De novo gliosarcoma occurring in the posterior fossa of a 11-year-old girl

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Sir, – Gliosarcoma, a tumor that displays a biphasic histomorphology, with glial and mesenchymal areas, is now considered to be a monoclonal neoplasm resulting from aberrant mesenchymal differentiation of glial cells and hence considered to be a variant of glioblastoma. These tumors constitute 2% of all glioblastomas. They usually manifest in adults and are commonly located in the supratentorial region, with the posterior fossa being a rare site [1]. Gliosarcomas occurring in children are very rare, with few reported cases following whole brain irradiation for other pediatric malignancy [2, 3, 4]. We report, for the first time in literature, an unusual case of a de novo gliosarcoma in an 11-year-old girl occurring in the posterior fossa.

A 11-year-old girl presented to the neurosurgical outpatient services of our hospital with headache, vomiting and swaying while walking for 1 month. There was no history of fever, double vision or seizures. Past and family histories were non-contributory. There was no history of receiving cranial irradiation prior to this illness. On examination, she was conscious, alert and responded to commands. There was bilateral appendicular ataxia. There was no sensory or motor deficit. Bilateral papilledema was observed on fundoscopy. Her routine hematological and biochemical investigations were within normal limits. Cranial magnetic resonance imaging (MRI) was performed and showed irregularly enhancing lesion in the cerebellar vermis extending bilaterally. The lesion was hypointense on T1 weighted and hyperintense on T2 weighted images and was homogeneously enhancing on contrast (Figure 1A, B). With the above features, a clinical diagnosis of tuberculoma of cerebellum was considered and she underwent subtotal occipital craniotomy and gross total decompression. At surgery, the lesion was firm and reaching the surface of the cerebellum.

Grossly, the tumor was in multiple pieces, white, glistening with areas of hemorrhage and necrosis. Microscopically the tumor was highly cellular, consisting of tightly packed clusters of tumor cells exhibiting a biphasic pattern, with glial and sarcomatous areas. The glial component consisted of fibrillary and gemistocytic astrocytes whilst the mesenchymal component comprised of spindle cells with myxoid stroma. Both components revealed malignant features and the cerebellum were compressed by the tumor (Figure 1C, D, E, F). There were areas of necrosis within the tumor. Rich reticulin response was noted in the mesenchymal component on reticulin silver stain (Figure 2B). GFAP immunoreactivity was confined to the glial component whilst vimentin positivity was seen in both components. High MIB-1 and p53 labeling was evident in both components, reflecting the monoclonality of the tumor (MIB-1 labeling index reached 25% in glial zones and 12% in the mesenchymal areas) (Figure 2C, D, F). The tumor was negative for epithelial membrane antigen (EMA) and synaptophysin, which excluded the diagnosis of anaplastic ependymoma, meningioma or glioneuronal tumor. In view of the above features, the diagnosis of de novo pediatric gliosarcoma was made.

Gliosarcomas were first described by Stroebe in 1985 and they gained wide acceptance after the landmark paper of Feigen and Rubinstein [5]. They constitute 2 – 8% of glioblastomas in various reported series [2, 3, 4, 5, 6]. Generally these tumors occur in the age group of 40 – 60 years with only a handful of reported cases in children. They commonly occur in the supratentorial region with the temporal lobe being the commonest site followed by the parietal, frontal and occipital lobes. These tumors are also reported in rarer sites like interventricular, spinal cord, brain stem and posterior fossa [1, 2, 3, 4, 5, 6, 7].

Sarkar et al. [2] studied 29 cases of gliosarcoma, out of which 3 were in the pediatric age group. The youngest age recorded was 9 months and all these tumors were in the supratentorial region. Radotra et al. [3] reported 19 cases, with only one occurring in the pediatric...
age, involving the supratentorial region. None of the cases in the series of primary gliosarcoma reported by Kumar et al. [6] were in the posterior fossa or in the pediatric age group. To date there are only 3 cases of gliosarcoma occurring in posterior fossa that have been reported, and all have been in adults [8]. This is the first case of de novo gliosarcoma to be reported in the posterior fossa in a child.

The histogenesis of this rare neoplasm is not fully understood. Initially, these were considered collision tumors, wherein the sarcomatous component develops from the exuberant proliferation of the cells lining the blood vessels. This theory was supported by positive staining of the sarcomatous component for the vascular markers, like Factor VIII related antigen and Ulex europaeus agglutinin. The second was the composite theory, where neoplastic transformation in one component induces transformation in another. The third was the transdifferentiation theory, which states that the sarcomatous component results from advanced glioma dedifferentiation with subsequent loss of GFAP expression and acquisition of sarcomatous phenotype. This hypothesis is supported by uniform expression of p53 in both components (as observed in our case), identical PTEN mutation, p16 deletion and co-amplification of MDM2 and CDK4 in both components [1]. It has been observed in the literature that gain/amplification of genes on the proximal part of chromosome 12q may facilitate the development of a sarcomatous phenotype [9].

On neuroimaging, tumors with a predominant glial component will have features similar to glioblastoma, whereas those with a predominant sarcomatous component appear as well demarcated hyperdense masses with homogenous contrast enhancement, as seen in our case. The common radiological differential diagnosis of gliosarcoma in the posterior fossa includes glioblastoma, tuberculoma, hemangioblastoma and medulloblastoma [1, 2, 3, 4, 5, 6].

Histopathologically, gliosarcomas are biphasic tumors, composed of two distinct malignant cell populations. The gliomatous component is composed of astrocytes and exhibits endothelial proliferation and necrosis. The sarcomatous component is a fibrosarcoma in most cases; however, aberrant differentiation patterns resembling osteosarcoma, chondrosarcoma, angiosarcoma, and rhabomyosarcoma have also been reported [1, 6, 8]. The mono-
De novo occurrence in the posterior fossa is rare and it needs to be differentiated from tuberculoma, anaplastic ependymoma, hemangioblastoma, and medulloblastoma. De novo occurrence in the pediatric age group is being reported for the first time.

In conclusion, occurrence of gliosarcomas in the posterior fossa is rare and it needs to be differentiated from tuberculoma, anaplastic ependymoma, hemangioblastoma, and medulloblastoma. De novo occurrence in the pediatric age group is being reported for the first time.

References


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