Lipidization of the low-grade astrocytic tumor is a very rare phenomenon. We report a case of pilocytic astrocytoma with adipocytic differentiation involving the left cerebellar hemisphere and pontis in an 11-year-old boy. Till date, very few such cases have been reported in children. A young boy presented with a clinical picture suggestive of cerebellar dysfunction since 7 months. Imaging revealed a mass lesion involving the left cerebellar hemisphere measuring 4.5 × 4.1 cm. Subtotal excision of the tumor was carried out. Microscopic features were typical of pilocytic astrocytoma but with extensive lipidization of tumor cells. Immunohistochemically, the tumor cells were immunoreactive to glial fibrillary acidic protein, S-100, and immunonegative to p53 and isocitrate dehydrogenase 1. Ki-67 labeling index was 1%. The patient had an uneventful postoperative period and is doing well on follow-up. An extensive review of prior work was carried out to elucidate the clinicopathologic significance of this entity, if any, with special reference to the pediatric age group.

Keywords: Adipocyte, astrocytoma, pilocytic

INTRODUCTION

Primary glial tumors rarely show mesenchymal differentiation. Lipomatous change in astrocytic tumors is even rarer, and it was first described by Kepes and Rubinstein[1] in 1981. Astrocytic tumors showing lipomatous differentiation include the ependymoma and pilocytic astrocytoma.[2] Recent work on the ependymoma has suggested that lipomatous differentiation may be a harbinger of a “tenacious” biological course.[3] The clinical, radiological, and histopathological features of cases showing this pattern have seldom been studied. Herein, one such case of adipocyte-like morphology in a pilocytic astrocytoma is reported. Only few cases have been reported in the pediatric age group, with the current case being the first from India. A brief literature review is also incorporated to elucidate the clinicopathologic connotations of this phenomenon, especially in children.
hemisphere and left brachium pontis causing midline shift. The lesion was hyperintense on T2-weighted/ fluid-attenuated inversion recovery (FLAIR) images and isointense to hypointense on T1-weighted scans [Figure 1]. Abdominal and chest CT as part of staging workup did not reveal any metastases. The patient had a prior operative intervention 2 months back at a local center, where a right ventriculoperitoneal shunt had been inserted.

**Operative Findings**

Subtotal tumor excision was performed via a midline suboccipital craniotomy. Peroperatively, a solid cystic posterior fossa mass was noted 2 cm below the surface. After decompressing the cystic component, a grey–white moderately vascular mural nodule was observed. As the lesion had an ill-defined plane of cleavage, a small portion infiltrating the roof of the fourth ventricle could not be completely excised.

**Histopathological Findings**

Histologically, a cellular tumor was noted, which was composed of bipolar astrocytes in sheets and fascicles. Hypercellular and hypocellular areas were noted with individual tumor cells having a piloid configuration. Microcystic foci and hyalinized vessels were interspersed. Large areas (60%–70%) of the tumor showed an adipocytic appearance on hematoxylin and eosin stain (H&E) [Figure 2A and B]. Periodic acid–Schiff and Alcian blue stains were carried out to rule out the presence of mucinous change, which in this case was negative. Cytoplasmic rims of the tumor cells were immunopositive for glial fibrillary acidic protein (GFAP) and S-100, ascribing to a glial lineage of the tumor [Figure 2C and D]. The tumor cells were negative for isocitrate dehydrogenase 1 and p53. Ki-67 labeling index was 1%. Extensive sampling failed to reveal histologically aggressive features of necrosis, atypia, mitotic figures, or vascular proliferation. A clear
transition between the non-lipomatous and lipidized areas was not apparent in this case, with the fat vacuoles blending in with individual cells. A diagnosis of pilocytic astrocytoma (the World Health Organization Grade I) with lipomatous change was offered. The patient is currently on close follow-up and is doing well.

**DISCUSSION**

Lipidization of glial tumors is a well-recognized, albeit, infrequently encountered phenomenon. The exact etiopathogenesis of glial lipidization is not well understood. Some of the proposed mechanisms behind this change include anoxic damage, hamartomatous change, adipocytic metaplasia of neuroectodermal cells, and fatty degeneration of neoplastic cells. Immunoexpression of the same tumor cells to both GFAP and S-100 may point toward true adipocytic metaplasia in glial cells as seen in our case, though many authors negate this hypothesis.

Lipomatous differentiation in tumors of central nervous system (CNS) may be seen in two forms. The first is the xanthomatous change, which refers to the presence of multiple intracytoplasmic lipid vacuoles, as seen in lipidized glioblastoma and pleomorphic xanthoastrocytoma. The other form is characterized by an adipocyte-like morphology of an individual tumor cell, that is, the presence of a single coalescent lipid vacuole within the cytoplasm. This has been described in CNS neurocytoma, ependymoma, cerebellar neurolipocytoma, and medulloblastoma. Lipomatous differentiation in pilocytic astrocytoma is one of the rarely reported entities.

A review of the literature identified four prior cases of astrocytoma showing lipomatous differentiation in children, clinicopathologic profile of which is summarized in Table 1. The mean age of involvement was 8.8 years. Four cases have previously been described in the pediatric age group. The majority of these cases (60%) showed definite piloid-like features histologically. Another case that was devoid of piloid features initially, developed frank pilocytic astrocytoma on follow-up. Most cases were well circumscribed, and the tumor was totally excised in three of them. A subtotal tumor excision was performed in our case because of lack of a definite cleavage plane.

Notably, three of the four previously reported pediatric cases showed local recurrence, secondary malignancy, or fatality. Our case, however, at 1 year of...
follow-up has not shown any recurrence or metastases. The management protocol employed herein involved gross resection followed by radiological surveillance. The role of adjuvant therapy is still not known. Other tumors with lipidization such as liponeurocytoma and lipidized medulloblastoma show favorable prognosis as compared to their corresponding non-lipidized variants. However, a recent report on the “lipomatous” ependymoma suggested a tendency to recur.

To conclude, lipidization is a rare change in pilocytic astrocytoma and merits a cautious follow-up of the patient. Larger retrospective studies are required to validate the exact clinical outcome of these cases.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References
1. Kepes JJ, Rubinstein LJ. Malignant gliomas with heavily lipidized (foamy) tumor cells: a report of three cases with immunoperoxidase study. Cancer 1981;47:2451-9.
2. Ruchoux MM, Kepes JJ, Dhellemmes P, Hamon M, Maurage CA, Lecomte M, et al. Lipomatous differentiation in ependymomas: a report of three cases and comparison with similar changes reported in other central nervous system neoplasms of neuroectodermal origin. Am J Surg Pathol 1998;22:338-46.
3. Gaur K, Batra VV, Gupta R, Sharma MC, Narang P, Pandey PN. Lipomatous ependymoma: report of a rare differentiation pattern with a comprehensive review of literature. Brain Tumor Pathol 2016;33:209-15.
4. Leech RW, Alvord EC Jr. Glial fatty metamorphosis. Am J Pathol 1974;74:602-10.
5. Roncaroli F, Scheithauer BW, Laeng RH, Cenacchi G, Abell-Aleff P, Moschopulos M. Lipomatous meningioma: a clinicopathologic study of 18 cases with special reference to the issue of metaplasia. Am J Surg Pathol 2001;25:769-75.
6. Kepes JJ. Pleomorphic xanthoastrocytoma: the birth of a diagnosis and a concept. Brain Pathol 1993;3:269-74.
7. Cenacchi G, Giangaspero F. Emerging tumor entities and variants of CNS neoplasms. J Neuropathol Exp Neurol 2004;63:185-92.
8. Giangaspero F, Kaulich K, Cenacchi G, Cerasoli S, Lerch KD, Breu H, et al. Lipoastrocytoma: a rare low-grade astrocytoma variant of pediatric age. Acta Neuropathol 2002;103:152-6.
9. Massimi L, Caldarelli M, D’Alessandris QQ, Rollo M, Lauriola L, Giangaspero F, et al. 12-year-old boy with multiple brain masses. Brain Pathol 2010;20:679-82.
10. Craver R, Arcement C, Chrientery Singleton T. Diffuse pontine astrocytoma with lipocytic differentiation. Ochsner J 2012;12:244-8.