Value of three-dimensional contrasted-enhanced MR angiography combined with MRI in diagnosis and treatment of cerebral arteriovenous malformations

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Background

Cerebral arteriovenous malformations (AVMs) are congenital vascular lesions with dilated feeding arteries and draining veins without an intervening capillary bed. Treatment is recommended for most patients because of the risk of hemorrhage, which largely dependent on the imaging information available before treatment.

Objective

The aim was to assess the value of three-dimensional contrast-enhanced MR angiography (3D CE-MRA) combined with MRI in diagnosis and treatment for AVMs.

Methods

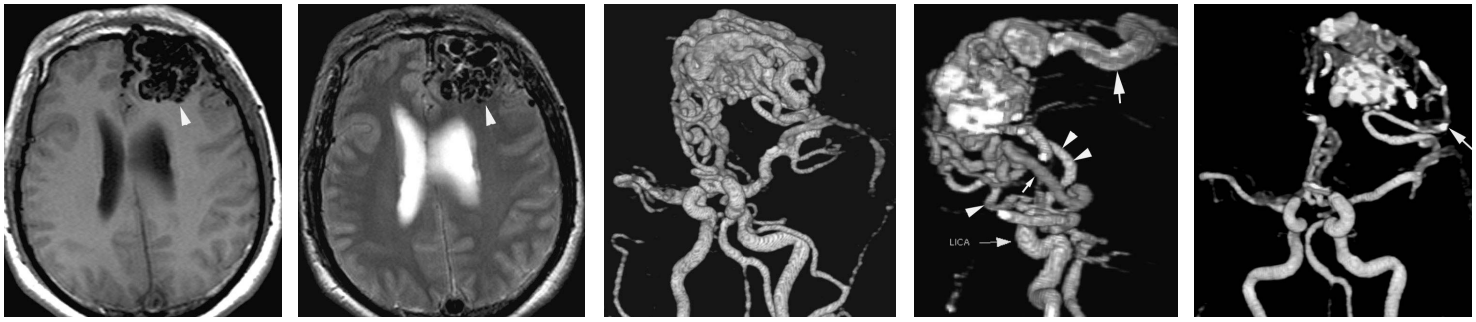
Fifty-seven cases of cerebral AVMs examined by MRI and 3D CE-MRA. DSA was performed in 46 cases. A three-dimensional fast low angle shot (TR/TE/FA = 2.97/1.17ms/20degrees, matrix=115×256, eff. Slice=1.02mm, FOV=16cm×22cm, acquisition time=10s) was used with Gd-DTPA dose, 0.2 mmol per kilogram for body weight. The source images were subtracted from mask images and transferred to computer workstation subsequently post-processed using volume rendering (VR), maximum intensity projection (MIP) and multiplaner reformation (MPR).

Results

Among 57 cases, 49 showed typical AVMs "flow effects" signal on MR images. 3D CE-MRA clearly displayed the nidus, feeding artery and draining vein. 55 foci were above and 2 under the cerebellum tentorium. 32 foci of AVMs located within one lobe, 16 exceed the lobe, 9 situated in the deep of cerebrum, Feeding arteries were derived from single artery in 17 cases, and mixed supply in 32 cases. Draining veins diverted to sagittal sinus and/or sigmoid sinus in 9, deep cerebral veins in 12 and mixed in 28. Correlated with DSA in 46 cases, 3D CE-MRA was superior in three-dimensional demonstration of the nidus than DSA (Fig.1), But inferior in some details. 3D CE-MRA depicted the feeding arteries and draining veins in 78.4% and 84%. In addition, Tiny pathologic blood vessels smaller than 1 centimeter were detected by DSA, but could not be found by 3D CE-MRA and only showed hemorrhage lesions on MR images in 8 cases.

Conclusion

As a non-invasive technique, 3D CE-MRA combined with MRI has the advantage of imaging the entire brain and cerebrovasculature in a single examination with the ability to visualize both the arterial and venous systems. It can gain a better understanding of the complex vascular anatomy and be accurate in diagnosis and localization of cerebral AVMs. 3D CE-MRA provides more stereoscopic information of the nidus, feeding arteries, venous drainage pattern and adjacent brain parenchyma than DSA. These data are important for the planning of surgical resection, endovascular embolization and radiotherapy. It can be used as the first choice for those clinically suspected with AVM. But DSA remains need for some details and tiny AVM.



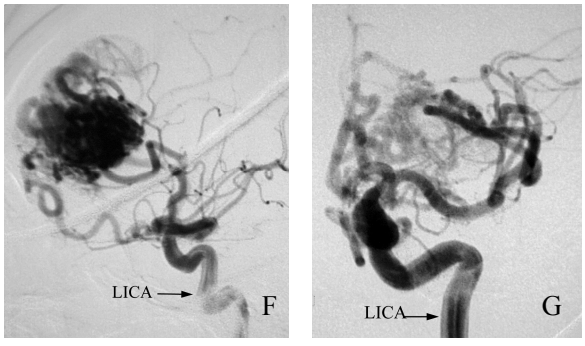


Fig.1 AVM of right frontal lobe with its supplying artery. A and B. T_1WI and T_2WI images show typical "flow effects" signal in left frontal lobe. C-E. 3D CE-MRA images define left anterior and middle cerebral artery as arterial feeding supply. F and G. DSA image confirm the AVM and left anterior and middle cerebral artery supply.