

Combined acquisition of low-dose time-resolved and single-phase high-resolution contrast-enhanced MRA in the evaluation of spinal vascular diseases

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Purpose:

Spinal cord MRA is useful in preangiographic evaluation of spinal vascular diseases, but limited FOV makes their detection in a single MRA session difficult¹⁻³. We report combined low-dose time-resolved and single-phase high-resolution (HR) contrast-enhanced MRA (CE-MRA) at 3.0T that has the potential to be performed in a single session.

Methods:

We retrospectively reviewed the CE-MRA of 9 consecutive patients with a spinal vascular disease confirmed by DSA. All patients underwent combined low-dose time-resolved CE-MRA and 3D single-phase HR CE-MRA at 3T. Lesions were analyzed for the type of spinal vascular disease, the side, level, and number of arterial feeders.

Results:

CE-MRA correctly diagnosed spinal AVM (n=5) and spinal dural arteriovenous fistula (DAVF) (n=4). Low-dose time-resolved CE-MRA demonstrated early venous visualization and aided proper placement of following HR CE-MRA in all patients including 2 patients with high or low level of shunt and feeding artery. HR CE-MRA exactly localized the arterial feeder in 8 patients, and within one vertebral level in remaining one patient.

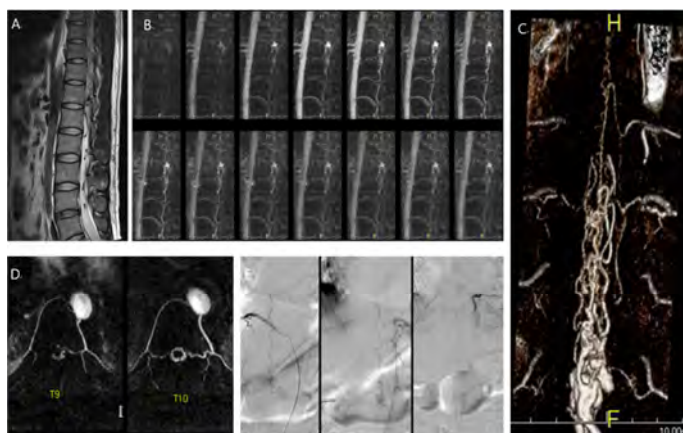


Figure 1. A 31-yr-old man with spinal perimedullary AVF. Sagittal T2WI (A) showed vascular signal voids. Serial MIP images of low-dose time-resolved CE-MRA (B) showed early visualization of dilated venous sac. VR reconstruction image (C) and segmental MIP images (D) of HR CE-MRA suggested feeders of the shunt including anterior spinal artery from left T9 level and posterior spinal arteries from both T10 levels. Spinal DSA (E) confirmed spinal perimedullary AVF with matched level of feeding arteries from posterior spinal arteries,, and collateral supply to the fistula from anterior spinal artery from left T9 level through the basket.

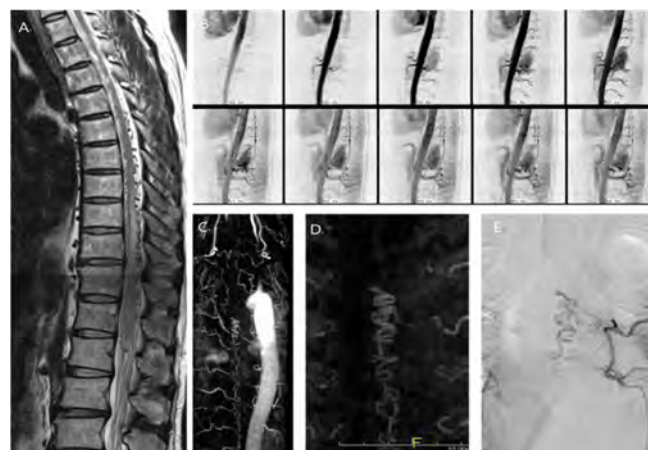


Figure 2. A 53-yr-old man with spinal DAVF. T2WI (A) showed dilated perimedullary veins in spinal canal. Serial MIP images of low-dose time-resolved CE-MRA (B) showed sequential visualization of dilated perimedullary veins from the top of field-of-view. MIP images (C and D) of 3D single-phase HR CE-MRA suggested fistula at the left T6 level, which was confirmed by DSA (E).

Discussion:

With injection of 0.03 mmol/kg of gadolinium-based contrast agent, low-dose time-resolved CE-MRA in our protocol facilitated evaluation of the arteriovenous shunt and flow pattern of venous drainage. In addition, low-dose time-resolved CE-MRA in our series was used as a test bolus sequence to ensure timely bolus arrival during acquisition of the following single-phase HR CE-MRA with injection of 0.1 mmol/kg of contrast agent, which allows less repeated examination and smaller total dose (0.13 mmol/kg) of injected contrast media compared to previous reports¹⁻³.

Conclusion:

Combined acquisition of low-dose time-resolved CE-MRA and single-phase HR CE-MRA at 3T is useful for preangiographic evaluation of spinal vascular diseases in a single session.

References

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2. Lindenholz A et al., *Eur Radiol* 2014;24:2885-2894
3. Cao JB et al., *J Comput Assist Tomogr* 2014;38:474-479