Case Report

Papillary variant of hemangiopericytoma – a rare morphological variant presenting as a recurrent occipital tumor

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Abstract

Solitary fibrous tumor / Hemangiopericytoma (SFT/ HPC) of central nervous system are the most common mesenchymal nonmeningothelial neoplasms, accounting for <1% of all primary central nervous system (CNS) tumors and most commonly affects adults. Histologically two morphological types exist, the SFT phenotype and the HPC phenotype. Tumors with the hemangiopericytoma phenotype have a high rate of recurrence and may develop extracranial metastases. Papillary morphology is unusual in SFT/ HPC and only four cases of HPCs with a papillary pattern have been reported in the literature. Ours is probably the fifth reported case. Papillary variant of HPC is a rare morphological variant, and its differential diagnosis includes other primary intracranial tumors with papillary pattern like papillary meningioma, papillary ependymoma or metastatic carcinoma, which the pathologists and clinicians should bear in mind before making the correct diagnosis. Even after gross total resection, HPC have high rate of recurrence, and patients benefit from adjuvant radiotherapy.

Key words: Papillary variant, Hemangiopericytoma, Solitary fibrous tumor

Introduction

Solitary fibrous tumor / Hemangiopericytoma (SFT/ HPC) of central nervous system is a mesenchymal tumor of fibroblastic type, often showing a rich branching vascular pattern, encompassing a histological spectrum of tumors previously classified separately as meningeal solitary fibrous tumor and hemangi-opericytoma [1]. It is rare, accounting for <1% of all primary central nervous system (CNS) tumors and most commonly affects adults [2]. Majority of these tumors are Dural-based. These tumors are commonly seen in skull base, parasagittal, and falcine locations [1]. Histologically two morphological types exist, the SFT phenotype and the HPC phenotype. SFT is a mesenchymal neoplasm first recognized in the pleura by Klemperer and Rabin [3] and subsequently reported in several other sites, including the craniospinal axis [4,5]. The term HPC was first describe by Stout and Murray in 1942, but Begg and Garret, in 1954, reported the first case of intracranial HPC in the left parietal region [6,7]. The first report of CNS SFT was described by Caroli E et al. in 1996 [8,9]. Tumors with the hemangiopericytoma phenotype have a high rate of recurrence and may develop extracranial metastases.

Papillary variant of HPC is a rare morphological variant, and its differential diagnosis includes other primary intracranial tumors with papillary pattern like papillary meningioma, papillary ependymoma or metastatic carcinoma, which the pathologists should bear in mind before making the correct diagnosis. STAT6 nuclear localization distinguish HPC from other malignant tumors. Clinico-radiological findings and histopathology including IHC findings correlation will help in making the right diagnosis.

Case Report

A 38-year-old gentleman presented with chronic occipital headache which was throbbing in nature, for three months. Recently the headache has been associated with blurring of vision and occasional vomiting. There is no history of loss of consciousness or seizures and no evidence of weakness. On general examination the patient was conscious, oriented and

Manuscript received: 4th October 2019
Reviewed: 14th October 2019
Author Corrected: 20th October 2019
Accepted for Publication: 24th October 2019

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afebrile. There was no pallor or icterus or lymphadenopathy. Ear, nose, throat examination was normal. CNS examination revealed normal higher mental functions with grossly intact cranial nerves. Power in all four limbs, deep tendon reflexes and gait were within normal limits. The detailed clinical examination of respiratory and cardiovascular system and abdomen were within normal limits. Magnetic resonance imaging (MRI) with contrast images showed a right occipital dural based enhancing mass lesion measuring 3x2x2cm, with perilesional edema and mild mass effect (Figure1)

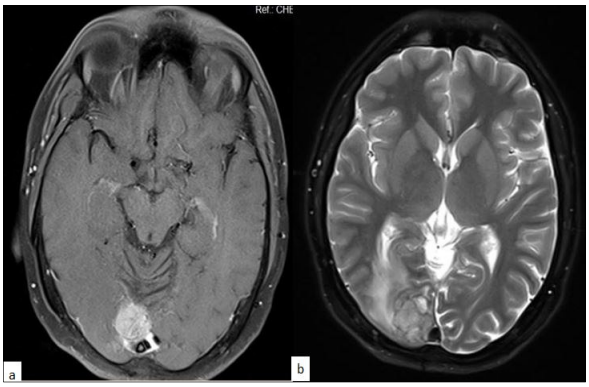

Figure 1 a & b: MRI contrast showing right occipital dural based enhancing mass with perilesional edema.

The patient was operated for an occipital lesion in 2014 in an outside hospital and was reported as Hemangiopericytoma, Grade II. Further details were not known since there were no previous case records. The tumor was completely excised and sent for histopathological examination. Grossly the specimen comprised of single greyish brown circumscribed nodule measuring 3.0x2.2x2.0cm, with small portion of attached dura. Cut surface showed grey white and grey brown firm areas. Histologically the tumor was circumscribed having cells with round to oval nuclei with moderate cytoplasm and distinct cell membrane (Figure 2 to 5).

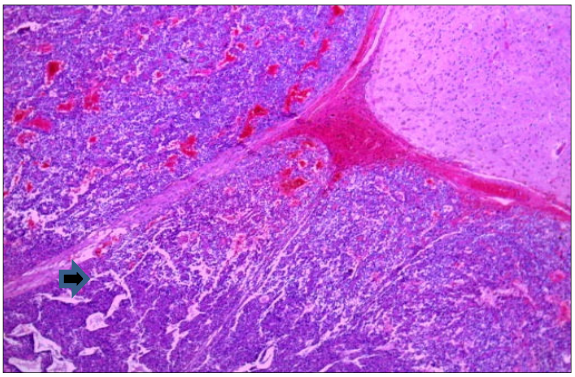

Figure 2: Hematoxylin and eosin (H&E) stained sections showing a cellular tumor with sharp tumor-brain interface, with focal stag horn vessels (arrow) 4x view.

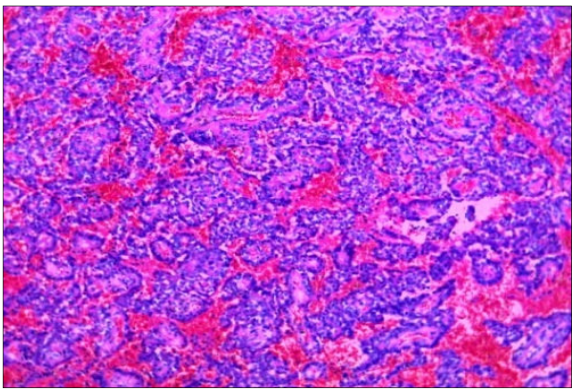

Figure 3: Hematoxylin and eosin (H&E) stained sections showing papillary pattern of tumor cells with central fibro vascular core and stromal hemorrhage, 10 x views

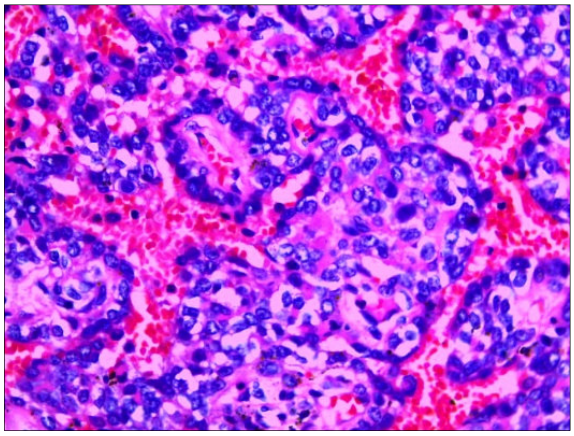

Figure 4: Hematoxylin and eosin (H&E) stained sections showing papillary pattern of tumor cells with central fibro vascular core and stromal hemorrhage, 40 x views

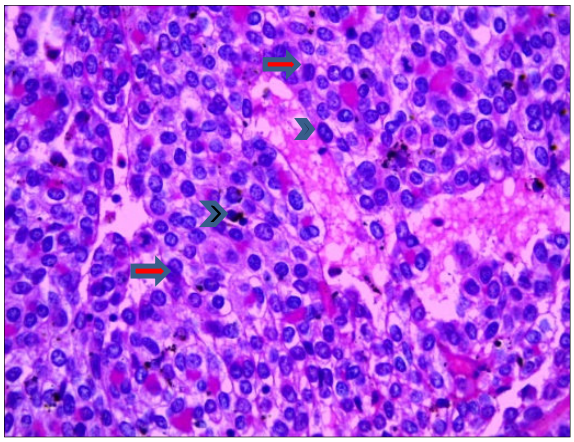

Figure 5: Hematoxylin and eosin (H&E) stained sections showing tumor cells with round to oval nuclei and distinct cell membranes, with interspersed eosinophilic collagen spherules (Arrows) and increased mitotic activity (arrow heads), 40x view

The tumor cells were arranged predominantly in papillary pattern with central fibrovascular core, comprising of >50% of tumor. Periphery of the tumor shows cells arranged in diffuse sheets, with interspersed stag horn type branching blood vessels and moderate cautery artifact.

Mitotic figures were increased with a count of 8 to 10 per 10 high power field. Eosinophilic collagen globules were seen interspersed among tumor cells, highlighted by Masson's trichrome stain. There was no evidence of tumor necrosis or brain invasion.

There were no whorls or intranuclear inclusions or psammoma bodies. Reticulin stain showed no increase in reticulin fibers around the tumor cells. Based on the above histopathological findings the differential diagnosis of Papillary variant of Hemangiopericytoma and papillary meningioma were made.

The histopathology slides and blocks of the previous surgery done outside were not available for review. On immunohistochemistry, the tumor cells showed strong nuclear positivity for STAT-6 with focal weak positivity for epithelial membrane antigen (Figure 6). Progesterone receptor (PR) and CD34 were negative.

Ki-67 proliferation index was 08%.

The case was reported as papillary variant of Hemangiopericytoma, WHO grade III. The patient was referred for adjuvant radiotherapy and was lost for further follow up.

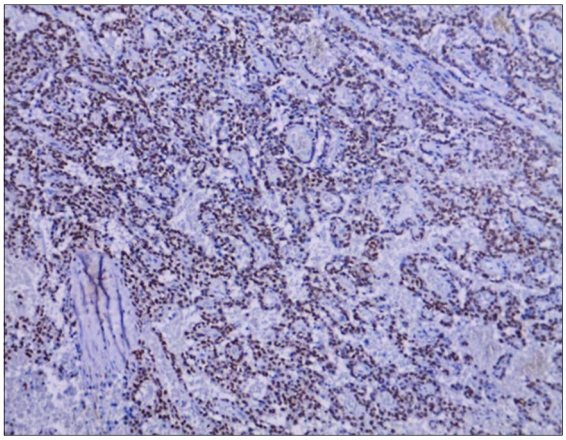

Figure 6: Immunohistochemistry shows strong nuclear positivity of STAT-6, highlighting papillary structures, 4 x views

Discussion

CNS SFT/HPCs are rare, usually dural-based intracranial tumors which are thought to develop from CD34-positive fibroblasts present in the dura mater or in the intraparenchymal perivascular connective tissue [10,11]. They account for about less than 1% of all primary CNS tumors [12]. HPCs are highly cellular, richly vascular, and usually show recurrence despite complete resection. In contrast, most SFTs occurring in the CNS have been reported to behave favorably.

Hence, both these entities were considered to be distinctive in the past [6]. The World Health Organization (WHO) [1] in 2016 CNS tumor updates, combined these terms to SFT/HPCs due to frequent morphologic overlap [8]. These tumors have a fusion of the *STAT6* and *NAB2* genes. *STAT6* is normally present in cytoplasm and *NAB2* in the nucleus. The NAB2-STAT6 fusion protein has the NAB2 ability to find the nucleus. This drags the STAT6 portion of the molecule into the nucleus, which can be detected by immunohistochemistry for confirmation of these tumors [13].

The commonality among both HPC and SFT (intracranial and systemic) of STAT6 and NAB2 gene fusions provides a strong argument that HPC and SFT are similar tumors [14]. Although both SFTs and HPCs share inversions at 12q13, fusing the NAB2 and STAT6 genes, it is difficult to predict the clinical behavior of these neoplasms, as HPCs were described to have worse prognosis than SFTs [1,8].

Histologically these tumors show two main morphological variants, the SFT phenotype and the HPC phenotype. The SFT phenotype shows a pattern less architecture or short fascicular pattern, with alternating hypocellular and hypercellular areas with thick bands of collagen. The HPC phenotype is characterized by high cellularity and a delicate, rich network of reticulin fibers typically investing individual cells. Thin-walled branching hemangiopericytoma-like (staghorn) vessels are a feature shared by both phenotypes [1]. The tumors with SFT phenotype show benign behavior hence have been assigned as grade I tumors and treated by surgical resection alone.

The tumors with HPC phenotype have a high rate of recurrence (> 75% at 10 years) and may develop extracranial metastases, especially in bones, lungs, and liver (in 20% of cases) [1], hence these tumors with a HPC phenotype are considered malignant and are sub classified as grade II or grade III (anaplastic), depending on the mitotic count (<5 vs. >5 mitoses per 10 high-power fields (HPFs) [2]. The parameters of prognostic significance include large size, location, and extent of resection. The morphologic parameters such as histologic grade, high cellularity, abnormal patterns, nuclear pleomorphism, mitoses, necrosis, and Ki67 proliferative index also play a pivotal role in predicting recurrence [8].

The presence of papillary architecture is very rare in these tumors and only four cases with HPC with papillary structures have been reported in the literature [2,5,15,16].

Tomek et al [5] described a 66-year-old man with a spinal, extradural SFT/HPC with unique retiform and papillary architecture. The tumor was low grade and was confirmed by immunohistochemistry for CD34 and nuclear expression of STAT6. The second case was reported by Tsukamoto et al [15] in a 22-year-old woman, located in orbit where the tumor was mostly composed of a papillary growth pattern. The tumor cells

were positive for Bcl-2, & CD34 by IHC and STAT6. The Third case was reported by Ishizawa et al [16], in 2016 in a 83-year-old woman who presented with a bulge on the left side of the forehead, which showed a tumor showing a prominent papillary structure and some solid areas. CD34 was positive and STAT6 showed nuclear expression which was also confirmed by detection of NAB2 exon6-STAT6 exon 17 using reverse transcription-polymerase chain reaction (RT-PCR). Cao et al [2] reported a case of SFT/HPC of CNS with papillary morphology in a 59 year old patient, with a basifrontal lesion.

The lesion showed increased mitoses (6-7/10hpf) and Ki67 proliferation index of 8%. The tumor showed nuclear STAT-6 expression but CD34 was negative.

The patient underwent resection of tumor followed by radiation [2]. Our case also showed predominantly papillary pattern with increased mitoses (8-10/10hpf). On immunohistochemistry, the tumor cells were CD34 negative with strong nuclear expression of STAT-6. Ki 67 proliferation index was 8%.

The differential diagnosis of papillary HPC includes primary intracranial tumors like papillary meningioma, ependymoma and metastatic carcinoma. The typical morphology of HPC can be seen at least focally with stag horn vessels and pericellular reticulin fibers. STAT6 nuclear localization distinguish HPC from other malignant tumors.

They lack GFAP positivity unlike gliomas, and CD 34 can be weakly positive or negative [13]. Nevertheless, papillary HPC should be kept in mind in the differential diagnosis of papillary lesions of the CNS. Clinico-radiological findings and histopathology including IHC findings correlation will help in making the right diagnosis.

Conclusion

SFT/HPC of the CNS is rare; the papillary variant of HPC is a rare morphological variant. The differential diagnosis of papillary HPC includes primary intracranial tumors with papillary pattern. The right diagnosis is very important for the patient, since treatment methods differ for SFT/HPC and other tumors of the nervous system.

Keeping in view the diverse histomorphologic spectrum, a panel of immunohistochemical markers is necessary to support the diagnosis of HPC in nonclassical cases.Multiparametric approach is essential for deciding postsurgical patient's management. Even after gross total resection HPC have high rate of recurrence, and patients benefit from adjuvant radiotherapy.

Funding: No funding sources
Conflict of interest: None declared
Ethical Approval: Not Required

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How to cite this article?

Salapathi S, Rajeshwari B, Ghosh M. Papillary variant of hemangiopericytoma – a rare morphological variant presenting as a recurrent occipital tumor. Trop J Path Micro 2019; 5(10):827-832.doi:10.17511/jopm.2019.i10.12.

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