ISSN: 2091-2331 (Print) 2091-234X (Online)

Journal of Nobel Medical College

Volume 13, Number 01, Issue 24, January-June 2024, 100-103

Case Report

An Intriguing Case of Angiomatous Meningioma Mimicking a Hemorrhagic Metastasis

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Article Received: 12th May, 2024; Accepted: 18th June, 2024; Published: 30th June, 2024

DOI: https://doi.org/10.3126/jonmc.v13i1.68122

Abstract

Meningiomas comprise a family of neoplasms derived from the meningothelial cells of the arachnoid mater. Peritumoural cerebral oedema can be prominent with certain histological subtypes, such as secretory, angiomatous/microcystic, lymphoplasmacyte-rich, and high-grade meningiomas. We report one such case presenting in our institute that showed well defined blood density hyperdense lesion of size 3.1x2.9x3.4 cm with marked perilesional edema in right parafalcinefronto-parietal lobe and was thought to be a hemorrhagic metastatic lesion or a primary glioma on CT as well as MRI scans. The histopathology however revealed it to be an angiomatous meningioma.

Keywords: *Angiomatous meningioma, Edema, Metastasis*

Introduction

Meningiomas are the most common primary brain tumor in adults and isestimated to occur in up to 1% of the adult population [1]. As per recent 5th edition of WHO CNS (World Health Organization Central Nervous System) tumor classification, they are divided into 3 grades depending upon histomorphological features and prognostic biomarkers [2]. Meningiomas characteristically appear as isodense, uniformly contrast-enhancing dural masses on MRI (Magnetic resonance imaging). Neuroimaging features are not always specific for clinching the diagnosis of meningiomas and peritumoral cerebral edema can be prominent with certain subtypes, such as secretory, angiomatous/microcystic, lymphoplasmacyte-rich, and high-grade meningiomas [3]. We report one such case of angiomatous meningioma that had marked perilesional edema along with blood contents and was suspected to be a hemorrhagic metastasis or a hemorrhagic glioma on imaging grounds.

Case report

A 55 years old lady presented in the Emergency department with left sided weakness since 3 days and 3 episodes of vomiting. She had a history of pulmonary Tuberculosis 4 years back that was treated. There was no history of fever or loss of consciousness and her vitals were stable. A provisional diagnosis of cerebrovascular accident was rendered.

Non Contrast Computed Tomography (NCCT) head showed well defined blood density hyperdense lesion of size ~ 3.1 x 2.9 x 3.4 cm with marked perilesional edema in the right parafal-

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Citation
Shrestha N, Shrestha O, Gurung A, Khatiwada S, An Intriguing Case of Angiomatous Meningioma Mimicking a Hemorrhagic Metastasis, JoNMC. 13:1 (2024) 100-103. DOI: https://doi.org/10.3126/jonmc.v13i1.68122.

cine frontal lobe. This was associated with mild compression of the lateral ventricles and midline shift to contralateral side by 4 mm. Rest of the bilateral cerebral hemispheres was normal in attenuation with maintained gray-white matter differentiation. MRI was then advised with a differential diagnosis of hemorrhagic metastasis versus a primary lesion.

Plain and contrast MRI revealed an altered signal intensity lesion measuring ~2.9cm x3.9cm x 3.8cm in grey white matter junction of right high fronto-parietal lobe adjacent to interhemispheric falx. The lesion displayed heterogeneously enhancing altered signal intensity on T1/T2WI containing central areas of fluid-fluid level and was associated with marked surrounding T2/FLAIR hyperintensity suggesting vasogenicedema. Post contrast study showed heterogenous enhancement at the posterior margin of the lesion. No diffusion restriction was noted on DWI/ADC (Diffusion Weighted Imaging/Apparent diffusion coefficient). SWI (Susceptibility Weighted Imaging) showed blooming artifact with high signal on corresponding filtered phase image. Mass effect was evident by compression of the right lateral ventricle and midline shift of ~5 mm to contralateral side. An impression of hemorrhagic metastasis versus a hemorrhagic glioma was suggested.

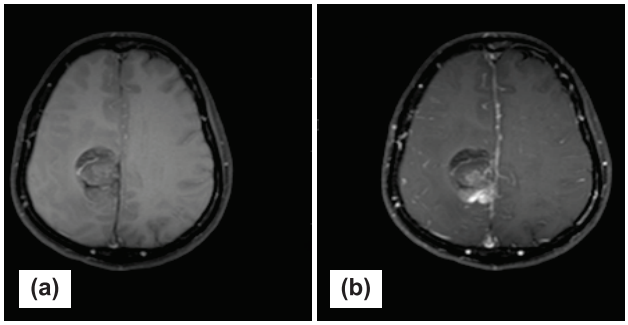

Figure 1: MRI findings: A) T1WI with extra-axial heterogenous, predominantly hypointense lesion arising from interhemispheric falx on right side compressing adjacent frontal lobe. B) T1 post contrast study showing heterogenously enhancing lesion towards centre with peripheral non enhancing areas.

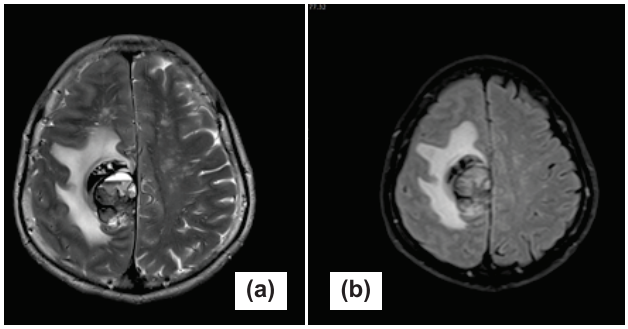

Figure 2: A) T2WI MRI showing heterogenous lesion with central area having fluid levels B) FLAIR image showing suppressed fluid levels and demonstrating marked peripheral edema

Histopathological examination of the lesion however showed it to be composed of predominantly hyalinised small and medium sized blood vessels with intermingled areas composed of meningiomacells. Areas of hemorrhage were also noted and the glial tissues included in the biopsy were unremarkable. These findings were peculiar for angiomatous meningioma which is a grade 1 meningioma. The patient's condition gradually improved and was subsequently discharged with a plan of close follow-up.

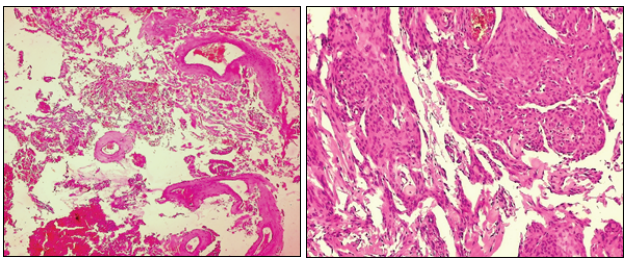

Figure 3: A) Highly vascular tumor with varying sized hyalinised blood vessels. (200x) B) Interspersed nodules of mengingothelial cells in syncytial clusters (400x)

Discussion

Angiomatous meningioma is a rare histological subtype of meningioma comprising only ~2.1% of all meningiomas [4]. The microcytic and angiomatous varieties of meningiomas are considered benign, WHO grade I tumors, but they resemble aggressive tumors on routine MRI. Liu et al. considered that angiomatous meningiomas were slightly hyperintense compared to normal brain parenchyma on CT scan. They also found that on MRI, if the setumors were hypointense on T1-weighted images (T1WI) and hyperintense on T2-weighted images (T2WI), slightly hypointense on DWI, with signal voids of vessels and obvious peritumoraledema, the possibility of angiomatous meningiomashould be considered[5]. This is in accordance with the MRI findings of our case.

Kim et al. in their study of 86 meningiomas observed measurable peritumoral brain edema in 53.5% of WHO grade 1 and 80% of WHO grades 2 and 3 tumors [6]. They thus showed that more than half of WHO grade 1 meningiomas can also have peritumoraledema which was also seen in our case. This finding also corroborates with the study by Azizyan et al who found significant peritumoraledema in 100% cases of angiomatous meningioma [7]. Our case also showed marked perilesional edema. The peritumoral edema in imaging however raises the suspicion for other entities like high grade gliomas, atypical/anaplastic meningiomas and

metastatic carcinomas.The explanation for edema is probably wide range of angiogenic factors associated with the growth and neovascularization ofmeningiomas, including VEGF-A (Vascular endothelial growth factor alpha) and the matrix metalloproteinase-9 (enzyme involved in degradation of the extracellular matrix) which are now incriminated in the development of peritumoral brain edema in these meningiomas[8].

Studies have shown that ADC values in DWI can aid in distinguishing low grade meningiomas from higher grades with the low grade tumors having significantly higher values [9, 10]. The absolute ADC value of our case was $0.8x10^{-3}mm^2/s$ that is on higher side.

A recent study by Wu et al in 2023 to differentiate intradural metastasis from meningiomas didn't find any difference in ADC values among the 2 entities however they suggested that assessing vascular permeability (wash-in parameter with dynamic contrast enhancement) by multiparametric MRI may serve as a refining criterion for distinguishing between these lesions in future —[11]. Dural tail sign also may serve as an indicator in meningiomas which may however not be present in all cases of meningioma [5]. Since there are no specific findings on meningiomas on imaging, Zhang et al in 2022 performed an study on 50 brain tumors to differentiate meningiomas from gliomas by imaging and suggested that amide proton transfer imaging (APT) combined with conventional magnetic resonance imaging (MRI) can be used for the differential diagnosis of meningiomas and gliomas[12].

Histopathological examination is diagnostic of angiomatous meningioma where the tumor shows numerous varying sized vessels with frequent hyalinization of their walls and focal mengingothelial cells in compact lobules of syncytial bland cells[4].

Pre-operative recognition of this entity is important because devascularization of the tumor by embolizingmain feeding arteries can markedly reduce the intraoperative bleeding and allowsfor a safer tumor resection.

Conclusion

Being a vascular lesion, distinguishing angiomatous subtype of meningioma from other mimics like haemorrhagic glioma or a vascular metastatic tumor can be challenging on conventional imaging grounds alone. However, there are certain clues in imaging and ADC values and APT imaging modalities may help.This will limit unnecessary investigations in search of a primary tumor elsewhere in the body and a pre-operative embolization may also be of benefit in these cases to avoid excessive blood loss during surgery.

Acknowledgement: None

Conflict of interest: None

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