy. In this case, the patient underwent radiation therapy according to the ACNS 0423 protocol of the Children's Oncology Group, including concomitant radio-chemotherapy with temozolomide (90 mg/m^2/day for 42 days) and radiation therapy treatment with a total dose of 54.0 Gy, followed with a boost of 5.4 Gy. One month after the end of radiotherapy, the patient started adjuvant chemotherapy consisted of up to 6 cycles of CCNU 90 mg/m^2 on day 1 and temozolomide 160 mg/m^2/day ×5 every 6 weeks.

Neuroimaging of the course of the disease is presented in Figures 2 and 3. It was proposed that a head and spinal cord MRI should be performed after 6 months. There was no evidence of the expansive relapse process after reevaluation with intravenous contrast brain MRI after 6 months.

The neurologist should discuss the case again with the pathologist to seek further data on the *BRAF* V600E mutation and any chromosomal analysis (CDKN2A, chromosome 1q, 9p, 10p, 12q, 18q).

APXA can be difficult to differentiate from other types of gliomas, particularly pilocytic astrocytomas, due to their similar radiographic and histologic features. However, APXA is characterized by its high degree of pleomorphism and atypia, as well as the presence of mitotic figures and lack of Rosenthal fibers, which are characteristic of pilocytic astrocytomas. The prognosis for APXA is generally poor, with a high potential for recurrence and progression despite initial treatment. Close monitoring and further treatment options, such as re-operation or additional radiation therapy and/or chemotherapy, should be considered for patients with APXA, especially those with a recurrence of the tumor.

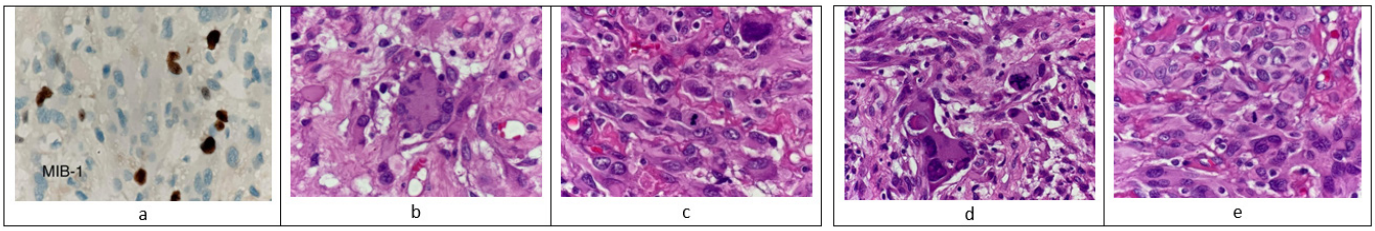

Fig. 1. *Microscopic images of the patient. A. Positivity of MIB-1 after staining with immunohistochemistry. B. Multinucleated cell at 400X magnification. C. D and E. Proliferation of markedly pleomorphic cells, with variation in sizes and shapes. There is focally seen lymphocytic infiltration. Neoplastic cells show prominent eosinophilic cytoplasm with intracytoplasmic vacuoles. Mitotic figures are seen (400X).*

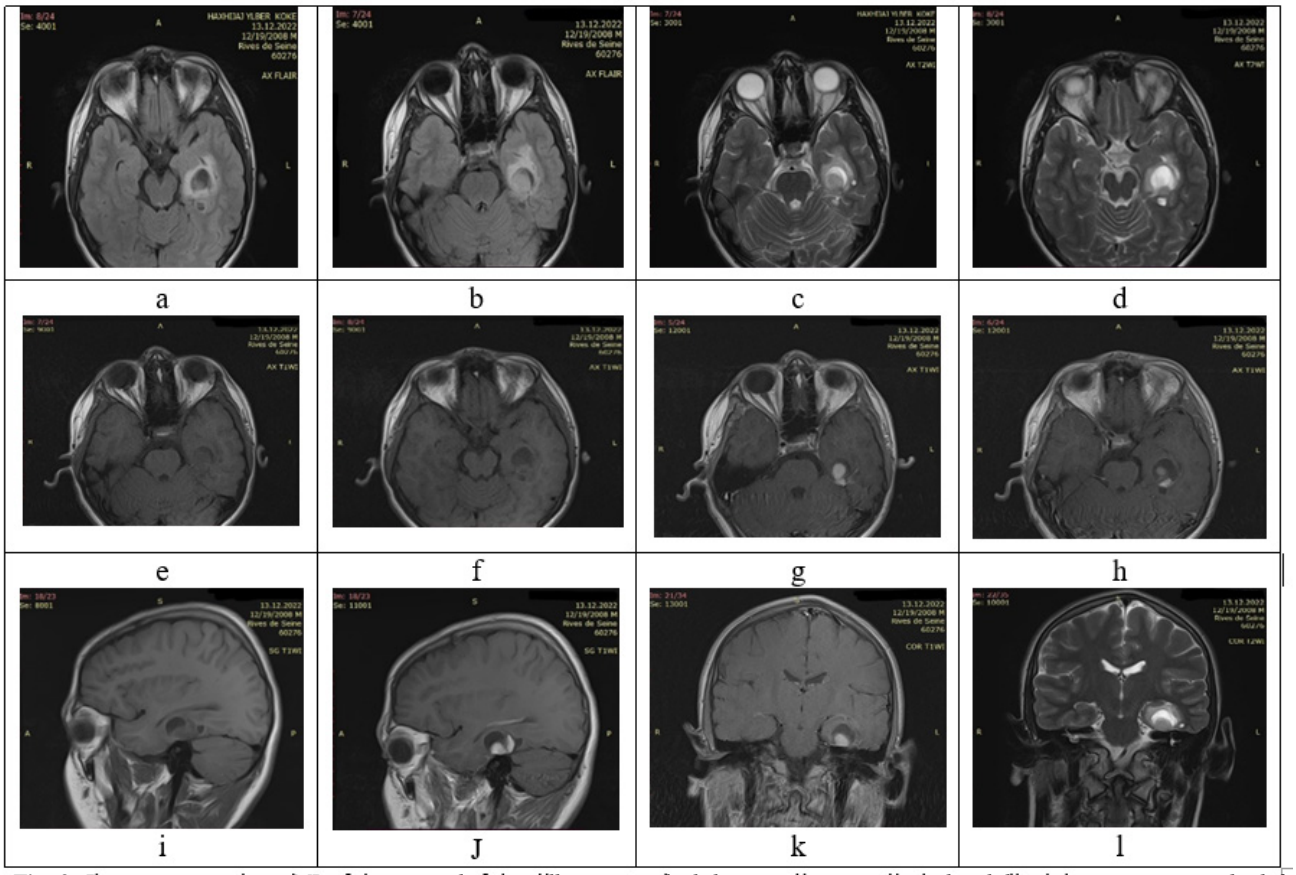

Fig. 2. *Preoperative images. MR images revealing a well-circumscribed, heterogeneous tumor with solid-cystic components in the left temporal lobe, approximately 26x20 mm in size, with perifocal edema presented on axial Flair (a.b), on axial T2 images showing proximal cystic components 18mm very hyperintense (c,d). In T1, before the contrast, the cystic component is hypointense, while the solid part is isointense (e,f). After the gadolinium contrast application, there is the pathological enhancement of the solid component, mainly heterogeneous in the form of the nodule with a tracheal extension over the tentorium (g,h), while T1 in the sagittal plane before and after gadolinium, the pathological enhancement of the solid component is presented (i,j). Coronal T1 post-gadolinium (k) and coronal T2 (l) MR images.*

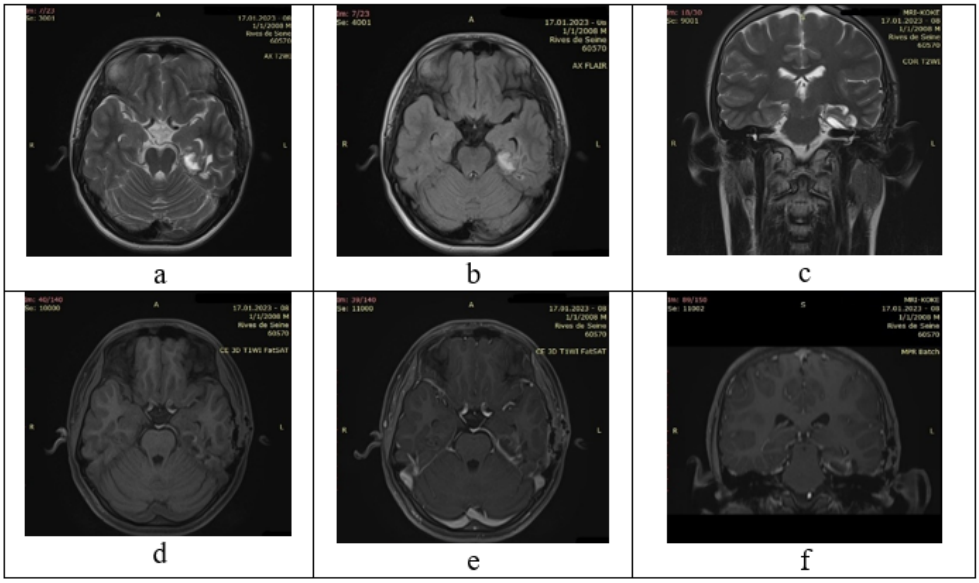

Fig. 3. *MR images one month after the surgical resection reveal a well-limited postoperative parenchymal defect, mostly homogeneous, with porencephalic cystic components in the left temporal lobe, without perifocal edema. Axial T2 images show porencephalic cystic components approximately 14x8mm, very hyperintense, with the expansion of the left temporal horn (a). Axial Flair presents postoperative cicatricial edema, not expansive edema(b). Coronal T2 clearly shows the postoperative defect (c). In T1 before the contrast, we notice a hypointense cystic component, while the solid component is not present, there is methemoglobin retention sleep(d), after the gadolinium contrast, we have very discrete pathological marginal enhancement of the postoperative defect (e), while in T1 in the coronary plan after gadolinium is presented the discrete marginal pathological enhancement from the postoperative porencephalic cystic component (f).*

Discussion

This case report explains in detail the diagnosis and treatment of a 15-year-old male patient with APXA in the left temporal region. APXA is a rare type of brain tumor, with an estimated incidence of only 0.1%-0.2% of all brain tumors.[4] However, the exact incidence of APXA worldwide is not well-established, as it is a rare tumor and data is limited. A study published in the Journal of Neuro-Oncology found that the incidence of APXA in the United States is 1-2 cases per million per year.[4] It is important to note that the true incidence may be higher, as the tumor can be misdiagnosed as other types of brain tumors. Due to its rarity, there is limited data and research available on the incidence of APXA worldwide.

APXA primarily affects individuals in their second decade of life, with an average age of presentation being 47.7 years old, as reported by She et al.[5] These tumors are commonly found in the cerebral hemispheres and do not involve the dura mater. They are often difficult to distinguish from other types of desmoplastic neuroepithelial neoplasms, such as gliosarcoma, desmoplastic infantile ganglioglioma, and desmoplastic cerebral astrocytoma of infancy, due to their similar clinical, radiological, and pathologic features.[6] Additionally, epithelioid glioblastoma can also resemble APXA due to similar histopathological characteristics.[7,8]

MRI is an important tool in the diagnosis of APXA, as it can provide useful information about the size, perilesional edema, infiltration, hemorrhage, and necrosis of the tumor. Previous case reports have shown that APXA tumors are larger than pilocytic astrocytoma due to an increased mitotic rate of more than five mitoses per 10 high-power fields.[1] Additionally, APXA tumors have been found to have more significant tumoral enhancement and perilesional edema compared to PXA tumors.

There have been various attempts to develop tools to differentiate between PXA and APXA, such as the ratio between diffusion-weighted imaging (DWI) and apparent diffusion coefficient (ADC) values,[9-11] which aims to assess the differences between the two tumors based on the nuclear to cytoplasmic ratio. Another study reported that increased microvascular proliferation in anaplastic tumors increases the relative cerebral blood volume (rCBV) value, which is correlated with cellular proliferation in high-grade gliomas, and in modern MRI techniques, rCBV is considered a significant marker for tumor vascularity. However, these case studies have a small sample size, making generalization difficult.[12-14]

Currently, there is no standard postoperative therapy for APXA as the rarity of the tumor makes it challenging to develop a treatment protocol. Surgical resection and stereotactic radiation therapy are effective in achieving long-term control, but conventional radiotherapy and chemotherapy are not proven to have been beneficial in the treatment of APXA. Stereotactic radiosurgery may have the potential to reverse progression, but more research is needed to confirm its effectiveness.

It is important to note that due to the rarity of APXA, the true incidence may be higher than reported, and the tumor can be misdiagnosed as other types of brain tumors. More research is needed to better understand the incidence, diagnosis, and treatment of APXA.

Conclusion

This case report aims to provide detailed information about the diagnosis, treatment, and outcome of a patient with APXA. The rarity of this tumor, the differential diagnosis with pilocytic astrocytoma, and the aggressiveness of the APXA tumor are highlighted in this report. Additionally, the importance of close monitoring and further treatment options for patients with APXA is emphasized. Despite the rarity of this tumor and the lack of standard postoperative therapy, surgical resection and stereotactic radiation therapy have been reported to provide long-term control in some cases. However, more research is needed to fully understand the best treatment options for APXA and to improve outcomes for patients diagnosed with this rare and aggressive brain tumor.

Competing Interests

The authors declare that they have no competing interests.

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