Scientific Research Publishing

Open Journal of Modern Neurosurgery, 2024, 14, 203-211
https://www.scirp.org/journal/ojmn
ISSN Online: 2163-0585
ISSN Print: 2163-0569

Extra-Axial Anaplastic Pleomorphic Xanthoastrocytoma Mimicking Meningioma: A Case Report with Literature Review

Kaoutar Stitou*, Ilias Zahir, Oualid Mohammed Hmamouche, Marouane Hammoud, Faycal Lakhdar, Mohammed Benzagmout, Khalid Chakour, Mohammed El Faiz Chaoui

Department of Neurosurgery, University Hospital of Fez, Fez, Morocco
Email: *kaoutar.stitou23@gmail.com, zahirilias92@gmail.com, oualid.hmamouche@usmba.ac.ma, marouane.hammoud@gmail.com, lakhdar.faycal@gmail.com, benzagmout@hotmail.fr, chakour.khalid@gmail.com, fmchaoui@yahoo.fr

How to cite this paper: Stitou, K., Zahir, I., Hmamouche, O.M., Hammoud, M., Lakhdar, F., Benzagmout, M., Chakour, K. and Chaoui, M.E.F. (2024) Extra-Axial Anaplastic Pleomorphic Xanthoastrocytoma Mimicking Meningioma: A Case Report with Literature Review. *Open Journal of Modern Neurosurgery*, **14**, 203-211.
https://doi.org/10.4236/ojmn.2024.143021

Received: April 25, 2024
Accepted: July 7, 2024
Published: July 10, 2024

Abstract

Background: A number of meningeal neoplastic lesions may radiologically and clinically simulate meningioma, include hemangiopericytomas, solitary fibrous tumors, schwannomas, hematolymphoid lesions, metastases, and others very rarely, also may clinically mimic meningiomas. **Case Description:** We present the case of A 28-year-old male patient, with no notable medical history, who presented with worsening headaches for 3 months, imbalance, and visual deficits, An initial MRI revealed extra-axial lesion involving the right Parieto-occipital, The tumor was hypointense on T1-weighted MR images, hyperintense signals on T2-weightedMR images, and heterogeneously enhanced suggestive of a meningioma, total resection was achieved, and the histopathological analysis confirmed the diagnosis of an angioblastic meningioma. However, 15 months later, the patient presented with the same initial visual complaints. A subsequent MRI showed lesion recurrence, leading to a second surgical intervention. The histopathological analysis confirmed the diagnosis of an anaplastic xanthoastrocytoma. **Conclusion:** This represents an unusual location for an anaplastic pleomorphic xanthoastrocytoma, which should broaden the differential diagnosis of extra-axial lesions.

Keywords

Anaplastic Features, BRAF, Extra-Axial, High Mitotic Rate, High Proliferation Index, Meningeal, Pleomorphic Xanthoastrocytoma

1. Introduction

With an incidence of less than 1% among astrocytomas, pleomorphic xanthoas-

trocytoma (PXA) is rare. When its mitotic activity exceeds 5 mitoses/10 high-power fields, PXA is defined as anaplastic pleomorphic xanthoastrocytoma (APXA). In 1979, Kepes *et al.* first identified PXA with anaplastic characteristics [1]. It most often arises in children and young adults and usually has a predominant—often nodular and cystic—intra-axial component, which occurs superficially in the cerebral hemispheres. It also frequently involves the leptomeninges and occasionally disseminates within the subarachnoid space [2].

We present a case of primary meningeal PXA that occurred in adult male and showed high proliferative indices and aggressive clinical courses. These rare tumors expand both the differential diagnosis of primary meningeal tumors.

2. Patient and Observation

28-year-old male, with no notable medical history, who presented with worsening headaches for 3 onths, imbalance, and visual deficits, without the notion of a convulsive seizure.

Physical Examination After Admission: The patient was conscious and fluent in his speech, and could understand and answer our questions. Of equal size, his pupils were round and were sensitive to light reflection. He had normal eye movements, with no nystagmus, without sensorimotor deficit, Ophthalmological examination: no papillary edema, the patient presented left Homonymous hemianopia.

Magnetic resonance (MR) imaging showed extra-axial mass, It measured approximately 4.4 cm × 3.8 cm × 4.1 cm (anterior-posterior (AP) × width (W) × craniocaudal (CC)) demonstrate a right parieto-occipital extra-axial lesion that appears as hypointense on T1 (**Figure 1(a)**), hyperintense on T2 (**Figure 1(b)**), and shows heterogeneous enhancement on post-contrast T1 (**Figure 1(c)** & **Figure 1(d)**) images and an enhancing-thickened dural tail convexity meningiom a was favored clinically and radiologically. The patient underwent a right occipito-parietal craniectomy (**Figure 2(a)**), the tumor was subjected to gross total resection with a dura mater graft. The tumor had a faint cleavage plane, red in color, encapsulated, hypervascularized, bounded, without infiltrating cerebral parenchyma The postoperative course was uneventful." (**Figures 2(b)-(d)**).

The patient's postoperative course was uneventful; the patient's neurological status remained good. Postoperative MRI (**Figure 3**), confirmed total removal of the lesion he stayed in the intensive care unit for two days after the operation and was then transferred to the Neurosurgery Department, without post-operative complication.

The histopathological examination revealed features of angiomatous meningioma.

Fifteen months after the initial surgery, the patient presented left Homonymous hemianopia. MRI revealed tumour recurrence (**Figure 4**). The tumor was subjected to gross total resection followed by radiotherapy was performed; brain MRI confirmed complete excision of the tumor (**Figure 5**).

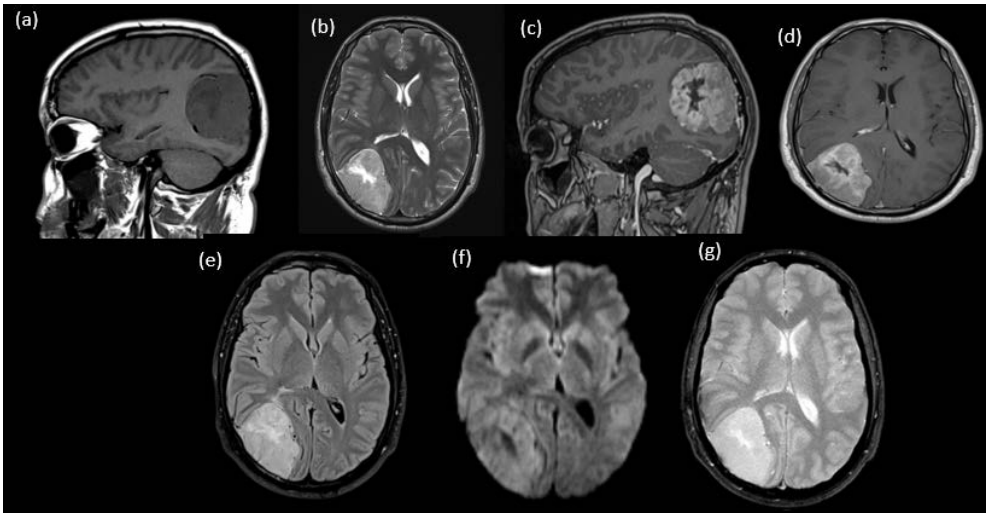

Figure 1. Preoperative sagittal T1-weighted (a), T2-weighted axial (b), and postcontrast T1-weighted axial (c), postcontrast sagittal T1-weighted (d), axial flair (e), axial diffuxsion (f), axial T2 EG(g), MR images demonstrate a right parieto-occipital extra-axial lesion that appears as hypointense on T1, hyperintense on T2, and shows heterogeneous enhancement on post-contrast T1 images and an enhancing-thickened dural tail with a small perilesional edema.

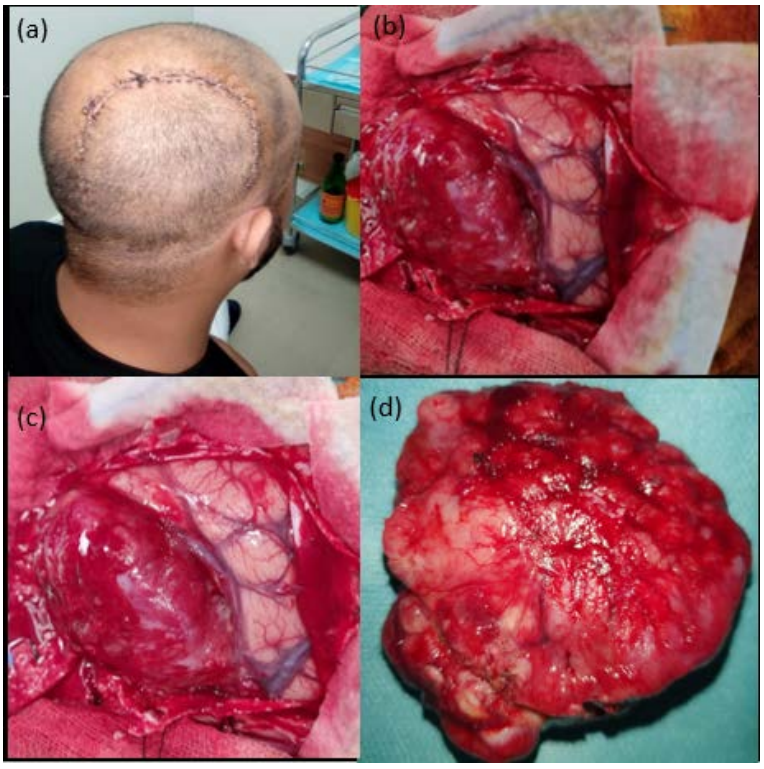

Figure 2. (a) right parieto-occipital approach, (b) (c) intraoperative image showing a cleavage plane between the tumor and the cerebral parenchyma, (d) Macroscopic findings of extracted tumor.

Histopathological examination showed: pleomorphic astrocytic glial tumor proliferation with anaplastic aspects. The neoplasm is made up of a fusiform background made up of elongated atypical elements and dotted with numerous

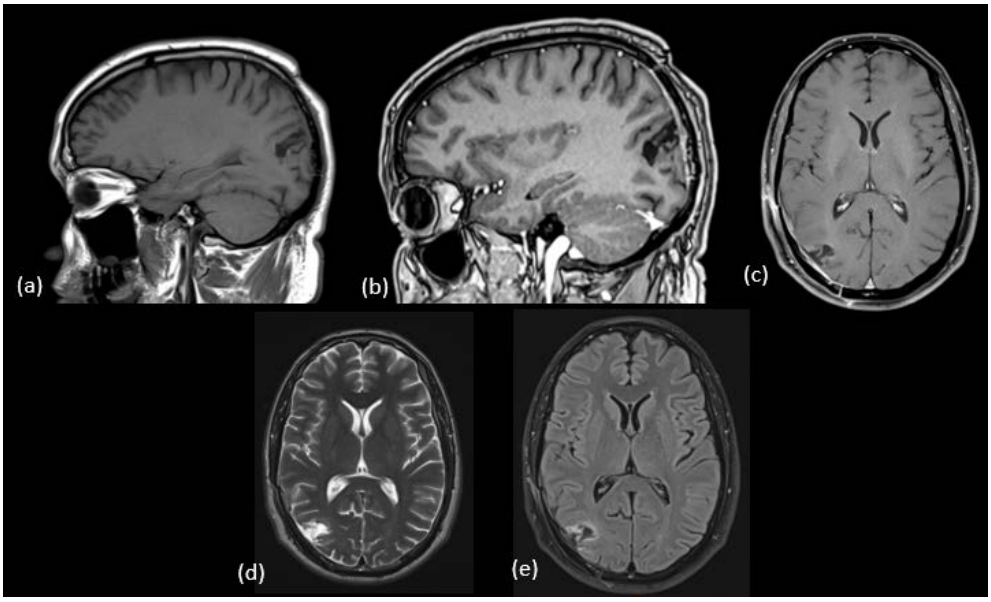

Figure 3. Postperative sagittal T1-weighted (a), postcontrast sagittal T1-weighted (b) postcontrast T1-weighted axial (c) T2-weighted axial (d), and, axial flair (e) confirmed complete excision of the tumor.

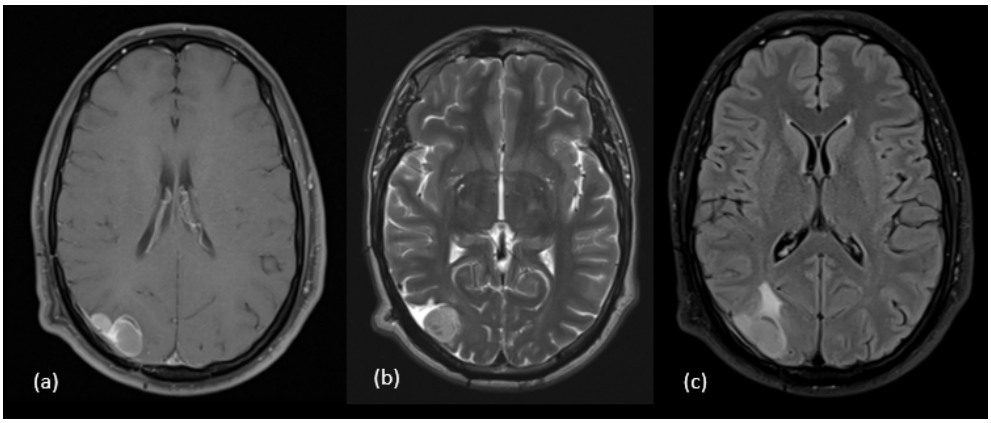

Figure 4. Postcontrast T1-weighted axial (a), T2-weighted axial (b) axial flair (c) revealed tumour recurrence.

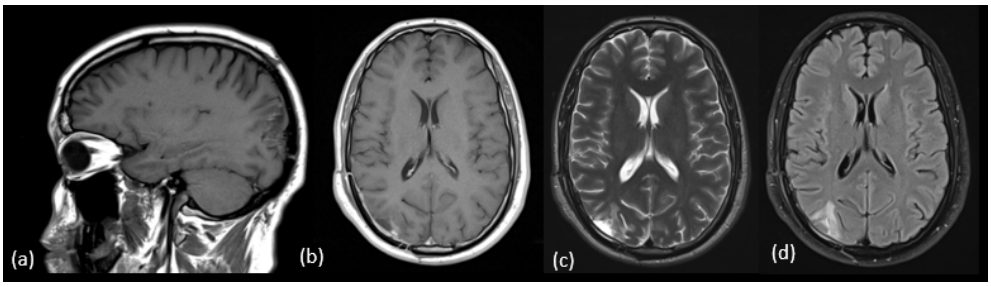

Figure 5. Postperative sagittal T1-weighted (a), postcontrast T1-weighted axial (b) T2-weighted axial (c) and, axial flair (d), confirmed complete excision of the tumor.

multinucleated giant cells and large cells, few in number with vacuolated cytoplasm. Monstrous figures are observed and mitoses are numerous Absence of tu-

mor necrosis. The adjacent glia was the site of moderate gliosis (Figure 6).

The immunohistochemical study showed moderate GFAP positivity, discrete synaptphysin positivity and Ki67 is quite high 25% - 30%.

The definitive histological examination, with immunohistochemical study of the tumour, confirmed the diagnosis of PXA., a review of the first anatomopathological study confirmed the same diagnosis. The patient made a complete recovery, and he was asymptomatic

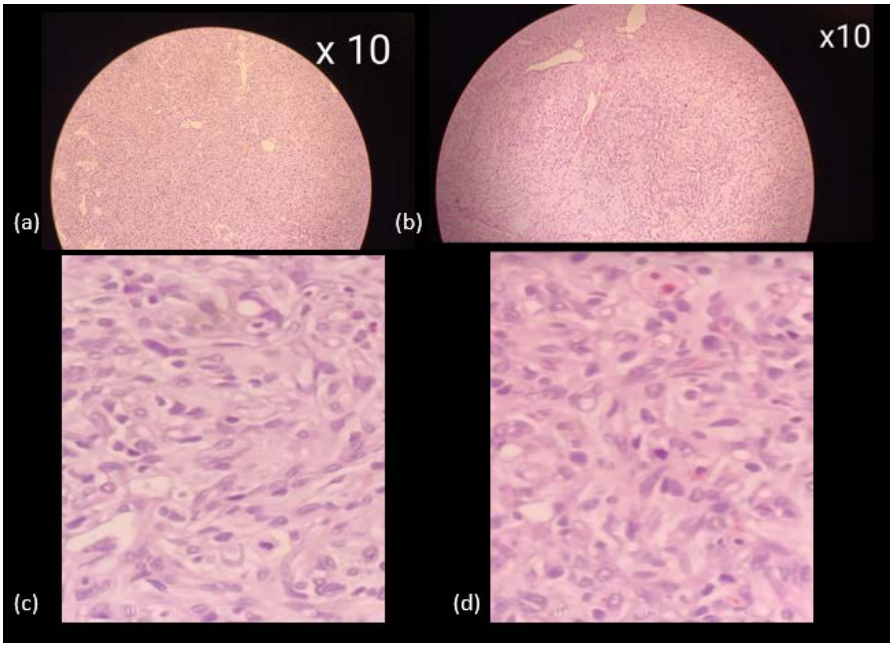

Figure 6. Histologic findings HE ×10 Richly vascularized high-density tumor proliferation (a), HE ×10 some foci are specially arranged around an eosinophilic fibrillar center (b) Moderately atypical cells with HE ×40 mitoses ((c), (d)).

3. Discussion

A number of neoplastic meningeal lesions may radiologically mimic meningioma and even show the dural tail sign characteristic of this neoplasia [3]. Primary meningeal gliomas (PMG) are a rare cause of extra-axial lesions in the central nervous system. PMGs may occur as a solitary mass or as diffuse meningeal involvement. The former subtype, solitary intracranial PMGs, is extremely rare with only 30 cases reported so far, excluding the present case. This is the fouth reported case of a primary meningeal extra-axial PXA [4]. The current case is compared with the 3 previously reported cases of primary meningeal PXAs in (Table 1).

PXA accounts for about 1% of astrocytomas. It mainly arises in the outer parts of the cerebral cortex, and most often in the temporal lobe. The lesions are often localized, manifesting as solid or cystic masses, and can affect the pia mater. The clinical symptoms mainly consist of epilepsy. There have also been reports of cases of PXA in other regions, including the cerebellum [5] [6] spinal cord [7] tectorial area, meninges [8] and retina [9], and the third ventricle [10].

Table 1. Summary of reported cases of solitary intracranial primary meningeal pleomorphic xanthoastrocytomas.

	Author, Year	Age (Years)/ Sex)	Site	Extra-axial on Imaging	Extra-axial on Surgery	Pathology	RAF Mutation	Outcome
1	Usubalieva *et al.*, 2015	56/F	Left tentorial	Yes	NA	Anaplastic PXA	Negative	Alive 37 months after surgery
2	Usubalieva *et al.*, 2015	35/F	Left frontal	Yes	NA	Anaplastic PXA	Positive	Died 26 months after presentation
3	Dadhich *et al.*, 2019	9/F	Right tentorial	Yes	Yes	PXA	Positive	Well 6 months from presentation, then lost to follow-up
4	Stitou. K, *et al.*, 2024	28/M	right parieto-occipital	Yes	Yes	Anaplastic PXA	Positive	Alive 7 months after surgery

F, female, M; male; NA, not available; PXA, Pleomorphic xanthoastrocytoma.

The typical histopathological features of PXA include a prominent pleomorphism, with multinucleated giant cells, giant cells with atypical nuclei, and foamy tumor cells. In some cases, there can also be local epithelioid tumor cells, which need to be distinguished from epithelioid glioblastoma. Lymphocytes can scatter among the tumor cells and form an interstitial perivascular lymphoid sleeve, where acidophilic bodies can be found. The WHO defined PXA with a mitotic activity ≥ 5 mitoses/10 HPF as "anaplastic pleomorphic xanthoastrocytoma (APXA)," classifying it as WHO grade III. The location, morphology, and immunological markers of APXA are similar to those of PXA. Thus, the cut-off value for mitotic activity of ≥5 mitoses/10 HPF is key to their differentiation. [11].

Recently, the BRAFV600E mutation has been known as a common finding in certain CNS tumors, most commonly in PXAs (nearly 50% - 60%) [12]. Amongst CNS tumors, the presence of BRAFV600E may be helpful in distinguishing PXAs from diffusely infiltrating gliomas that always lack BRAFV600E mutation. Conversely, IDH1/2 mutations, which are frequently present in diffusely infiltrating gliomas, rarely occur in PXAs [13]. Relatively few examples of adult PXAs have been studied for BRAF and IDH1/2 mutation status. Schindler *et al* [14] indicated that there may be age-related differences in the BRAFV600E mutation status, based on the fact that 66% of PXAs (63% adult, 69% pediatric) showed this mutation, and 65% of anaplastic PXAs (38% adult, 100% pediatric) showed this mutation as well. Kepes JJ, Rubinstein LSchmidt *et al.* [15] also reported that 50% (5/10) adult anaplastic PXAs demonstrated the BRAFV600E mutation. Similar to previous research, 41% of PXAs in our study demonstrated the BRAFV600E mutation, and 20% adult anaplastic PXAs demonstrated this mutation. Whereas, in our current series, all cases except one were negative for IDH1 mutation and all negative for IDH2 mutation. Yan *et al.* [13] has also

reported that one case of PXAs was positive for the IDH1 mutation. Identification of BRAFV600E mutations in PXAs could be helpful in deciding the proper therapy. Indeed, for these patients, the use of targeted therapies, such as vemurafenib, was discussed in previous case reports [16] [17]. This novel therapeutic approach must be validated, and may ultimately represent a new opportunity for these patients and agents such as dabrafenib [18] and vemurafenib [19] [20].

The extra-axial presentation of these tumors may provide a clue to the origin of PXAs. Kepes *et al* [21] originally postulated that PXAs could be derived from subpial astrocytes. An analogous hypothesis extrapolated to contemporary tumor stem cell theory would implicate cortical radial glial or cortical or leptomeningeal pluripotent neural progenitor cells derived from radial glia or neural crest cells in the development of PXAs [2] [22] [23].

In the management of parenchymal PXAs, the extent of resection is strongly predictive of recurrence-free survival, [2] [21] and achieving gross total resection is considered ideal. No improvement in survival has been shown with adjuvant radiotherapy or chemotherapy, [24] but risk of recurrence is reduced [25] [26]. It is plausible that primary meningeal PXAs would respond similarly to these therapeutic modalities.

In general, the prognosis of PXA is relatively favorable [21]-[27]. Postoperative survival of up to 25 years has been reported[24]; however, up to 30% of PXAs can recur, and 10% to 20% an anaplastic transformation [2] [25] [28].

4. Conclusion

Solitary extra-axial intracranial primary meningeal PXA is an extremely rare entity with only 4 reported cases in the literature including the present case. Primary meningeal PXA can manifest as an extra-axial mass lesion and may warrant inclusion in the differential diagnosis of extraaxial mass lesions.

Declarations

Patient was informed and his consent was obtained before submission of this case report.

Approval of Ethic committee of Teaching hospital of Fes has been obtained.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Kepes, J.J., Rubinstein, J. and Eng, F. (1979) Pleomorphic Xanthoastrocytoma: A Distinctive Meningocerebral Glioma of Young Subjects with Relatively Favorable Prognosis. *Cancer*, **44**, 1839-1852. https://doi.org/10.1002/1097-0142(197911)44:5%3C1839::AID-CNCR2820440543%3E3.0.CO;2-0

[2] Giannini, C., Paulus, W., Louis, D.N., *et al.* (2007) Pleomorphic Xanthoastrocytoma. In: Louis, D.N., Ohgaki, H., Wiestler, O.D., Cavenee, W.K., Eds., *WHO Classification of Tumours of the Central Nervous System*, International Agency for Research on Cancer, 22-24.

[3] Barresi, V., Caffo, M., Branca, G., Caltabiano, R. and Tuccari, G. (2012) Meningeal Tumors Histologically Mimicking Meningioma. *Pathology-Research and Practice*, **208**, 567-577. https://doi.org/10.1016/j.prp.2012.07.002

[4] Dadhich, H., Sharma, R., Borkar, S.A., Dash, A., Mahajan, S. and Sharma, M.C. (2019) Solitary Extra-axial Intracranial Primary Meningeal Pleomorphic Xanthoastrocytoma: An Extremely Rare Case. *World Neurosurgery*, **130**, 386-390.

[5] Lindboe, C.F., Cappelen, J. and Kepes, J.J. (1992) Pleomorphic Xanthoastrocytoma as a Component of a Cerebellar Ganglioglioma: Case Report. *Neurosurgery*, **31**, 353-355. https://doi.org/10.1227/00006123-199208000-00023

[6] Herpers, M.J., Freling, G. and Beuls, E.A. (1994) Pleomorphic Xanthoastrocytoma in the Spinal Cord. Case Report. *Journal of Neurosurgery*, **80**, 564-569. https://doi.org/10.3171/jns.1994.80.3.0564

[7] VizcaIno, M.A., Caccamo, D.V., Fox, E. and Rodriguez, F.J. (2014) Pleomorphic Xanthoastrocytoma: Report of Two Cases with Unconventional Clinical Presentations. *Clinical Neuropathology*, **33**, 380-387. https://doi.org/10.5414/NP300766

[8] Dadhich, H., Sharma, R., Borkar, S.A., Dash, A., Mahajan, S. and Sharma, M.C. (2019) Solitary Extra-Axial Intracranial Primary Meningeal Pleomorphic Xanthoastrocytoma: An Extremely Rare Case. *World Neurosurgery*, **130**, 386-390. https://doi.org/10.1016/j.wneu.2019.06.218

[9] Zarate, J.O. and Sampaolesi, R. (1999) Pleomorphic Xanthoastrocytoma of the Retina. *The American Journal of Surgical Pathology*, **23**, 79-81. https://doi.org/10.1097/00000478-199901000-00008

[10] Menendez, R., Fernandez, J., Monti, A. and Sevlever, G. (2014) Intraventricular Pleomorphic Xanthoastrocytoma: A Case Report. *Turkish Neurosurgery*, **24**, 987-991. https://doi.org/10.5137/1019-5149.JTN.10063-13.1

[11] Liu, J., Sun, Y.H. and Liu, X. (2020) Anaplastic Pleomorphic Xanthoastrocytoma: A Case Report and Literature Review. *International Journal of General Medicine*, **2020**, 1581-1587. https://doi.org/10.2147/IJGM.S285989

[12] Venneti, Sriram, M.D. and Huse, J.T. (2015) The Evolving Molecular Genetics of Low-Grade Glioma. *Advances in Anatomic Pathology*, **22**, 94-101. https://doi.org/10.1097/PAP.0000000000000049

[13] Koelsche, C. *et al.* (2014) *BRAF*-Mutated Pleomorphic Xanthoastrocytoma Is Associated with Temporal Location, Reticulin Fiber Deposition and CD34 Expression. *Brain Pathology*, **24**, 221-229. https://doi.org/10.1111/bpa.12111

[14] Yan, H. *et al.* (2009) *IDH1* and *IDH2* Mutations in Gliomas. *The New England Journal of Medicine*, **360**, 765-773. https://doi.org/10.1056/NEJMoa0808710

[15] Schindler, G. *et al.* (2011) Analysis of *BRAF*V600E Mutation in 1,320 Nervous System Tumors Reveals High Mutation Frequencies in Pleomorphic Xanthoastrocytoma, Ganglioglioma and Extra-Cerebellar Pilocytic Astrocytoma. *Acta Neuropathologica*, **121**, 397-405. https://doi.org/10.1007/s00401-011-0802-6

[16] Fortin, J.P., Labbe, A., Lemire, M., Zanke, B.W., Hudson, T.J., Fertig, E.J., *et al.* (2014) Functional Normalization of 450k Methylation Array Data Improves Replication in Large Cancer Studies. *Genome Biology*, **15**, Article No. 503. https://doi.org/10.1186/s13059-014-0503-2

[17] Fukuoka, K., Mamatjan, Y., Tatevossian, R., Zapotocky, M., Ryall, S., Stucklin, A.G.,

et al. (2020) Clinical Impact of Combined Epigenetic and Molecular Analysis of Pediatric Low Grade Gliomas. *Neuro-Oncology*, **22**, 1474-1483. https://doi.org/10.1093/neuonc/noaa077

[18] Subalieva, A., Pierson, C.R., Kavran, C.A., *et al.* (2015) Primary Meningeal Pleomorphic Xanthoastrocytoma with Anaplastic Features: A Report of 2 Cases, One with *BRAF*^{V600E} Mutation and Clinical Response to the *BRAF* Inhibitor Dabrafenib. *Journal of Neuropathology & Experimental Neurology*, **74**, 960-969. https://doi.org/10.1097/NEN.0000000000000240

[19] Chamberlain, M.C. (2013) Salvage Therapy with BRAF Inhibitors for Recurrent Pleomorphic Xanthoastrocytoma: A Retrospective Case Series. *Journal of Neuro-Oncology*, **114**, 237-240. https://doi.org/10.1007/s11060-013-1176-5

[20] Lee, E.Q., Ruland, S., LeBoeuf, N.R., Wen, P.Y. and Santagata, S. (2016) Successful Treatment of a Progressive *BRAF* V600E-Mutated Anaplastic Pleomorphic Xanthoastrocytoma with Vemurafenib Monotherapy. *Journal of Clinical Oncology*, **34**, e87-e89. https://doi.org/10.1200/JCO.2013.51.1766

[21] Kepes, J.J., Rubinstein. L.J. and Eng, L.F. (1979) Pleomorphic Xanthoastrocytoma: A Distinctive Meningocerebral Glioma of Young Subjects with Relatively Favorable Prognosis *A study of 12 cases*. *Cancer*, **44**, 1839-1852. https://doi.org/10.1002/1097-0142(197911)44:5%3C1839::AID-CNCR2820440543%3E3.0.CO;2-0

[22] Lehman, N.L. (2008) Central Nervous System Tumors with Ependymal Features: A Broadened Spectrum of Primarily Ependymal Differentiation? *Journal of Neuropathology & Experimental Neurology*, **67**, 177-188. https://doi.org/10.1097/NEN.0b013e31816543a6

[23] Cooper, I.S. and Kernohan, J.W. (1951) Heterotopic Glial Nests in the Subarachnoid Space: Histopathologic Characteristics, Mode of Origin and Relation to Meningeal Gliomas. *Journal of Neuropathology & Experimental Neurology*, **10**, 16-29. https://doi.org/10.1097/00005072-195110010-00002

[24] Whittle, I.R., Gordon, A., Misra, B.K., Shaw, J.F. and Steers, A.J. (1989) Pleomorphic Xanthoastrocytoma. Report of Four Cases. *Journal of Neurosurgery*, **70**, 463-468. https://doi.org/10.3171/jns.1989.70.3.0463

[25] Pahapill, P.A., Ramsay, D.A. and Del Maestro, R.F. (1996) Pleomorphic Xanthoastrocytoma: Case Report and Analysis of the Literature Concerning the Efficacy of Resection and the Significance of Necrosis. *Neurosurgery*, **38**, 822-829. https://doi.org/10.1227/00006123-199604000-00038

[26] Macaulay, R.J., Jay, V., Hoffman, H.J. and Becker, L.E. (1993) Increased Mitotic Activity as a Negative Prognostic Indicator in Pleomorphic Xanthoastrocytoma. Case Report. *Journal of Neurosurgery*, **79**, 761-768. https://doi.org/10.3171/jns.1993.79.5.0761

[27] Tien, R.D., Cardenas, C.A. and Rajagopalan, S. (1992) Pleomorphic Xanthoastrocytoma of the Brain: MR Findings in Six Patients. *American Journal of Roentgenology*, **159**, 1287-1290. https://doi.org/10.2214/ajr.159.6.1442403

[28] Perkins, S.M., Mitra, N., Fei, W. and Shinohara, E.T. (2012) Patterns of Care and Outcomes of Patients with Pleomorphic Xanthoastrocytoma: A SEER Analysis. *Journal of Neuro-Oncology*, **110**, 99-104. https://doi.org/10.1007/s11060-012-0939-8