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Anaplastic Oligodendroglioma: A Case Report

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ABSTRACT

Oligodendrogliomas are glial tumors, representing approximately 5% of primary brain malignancies and 20% of all glial neoplasms. This case report presents an uncommon instance of anaplastic oligodendroglioma in a 53 yr old female.

Magnetic resonance imaging (MRI) revealed a large, high-grade oligodendroglioma. However, histopathological examination definitively diagnosed the tumor as anaplastic oligodendroglioma. This case highlights the importance of considering anaplastic oligodendroglioma

Oligodendroglioma: A Glimpse into a Brain Tumor

Oligodendrogliomas are a type of diffusely infiltrating glioma, constituting roughly 5% of all primary intracranial tumors [1]. These tumors often involve the cortical gray matter and are most commonly found in the frontal lobes [1]. Traditionally, diagnosis relied solely on histological examination of the tumor [1]. Oligodendrogliomas are generally classified as World Health Organization (WHO) grade II neoplasms, which are slow-growing tumors with a better prognosis compared to other gliomas [1]. However, the 2016 update to the WHO criteria for central nervous system (CNS) tumor categorization now incorporates both phenotypic and genotypic analysis [2].

A Shift in Classification: Anaplastic Oligodendroglioma

The fifth edition of the WHO classification of CNS tumors (2021) has eliminated the term "anaplastic" and now assigns tumors a grade of 2 or 3 [3]. Previously known as grade III anaplastic oligodendroglioma (AO), these more aggressive tumors carry a poorer prognosis and can arise de novo (independently) or through the degeneration of lower-grade oligodendrogliomas [4].

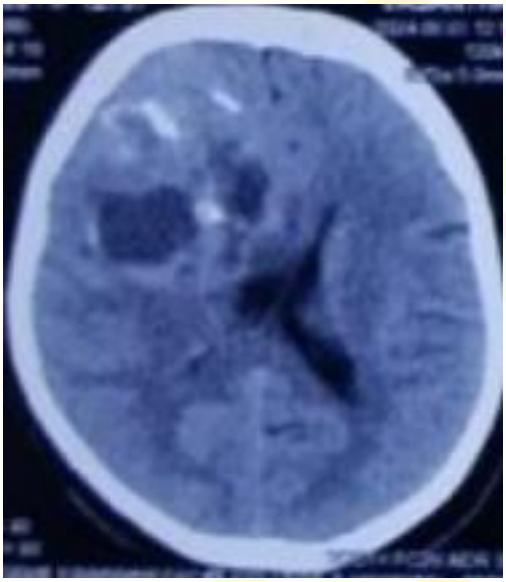
Epidemiology: Age, Gender, and Prevalence

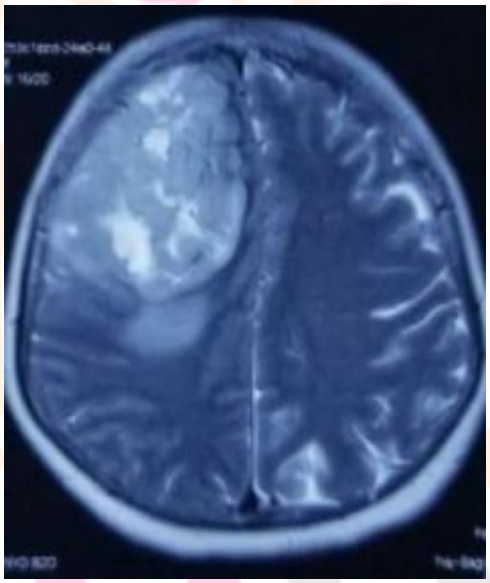
Oligodendrogliomas typically affect middle-aged adults, with a higher prevalence observed in the fourth and fifth decades of life compared to grade 3 tumors [4]. Additionally, there is a slight male predominance for this type of cancer [4].

Atypical Presentation of Anaplastic Oligodendroglioma

A 53-year-old female presented to our hospital with a two-week history of weakness in Left side limbs for 2 weeks and increasing headache starting right side to holocranial, more in early morning and relieved with vomiting for the past week.

Given the persistent headaches and concern for an underlying neurological issue, brain magnetic resonance imaging (MRI) with contrast was promptly performed. The MRI revealed a large, heterogeneous mass with





central necrosis within the right frontal lobe.

Further analysis of the MRI findings included:

- **T1-weighted imaging with contrast:** The tumor demonstrated heterogeneous enhancement

Based on the clinical presentation and initial imaging findings, a high-grade glioma was suspected. The patient underwent gross-total tumor resection. However, the definitive diagnosis came through histopathological examination of the surgical specimen, which revealed anaplastic oligodendroglioma (AO).

Oligodendroglioma: Unveiling the Biology and Clinical Presentation

Oligodendrogliomas were first named by Bailey and Bucy in 1929 due to their microscopic resemblance to oligodendrocytes [6]. However, recent research suggests the tumors might originate from precursor cells rather than mature oligodendrocytes, with limited ability to myelinate [5, 6]. Supporting this concept is the frequent

presence of the isocitrate dehydrogenase (IDH) mutation, a common feature across various diffuse gliomas [5, 6].

Clinical Presentation: A Spectrum of Symptoms

Patients with oligodendroglioma often present with non-specific symptoms like headaches. Seizures are another frequent presentation, affecting 35%-85% of individuals, with some studies reporting even higher rates [7]. The tumor's location can sometimes cause localized neurological deficits. In such cases, or for those experiencing new-onset seizures, CNS imaging is crucial for diagnosis [8].

MRI: Unveiling the Tumor's Landscape

Magnetic resonance imaging (MRI) offers a detailed picture of the tumor, revealing its extent and infiltrative nature. T2-weighted sequences typically show a well-defined, but heterogeneously hyperintense mass, often located in the cortical or subcortical region. It may also exhibit a slight increase in signal intensity around the tumor (peritumoral edema). Low signal intensity areas on T2 sequences might indicate cystic components, microhemorrhage, or calcifications within the tumor. On T1-weighted images, oligodendrogliomas typically appear hypointense compared to gray matter. Low-grade tumors often show enhancement with contrast, ranging from patchy to significant. However, enhancement is not always a reliable indicator of tumor grade. Conversely, diffusion-weighted imaging (DWI) with apparent diffusion coefficient (ADC) maps often show increased signal intensity and higher diffusion within the tumor compared to surrounding tissue.

Advanced MRI techniques like spectroscopy and perfusion can complement anatomical imaging. Spectroscopy may reveal elevated choline and reduced N-acetyl aspartate peaks, with these changes being more prominent in high-grade tumors due to increased cellular activity [9]. Similarly, high-grade tumors might exhibit increased cerebral blood flow on perfusion imaging compared to low-grade tumors. However, there can be significant overlap between the two [9, 10].

Histopathological Diagnosis: Unveiling the Cellular Fingerprint

Histopathological examination plays a crucial role in diagnosing oligodendroglioma. While these tumors might lack myelin basic protein, a marker for mature oligodendrocytes, they may express glial fibrillary acidic protein (GFAP), a marker for astrocytes, or oligodendrocyte transcription factor 2 (Olig2), which is specific to oligodendrocyte progenitor cells [11, 12].

Treatment Considerations:

Surgery remains the mainstay of treatment for oligodendroglioma whenever feasible. The goal is to obtain tissue for diagnosis and remove as much of the tumor as possible while minimizing neurological deficits. Post-surgical management may involve radiation therapy, chemotherapy, or participation in clinical trials [13, 14].

Conclusion

Anaplastic oligodendroglioma (AO) is an uncommon but aggressive brain tumor with features suggestive of the oligodendroglial lineage and characteristics corresponding to WHO grade III. Despite its rarity, considering AO in the differential diagnosis of high-grade glioma is crucial for optimal patient management.

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