Case Report

A Rare Presentation of Multifocal Anaplastic Oligodendroglioma

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Abstract

Multifocal tumors are usually reported within the same cerebral hemisphere due to widespread dissemination along the white matter tracts. This case report describes the magnetic resonance imaging appearances of multifocal anaplastic oligodendroglioma in a 28-year-old adult male that showed three discrete heterogeneously enhancing cortical-based lesions in the left frontoparietal lobes. Left frontal craniotomy was performed and biopsy of the lesion was obtained, histopathology of which showed features of anaplastic oligodendroglioma.

Keywords: Anaplastic, high-grade glioma, multifocal, oligodendroglioma

Introduction

Multifocal oligodendrogliomas are typically located within adjacent lobes from the same cerebral hemisphere due to the widespread dissemination of tumor along the white matter tracts. Multifocal anaplastic oligodendroglioma is a high-grade and exceedingly rare tumor with high potential for malignant transformation regardless of the insidious onset of clinical symptoms at presentation.[1] Multiple cortical-based mass lesions within the same hemisphere of the brain in a young adult with multiple episodes of seizures should raise suspicion of anaplastic oligodendroglioma and should be included in the differential diagnosis. This case report describes the imaging appearances and histopathology of multifocal anaplastic oligodendroglioma in a 28-year-old adult male.

Case Report

A 28-year-old adult male presented to the Department of Neurology with complaints of chronic left-sided headache for 3 months with gradual onset, multiple episodes of seizures for 9 months. There was no associated loss of consciousness or vomiting or symptoms related to raised intracranial pressure. Clinical examination revealed an alert and conscious patient with normal higher mental functions, normal visual acuity, and normal color vision test. There were no features of raised intracranial tension on fundus examination for evidence of papilledema.

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The patient was referred for magnetic resonance imaging Brain which revealed three cortical-based infiltrative lesions of heterogeneous signal intensity and varying size distributed in the frontoparietal lobes of the left cerebral hemisphere [Figure 1a and b]. The largest of the lesions was noted in the left frontal lobe. There was no mass effect in the form of compression of the left lateral ventricle and subfalcine herniation to the contralateral side. Computed tomography brain revealed isodense mass lesions distributed in the left frontoparietal lobes with dense foci of calcifications [Figure 2]. Differential diagnoses considered based on imaging findings were astrocytoma, ganglioglioma, pleomorphic xanthoastrocytoma, and calcifying pseudoneoplasm of the neuraxis. An imaging diagnosis of multifocal oligodendroglioma was made and the patient was referred to the department of neurosurgery where he underwent left coronal flap craniotomy, decompression of lesion in piecemeal manner, and excisional biopsy.

Histopathology of the resected specimens revealed oligodendroglial cells admixed with vessels showing endothelial proliferation. Anaplastic features identified on histopathology were areas of necrosis, microvascular proliferation, and mitotic figures >5/10-HPF [Figures 3 and 4].

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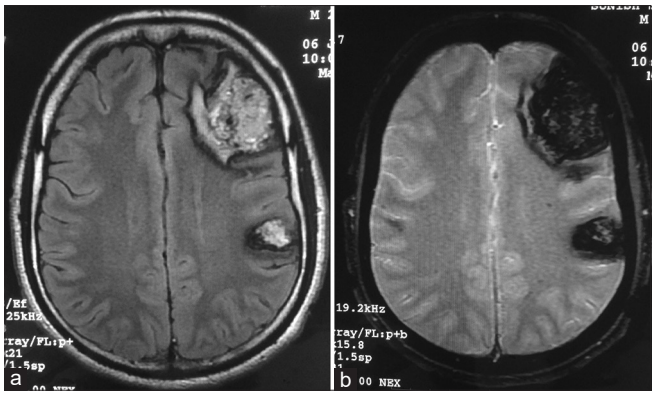

Figure 1: (a) Axial T2 FLAIR MR image demonstrating multifocal cortical based heterogeneously intense lesions in the left fronto-parietal lobes. (b) Axial GRE image demonstrating dense blooming in the cortical based fronto-parietal lobe lesions

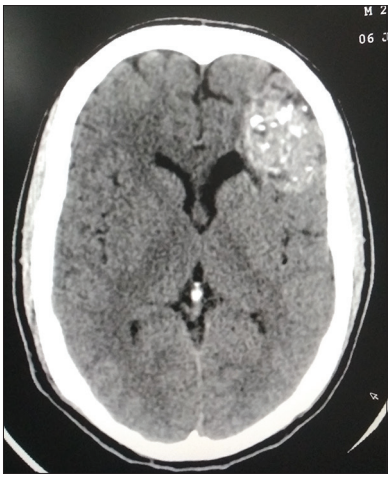

Figure 2: Axial Computed tomography revealing dense foci of calcifications in the predominant left frontal lobe lesion

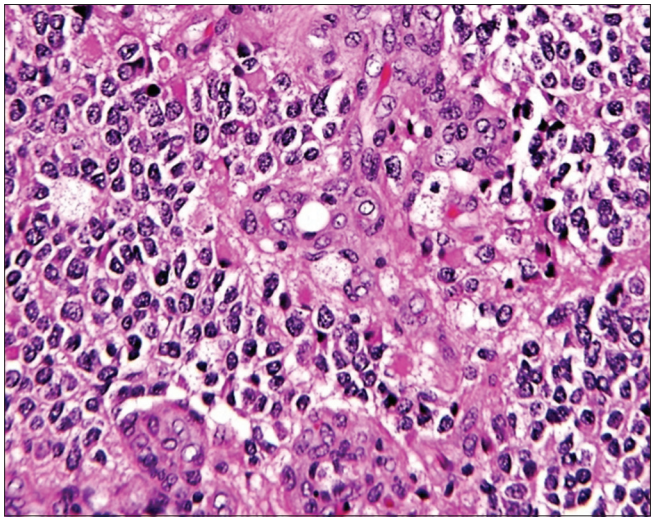

Figure 3: HPE (Histopathological) image demonstrating oligodendroglial cells showing mitotic figures admixed with vessels showing endothelial proliferation (H and E, × 400)

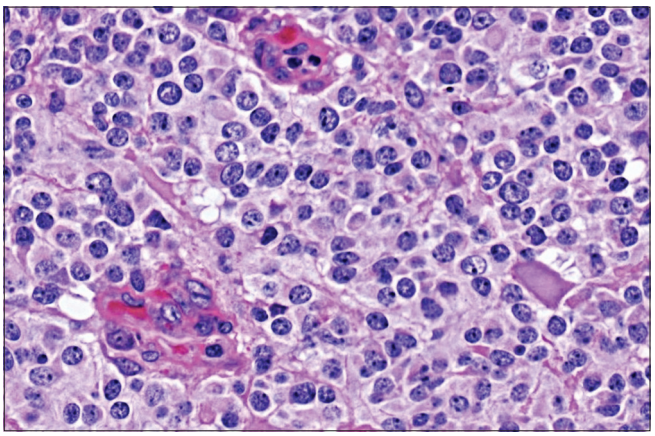

Figure 4: Immunohistochemical staining of Ki-67 (a) and image demonstrating positivity for glial fibrillary acidic protein (b) (IHC, × 400)

Immunohistochemistry showed minigemistocytes that stained strongly with glial fibrillary acidic protein (GFAP) and had a MIB-1 labeling index of 40% [Figure 5a and b]. Molecular markers such as isocitrate dehydrogenase 1 mutation and 1p/19q codeletion were demonstrated by the tumor. Features on histopathology and immunohistochemistry were consistent with a diagnosis of high-grade anaplastic oligodendroglioma.

Discussion

Anaplastic oligodendroglioma is a rare central nervous system malignant tumor of oligodendroglial lineage with histological features corresponding to World Health Organization (WHO) Grade III.[2] Anaplastic oligodendroglioma comprises 0.5% to 1.2% of all primary malignant tumors of the brain with an annual incidence rate ranging from 0.07 to 0.18/1,00,000 individuals screened in 1 year.[3] However, high-grade anaplastic oligodendroglioma constitutes 30% of all oligodendrogliomas.[4]

Anaplastic oligodendroglioma tends to present at a later age group generally between 45 and 50 years.[5] Oligodendroglioma tends to preferentially involve the frontal lobe of the cerebrum, with the temporal lobe being the second common location. Clinical features encountered are multiple episodes of seizures, speech, and behavioral changes. The presence of the above-mentioned clinical features should raise suspicion of a brain tumor and imaging investigations should be strongly advised by clinicians.

Multifocal anaplastic oligodendroglioma is a rare entity with an incidence rate of 0.5% to 20% in various studies.[6] Salvati *et al*.[7] reported multicentric gliomas from a series of 25 cases of which six cases were multicentric anaplastic astrocytomas, 11 were multicentric glioblastomas, and other cases were combinations of anaplastic astrocytomas, glioblastomas, and low-grade gliomas. No cases of multifocal oligodendroglioma were found in their series.

Multiple gliomas noted on imaging studies can be either multifocal or multicentric depending on the mechanism of tumor spread.[8] Multicentric gliomas constitute

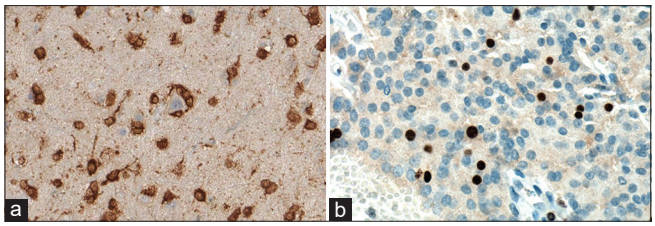

Figure 5: Histopathological examination (HPE) image demonstrating sheets of pleomorphic oligodendrocytes having hyperchromatic nuclei and clear to eosinophilic cytoplasm. Atypical mitotic figures are seen (H and E, × 400)

separate entities, in different lobes or hemispheres, and show no evidence of metastasis. Whereas multifocal gliomas demonstrate widespread dissemination along the corticospinal tracts from the site of the primary tumor, alongside metastases via hematogenous and cerebrospinal fluid routes. Multicentric gliomas with varying tumor histopathology is exceedingly rare entity and usually have a grave prognosis despite the availability of advanced management options.[9] Majority of multiple glioma cases are multifocal gliomas with the intervening parenchyma showing evidence of malignant cells. Management protocols in multifocal gliomas are based on the multiplicity of lesions. The main objective of surgical procedures in patients with multifocal gliomas is to achieve resection of the most accessible mass lesion pertaining to the brain without causing additional neurological deficits. In this case report, the three cortical-based infiltrative lesions of varying size distributed in the left frontoparietal lobes demonstrated similar radiological features and spectroscopic findings suggesting multifocal oligodendroglioma.

Conclusion

Multifocal anaplastic oligodendroglioma (WHO Grade III) is an exceedingly rare entity with high-grade features, such as increased mitotic activity, microvascular proliferation, and necrosis. Oligodendroglioma should be considered in the differential diagnosis in young adults presenting with multiple episodes of seizures and chronic headaches.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. van den Bent MJ, Smits M, Kros JM, Chang SM. Diffuse infiltrating oligodendroglioma and astrocytoma. J Clin Oncol 2017;35:2394-401.
2. Louis DN, Ohgaki H, Wiestler OD, Cavenee WK, Burger PC, Jouvet A, *et al.* The 2007 WHO classification of tumours of the central nervous system. Acta Neuropathol 2007;114:97-109.
3. Blakeley J, Grossman S. Anaplastic oligodendroglioma. Curr Treat Options Neurol 2008;10:295-307.
4. van den Bent MJ. Oligodendrogliomas: A short history of clinical developments. CNS Oncol 2015;4:281-5.
5. Liu S, Liu X, Xiao Y, Chen S, Zhuang W. Prognostic factors associated with survival in patients with anaplastic oligodendroglioma. PLoS One 2019;14:e0211513.
6. Smits M. Imaging of oligodendroglioma. Br J Radiol 2016;89:20150857.
7. Salvati M, Caroli E, Orlando ER, Frati A, Artizzu S, Ferrante L. Multicentric glioma: Our experience in 25 patients and critical review of the literature. Neurosurg Rev 2003;26:275-9.
8. Garcia Pulido P, Neal J, Halpin S, Hamandi K. Multicentric oligodendroglioma: Case report and review of the literature. Seizure 2013;22:480-2.
9. Patil CG, Eboli P, Hu J. Management of multifocal and multicentric gliomas. Neurosurg Clin N Am 2012;23:343-50, x.