Role of dynamic contrast enhanced magnetic resonance angiography in diagnosis of intracranial vascular disorders

Amr Abdel Azim Afify

Dynamic contrast-enhanced MRA is considered to be a novel technique for imaging vascular pathologies. It has been applied with great success in imaging of nearly all vascular territories. However, the intracranial application of dynamic contrast enhanced MRA technique is met with difficulties, mainly attributed to the fact that the arterial to venous time is very short (3-5 sec.) in intracranial circulation, which leads to venous contamination artifacts. This criterion necessitates increasing the temporal resolution to the sub second domain, to yield clear vascular imaging. As a result, a trade-off between the temporal and spatial resolution has to be -considered.Several attempts and studies have been carried to apply contrast enhanced MRA technique in the intracranial vascular pathologies including, vascular occlusive diseases (whether arterial or venous), aneurysms, and cerebral vascular malformations.The applied techniques included either contrast-enhanced imaging during the steady state after intravenous injection of gadolinium based contrast material using a TOF sequence (i.e.: phases are individually obtained). The later technique is either performed by multislab dynamic contrast-enhanced MRA acquisitions and reformatting modalities or by acquisition of a 2D thick-slab MRA (i.e.: Magnetic Resonance Digital Subtraction Angiography-MRDSA). More recently the earlier technique i.e. dynamic CE MRA using multislab acquisitions, was combined with parallel imaging at 3T magnetic field to increase the signal-to-noise ratio (SNR), thus furtherly improving the spatial resolution at relatively high temporal resolution.The techniques utilized for contrast-enhanced MRA showed the potentiality of such study to improve the visualization of the vascular pathologies by -virtue of elimination of the artifacts resulting mainly from turbulent, slow, or in plane flow through the T1 shortening effect of the intravenously injected gadolinium based contrast material. Moreover, some studies showed that the technique has quality comparable to DSA and may replace DSA in some cases especially where there is allergy to iodinated based contrast media or when DSA is -contraindicated.Conclusion:Contrast-enhanced techniques, with dynamic or time resolved technique has the potentiality to improve the visualization of intracranial vascular pathologies and may - in the future - be considered an alternative to conventional DSA in the setting of the diagnosis of intracranial vascular diseases.