Case Report

Is neurocysticercosis a risk factor for glioblastoma multiforme or a mere coincidence: A case report with review of literature

Narendra Kumar, Tapesh Bhattacharya, Ritesh Kumar, Bishan Das Radotra[1], Kanchan Kumar Mukherjee[2], Rakesh Kapoor, Sushmita Ghoshal

Departments of Radiotherapy and Oncology, [1]Pathology, [2]Neurosurgery, Post Graduate Institute of Medical Education and Research, Chandigarh, India

ABSTRACT

Simultaneous occurrence of Neurocysticercosis (NC) along with Glioblastoma Multiforme (GBM) is a very rare presentation. We herein describe a case report of treated case of NC 2 years back who presented with secondary GBM. The brief report highlights that there may be some associated factors which may lead to development of secondary GBM in preexisting helminthic infection.

Key words: Glioblastoma multiforme, neurocysticercosis, taenia solium

Introduction

Neurocysticercosis (NC) is the most frequent and widespread human parasitic infection of the central nervous system (CNS). Glioblastoma multiforme (GBM) is a neoplasm of CNS in elderly population and may have a similar clinical and radiologic presentation as of NC. The coexistence of NC and neoplastic intracranial lesion in an individual is a very rare entity. The incidence of NC among intracranial space occupying lesions is reported to be 1.2-2.5%.[1-4] Though cerebral cysticercosis may be associated with glioma,[5] but this rare coexistence of NC and brain tumors puts into question a causal relationship between the 2 diseases. Here we report a case in which glioma and cysticercosis appeared concomitantly, with continuing progression of low grade Glioma to high grade Glioma (GBM, WHO grade IV).

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A 47-year-old male presented in radiotherapy out door in December 2011 with history of repeated episodes of seizures and persistent headache for 4 months, weakness in left side of the body for 10 days, and altered sensorium for 3 days. His medical history revealed that he had NC 2 years back [Figure 1a and b], for which he received a course of antihelmenthics (Albendazole) and advised antiepileptic (Phenytoin). Subsequently patient was lost to follow up and stopped antiepileptic after 7 months. He again presented now after 2 years with the above complaints. On examination, patient had Glasgow coma scale of 13 (E4 V3 M6) and power of left upper and lower limb was 4/5. Contrast enhanced magnetic resonance imaging (MRI) brain showed multiple cystic ring enhancing lesions along with predominant enhancing lesions in the corpus callosum [Figure 2]. On retrospective review of initial brain MRI and comparing it with present one, it was suggestive of preexisting simultaneous glioma lesion along with NC which progressed to glioblastoma multiformme over a period of 2 years in same corpus callosum region of brain while NC lesions seem to be healed. Patient underwent right frontal craniotomy and total excision of tumor. Postoperative histopathology examination revealed GBM [Figure 3]. Patient has been started on Radical Radiotherapy with

Address for correspondence:
Dr. Narendra Kumar, Department of Radiotherapy and Oncology, Regional Cancer Centre, Post Graduate Institute of Medical Education and Research, Chandigarh, India. E-mail: drnarendra74@gmail.com

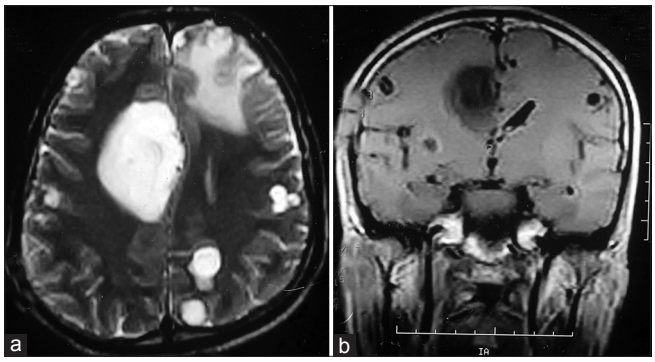

Figure 1: (a) Initial T2W MRI showing multiple cystic lesions along with predominant enhancing lesions in the corpus callosum (2009) (b) Initial contrast enhanced T1 weighted MR showing corpus callosul Glioma along with coexistent Neurocysticercosis (2009)

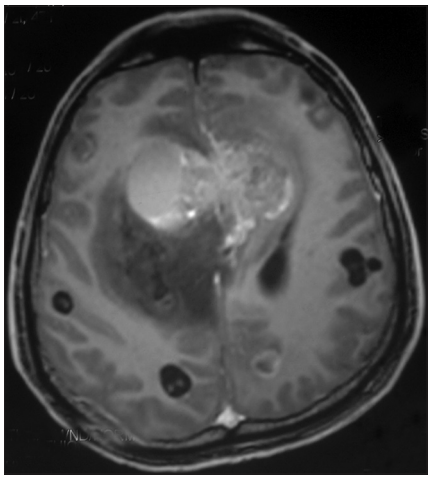

Figure 2: CEMRI showing heterogeneously enhancing lesion in the corpus callosum with multiple healed lesions of neurocysticercosis (2011)

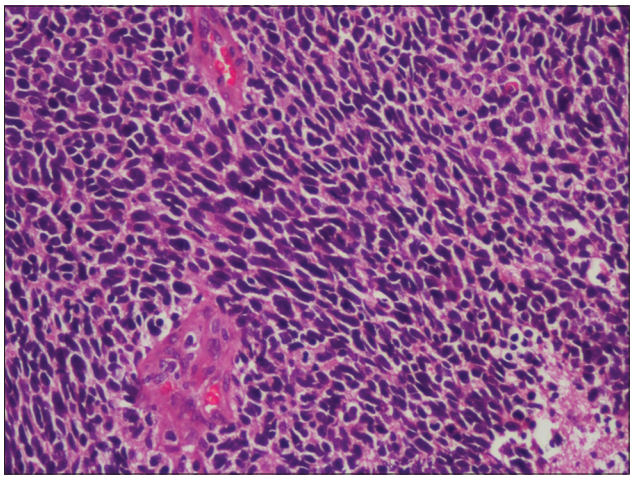

Figure 3: Photomicrograph showing high grade astrocytic tumor with areas of necrosis, hemorrhage and vascular proliferation

3DCRT with intent to deliver radical dose of 60Gy in 30 fractions over 6 weeks in phased manner. In view of his poor financial status no chemotherapy has been planned.

Discussion

NC is the most common helminthic infection of the nervous system and is a leading cause of acquired epilepsy worldwide. The disease occurs when humans become intermediate hosts of *Taenia solium* by ingesting its eggs from contaminated food or most often, directly from a taenia carrier by the fecal-to-oral route.[5] Cysticerci may be located in brain parenchyma, subarachnoid space, ventricular system, or spinal cord, causing innumerable pathological changes that are the main responsible factor for the pleomorphism of NC.[4] Seizures are the most common clinical manifestation of the disease,[5] but many patients present with focal deficits, intracranial hypertension, or cognitive decline. Accurate diagnosis of NC is possible after interpretation of clinical data together with findings of neuroimaging studies and results of immunological tests.[5] The coexistence of NC with various types of intracranial pathology has been reported. Previous reports have also suggested that NC may be a risk factor for various coexisting intracranial lesions such as Japanese encephalitis, glioma, and infarction; and that the immune alterations and a disturbance of the blood–brain barrier caused by NC could be responsible for the coexistence of other lesions.[6-10] The proposed relation between gliomas and NC is complex. A direct association between gliomas and NC has been reported[11] and might be more than a coincidence. An indirect association has been reported in studies that found positive reactions for cysticercosis in the cystic fluid of gliomas[12] raising the question of a cross reaction between the two pathologies. The association of NC and gliomas has been reported mainly in the endemic areas and raised the possibility of the parasitic disease acting as a risk factor for brain tumors.[5,13] In a study by Del Brutto *et al*., it had been shown that NC was more common among patients with cerebral gliomas than in controls ($P < 0.001$). The odds ratio for this association was 7.63 (95% confidence interval, 2.03-31.09).[5]

It has also been suggested that NC may be the result and not the cause of the neoplasm, arguing that cancer-induced immunosuppression favors the development of parenchymal brain cysticerci.[14] But this hypothesis seems unlikely, since NC is not a common disease among patients immunosuppressed by other causes.[15] The study by Del Brutto *et al*.[5] also revealed that patients of glioma with NC were older than those without NC. It suggested a temporal relationship between NC and the further development of a cerebral glioma and represented arguments against the hypothesis that NC appeared as the result of cancer-induced immunosupression.

Some parasitic diseases have been implicated in the development of human cancers. While the pathogenesis of this association is not totally understood, it has been suggested that the inflammatory reaction induced by the parasites may cause some cells of the host to proliferate so much that they undergo mutations that alter their normal behavior.[16] Some cysticercal antigens stimulate the production of specific antibodies that form the basis for the immunological diagnosis of cysticercosis, while others (particularly antigen B) play a role in the evasion of the immune surveillance against cysticerci.[17] In addition, it has been suggested the occurrence of cellular immune dysfunction in patients with NC, resulting from increased subpopulations of CD8 T-lymphocytes, impaired proliferation of lymphocytes, and abnormal concentration of cytokines. The depressed cellular immunity may be responsible for the reported association of NC with conditions resulting from immunodeficiency states, and with the development of gliomas.[13] In such cases, it has been hypothesized that the intense glial proliferation around the parasites, along with the suppression of the cellular immune responses may cause inhibition of the immunological surveillance against cancer, leading to malignant transformation of astrocytes.[13] Many authors believe that a possible explanation for the presence of brain tumors such as GBM in patients with NC could be the transfer of genetic material from the parasite to the host, resulting in DNA damage and malignant transformation of host cells surrounding the cysticercus and by chronic inflammation with liberation of nitric oxide and inhibition of tumor suppressor genes.[13,18] However, the association between NC and gliomas was not reproduced in a more recent large study,[19] and its authors made the assumption that the coexistence of NC with gliomas may be an incidental finding in patients from areas of high prevalence and endemicity.

In our case the MRI of 2009 showed predominant enhancing lesion in the corpus callosum along with multiple ring enhancing lesions of NC. But the index patient did not get any attention to that predominant enhancing lesion in corpus callosum which might be a low grade glioma. After 2 years, repeat MRI showed the same predominant lesion with significant change in size and characteristics in favor of high grade glioma. The patient underwent surgery and histopathologically it was confirmed to be a case of GBM. From this fact it is presumed to be a case of secondary GBM, which had developed from recognizable precursor lesion that may be a low grade glioma. Although the role of NC in this transformation is a matter of debate. The intense astrocytic gliosis that surrounds calcified cysticerci, together with the suppression of the cellular immune response induced by cysticerci, may contribute to the development of malignant glial cells in patients with NC.

Though the co existence of NC and gliomas is rare and intriguing, it is not a mere coincidence, might be more than that. Further studies are warranted to confirm this hypothesis.

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