



ORIGINAL RESEARCH PAPER

Radio Diagnosis

PICTORIAL REVIEW OF IMAGING FEATURES OF VARIOUS CEREBRAL VASCULAR MALFORMATIONS BY MRI AND MR ANGIO

KEY WORDS:

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INTRODUCTION

Cerebral vascular malformations (CVM) manifest with abnormal vessels in the brain at imaging and must be differentiated from one another due to their different treatment strategies.

Cerebral vascular malformations classified by histopathology into four major types.

1. Arteriovenous malformations
2. Venous angiomas (Developmental venous anomalies)
3. Capillary telangiectasias
4. Cavernous malformations.

BACKGROUND

Cerebral vascular malformations manifest with abnormal vessels in the brain at imaging and must be differentiated from one another due to their different treatment strategies. Cerebral vascular malformations classified by histopathology into four major types such as arteriovenous malformations, venous angiomas (Developmental venous anomalies), Capillary telangiectasias and Cavernous malformations. Vascular malformations of the brain are the rare entity that can cause major mortality and morbidity.

OBJECTIVE

To illustrate imaging features of various types cerebral vascular malformations by MRI and MR Angiography pictorially.

MATERIALS AND METHODS

A prospective study done in the department of Radiodiagnosis, government general hospital, Kurnool medical college, Kurnool. Patients from all age groups including men and women came for clinical work up of intracranial hemorrhage, seizures, focal neurological deficits and headaches found with imaging features of cerebral vascular malformations in MRI (Philips Ingenia 1.5 T scanner and Time of flight (TOF) MR Angiography are included in the study and evaluated.

RESULTS

A total of 6 patients with imaging features of cerebral vascular malformations noted and evaluated. Brain arteriovenous malformations has been observed in one patient, cavernous malformations in two patient, pial arterio venous fistula in one patient, dural arterio venous fistula in one patient and vein of galen malformations in one patient.

DISCUSSION

Cerebral vascular malformations are functionally classified as

1. CVMs with arteriovenous shunts

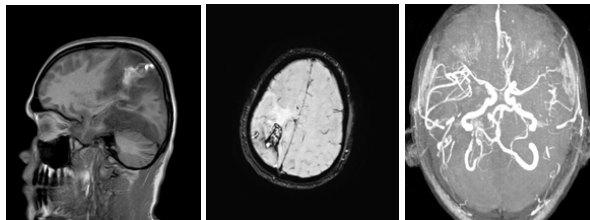
- a) Arteriovenous malformations
- b) Dural AV fistula
- c) Vein of Galen malformation

2. CVMs without arteriovenous shunts

- a) Developmental venous anomaly
- b) Sinus pericrani
- c) Cavernous malformation
- d) Capillary telangiectasia

CEREBRAL AV MALFORMATIONS

AV malformations are complex network of abnormal vascular channels consisting of three components; feeding arteries, central nidus, dilated draining veins without intervening capillaries and normal brain parenchyma. AVMs generally resemble bag of worms appearance formed by tangle of blood vessels with little or no mass effect on adjacent brain parenchyma. On MRI they appear as honeycomb of flowvoids on both T1 and T2 scans. T2* sequences show foci of blooming both within and around AVM. Haemorrhagic residua are common.



35 years male presented with focal neurological deficits, on MRI well defined lesion with heterogenous signal intensities in all sequences with blooming in SWI noted in right parietal lobe. On MRA lesion shows multiple closely spaced vessels (bag of worms appearance) s/o arteriovenous malformation in right parietal lobe.

DURAL AV FISTULA

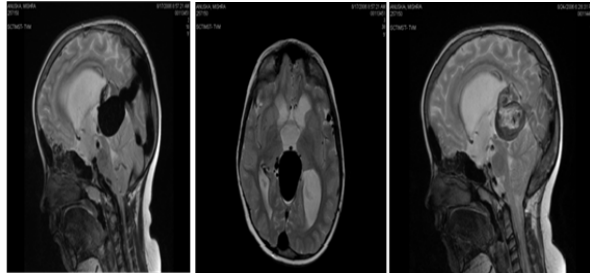
Dural AV fistula second major type of cerebrovascular malformation with AV shunting. It is a network of tiny vessels that shunt blood between meningeal arteries and small venules in the wall of dural venous sinus. These are usually acquired secondary to dural venous sinus thrombosis most common site being transverse and cavernous sinuses in adults and superior sagittal sinus in children.

CT Angiography findings may be abnormally enlarged and tortuous vessels in the subarachnoid space, corresponding to dilated cortical vein, an enlarged external carotid artery or

enlarged transosseous vessels. On MRI presence of dilated cortical veins without identifiable nidus adjacent to normal brain may suggest Davf. Most common finding is thrombosed sinus containing vascular flowvoids on T2 weighted images. DSA remains gold standard for the diagnosis of dural AVF.

VEIN OF GALEN MALFORMATIONS

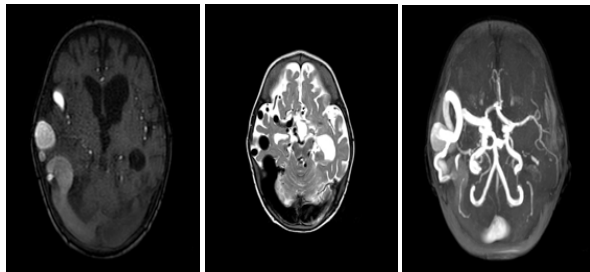
Vein of Galen malformation is direct AVF between deep choroidal arteries and a persistent embryonic precursor of vein of Galen, the median prosencephalic vein (MPV) of Markowski. CT imaging reveals a dilated venous pouch. Mass effect from the dilated vein may result in hydrocephalus due to compression of the aqueduct of Sylvius. Catheter angiography is still the gold standard for the evaluation of VOGM angio architecture. On MR, T1 hyperintensity may be seen in the pouch if a thrombus is present.



Axial and sagittal T2 images showing large central flow void above the pineal region draining into superior sagittal sinus findings s/o vein of Galen malformation.

PIAL AV FISTULA

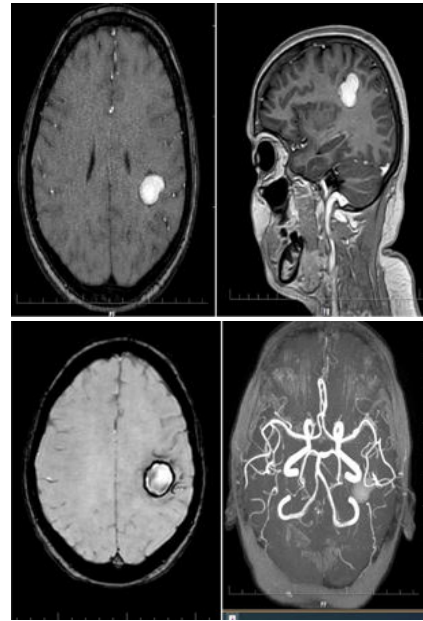
Pial AVF consists of single dilated pial artery connecting directly to enlarged cortical draining vein without intervening capillary bed or nidus.



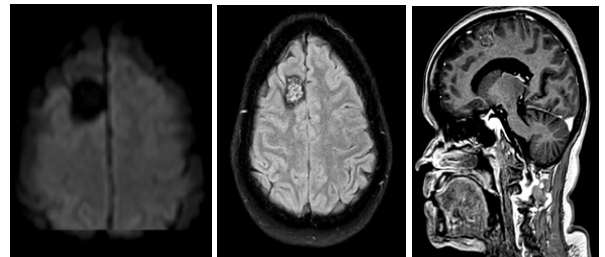
Axial T2 weighted image showing multiple large flowvoids right side, TOF MR Angiography source and 3D images showing large collateral vessels communicating between dilated right Middle cerebral artery and right Transverse sinus-pial arterio venous fistula.

CEREBRAL CAVERNOUS MALFORMATIONS

Cavernous malformations are slow flow lesions, most commonly recent in the 3rd or 4th decades of life with seizure, focal neurological deficits or acute intracranial haemorrhage, however most patients are asymptomatic. CMs may occur in combination with DVA. CT imaging is frequently negative, if the lesion is less than 1 cm, or in the absence of calcification or hemorrhage. On T2-weighted imaging, a peripheral hemosiderin rim may result in a black "halo" around the lesion. The adjacent brain parenchyma is normal. These lesions may have internal areas of thrombosis or hemorrhage, and these blood products are of varying ages. The presence of methemoglobin results in hyperintensity on T1 images. On post-contrast imaging are variable, with enhancement ranging from none to moderate. It is important to look for a DVA on post contrast imaging, as the location of the DVA will be important if surgical treatment is planned in order to avoid inadvertent damage to venous drainage.



46 years old female presented with seizures, on MRI well defined rounded T1 hyper, T2/FLAIR hypointense lesion with peripheral diffusion restriction and thick peripheral rim of blooming on SWI noted in left fronto-parietal region. S/o Type 1 Cavernoma left fronto-parietal region.



48 year old female with history of seizures, on MRI T1 heterogeneously isointense, T2/FLAIR central hyper intense area with peripheral blooming on SWI, showing minimal enhancement on post contrast study noted in right anterior frontal lobe s/o Cavernoma.

DEVELOPMENTAL VENOUS ANOMALY (DVA)

Developmental Venous Anomaly are the most commonly encountered cerebral vascular malformations. Patients are usually asymptomatic with the DVA representing an incidental finding on imaging, but acute thrombosis of the collecting vein may result in hemorrhage or infarction. The classic imaging finding of the caput medusae allows for ease of diagnosis on both contrast enhanced CT or MRI. On non-contrast CT, the draining vein will typically appear isoattenuating to slightly hyperattenuating to the cortex, but if acutely thrombosed, then a markedly hyperattenuating vein may be seen. MR imaging may reveal flow voids in the region of the medullary veins and draining vein depending on size.

CAPILLARY TELANGIECTASIA

These lesions comprise 4-12% of vascular malformations, and are usually small, asymptomatic, incidental findings. Capillary telangiectasias represent localized collections of dilated capillary-like vessels interspersed within normal brain. Capillary telangiectasias are not visible on CT imaging. MR imaging may reveal a focal area of T2 hyperintensity that on post-contrast imaging reveals ill-defined enhancement described as having a "stippled" or "brush stroke" appearance. T2* imaging reveals associated low signal thought to reflect the presence of deoxyhemoglobin due to sluggish blood flow through the region.

CONCLUSION

The rare entities of the vascular malformations with imaging features by MRI and MR Angiography have been reviewed pictorially. MRI and MR Angiography plays vital role in differentiation of various types of cerebral vascular malformations and also plays key role in planning management.

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