Suprasellar Pilomyxoid Astrocytoma With Leptomeningeal Dissemination In An Infant: A Case Report And Review Of The Literature

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ABSTRACT

Pilomyxoid astrocytoma (PMA) is a rare entity added to the 2007 WHO classification of tumors of the central nervous system for the first time. Recently in the literature, PMA have been further studied with regard to their occurrence, clinical and radiological features and treatment strategy. We present a case of an 8-month-old boy presented at the Emergency Department for suddenly lose consciousness, macrocephaly, anisocoria and no previous health problems, CT and MRI showed an obstructive hydrocephalus due to a multilobulated solid lesion centrally located (epicentre) in the suprasellar region with diffuse leptomeninges-based enhancing lesions in the brain, especially in the tentorial region, and spine. A biopsy revealed a glial neoplasm consistent with an aggressive PMA. To the best of our knowledge, there are no other reports of PMA with similar radiological findings in infants younger than 1 year.
INTRODUCTION:
Pilomyxoid astrocytoma (PMA), introduced as a distinctive entity in 1999 by Tihan et al. [1] and firstly described by Janisch et al [2] in 1985, is a rare entity, recently recognized as a variant of pilocytic astrocytoma (PA). It has been added to the 2007 WHO classification of tumors of the central nervous system [3]. The grading of PMA has been changed in 2016 WHO Classification of tumors of the central nervous system [4].

While previously designated as WHO grade II, recent studies have shown extensive histological and genetic overlap between pilomyxoid and PA, with some of the former maturing into the latter over time and less certainty that the pilomyxoid variant always follows a more aggressive course than a more classic appearing suprasellar pilocytic astrocytoma. It is not clear that PMA should be assigned to WHO grade II and the suggestion was made to suppress grading of pilomyxoid astrocytomas until further studies clarify their behavior [4].

PMA predominantly affects the hypothalamic/chiasmatic region and leptomeningeal dissemination occurs more frequently than PA [5]. We report the clinical course, comorbidity, radiological, and histological features of a leptomeningeal disseminated pilomyxoid astrocytoma in an 8-month old infant with radiological findings consistent with slow growth. A review of the relevant literature is also presented.

CASE REPORT
Clinical history and radiological findings
An 8-month-old boy presented at the Emergency Department for suddenly lose consciousness. He had macrocephaly, anisocoria with pupils reagents little to light. Hypertonia was documented.

No response to stimuli and language absence were showed. No previous health problems, even during the peri- or neonatal periods. The patient was undergone brain Computed Tomography (CT) that showed an obstructive hydrocephalus due to a cerebral lesion centrally located in the suprasellar region, with no evidence of calcifications. A ventriculoperitoneal shunt was positioned.

Magnetic Resonance Imaging (MRI) of the brain and spine with gadolinium revealed a multilobulated solid lesion centrally located (epicentre) in the suprasellar region associated with perilesional (adjacent) enlargement of cerebrospinal fluid spaces and hypoplasia of the frontal lobe.

The fronto-parietal region of right hemisphere showed subacute hyschemia. Diffuse leptomeninges-based enhancing lesions in the brain, especially in the tentorial region, and spine were detected (Figures.1,2,3).

A biopsy of the lesion were performed and the histological examination of the specimen revealed a glial neoplasm consistent with an aggressive pylomyxoid astrocytomaI with high malignancy features as large vessels proliferation with focal necrosis.

Postoperatively, was performed a CT that disclosed an intralesional hemorrhage with an associated blood component in the lateral ventricles and right hemisphere ischemia.

No therapy was performed in the meantime. A palliative treatment and his transfer to a regional hospital was planned.
Fig. 1: MR Axial and coronal T2-weighted (a,d), ADC map (b), axial GRE (c), coronal and sagittal T1-weighted with gadolinium images of brain show a multilobulated solid lesion, predominantly well-defined, centrally located in the suprasellar region associated with diffuse leptomeninges-based enhancing lesions. Sagittal T1-weighted image of spinal cord (g) shows multiple enhancing lesions in the subarachnoid space.

Fig. 2: MR coronal T2-weighted (a), DWI (b) and ADC map (c) images show the right fronto-parietal subacute hyaline(nzemia (arrows). Coronal TOF multiparametric reconstruction shows encasement and of the Circle of Willis.

Fig. 3: MR coronal (a) and axial (b) T2-weighted images show a perilesional enlargement of cerebrospinal fluid spaces, hypoplasia of the frontal lobe and falx cerebri, remodeling of anterior bone skull fossa with distortion of olfactory traits and scalloping of the adjacent bone.
DISCUSSION

Recently in the literature, PMA have been further studied with regard to their occurrence, clinical and radiological features and treatment strategy [6]. PMA is considered a tumor of pediatric population and tend to affect younger age group as compared to PA [7, 8]. A recent study, Alkonyi B. et al. analyzed a population group of 15 children and confirm the younger age at tumor diagnosis compared to PAs. Their median age was 19 months, in accord to current literature (18 months) [9,10]. PMAs are mainly pediatric tumor, but reports have indicated that PMA can occur also in adolescents and adults. In their study, L.L.Linscott et al. revealed a larger age range with a mean age at presentation of 7 years. One third of their patients were adolescents and young adults [11].

PMA histology consists of a markedly myxoid matrix, with small, compact, piloid and highly monomorphous cells. Tumor cells are often located radially around vessels in a pattern that resembles the perivascular rosettes found in ependimomas [Burger PC 2005].

In 2013 Bhargava D. et coll reviewed the histology of all cases coded as Astrocytoma in the histopathology archives from 1990 to 2003 and only the cases coded as PA or PMA were included. A population group of 91 patients (range 1-17 years) were analyzed, first study about the incidence of this tumor entity. Their results show that 9 patients had histological features of PMA (8 children and 1 adults). PMAs constitute about 10% of tumour previously diagnosed as PAs. The mean age at diagnosis was 3.33 years. In this study, the difference compare to data from literature may due to European setting of the study population based on geographic and cultural variation in disease demographics [6].

PMAs show a predilection for the hypothalamic/chiasmatic region [8, 9], nearly 2/3rds, but may occur anywhere along the neuraxis. L.L.Linscott et al. found that in almost half of patients PMA lesion was located outside this typical region (parietal lobe, temporal lobe, cerebellum, basal ganglia and fourth ventricle). The tumor in the adult age is mostly located in the hypothalamo-chiasmatic region [6, 11]. PMA has been shown to have a more aggressive behaviour with shorter volume doubling time [12] and worse prognosis as a result of higher recurrence rates, more frequent cerebral spinal fluid (CSF) dissemination and difficult in resection [13] compare to PA. CSF dissemination for PA was reported but it is rare [8].

Alkonyi B. et show a significantly higher MRI evidence of CSF dissemination at the time of diagnosis compared to PAs. Patients with PMA show shorter progression-free survival and higher local recurrence than those with PAs [9].

No difference in clinical presentation at diagnosis between the PMAs and PAs. Headaches was the most common symptom, followed by ataxic gait, nausea, diplopia and seizures. In the younger population are recorded developmental delay, failure to thrive, irritability, altered level of consciousness, feeding difficulty, vomiting, hemiparesis, and increasing head circumference [6].

Radiological features of PMAs reported in the previous studies are similar in the description. MRI is routinely performed to delineate the CNS neoplasm findings. This entity is well circumscribed, isointense on T1-weighted images and hyperintense on T2-weighted images, may have solid or cystic components without evidence of peritumoral edema or parenchymal infiltration and an usually homogeneous enhancement after the injection of gadolinium. Hydrocephalus was noted in 20% of cases. Khanani et al.[14] highlighted that radiological features in their case resemble the findings of Tihan et al.[1] and Arslanoglu et al.[8], who described typical pilomyxoid tumors as enhancing lesions with central cystic component.

Nabavizadeh SA. et al. [13] found that PMA can be differentiated from PA with high degree of accuracy using Arterial Spin Labeling (ASL) perfusion imaging. In addition their results did not show any difference in diffusion imaging ADC values between PA and PMA, in keeping with previous studies which demonstrated that
neither of these tumors show restricted
diffusion [10,11]. No singular neuroimaging
feature can actually reliably diagnose
PMA. Our case was radiologically
characterized by a polylobulated lesion with
well circumscribed margins, dysomorphic
gointense on T1-weighted images, hyperintense on T2-weighted images. After
injection of gadolinium, the lesion showed an
heterogeneous markedly enhancement of the
solid component with a central areas of
hypointensity in T1, probably do to necrosis
based on DWI features. It was observed a
tentorial dural and lateral ventricles ependyma
enhancement. An encasement of the Circle of
Willis was found and on the right emisfere, in
the fronto-parietal and basal ganglia region,
ischemic appearance of the brain parenchyma
was detected. They were also present
perilesional enlargement of cerebrospinal fluid
spaces and hypoplasia of the frontal lobes.
These last finding are suggesting for slow
growth development or hypothesis of a
congenital lesion. To the best of our knowledge,
there are no other reports of PMA with similar
radiological findings in infants younger than 1
year. In the literature, patients with low-grade
astrocytomas rarely present spontaneous
intracranial hemorrhage, and only few authors
have described bleeding associated with
pilocytic astrocytoma [15]. High-grade gliomas
and metastatic lesions bleed from involvement
of neoangioiogenesis vessels and tumor invasion
of vessels. However, the mechanisms
underlying hemorrhage in low-grade gliomas
remain unclear. Two case of pilomyxoid
astrocytoma presenting with intracranial
hemorrhage have been reported [15,16].
Hamada et al. [15] described a case initially
admitted with a suprasellar and third ventricle
lesion characterized by acute intracranial
hemorrhage, and a second fatal hemorrhage 4
months after the first operation. Gottfried et al.
[16] report a case of acute spontaneous
hemorrhage associated with a pilomyxoid
astrocytoma in a 24-year-old man, unusual age
onset for PMA. The location of the lesion
induced to consider in the differential diagnosis
hypothesis a glioma related to
Neurofibromatosis type 1 (NF1). Alteration in
the NF1 gene can lead a wide range of
complications, including the development of
benign and malignant neoplasms. Intracranial
tumors are the bigger group of NF1-associated
neoplasms and the age range more affected is
under age of 10 years. In the literature are
reported 3 cases of PMAs patient with NF1
[11,14]. All patients presented with PMA in the
optic pathway/hypothalamus/third ventricle
region. It is reported a rare case of PMA
associated with Williams Syndrome in a 3 years
old boy. The tumor location was the
cerebellum. Williams syndrome apparently is
not correlated with a predisposition for tumor,
but several patients have developed malignancy
in childhood and younger adults. The tumors
was limited to lymphomas and gliomas [17]. It
is also reported a patient with Noonan
Syndrome that develop an optic
pathway pilomyxoid astrocytoma [18].

CONCLUSION
PMA was previously considered as a more
aggressive entity compare to PA occurring in
younger children. Recent studies have shown
extensive histological and genetic overlap
between PMA and PA with less certainty that
the pilomyxoid variant always follows a more
aggressive course than a more classic appearing
suprasellar pilocytic astrocytoma.
Our case show a PMAs with the epicentre in the
suprasellar region, most common location of
this entity, in a 8-month-old boy with
leptomeningeal dissemination. The very young
age, the associated radiological feature of
perilesional enlargement of cerebrospinal fluid
spaces and hypoplasia of the frontal lobe
suggest to consider the hypothesis of a
congenital origin. Further studies should
investigate this correlation.

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