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Case Reports

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Papillary Glioneuronal Tumor - a New Variant of Benign Mixed Brain Neoplasm

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We report a case of a 14-year-old girl with papillary glioneuronal tumor (PGNT) in right parietal lobe. On MRI the tumor presented as a contrast enhancing mass with small central hypodense area and consisted of areas similar to central neurocytoma intermixed with vessels surrounded with glial cells. There were also small loose areas superficially reminding DNT. Neurocytic component presented strong synaptophysin immunostaining, while intermixed glial element presented GFAP-immunopositivity. Our case is similar to previously reported PGNT, but an important difference lies in not distinct cystic formation and a presence of loose, edematous tissue. PGNT may be regarded as a variant of ganglioglioma or as a complex variant of extraventricular neurocytoma and belongs to a wide group of benign, dysembryoplastic or even hamartomatous neuroepithelial tumors, which may differentiate into both, glial or neuronal direction: pleomorphic astrocytoma may posses neurocytic differentiation, desmoplastic infantile ganglioglioma may be regarded as complex superficial dural astrocytoma and DNT may present gliomatous areas (complex DNT). Also other rare tumors reminding DNT have been reported: DNT-like neoplasm of septum pellucidum and rosetted glioneuronal tumor. From this point of view it is important to remember that such a wide spectrum may be difficult to discriminate into very narrow clinico-pathological entities.

Introduction

The last WHO classification of central nervous system adopted only a part of described benign neuroglial neoplasms: desmoplastic infantile ganglioglioma, dysembrioplastic neuroepithelial tumor and usual ganglioglioma regarding them as distinct entities [13]. Other, as rosetted glioneuronal tumor or papillary glioneuronal tumor were not included as separate entities; the latter was regarded a variant of ganglioglioma [5, 9, 11, 13].

Papillary glioneuronal tumor (PGNT) was primarily described in 1997 in temporal lobe as a pseudopapillary neurocytoma with glial differentiation, and this name well corresponded with the morphology and immunohistochemical profile of this tumor [12]. Following this report, other nine cases of similar neoplasms were presented under the name PGNT [14]. This benign tumor occurs in both sexes in a wide range of age (4 - 52 years) and presents as a cystic, well demarcated contrast enhancing mass [3, 6, 14, 20].

We present here a case of PGNT.

A Case Description

This 14-year-old girl had a general tonic/clonic convulsion without focal signs, just before this she was well. Later that day she was wide awake, with no abnormalities on physical examination. Cranial CT performed without contrast was normal. Standard EEG was also normal, and she was discharged with no medication. A few weeks later, she had two new epileptic attacks, and treatment with Carbamazepin was introduced with no other further attacks. MR examination was performed a few months later and was abnormal: in the left parietal lobe there was a small, contrast enhancing tumor with central unenhancing area (Fig. 1). One year postoperatively there was no sign of tumor recurrence and after 6 months antiepileptic drugs medication was stopped.

The tumor was sent for study by a pathologist in a few small pieces. Microscopically it consisted of different intermixed areas (Fig. 2). The most common was a component similar to central neurocytoma, with small, bland-looking cells within neuropil like stroma. This more compact element was accompanied with more loose, reminding DNT areas, which dominated on frozen section. This element was separated by the massive vessel proliferation, giving a "pseudopapillary" picture. Neurocytic component presented intensive synaptophysin-immunoreactivity. GFAP-immunostaining revealed diffuse immunoreactivity in cells surrounding vascular pro-

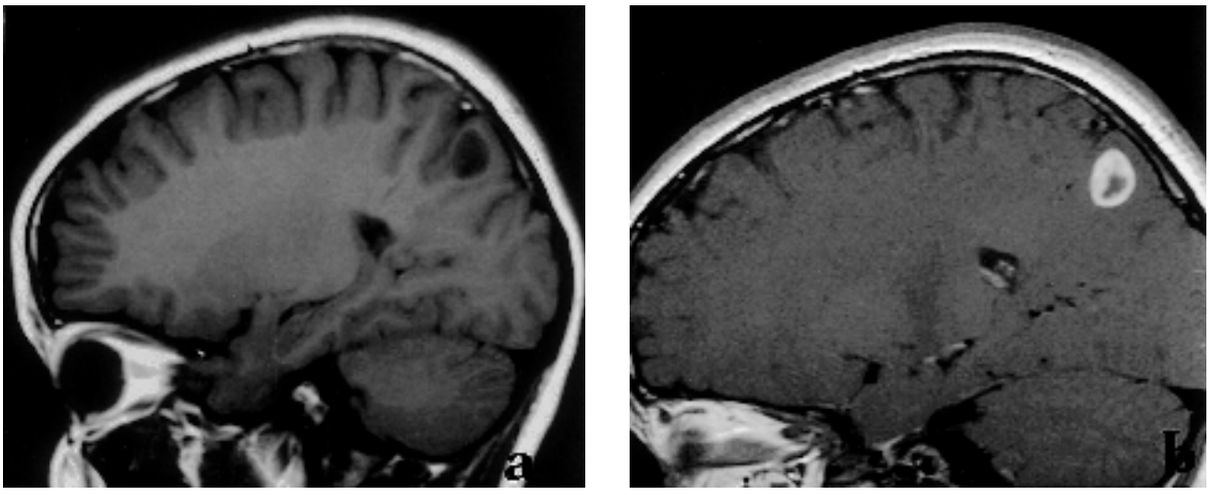

Fig. 1. a. MRI showing a small pericortical mass; b. contrast enhancement reveals a small cystic space in the tumor center .

liferations, but GFAP-positive cells were also scattered in between "neurocytic" cells. No neuronal or gangliocytic - more differentiated cells - were identified.

Discussion

PGNT presents mostly as asymptomatic or mildly symptomatic [14]. Our patient had only three epilepsy attacks, responding well to standard therapy. In many aspects our case is similar to previously reported PGNT, but an important difference lies in the not distinct cystic formation - we had only a small central, not contrast enhancing mass. Other important observation, is a presence of one piece of the tumor composed only of loose area superficially reminding DNT, but with strong synaptophysin immunopositivity.

As already mentioned, similar tumors were described under different denominations [1, 4, 8, 12, 14, 18]. The first reported case of this tumor presented as a mixture of neurocytic areas and vessels surrounded with glial cells - features similar to our case - and which was a basis for a proposed name "pseudopapillary neurocytoma with glial differentiation" [12]. More recent studies revealed that similar tumors may possess not only neurocytic, but also better differentiated neuronal cells as ganglioid or ganglion cells [4, 8, 14], and a name PGNT was proposed for these tumors. In our opinion, papillary structures in PGNT are not real, thus this tumor should be named as a pseudopapillary neoplasm (pseudopapillary glioneuronal tumor).

Ishiuchi et al. cultured cells from three cases of typical central neurocytomas and found that two different cell populations developed: matured neuron-like cells with neurofilament proteins and glial cells possessing GFAP [10]. No coexpression of these antigens was found. This experiment clearly shows, that cells from classical central neurocytoma exhibit both neuronal and glial differentiations and have properties reminiscent of precursor cells. Similar results obtained Westphal et al. [23]. In this light, it is not surprising that a neurocytic tumor has a ganglioneurocytic [7], or mixed glioneuronal counterpart. An interesting case was reported by Schweitzer et Davies - 18 years following excision of a typical central neurocytoma, a patient had a recurrence showing features of neurocytoma and ganglioglioma [21].

Glial differentiation is not the only one described in neurocytoma - unusual case with rhabdomyomatous differentiation was reported [19].

Studies on gangliogliomas have shown that in 13% cases they were accompanied by glioneuronal hamartias, which suggests that gangliogliomas may arise from glioneuronal hamartias by a transformation of the astrocytic component [24].

We suggested previously, that there are some similarities between pleomorphic xanthoastrocytoma and superficial cerebral astrocytoma of infancy (SCAI), as both may differentiate toward subpial astrocytes and may possess neuronal component (PXA with neuronal component and desmoplasic infantile ganglioglioma (DIG)) [15]. Now it seems, that this group of benign, pluripotentially differentiating tumors may be dramatically widened as the new variants of entities are reported.

WHO classification [13] discriminates these neoplasms into two groups: astrocytic tumors (with PXA and its variants) and neuronal and mixed neuronal-glial tumors with gangliocytoma, ganglioglioma, DIG/SCAI, neurocytoma and DNT. DNT is known to represent early neuroglial differentiation with inconsistent GFAP immunoreactivity or even with glioma-like areas (complex DNT) [16, 17]. Recently, rare tumors having features reminding DNT have been reported: DNT-like neoplasm of septum pellucidum and rosetted glioneuronal tumor [2, 11, 22]. Similarly, PGNT may represent a more complex counterpart of

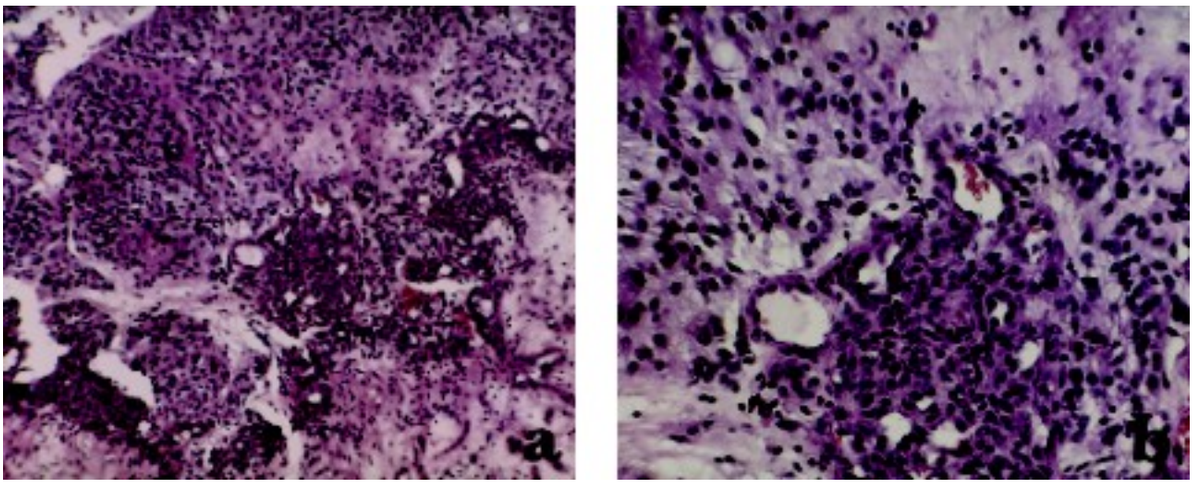

Fig. 2. a. Thick pseudopapillary structures with proliferating vessels; b. endothelial proliferation with surrounding neurocytoma-like tissue. HE.

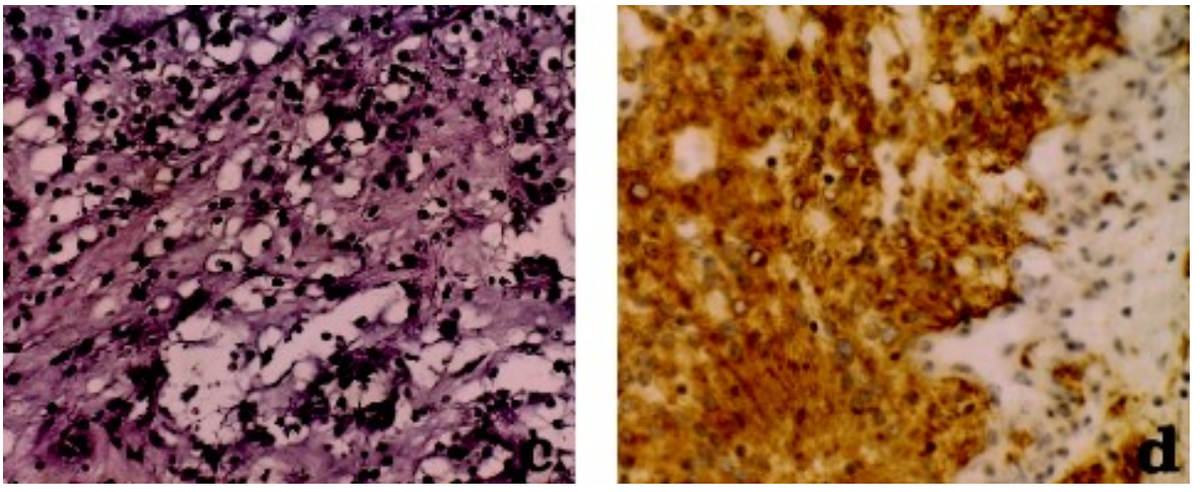

Fig. 2. c. More loose, edematous neurocytic area, superficially reminding DNT. This area presented strong synaptophysin immunoreactivity. HE; d. strong synaptophysin immunopositivity in neurocytic tissue. On the right - vascular proliferation.

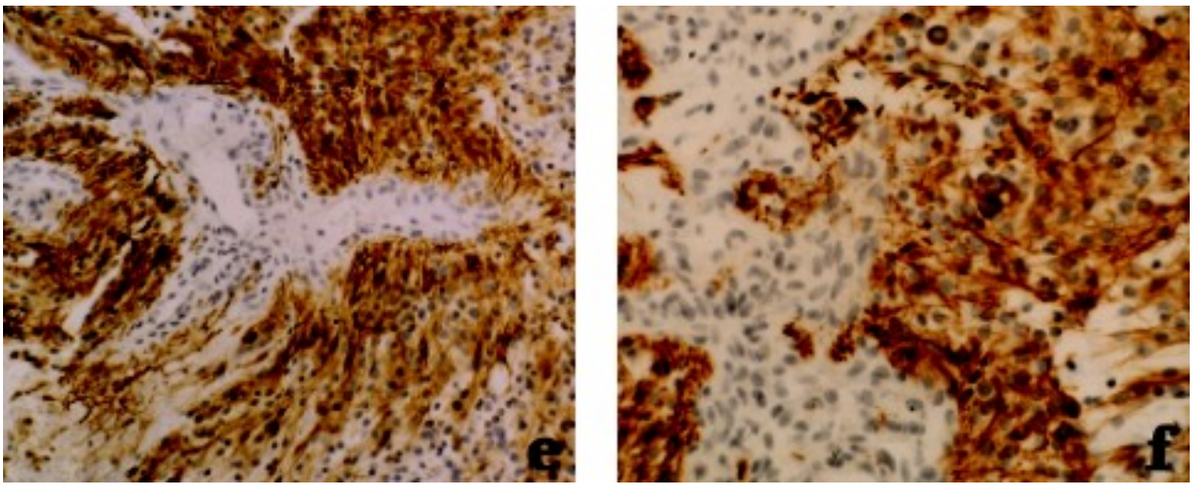

Fig. 2. e. GFAP-immunopositive cells are located mostly around proliferating vessels. f. As fig. 2. e. higher magnification.

extraventricular neurocytoma. Thus, in our opinion we have a wide group of benign, dysembryoplastic or even hamartomatous neuroepithelial tumors, which may differentiate into both, glial or neuronal direction. From this point of view it is important to remember that such a wide spectrum may be difficult to discriminate into very narrow clinico-pathological entities.

References

1. *Alkhani AM, Bilbao JM, Medline P, Ogundimu FA:* Ganglioglioneurocytoma of the posterior fossa. Can J Neurol Sci 1999, 26, 207-210.
2. *Baisden BL, Brat DJ, Melhem ER, Rosenblum MK, King AP, Burger P:* Dysembryoplastic neuroepithelial tumor-like neoplasm of the septum pellucidum: a lesion often misdiagnosed as glioma. Am J Surg Pathol 2001, 25, 494-499.
3. *Barnes NP, Pollock JR, Harding B, Hayward RD:* Papillary glioneuronal tumour in a 4-year-old. Pediatr Neurosurg 2002, 36, 266-270.
4. *Biernat W, Zakrzewski K, Liberski PP:* 12 years old boy with recent onset seizures. Brain Pathol 2000, 10, 313-4, 319.
5. *Bouvier-Labit C, Daniel L, Dufour H, Grisoli F, Figarella-Branger D:* Papillary glioneuronal tumor: clinicopathological and biochemical study of one case with 7-year follow up. Acta Neuropathol 2000, 99, 321-326.
6. *Broholm H, Madsen FF, Wagner AA, Laursen H:* Papillary glioneuronal tumor - a new tumor entity. Clin Neuropathol 2002, 21, 1-4.
7. *Funato H, Inoshita N, Okeda R, Yamamoto S, Aoyagi M:* Cystic ganglioneurocytoma outside the ventricular region. Acta Neuropathol 1997, 94, 95-98.
8. *Giangaspero F, Cenacchi G, Losi L, Cerasoli S, Bisceglia M., Burger PC:* Extraventricular neoplasms with neurocytoma features. A clinicopathological study of 11 cases. Am J Surg Pathol 1997, 21, 206-212.
9. *Gultekin SH, Teo JGC, Rosenblum MK:* Rosetted glioneuronal tumors of the cerebellum. J Neuropathol Exp Neurol 1999, 58, 510.
10. *Ishiuchi S, Nakazato Y, Iino M, Ozawa S, Tamura M, Ohye C:* In vitro neuronal and glial production and differentiation of human central neurocytoma cells. J Neurosci Res 1998, 51, 526-535.
11. *Keyvani K, Rickert CH, von Wild K, Paulus W:* Rosetted glioneuronal tumor: a case with proliferating neuronal nodules. Acta Neuropathol 2001, 101, 525-528.
12. *Kim DH, Suh YL*: Pseudopapillary neurocytoma of temporal lobe with glial differentiation. Acta Neuropathol 1997, 94, 187-191.
13. *Kleihues P, Cavanee WK:* Pathology and Genetics of Tumors of The Central System. World Health Organization Classification of Tumors. Iarc Press, London, 2000.
14. *Komori T, Scheithauer BW, Anthony DC, Rosenblum MK, McLendon RE, Scott RM, Okazaki H, Kobayashi M:* Papillary glioneuronal tumor. A new variant of mixed neuronal-glial neoplasms. Am J Surg Pathol 1998, 22, 1171-1183.
15. *Kordek R, Biernat W, Sapieja W, Alwasiak J, Liberski PP:* Pleomorphic xanthoastrocytoma with a gangliomatous component - an immunohistochemical and ultrastructural study. Acta Neuropathol Berl 1995, 89, 194-197.
16. *Kordek R, Biernat W, Zakrzewski K, Polis L, Liberski PP:* Dysembrioplastic neuroepithelial tumor (DNT): an ultrastructural study of six cases. Folia Neuropathol 1999, 37, 167-170.
17. *Kordek R, Waschnitz J, Biernat W, Saringer W, Zakrzewski K, Alwasiak J, Liberski PP:* Clinical, radiological and histological data for a diagnosis of dysembryoplastic neuroepithelial tumor (DNT). Folia Neuropathol 1996, 32, 199-205.
18. *Min KW, Cadhman RE, Brumback RA:* Glioneurocytoma: tumor with glial and neuronal differentiation. J Child Neurol 1995, 10, 219-226.
19. *Pal L, Santosh V, Gayathri N, Das S, Das BS, Jayakumar PN, Shankar SK:* Neurocytoma/rhabdomyoma (myoneurocytoma) of the cerebellum. Acta Neuropathol 1998, 95, 318-323.
20. *Prayson RA:* Papillary glioneuronal tumor. Arch Pathol Lab Med. 2000, 124, 1820-1823.
21. *Schweitzer JB, Davies KG*: Differentiating central neurocytoma. Case report. J Neurosurg 1997, 86, 543-546.
22. *Teo JGC, Gultekin SH, Bilsky M., Gutin Ph, Rosenblum MK:* A distinctive glioneuronal tumor of the adult cerebrum with neuropil-like (including "rosetted") islands. Am J Surg Pathol 1999, 23, 502-510.
23. *Westphal M, Stavrou D, Nausch H, Valdueza JM, Herrmann HD:* Human neurocytoma cells in culture show characteristics of astroglial differentiation. J Neurosci Res 1994, 38, 698-704.
24. *Wolf HK, Muller MB, Spanle M., Zentner J, Schramm J, Wiestler OD:* Ganglioglioma: a detailed histopathological and immunohistochemical analysis of 61 cases. Acta Neuropathol 1994, 88, 166-173.

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