

Anaplastic Pilocytic Astrocytoma: The “fusion” of good and bad

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Abstract

Pilocytic astrocytoma is considered by the WHO classification of the CNS tumors (2007) as a benign neoplasm (grade I), whereas the same taxonomy applies to anaplastic astrocytoma a high grade of malignancy (grade III). The occurrence of tumors combining both features of pilocytic and anaplastic astrocytomas has been already described previously in a few case reports.

Herein, we present the case of a three years old boy, who presented signs and symptoms consistent with obstructive hydrocephalus caused by an intracerebellar neoplasm. The latter demonstrated both solid and cystic areas and contrast enhancement in the performed magnetic resonance imaging (MRI). The microscopic evaluation of the excised specimens showed the typical biphasic pattern of pilocytic astrocytoma together with Rosenthal fibers, eosinophilic granular bodies (EGBs) and hyaline droplets but also anaplastic features such as hypercellularity, endothelial proliferation, high mitotic index and focal necrosis.

Due to the rarity of this neoplasm and the absence of definite diagnostic criteria and exact grading, there are no consistent therapeutic approach, which in turn allows no accurate prognosis and prediction to be made. Therefore, it is our belief that this combined tumor should be reviewed accordingly and included as a distinct entity in WHO classification of CNS tumors.

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Introduction

Astrocytic neoplasms are divided in four grades, according to the WHO (World Health Organization) Classification of Tumors of the CNS (2007), dependent on specific histomorphologic features, which are in accordance to their biological behavior¹. Pilocytic astrocytoma (PA) was found to represent -with a prevalence of 18,2%- the most common intracerebral tumor in 1195 affected children². It is defined as grade I tumor and is characterized by its relatively well

circumscription, its slow growth and the frequent presence of cystic changes. Anaplastic astrocytoma (AS), on the other hand, is a grade III tumor with a malignant potential and has further a propensity to develop to glioblastoma multiforme (GBM)¹. The occurrence of astrocytoma with characteristics of both entities, namely pilocytic and anaplastic is rare, and one such case will be discussed below.

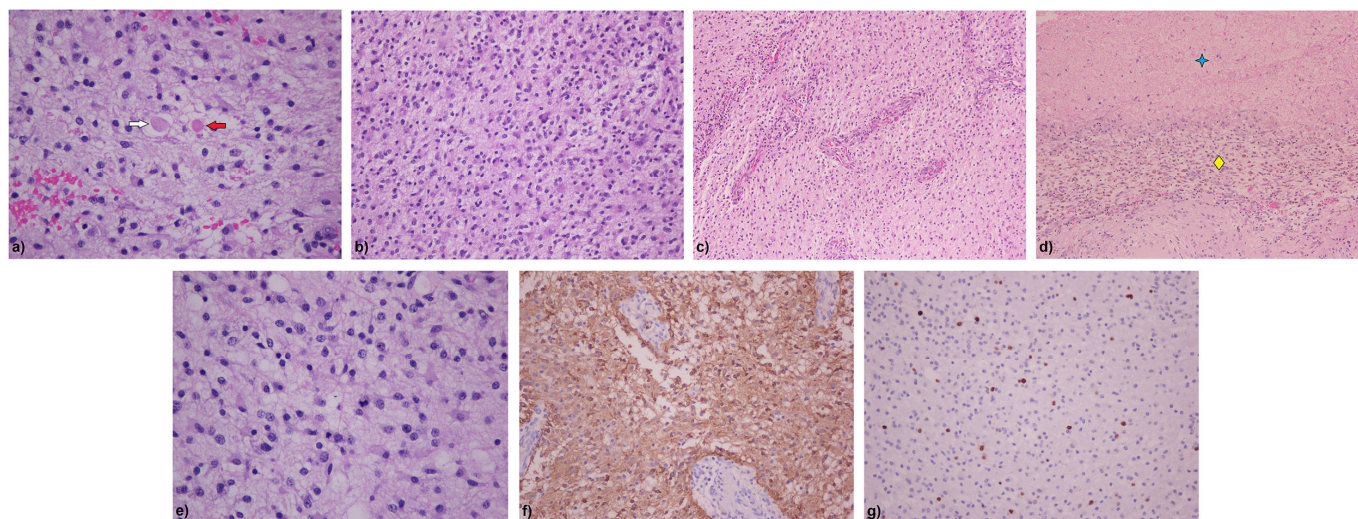


Figure 1:

- a) Presence of eosinophilic granular bodies (EGBs; white arrow) and hyaline droplets (red arrow) (Hematoxylin & Eosin, x 400).*
- b) High cellularity in combination with cellular and nuclear pleomorphism (Hematoxylin & Eosin, x 200).*
- c) Vessels with endothelial proliferation (Hematoxylin & Eosin, x 100).*
- d) Necrosis (blue star) next to an old hemorrhage with numerous hemosiderophages (yellow rhombus) (Hematoxylin & Eosin, x 100).*
- e) Two mitoses in one high power field (Hematoxylin & Eosin, x 400).*
- f) High expression of the astroglial marker GFAP (IHC, x 200).*
- g) Nuclear accumulation of Ki67/MiB1 in the neoplastic cells (IHC, x 200).*

Description of case

A three years old boy was admitted to our hospital, with a four months symptomatology of vomiting, nausea and unstable gait. The clinical examination revealed full consciousness, sluggishness, gait ataxia and papilledema.

The radiological examination, which was carried out, identified a solid tumor mass combined with cystic changes, which was located in the posterior fossa. In addition, the tumor showed contrast enhancement and caused occlusive hydrocephalus, along with the above mentioned clinical symptomatology. One week later, an operation was performed and the extracted specimen of the neoplasm was sent for pathological evaluation.

The tumor was characterized macroscopically by a yellow-pale color, clear defined borders, negligible vascularity and cystic changes. The histopathological assessment revealed an astrocytic neoplasm consisting of alternating areas; on the one hand with bipolar (pilocytic) and on the other hand with multipolar (protoplasmic) astrocytes. In the above mentioned regions both Rosenthal fibers and eosinophilic granular bodies (EGBs) together with hyaline droplets (Figure 1a) were identified, respectively. In addition, areas with increased cellularity and significant cellular and nuclear pleomorphism were seen (Figure 1b). Further characteristic histomorphological features of the neoplasm included endothelial proliferation (Figure 1c), a necrotic focus adjacent to an old hemorrhage (Figure 1d), as well as a high mitotic index; ten mitoses per ten high power fields (10/10 HPFs) (Figure 1e). The performed immunohistochemistry showed diffuse positivity of the neoplastic cells for glial fibrillary acidic protein (GFAP) (Figure 1f), whereas the

proliferative index Ki67/MiB1 reached an average of 7% (Figure 1g).

Discussion

As it was mentioned previously, PA is a benign astrocytic tumor, which can emerge from almost all parts of the central nervous system (CNS)¹. However, in pediatric population shows a predilection for infratentorial regions, with the majority of them arising in the cerebellum and no supratentorial cases were identified in patients less than 18 years of age in a study carried out by Ohgaki and Kleihues³. Our case showed radiologically the classic appearance that has been described in two-thirds of all PAs, thus a cystic mass with an enhancing mural nodule⁴. Furthermore, as it has also been described in the present neoplasm, PAs are characterized in the microscopic level by low to moderate cellularity and a biphasic pattern, consisted of densely fibrillated areas with bipolar cells and often Rosenthal fibers as well as a second population of cytoplasmic astrocyte-like cells, within which eosinophilic granular bodies (EGBs) or hyaline droplets can be observed. Apart from the above referred histological features, our case showed classic signs of anaplasia, specifically hypercellularity, considerable cytologic/nuclear atypia, brisk mitotic activity, microvascular proliferation and necrosis⁵. These latter findings are consistent with an anaplastic astrocytoma, according to the criteria of WHO for the tumors of the CNS¹.

Although, in the WHO Classification of CNS tumors (2007), no definitive criteria for the diagnosis of anaplastic pilocytic astrocytoma exist, a large study of 34 such cases carried out by Rodriguez et al. proposed the minimal requirements for setting this diagnosis⁶. However, in a small number of previously published case reports there is a considerable

difference in the appraisal of histomorphological characteristics corresponding to anaplasia. Therefore, a consensus should be made

considering the diagnostic criteria and grading of this tumor entity, which would further assist in the decision of the right treatment.

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