The combined application of MRI and 3D contrast enhanced time-resolved MRA in detecting spinal cord vascular diseases

W-Z. Zhu[1]

[1]Radiology, Tongji Hospital, Huazhong University of Science and Technology, Wuhan, Hubei Province, China, People's Republic of

Introduction

Vascular malformations are a treatable cause of myelopathy. Early diagnosis is very important to its prognosis. Magnetic resonance (MR) angiography is a useful complement to MR imaging for detection and characterization of spinal vascular malformations before DSA.

Objective

To detect spinal cord vascular lesions by combined application of standard MRI and 3D contrast enhanced time-resolved MRA (3D-CETRMRA) and assess the potential of 3D-CETRMRA in identifying arterial feeders and venous drainage of spinal vascular malformation; and to study the MRI features of different cord vascular diseases for accurate diagnosis.

Methods

22 cases of spinal vascular disease proved by DSA or pathology were studied, including spinal AVMs (n=9), AVFs (n=4), cavernomas (n=6) and capillary hemangiomas(n=3). MRI techniques included plain scanning and enhanced MRI. A dynamic contrast enhanced 3D-SPGR sequence within 30s was applied to provide angiographic information. Visibility of the arterial feeder and venous drainage were evaluated by MRA and DSA.

Results

1. In 9 cases of AVMs, MRI showed abnormal flow void along the surface of the cord and serpentine vascular structures involving the cord.MRA demonstrated the arterial feeder, nidus and dilated draining veins in 7 of 9 cases, corresponding to DSA findings. For the other 2 cases, the feeding vessels couldn't be detected by MRA, but the nidus and dilated draining veins were demonstrated as well as that of DSA. 2. In 4 cases of spinal AVFs, MRA could display the feeding artery and tortuous enlarged draining perimedullary veins, depicted the identical location of the fistula to DSA. 3. In 6 cases of spinal cavernomas, MRI findings was characteristic, with a hypointense rim and heterogeneous signal intensity abnormalities on T1WI and T2WI representing blood products of various ages and with mild to moderate enhancement. Gliosis, edema ,hemorrhage and secondary syrinx adjacent to the lesion could cause abnormal signal intensity in the surrounding spinal cord parenchyma. 4. In 3 cases of spinal capillary hemangiomas, 2 were intradural and 1 within the cord. MRI showed a well-demarcated mass, hypointensity on T1WI and hyperintensity on T2WI, and with strong enhancement. 2 of 3 had extensive serpiginous retromedullary vessels along the surface of the cord, this sign was the hallmark of capillary hemangioma to differentiate from neurinoma or meningioma.

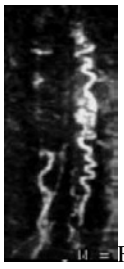
Fig1

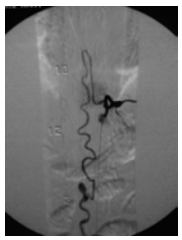
Fig2


Fig3


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Fig1.Perimedullary AVF. MRA demonstrated the feeder was Adamkiewicz A, the location of fistula and tortuous enlarged perimedullary draining veins were detected clearly too. The findings was identical to that of DSA (Fig2).

Fig3. Cavernoma in the cord. T2WI showed a hypointense rim and heterogeneous high signal intensity abnormalities in the cord.

Fig4. Capillary hemangioma. A strongly enhanced and well-demarcated mass in the cord with serpiginous vessels along the surface of the cord.

Conclusion

Dynamic 3D-CETRMRA is a noninvasive technique with high accuracy in the diagnosis of spinal AVM and AVF. The artery pedicles, nidus and draining veins correspond well with that of DSA. MRI features of the spinal cavernoma and capillary hemangioma are characteristic. The combined application of standard MRI and 3D-CETRMRA plays an important role in detecting spinal vascular diseases.

Reference

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