Glioblastoma Multiforme of Optic Nerve in Adults with Hyper intense Diffuse Weighted Imaging

Karthik Adiraju ;Phani Harshitha Yarlagadda;Sohil Patel
(General Medicine,Kamineni Institute Of Medical Sciences,India )
(General Medicine,Kamineni Institute Of Medical Sciences,India)
(Fellow NeuroRadiology,Massachusettes General Hospital,Boston,U.S)

Abstract: We present a case of glioblastomamultiforme of the optic nerve with Hyper intense Diffusion Weighted Imaging(DWI) in a 56 year old man without Neurofibromatosis1 who presented with generalized tonic clonic seizures and loss of vision in right eye. Presence of hyperintense DWI imaging of optic nerve makes this case unique.Further details about diagnostic methods available with major emphasis on Magnetic Resonance Imaging in adults is been done.

Keywords: GlioblastomaMultiforme,Gliomas,Imaging options of GBM,Optic Nerve Tumors,Optic nerve thickening.

I. Introduction:
Glioblastoma Multiforme of the optic nerve a rare kind of cancer, usually slow-growing and found in children. It is rarely found in individuals over the age of 20. It has also been associated with the genetic disorder neurofibromatosis Type 1(NF1). Generally optic nerve gliomas are not hyperintense on diffusion weighted imaging(DWI). It is mostly seen in conditions of infarction and papilledema. The malignant optic glioma of adulthood, on the other hand, is an extremely rare optic pathway tumor. Till 1990, only 30 cases were reported in this century. In a review of literature in 2004 by Bettina Wabbles et al, 45 cases of adult malignant optic gliomas have been described. Of these patients 51% were male, 49% females; the mean age at diagnosis was 54 years (median 59yrs, range 22 to 79yrs). The most common sign of ONG is progressive loss of vision and may lead to death in children.

II. Casepresentation
A 56 years old man presented with complaints of loss of vision in the right eye since 2days. It was not associated with any pain or discharge. There was also a history of irritability and generalized tonic clonic seizures since two to three years. His general physical examination was normal. Best corrected visual acuity in the left eye was 6/24. Anterior segment examination revealed sluggish pupillary reaction in both the eyes. On fundus examination, no papilloedema or any vessel occlusion was not seen bilaterally. The color vision on Ishiara's chart was 5/14 in the left eye and none in the left eye. On confrontation test, temporal fields of both right and left eyes were decreased.

With this background, an MRI of the brain was done on 1.5 Tesla Siemens Essenza system. We found that there was thickening of the right optic nerve (Fig1)showinghyperintense signal on T2W/ FLAIR images(Fig2). The lesion appeared hypointense to isointense on T1W images and showed hyper intensity on DWI. The right optic nerve appear expanded. The intracanalicular optic nerves appeared normal with thickening of intraorbital part on right side(Fig3). The post contrast images (using 20ml of Gadodiamin revealed a small (size) enhancing focus in posterior part of optic nerve on the right side. Rest of the lesion showed no significant enhancement.

The patient was then taken up for biopsy. Histopathological examination of the biopsy showed cerebral tissue with varying degree of cellularity, characteristic cyto-morphology, abundant mitotic figures, increased vascularity consistent with a diagnosis of glioblastomamultiforme.(Fig4)

III. Discussion
Gliomas account for 40-50% of all primary and metastaticintracranial tumors. Glioblastoma is the most common typeof glioma.WHO 2000 classification grades astrocytic tumors fromgrade I to grade IV. WHO Grade I tumor includes pilocyticastrocytoma, pleomorphic xanthoastrocytoma andsubependymal giant cell astrocytoma. Other astrocytomas include diffuse astrocytoma (grade II), anaplasticastrocytoma (grade III) and glioblastoma (grade IV).

Gliomas of the optic pathway are classified as (a) the relatively benign optic nerve glioma (typically occurring in the pediatric age group) and (b) the malignant optic glioma of adulthood. Benign optic nerve gliomas represent 4% of orbital tumors, 4% of intracranial gliomas, and 2% of intracranial tumors. They also
Gliomas generally demonstrate high signal intensity on T2w images. For example, electroencephalography (EEG) uses electroencephalography to evaluate conduction of nerve fibers. Differentiation of neural dissemination and associated neurofibromatosis is important for the treatment of gliomas. The modified Dodge classification further categorizes gliomas into three categories. Specifically, the lactate/water ratio can be used to distinguish neoplastic cell infiltration from diffuse axonal injury. Gliomas prone to CR. Hyperintense Dwi is a form of MR imaging based on diffusion of water molecules within a voxel. The greater the cellularity, the greater the diffusion restriction, e.g. tumors. DWI can be used for early identification of ischemic stroke, differentiation of epidermoid cyst from arachnoid cyst, abscess, cortical lesions in CJD, differentiation of herpes encephalitis from diffuse temporal gliomas, extent of diffuse axonal injury, active MS plaque (old plaques will not be bright). The signal intensity of gliomas on DWI is variable (hyper-, iso-, or hypointense) but no case in literature has been reported with hyper intense DWI in GBM of optic nerve. Imaging optic nerve gliomas: Diffusion weighted imaging (DWI) and/or ADC maps may not be reliable to distinguish neoplastic cell infiltration from peritumoral edema in patients with malignant glioma.

Magnetic resonance spectroscopy (MRS) MRI with non-invasive characterization of tissue spectroscopic patterns of gliomas different than normal brain tissue potentially help in delineating tumour spread. MRS shows increased Cho values in glioma with associated decrease in NAA/Cho and Cr/Cho ratios with lipid-lactate peaks. One study has shown that specific metabolites, when standardized to water, are of diagnostic value in the division of tumors into three categories. Specifically, the lactate/water ratio can be used.
to differentiate GBMs, anaplastic astrocytomas, and low-grade tumors. The choline/water, choline/creatine, and lactate/creatine ratios can be used to distinguish high-grade from low-grade tumors (5).

5.5 MR PERFUSION STUDIES shows a correlation between relative cerebral blood volume and tumor grade.

5.6 PET-CT SCAN Helpful in staging of the disease Effectively locates the tumour which is useful for treatment Can assess tumour progression/recession following treatment Allows the possibility for a less invasive technique that could easily replace more invasive ones PET-MRI SCAN Same application as a PET-CT scanner Better soft tissue than CT More expensive.

VI. Figures:

Fig 1. optic nerve thickness on right side

Fig 2. Hyperintense imaging of Optic Nerve

Fig 3. Intraorbital optic nerve thickening
VII. Treatment Options

To halt the progression in vision loss or tumor growth, types of treatment include: surgery, chemotherapy and radiation therapy. CHEMOTHERAPY has now been determined as the best form of treatment for all ages. If Chemotherapy fails, radiation therapy is then used. RADIATION THERAPY: Major side effects of cranial irradiation: Mental retardation, Endocrinopathies, Cerebrovascular disease. Fortunately, side effects are less common today due to treatments that are more precisely focused on abnormal tissue. This patient is on chemotherapy and under follow up.

VIII. Conclusion

Glioblastoma are very rare in adults compared to children. They are generally malignant in adults resulting in loss of vision. GBM of optic nerve can present with hyperintense DWI. The possibility of tumor cannot be excluded in differential diagnosis of hyperintense DWI in optic nerve apart from infarction and edema. New imaging and treatment options can be used for earlier detection, more accurate treatment planning and better prognosis.

References